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The Adoption of Renewable Technologies: A Performance Analysis of Strategic and Organizational Approaches for Energy Utilities

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Abstract

The path towards achieving a significant diffusion and adoption of renewable technologies by major energy utilities is one of key challenges for this century, and recent trends characterized by continuous and turbulent changes make this issue well-worth studying. Renewable adoption is the aim of different entities, starting from the society, directly involved in the question as primary user and consumer, Governments which own the power of boosting or discouraging the adoption of renewable technologies, and energy utilities who are up to shape themselves through models and structures which foster innovation.

This thesis focuses on the role played by energy producers in this picture: we tried to depict organizational and strategic choices implemented by major utilities in order to survive to the changing context without falling into the Incumbent's Curse phenomenon.

In particular, this study aims to different goals, which may be summarized in three macro-objectives: (i) to identify the approaches adopted by incumbent firms operating in energy market to manage renewable technologies, (ii) to understand the correlations between contextual variables and implemented models of point (i), and finally (iii) to define the pivotal levers which allow energy incumbents to obtain specific operating and economic performances, in order to highlight which organizational variables are more significant and effective on corporate results.

In order to achieve preposed goals, information concerning firms' business models and organizational structures have been collected, both through direct interviews and through secondary sources; as a second step, the data has been organized following a study framework containing three main points: (i) business model, i.e. offered value proposition and revenue model, (ii) internal organization, including adopted structure, culture and necessary human resources, and (iii) external organization, concerning external networks created to execute specific processes.

The results of this study consist of identifying key connection between organizational levers and corporate performances, starting from influencing contextual factors and considering the moderating role of contingent elements.

Abstract

Scontato, ma doveroso è introdurre il seguente lavoro approfondendo l'importanza che le rinnovabili stanno progressivamente assumendo e assumeranno nel prossimo futuro.

L'attuale consumo energetico in Italia è disegualmente distribuito tra le diverse fonti/tecnologie produttive ("Dati di Produzione", Terna, 2011): il quadro attuale è sicuramente dominato dalla produzione energetica da impianti termoelettrici (75,5%), seguita dalle fonti di energia alternative suddivise in "classiche", come l'idroelettrico di grande taglia (13,7%) e "nuove Fonti di Energia Rinnovabile" (nFER), che comprendono l'energia generata da impianti fotovoltaici (3,1%), eolici (2,8%) e termovalorizzatori (3,3%).

Seguendo un approccio Top-Down e partendo dagli effetti generali di tale quadro è importante scomporre il fenomeno nelle sue possibili cause, in modo da comprenderne in toto i meccanismi e giungere a delle possibili leve operative.

Identificare puntualmente le cause di una situazione tanto preoccupante è decisamente difficoltoso, dal momento che il settore energetico, in parte per sua natura e in parte per la contingente situazione socio-politica, coinvolge aree e soggetti diversi per ambito, livello di responsabilità e identità giuridica. Al fine di proporre un'analisi sistematica, la relativamente bassa diffusione delle rinnovabili nel nostro Paese è ascrivibile a quattro cause principali:

1. La **multidisciplinarietà** stessa del fenomeno e del settore fa sì che in certi casi gli interventi dei diversi soggetti lascino degli spazi vuoti rilevanti o al contrario si sovrappongano creando un'inefficace ed inefficiente incertezza;
2. **Cause tecnologiche**: i costi legati alla produzione di energia da fonti rinnovabili risultano a ora ancora maggiori rispetto a quelli derivanti dalla generazione elettrica da fonti tradizionali, tanto che la cosiddetta *grid parity,* cioè il punto di *"indifferenza perfetta almeno da un punto di vista economico, fra le diverse fonti di energia"* (Solar Energy Report, 2009) è ancora relativamente lontana[1].
3. **Cause macro-economiche**: il settore energetico è stato liberalizzato solo in un'epoca relativamente recente[2] dopo una fase di nazionalismo sfociato nel monopolio per Italia e Francia.
4. **Cause micro-economiche**: le aziende attualmente operanti nel settore energetico sono per loro natura esse stesse una delle cause della scarsa diffusione delle tecnologie rinnovabili. Sistematizzando la situazione del nostro Paese, le società energetiche possono essere raggruppate in quattro categorie: (i) l'ex-monopolista che controlla ancora oggi circa il 30% della totale quota di mercato relativa al consumo di energia elettrica, (ii) le multi-utility municipalizzate, che durante la nazionalizzazione del settore hanno mantenuto il controllo della vendita energetica sul territorio cui

[1] Per gli impianti fotovoltaici da 3 kW, ad esempio, la grid parity è raggiunta nel giro di meno di 10 anni (ossia circa nel 2020) nelle aree italiane a maggior insolazione (Solar Energy Report, 2009)

[2] In Italia il Decreto Bersani ha sancito la liberalizzazione del settore energetico nel 1999; in Francia tale processo è iniziato nel 2000, mentre in Germania la nazionalizzazione dell'industry elettrica è terminata nel 1998

storicamente afferiscono, (iii) i gruppi industriali generatori di energia elettrica da circa un secolo ed infine (iv) le nuove società energetiche, entrate nel settore a seguito della liberalizzazione del mercato, che comunque costituiscono una quota estremamente bassa del totale. Ne consegue che il settore energetico italiano (molto simile in ogni caso a quello francese e tedesco) è perlopiù composto da operatori che da decenni sono attivi nella generazione da fonti tradizionali e potrebbero almeno apparentemente sembrare restii ad innovare. Tale fenomeno in letteratura va sotto il nome di *Incumbent's Curse* e può essere meglio definito come la resistenza da parte delle aziende *incumbent* ad introdurre nuove generazioni di prodotti o tecnologie, a causa dell'inerzia organizzativa creatasi all'interno dell'impresa stessa nel corso degli anni, sia negli aspetti soft, quali la cultura, i valori, il *commitment* del personale, che in elementi più hard, come i processi, le strutture, etc. (Chandy e Tellis, 2000).

Evidenziate e sistematizzate le cause del fenomeno, ciò che davvero merita attenzione sono le leve operative, cioè gli ambiti di applicazione che effettivamente permettono di cambiare il corso drammaticamente inerziale della situazione attuale. In base ai soggetti che maggiormente detengono il potere di influenzare l'evoluzione del contesto, è possibile identificare due leve d'azione:

- **Leva politica**: i governi locali dovrebbero agire al fine di arginare le prime tre cause identificate, mediante i differenti strumenti di cui dispongono; attraverso incentivi e tariffe *feed-in* adeguati è possibile almeno temporaneamente tamponare lo svantaggio economico delle nFER dovuto alla mancata *grid parity* e sostenerne gli investimenti in modo che naturalmente si giunga al punto di pareggio tramite consistenti attività di R&D (cause tecnologiche); inoltre l'emanazione di normative e regolamentazioni coerenti, a diversi livelli, garantisce da un lato una maggiore chiarezza circa gli ambiti di intervento di ciascun soggetto (multidisciplinarietà) e dall'altro la creazione di un ambiente consono alla competizione e pertanto all'innovazione (cause macro-economiche).
- **Leva industriale**: le società energetiche possono strutturarsi in modo tale da superare l'inerzia organizzativa derivante da secoli di attività nella generazione di energia da fonti combustibili e fare pertanto fronte alle cause micro-economiche in primis e indirettamente a quelle tecnologiche, favorendo ed incentivando la ricerca e aumentando la scala produttiva da nFER.

Il presente lavoro si sofferma, dopo una breve analisi della letteratura, sulle cause micro- e macro-economiche, sulle leve industriali e sugli effetti micro-economici che esse provocano; dal momento che il focus dello studio sono le imprese *incumbent*, verrà assunto il loro punto di vista: pertanto cause tecnologiche e leva politica sono considerati fattori esogeni, necessariamente rilevanti nell'analisi degli effetti, ma esterni e non controllabili dalle imprese stesse.

In particolare, questo documento si pone molteplici fini, sintetizzati in tre macro-obiettivi: (i) identificare gli approcci applicati dalle imprese *incumbent* nel settore *energy* per gestire le rinnovabili, (ii) comprendere i legami tra variabili di contesto e approcci, di cui al punto (i), e (iii) definire le principali leve che hanno permesso agli *incumbent* studiati di ottenere determinate performance economiche ed operative, al fine di mettere in luce le variabili organizzative maggiormente efficaci sui risultati aziendali. Per ciascun obiettivo è

possibile definire l'approccio utilizzato per condurre la ricerca e i risultati chiave emersi dall'analisi empirica.

Approcci Strategici ed Organizzativi

In primo luogo il presente lavoro si propone di fornire un quadro empirico sufficientemente completo riguardo gli approcci strategici ed organizzativi adottati dalle imprese *incumbent* del settore *energy* al fine di gestire le tecnologie rinnovabili, superando quindi l'inerzia all'innovazione definita dal fenomeno dell'*Incumbent's Curse*. La prima fase del lavoro ha pertanto fini meramente esplorativi, volti a porre le basi per le analisi successive fornendo un quadro oggettivo e sintetico delle principali imprese *incumbent* attive nella generazione, trasmissione e vendita dell'energia elettrica.

A tal fine sono stati innanzitutto scelti gli operatori italiani rispondenti alla definizione di "*Incumbent*"[3] fornita dalla letteratura e appartenenti ai quattro gruppi di società energetiche identificati sopra: (i) l'ex-monopolista (Azienda A), (ii) le *multi-utility* municipalizzate (Aziende C ed F), (iii) i gruppi industriali (Azienda B) e (iv) le aziende nate nella fase di post-liberalizzazione (Azienda G). Il campione è stato poi ampliato includendo l'ex-monopolista italiano del settore oil&gas (Company H), attualmente attivo nella catena del valore del business nFER, al quale è stata però dedicata un'analisi ad hoc dal momento che adotta un business model singolare, quasi esclusivamente focalizzato su R&D. Infine, l'analisi è stata arricchita dai dati empirici riguardanti quattro imprese estere, tre tedesche (Aziende E, I e J) e una francese (Azienda D) per due principali motivazioni: da un lato il mercato italiano a seguito della liberalizzazione non è esente da *new entrant* stranieri; al contrario le Aziende D ed E controllano attualmente una quota rilevante del mercato del nostro Paese; in secondo luogo, includere imprese straniere nel campione è strumentale alle analisi di cui ai punti (1.2) e (1.3), poiché permette di identificare le specificità geografiche di alcuni fattori ed il loro eventuale impatto su alcune performance.

I dati sono stati raccolti tramite interviste dirette a ruoli manageriali, CFO o responsabili dell'unità di R&D e successivamente ampliati tramite una ricerca trasversale su diversi data base generici, articoli, saggi, pubblicazioni, etc.

Affinché i dati raccolti fossero funzionali alle analisi conseguenti, i risultati della ricerca sono stati organizzati in dieci casi di studio (Capitolo 4: "Case Studies"). I casi sono stati suddivisi in quattro sezioni, rispettivamente riguardanti il **background** dell'azienda, il **modello di business** utilizzato per gestire le nuove tecnologie, la **riorganizzazione interna**[4] e infine l'**organizzazione esterna**, più o meno ampia e

[3] "Incumbents are the largest company in a certain industry that have developed a certain experience in a sector and that have commercialized successfully the previous generation of products" (Chandly and Tellis, 2000; Danneels, 2004)

[4] L'organizzazione interna è stata valutata sulla base di: (i) autonomia e gerarchia della struttura dedicata alle nFER (ad es. unità di business ad hoc, una o più subsidiary controllata/e, spin-off quotata, etc.), (ii) competenze e ruoli delle risorse umane responsabili del nuovo business, nonché sistemi di gestione del personale, strumenti di Knowledge Management, etc, e (iii) cultura e valori alla base della nuova struttura destinata alla gestione delle nFER.

profonda a seconda rispettivamente del numero di attività lasciate in outsourcing e della tipologia di relazione instaurata con i *partner*, sia per attività industriali che di ricerca.

Le dieci imprese *incumbent* sono state poi suddivise in quattro *cluster*, sulla base degli approcci adottati (Capitolo 5: "Clustering"):

1. **Approccio multinazionale mediante spin-off di primo livello**, adottato dal 50% del campione (imprese A, D, E, G e J) e caratterizzato da una forte autonomia e *commitment* nel nuovo business.
2. **Approccio nazionale mediante spin-off di secondo livello**, adottato da un solo caso, l'azienda F; tale approccio è caratterizzato dall'allocazione delle attività rinnovabili in una società *ad hoc* contraddistinta però da scarsa autonomia, dal momento che risulta controllata da una sussidiaria operante in uno dei business tradizionali.
3. **Approccio mediante Unità di Business**, in base al quale le nFER sono allocate in una *Business Unit* interna alla società tradizionale, condividendone pertanto risorse, processi e strutture; l'approccio è stato implementato dalle aziende C e B.
4. **Approccio basato sulla Ricerca e lo Sviluppo**: tale approccio ha il mero obiettivo di sviluppare soluzioni innovative in ambito rinnovabile tramite ricerca interna e *partnership* con soggetti esterni. Fine ultimo dell'azienda H (unico caso appartenente a questo cluster) non è perciò incrementare l'installato e quindi la generazione da fonti alternative; ciò differenzia completamente questa società dal resto del campione considerato.

Variabili di contesto

Il secondo macro-obiettivo di questo lavoro comprende due sotto-fini: (i) identificare le variabili di contesto che hanno influenzato le decisioni strategiche e organizzative di cui al punto (1), e (ii) metterne in luce i legami con gli approcci strategici ed organizzativi delle imprese analizzate.

L'approccio utilizzato per identificare le variabili di contesto maggiormente influenti e per indagarne i legami con i modelli adottati si basa sui principali contributi accademici; i fattori utilizzati nel *framework* del presente lavoro sono stati infatti raggruppati sulla base della letteratura attuale in due macro-categorie: **fattori contingenti** e **fattori organizzativi**. I primi si riferiscono alle variabili esogene, non riguardanti la storia dell'impresa considerata, bensì il contesto tecnologico e di mercato in cui l'*incumbent* operava al momento dell'introduzione delle nFER. I fattori organizzativi incorporano invece le diverse variabili concernenti la storia dell'azienda, le sue dimensioni, gli *asset* e le competenze possedute, etc. che necessariamente hanno impattato sulle scelte relative alla gestione delle rinnovabili

L'analisi contesto-approccio fa luce su due principali aspetti: (i) sui legami causa-effetto tra condizione iniziale e modello implementato, che talvolta appaiono lineari ed evidenti, e (ii) sulle diverse priorità, che aziende differenti assegnano ai vari fattori di contesto, principalmente basate su informazioni latenti concernenti aspetti più "*soft*", quali il *commitment* del *top management* o i valori aziendali. Il secondo punto,

in particolare, permette di spiegare le motivazioni alla base di approcci differenti derivanti però da uniformi condizioni di partenza[5] e viceversa.

Considerando i legami emergenti tra variabili di contesto e approcci implementati, è stato possibile redigere un Clustering di secondo livello, dal quale emergono cinque categorie che sono state poi utilizzate come basi per l'analisi delle performance, di cui al punto 1.3:

1. **Primo Cluster**: comprende le cosiddette *Utilities* (Aziende A, D, E e J), le quali dispongono di ampie risorse complementari che derivano dalla loro esperienza secolare nel settore e quindi dalle dimensioni e dalle disponibilità finanziarie e di brand;
2. **Secondo Cluster**, definito *Multiservice Cluster*, poiché raggruppa le Aziende C ed F operanti nell'erogazione di diversi servizi (gestione delle acque, trattamento dei rifiuti, riscaldamento) in un territorio di riferimento relativamente limitato;
3. **Terzo Cluster**, composto dalla sola Azienda G a causa delle peculiarità dovute alla sua recente creazione e alle indisponibilità finanziarie poiché non quotata;
4. **Quarto Cluster**, definito *Cluster* dei Gruppi Industriali, unisce le Aziende B ed I, accomunate da una storica diversificazione di portafoglio e quindi da un basso *commitment* nelle nFER;
5. **Quinto Cluster**, composto dalla sola Azienda H leader nazionale nel settore dell'*Oil&Gas*.

Performance Economiche ed Operative

L'ultimo macro-obiettivo del presente lavoro riguarda l'identificazione delle performance aziendali e del legame tra queste e gli approcci implementati per gestire le rinnovabili. Le variabili di performance utilizzate nel *framework* possono essere caratterizzate secondo un asse principale in variabili operative e variabili economiche; le prime esprimono l'efficacia degli approcci adottati per la gestione delle nFER utilizzando come grandezze di riferimento la capacità installata e la generazione di energia elettrica; le variabili economiche, coerentemente con una visione economico-patrimoniale, si basano sui principali dati contenuti nel bilancio (verranno utilizzati in questa analisi fatturato, EBITDA ed EBIT, a tre differenti livelli: corporate, generazione di energia elettrica, generazione di energia elettrica da rinnovabili).

Partendo da un generico gap accademico circa l'efficacia dei vari approcci strategici ed organizzativi, il presente studio vuole offrire un'analisi il più completa ed esaustiva possibile. Per tale motivo, l'impatto sulle performance economiche ed operative è stato studiato su due differenti livelli:

[5] Emblematico è l'esempio delle aziende C, F ed I; le tre multi-service operano come aziende di servizi municipalizzate e vantano una storia secolare nel settore dell'energia elettrica. Nonostante evidenti uniformità nei fattori di contesto, C ed I adottano l'approccio basato sulla creazione di una Business Unit, mantenendo le attività nFER all'interno di un'organizzazione esistente e adottando tanto il business model tradizionale, quanto quello anticonvenzionale (solo per grandi impianti), mentre F isola il nuovo business in una spin-off di secondo livello ad hoc e realizza impianti di grandi dimensioni esclusivamente per la gestione interna e installazioni fotovoltaiche per il mercato residenziale. Le cause di tali differenze vanno ricercate principalmente in fattori "soft", quali il minore commitment del top management di C nelle nFER e i valori aziendali di F (teoricamente e praticamente) incentrati sulla valorizzazione etica del territorio di riferimento.

1. **Diverso orizzonte temporale**: al fine di cogliere sia i valori attuali, che l'evoluzione temporale degli indici, lo studio delle performance è stato eseguito confrontando indicatori mono-periodo focalizzati sui risultati del 2011, con indicatori multi-periodo calcolati come incremento percentuale dal 2010 al 2011;
2. **Diversa granularità di analisi**: le performance sono state analizzate tanto a livello di *cluster*, che a livello di singola impresa. In tal modo è stato possibile valutare il differente peso che i fattori specifici della singola società hanno, rispetto a quelli ritenuti comuni per l'intero *cluster*; tre diversi obiettivi possono pertanto essere soddisfatti: (i) innanzitutto utilizzando l'approccio descritto è possibile capire se gli elementi identificati come discriminanti per la costruzione dei *cluster*, sono anche rilevanti per le performance, testando quindi la reale efficacia del *framework* utilizzato; (ii) inoltre, implicitamente, l'analisi empirica consente di identificare una gerarchia dei fattori organizzativi maggiormente influenti per i cinque diversi cluster; (iii) l'analisi a granularità maggiore, che si spinge cioè a livello di singola impresa, permette di non perdere completezza ed esaustività, mettendo in luce le peculiarità di ogni singola impresa, ove rilevanti ai fini dell'analisi delle performance.

I risultati emersi dall'analisi qualitativa necessitano di diverse considerazioni per i diversi livelli di analisi sopra enunciati:

- **Analisi delle performance operative**
  - **Multi-Periodo**: il *Cluster* delle aziende multiservizio registra performance particolarmente alte circa l'incremento annuale di capacità rinnovabile installata, soprattutto grazie ad una politica volta a ridurre i tempi necessari per svolgere le attività a monte nella catena del valore (ad es. ottenimento delle autorizzazioni esterne);
  - **Mono-Periodo**: l'Azienda A sovrasta tanto il suo *cluster* di appartenenza, quanto il resto del campione, grazie all'efficacia e all'efficienza generate dalla struttura organizzativa adottata (*spin-off* quotata e completamente autonoma);
- **Analisi delle performance economiche**
  - **Multi-Periodo**: la *Multiservice* C riconferma l'efficacia delle sue strategie circa l'incremento annuale dei risultati da nFER;
  - **Mono-periodo**: l'Azienda G registra nel 2011 dei risultati estremamente alti, anche se in parte dovuti ad una politica focalizzata sul breve periodo finalizzata però a porre le basi per una futura *leadership*.

Introduction

Background

In 2011, almost 75.5% of the energy produced in Italy was generated from thermoelectric plants; according with Terna's statistics, this share includes 63.5% from natural gas, 19.6% from coal, 3.7% from petroleum products, 2.5% from gas by-products and 10.7% from "other solid fuels" both renewable and non-renewable (petroleum coke, biomass, waste, bitumen, etc.).

Renewable Italian generation came in 2011 from both "classical" sources, such as hydroelectric (13.7%) mainly localized on the Alps and Apennines, and geothermic (1.6%) chiefly in Tuscany, and so-called new Renewable Energy Sources (nRES), such as photovoltaic plants (3.1%), wind installations (2.8%) and Waste To Energy and biomass (WTE) plants (3.3%) (Terna, "Dati di Produzione", 2011).

The present picture has alarming consequences, firstly concerning emissions resulting from the use of fossil fuels, but also regarding petroleum price volatility, which is considered a possible cause of current financial crisis by some analysts, and political instability which may issue from reliance on these products, "finite in quantity and unequally distributed around the world" (Shilling and Esmundo, 2009). In addition to theoretical assumptions, many countries have experienced in recent years practical alarm signs depending on the energetic picture, insomuch as NATO defined the concept of "Energetic Security"(NATO Review, 2011): key warring examples are European reliance on oil and gas, growing energetic needs of BRICS emerging countries (Brazil, Russia, India, China and South Africa), depletion of fossil fuels forecasted for the second half of this century, enhancing of environmental and nuclear discussions, armed raids to energetic provisions and the abuse of energetic sources availability as a political weapon by some countries, etc.

Nonetheless, there are also evident positive signs, which highlight how the renewable sector is actually developing, leaving open a glimmer of hope in this warring picture. Many experts state that an "Energetic Revolution" is actually ongoing (Energy Technology Perspectives, 2010), and whose more significant warnings on worldwide, European and National levels respectively are:

1. **Increasing investment** in renewable energy technologies, chiefly in photovoltaic and wind, are leading some experts to define the nRES industry "countercyclical" in this stage of negative trend: in 2008, the year in which the economic crisis started, "low carbon" worldwide investments reached $200 billion; increasing investments are also forecasted for the forthcoming years: the estimated average annual investment for the span of time between 2012 and 2020 is equal to $450 billion; this value rises up to $600 billion in the decade 2020-2030.
2. **European measures and continuous normative changes** in favor of renewables underline how the alternative sources industry is living and moving; starting from the 1980s, the European Community proposed RES as a solving tool for emission and global warming issues. In 1995 and 1997 two documents were drawn up containing some numerical but non-binding goals concerning

renewables[6]. The turning point was the European action plan of 2007, i.e. the climate and energy package comprising four pieces of complementary legislation which were intended to deliver on the three so-called "20-20-20 Targets":

a) A 20% reduction in EU greenhouse gas emissions from the 1990 levels;
b) Raising the share of EU energy consumption produced from renewable resources to 20%;
c) A 20% improvement in the EU's energy efficiency.

These points are the preamble for considering actual normative actions in favor of renewables: in order to foster renewable development and to reach the above stated targets, each nation introduced incentives and legislative measures, concretized in the CIP6 mechanism, then in continuously changing "feed-in tariffs" and "Green Certificates": in praxis, the Government bound itself in taking on an expense equal to the incentive amounts for the different renewable technologies in the name of European binding measures. An economic support to energy utilities is still necessary if the Government wants to reach such targets, because energy production from renewables remained more expensive than fossil fuel generation in 2011.

3. **Italian growing importance of energy efficiency** issue in OCSE area (Organizzazione per la Cooperazione e lo Sviluppo Economico).

A second important issue regarding "Energy Revolution" concerns the ownership of the over explained changing process. A further possible problem could in fact derives from the multi-sectorial nature of the energetic situation: reducing fossil fuel-based technologies in favor of "low-carbon" sources touches environmental, social, political, economic and industrial areas. When a process has so many shareholders belonging to several fields and with different goals, two possible consequences may occur: (1) nobody takes the real ownership of the procedure, or (2) several application areas overlap jeopardizing the achievement of final goal. A clear subdivision of goals and roles should thus be necessary, in order to actively and effectively foster both diffusion and innovation in the renewable field:

- **Governments** can play a fundamental role along two parallel avenues concerning respectively (i) deregulation, and (ii) incentive policy.

  On the one hand, deregulation which has progressively characterized energy industry in the last 15 years can generally permit new competitors to enter a field previously closed to them and guarantees the correct dynamic of a sector typically considered a natural monopoly. Many authors underline the importance of a concurrence to guarantee the conditions for innovation, changes and market evolution, which in the energy field could just be realized by an external authority, such as Governments and its several branches.

  On the other hand, Governments should adopts policies aiming at overcoming innovation barriers due to differential costs between traditional and renewable technologies, through many methods:

[6] In 1995 *"An Energy Policy for the European Union"* and in 1997 *"Energy for the future: Renewable Sources of Energy"* stated that within 2010 European Nations had to reach a value of 12% of internal energy consumption coming from renewable sources; in 2001 *"Directive2001/77/CE"* ratified that these guidelines were non-binding for EU states.

feed-in tariffs, fiscal reliefs, benefits, etc. These policies should boost an innovative industry which would otherwise be destined for a technological death, because of its costs, at least until the forecasted Grid Parity.

- **Final customers** also play a pivotal role for two reasons: (1) if at the beginning of the 1980s, renewables could be considered a "technology-push" innovation, social awareness and developed knowledge of that time transformed them in a "demand and market-pull" innovation; "Energy Revolution" is even more a Bottom-up change, starting by final users' increased consciousness and environmental responsibility. (2) The progressive commodization of electricity pushed energy utilities to "develop a new (called unconventional) value proposition, to maintain competitiveness in the changing energy landscape" (Richter, 2012). This unconventional value proposition changes the role of the customers, who become "active energy partners rather than passive rate-players", since the new business model requires the involvement of the consumption side in the demand-response program, by both the simple sale of energy plants to the customers (e.g. photovoltaic panels) or the stipulation of partnership agreements in which the customer makes, for instance, his roof available for solar devices owned by the utility (Richter, 2012). In any case, the user starts being an auto-generator of electricity from renewables.
- **Energy companies** finally have to find their renewed role and structure in this changing context, in order to successfully manage renewable innovations. The even greater technological complexity which characterizes renewable energy sources requires for instance new business models, based on the direct involvement of external shareholders previously marginalized and ignored: as already stated above, a successful incumbent should be able to consider the final users' active role as an opportunity, create strong and frequent relationships with the Government and its local departments due to their pivotal role, and finally open up with external know-how owners, such as other firms, research institutions, universities, etc. with different partnership forms.

In this study attention is paid to the renewable energy technologies industry, whose competing technologies system is the electric power generation industry, its dynamics and main shareholders.

The goal of this research is to investigate and evaluate the phenomenon of renewable technology development and its management by main Italian, German and French energy incumbents. In particular, it aims to offer two key contributions:

1. to provide a general picture of main strategic and organizational approaches, undertaken by ten energy firms starting from different contextual variables; as a result, this document tries to fill an existing gap in current literature, by taking into account all possible approaches including three levels, i.e. business model, internal structure and external organization, through which an energy incumbent could face renewables;
2. to qualitatively investigate the effectiveness of different approaches, by measuring their effects on both economic and operating performance.

Structure

The first section of this research provides a general overview of the up-to-date literature concerning the analyzed issue. In particular, this chapter contains a review about the general incumbent's curse theme: by starting from incumbency's definition, the section presents key contributions regarding inflexibility and inertia due to this phenomenon, its causes and possible solutions; in addition, objectors' ideas have been gathered, in order to consider also a possible overstatement of the phenomenon. Finally, the first Chapter contains a review of the issue applied to energy industry and identifies evident gaps in current literature.

The second Chapter contains a description of research methodology: empirical data has been collected by both direct and indirect sources; the majority of information used has in fact been gathered through direct interviews with managerial figures of the ten analyzed companies. Finally the picture has been completed with secondary data sources, such as internal sources (annual reports, industrial plans, presentations, etc.) and external sources (generic databases, articles, papers, etc.).

The gathered information has subsequently been verified, cross-referenced and presented in the fourth Chapter (on the basis of the framework reported in third Chapter), through the form of ten case studies: each case refers to a specific company and contains data concerning the society's background, adopted business model, internal structure and external organization.

The following section provides a systematic organization of study cases; resulting clustering has two key aims: (i) to investigate context-approach relationships and (ii) to provide a basis for subsequent discussions on the impacts of approaches on economic and operating performance.

Finally the sixth Chapter contains the discussions: each one of the five clusters is singularly analyzed and key mechanisms and levers which may affect corporate performance have been identified. In order to provide a wider analysis, two performance dimensions have been used, i.e. economic and operative. These two performance areas have then been divided in sub-goals, i.e. revenues, costs, risk and time, which help in offering a more detailed study.

The final Chapter aims to draw final conclusions and identify possible avenues for future researches starting from the limitations of this present work.

1. State of the Art

1.1 Incumbent's Curse

A frequent theme in innovation literature is incumbent enterprises' difficulty facing the industry revolution created by a radical technological innovation (Rothaermel and Hill, 2003). This phenomenon has been labeled "Incumbent's Curse" and can be defined as incumbents' resistance to innovate and introduce a new-generation product, caused by both bureaucratic and cultural inertia of the established firm (Chandy and Tellis, 2000). The Incumbent's Curse is described by Chandy and Tellis as a phenomenon that cyclic occurs, every time an innovative technology is introduced by an entrepreneur. Substancially, scholars argue that incumbents go into decline, while new entrants exploit the new technology and achieve success. As a result, new entrants become "new incumbents" for the next innovation wave (Chandy and Tellis, 2000). The essence of incumbents' problem can be summarized as the trade-off between the exploitation of existing technologies, capabilities and markets, with the exploration for new technologies, capabilities and markets (March, 1991). Empirical evidence of the phenomenon has been observed over the years by numerous studies (e.g. Abernathy and Utterback, 1978; Christensen, 1997; Henderson and Clarck, 1990; Ghemawat, 1991; Tushman and Anderson, 1986; Utterback, 1994).

1.1.1 Causes of incumbent's curse

Several explanations have been offered in the literature for incumbents' failure to pioneer radical innovation and to respond to the innovations of new entrants. These explanations are rooted in economics, organization theory and strategy and complement each other (Hill and Rothaermel, 2003).

Economics explanations: the economic point of view try to explain the phenomenon of incumbent's non-innovation as a problem of incumbents' lack of incentives in respect with new entrants (Henderson, 1993). These models are based on the concept of "perceived incentives": incumbents may perceive smaller incentives to introduce radical product innovations than non-incumbents (Chandy and Tellis, 2000) and more incentives to invest in incremental innovations, because in this way they can exploit their established knowledge base, maintain entry barriers (market power, monopoly rents etc.) and protect their current rent stream (Gilbert and Newbery, 1982; Reinganum, 1983). Furthermore, some models suggest that, under conditions of uncertainty, incumbent firms are less likely to invest in radical innovations than new entrants, because of the fear of cannibalizing the stream of rents from their existing products (Gilbert, Newbery and Reinganum, 1984; Reinganum, 1983): a rational enterprise prefers to maximize the returns from known technology, rather than dedicate resources to a new technology with an uncertain payoff. Moreover, incumbents have a disincentive to invest in new technology, because they might create a disequilibrium conditions that erode any market power they enjoy (Henderson, 1993; Reinganum, 1983). Hill and Rothaermel (2003) compare the phenomenon to opening Pandora's box: once the box of new technology has been opened, even by an incumbent, the technology may trigger changes that alter the structure of the

industry and cause the demise of the incumbent firm. Besides, the lack of incentives to invest in new technologies comes from companies shareholders (or private equity funds that participate firms capital), who prefer to invest in incremental innovations that allow them to have financial/economic returns in short terms (Pisano and Verganti, 2008).

Organization Theory explanations: incumbent inflexibility is also caused by the organizational inertia, that constrains an established firm's actions. Hannah and Freeman (1984) explain that organizations are valued for their predictability and reliability, that are ensured by the implementation of information systems and processes. These systems require formalization and bureaucracy, that tend to inhibit changes and cause inertia. Paradoxically, the systems that help an organization to be effective and efficient, contribute to inertia and maybe to firm decline in dynamic environments. Chandy and Tellis (2000) identify two different classes of organizational causes for incumbents' non-innovation: organizational filters and organizational routines.

- **Organizational filters** "are cognitive structures that screen out information unrelated to the organization's important tasks to focus its attention on these tasks." (Chandy and Tellis, 2000). Organizational theorists argue that the organizational filters of incumbents make them less effective at radical innovation (e.g., Hannan and Freeman 1977; Henderson and Clark 1990; Nelson and Winter 1982), but more at incremental innovation. In fact, they focus on existing customers and try to ensure that the current products meet consumer expectations as effectively as possible, in order to maximize the current stream of rents. As a result, these organizational filters may cause incumbents to be less effective than non-incumbents at spotting, developing, and marketing radical product innovations (Henderson 1993). Leonard-Barton (1992) summarized this concept, by documenting how core competencies of a firm can become core rigidities.

  The problem of organizational filters can be explained also as a lack of appropriate absorptive capacity (Cohen and Levinthal, 1990). Absorptive capacity refers to an organization's ability to "recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990). According to the concept of organizational filters, an incumbent may have excellent absorptive capacity capability regarding their established knowledge base, but it may fail in spotting and concretizing outside knowledge.
- **Organizational Routines**: organizations based in stable environments develop highly structured routines to reduce the costs of information acquisition and utilization and of manufacturing and distributing large volumes of the current product efficiently (Simon, 1955; Hannan and Freeman 1977; Henderson and Clark 1990; Nelson and Winter 1982). These routines have a high economic value in a stable environment, but cause great limits for incumbent in coping with disruptive technology: the organization does not look outside its standard frame of reference and, thus, may fail to spot or respond to the competitive threat posed by new entrants pioneering radical innovations (Hill and Rothaermel, 2003). Moreover, adoption of radical innovations would obsolete many of these routines and require the development of new routines, which is difficult, costly, and risky (Hannan and Freeman 1977; Nelson and Winter 1982).

Another cause of organizational inertia can be the importance of power and politics (Cyert and March, 1963; Pfeffer, 1992): in time of stability the different actors distribute the power and the influence over the resources, but organizational changes involve a redistribution of power and influence; absent strong leadership can slow down any attempts to achieve a transformation in power distribution and cause, thus, organizational inertia.

Strategy explanations: incumbent inflexibility can be also explained analyzing an incumbent's strategic orientation. A firm is obviously part of an open social and economic system, because it bases a great part of its value on the strategic relationships with customers, suppliers, investors, communities, complementary product providers etc. Its previous and current success is due to the existence of these strategic commitments. This network can and often produce incumbent inflexibility, when the organization faces with a disruptive innovation that requires a partial or completely new network (Hill and Rothaermel, 2003). Another strategic explanation, connected with the concept of strategic network and based on Resource-Based Theory, is the lack of "Customer Competence", i.e. the resources required to serve certain costumers: brand, reputation, access to sale channels, communication channles, etc. (Danneels, 2004). The focus of Danneels's research is on what resources the firm needs to add to its network to take advantage of the new technological field ("resource gap"). Also Christensen (2000) argues that incumbent tend to fail when the disruptive technology does not initially fulfill the needs of the customers of the mainstream network. The empirical proof of this theory is that many incumbent firms were able to develop working prototypes of products using the disruptive technology, demonstrating that they had the necessary technological competence, but they faltered when they tried to market the disruptive technology to their current customers (Danneels, 2002). Incumbent's problem is, in this strategic view, a commercialization problem (Dew et at., 2008).

Finally, Christensen (1997) proposes a further explanation that touches both economic, organizational and strategic fields. The scholars explains that incumbent's inflexibility by analyzing a firm's internal resources allocation processes (Bower, 1970): these processes are strategic designed to optimize the profitability of the firm's current operations. According to this theory, incumbents generally ignore radical innovations, because they provide inferior performance initially and only serve small fringe markets with different customers.

1.1.2 Overstatement of incumbent's curse

On the other hand, some recent researches demonstrate that in many case incumbents introduce new products and maintain the leadership of the sector (Danneels, 2004; MacCormack and Iansiti, 2009). Several scholars underline that the organizational inertia and the cultural problems of incumbent firms may have been overstated (Methe´ et al, 1997; Klepper and Simons, 2000; Chandy and Tellis, 2000), since counterexamples to the model of incumbent's curse are too frequent to ignored (Chandy and Tellis, 2000; Rosenbloom and Christensen, 1998; Rothaermel, 2001). For instance, Chandy and Tellis (2000) studied the origins of a broad range of radical product innovations in office products and consumer durables across 150 years. They find that after World War II, incumbents introduced the majority (74 percent) of radical product innovations within the two product classes they studied. Substantially, in order to explain their empirical foundations,

Chandy and Tellis argue that, if incumbents can muster the willingness to cannibalize their own investments (Chandy and Tellis 1998), they can exploit their many resources to lead with radical innovations. Some scholars appoint also that incumbents can rely on different capabilities that can create opportunities for radical innovation: a better customer knowledge, that let incumbents understand clients' needs and purchase behaviors (Chandy and Tellis, 1998); customer franchise, which renders customers less apprehensive about purchasing a radical product innovation that usually is perceived as risky (Bauer 1960; Folkes 1988; Gregan-Paxton and John 1997); a greater market power, which gives them preferential access to distribution channels in comparison to non-incumbents (Mitchell, 1989) and enable incumbents to sustain their market presence during the long and unprofitable period until the product takes off (Chandy and Tellis 1998); organizational slack, defined as "that cushion of actual or potential resources which allows an organization to adapt successfully to (…) external pressures for change in policy, as well as to initiate changes in strategy with respect to the external environment" (Bourgeois, 1981; Hill and Rothaermel, 2003); more financial resources, according to Neo-Schumpeterians (Nelson and Winter, 1982) (Hill and Rothaermel, 2003); accumulated experience from prior technological regimes, that for some scholars (King and Tucci, 2002) doesn't lead to inertia, but foster the entrance into new market segments.

1.2 Business Model and Organizational Approaches

Since empirical studies show that some incumbents survive and some pioneer disruptive new technologies and dominate the post-discontinuity market (Rothaermel, 2001; Rosenbloom and Christensen, 1998), a stream of literature deals with the different approaches that let established firms survive or even lead radical innovation market. The approaches that incumbent firms need to implement regard two levels of organization management: a strategic level and an organizational level. Both strategic and organizational approaches aim at proposing solutions that the management should follow in order to neutralize or diminish the power of one or more of the various sources of incumbent inflexibility (Hill and Rothaermel, 2003) and to enabling radical innovation from organization itself (Yu and Hang, 2010).

1.2.1 Strategic Level

First of all, in fact, an organization that enter a new market with a disruptive technology need to define a new business model (Hill and Rothaermel, 2003). The business model can be seen as the composition of the different elements that allow a company to make profit and the relationships between them. Therefore, "a business model tries to give an integrated and consistent picture of a company and the way it aims to generate revenues." (Schweizer, 2005). Although in literature doesn't exist a general representation for business models, some authors defined four dimensions: (1) the value proposition, (2) the customer interface, (3) the revenue model, and (4) the infrastructure. In regard to this strategic level, empirical evidence shows that the change in business model should be upstream in respect with organizational approaches: "Christensen (1997) argues that, even with the best of intentions, initiatives designed to exploit a radical new

technology can fail, because commercialization of the technology may require a business model different from that used by the firm." (Rothaermel and Hill, 2003). Thus, an incumbent firm who decides to enter a new market with a radical innovation, need to specify a business model, that is clearly different from the existing one. In literature is also underlined that the simultaneously management of two different business model within the same organization is impossible (Porter, 1985; Rothaermel and Hill, 2003).

1.2.2 Organizational Level

On the other hand, following Yu and Hang's (2010) review, the organizational solutions proposed in literature can be sorted into four aspects of organizational management: (1) human resources, (2) organizational culture; (3) resource allocation, and (4) organizational structure.

Human resources within companies can be grouped into two main categories, due to their different tasks, culture, commitment, etc: managers and employees. Starting with manager they may cause inertia and inflexibility, because of their strong commitment with past and current firm's situation and structure. Thus, they are skeptic in respect with changes and they are "locked-in" the present status and may not be able understand the promise of a disruptive innovation, because their mindset is calibrated on current market (Henderson, 2006). Therefore, in order to increase company's dynamism and flexibility, a possible solution may be the insertion of an additional team at corporate level, responsible for supporting the development of radical innovation ideas and their implementation (Christensen and Raynor, 2003). Furthermore, some researchers' attention focuses on incentive plans: these should be long-term oriented, so that managers are goaded into considering long term benefits of innovation, rather than avoiding the risk of disruptive innovation.

About employees' perspective, the researcher team should be composed by risk-takers and the firm should recruits outside expertise (Murase, 2003). Christensen (1993) states that innovation starting from people in direct contact with markets and technologies can be more effective and successful than innovation based on "analyst-laden corporate strategy or business development departments" (Yu and Hang's, 2010). Furthermore, the majority of radical innovations are founded by frustrated engineering teams from incumbent companies (Christensen and Bower, 1996; Yu and Hang, 2010). Thus, these firms should be able, through specific mechanisms, to avoid and "prevent disruption from outside due to brain drain of talents and disruptive ideas." (Yu and Hang's, 2010).

Organizational culture can be both an opportunity and a threat to the management of radical innovation. First, organizational culture can be an effective tool of controlling and coordinating people within a company, without using formal methods (Tushman and O'Reilly, 2002). If the firm is an incumbent, the culture is clearly stronger and better defined. But, as already stated, organizational culture can be a cause of incumbents' inertia in front of disruptive innovations. Thus, it is important that incumbents create an organizational culture that can foster the advent and the application of radical innovations (Lichtenthaler, 2006). Naranjo et al. (2011) used the Cameron and Quinn's (1999) model to identify the characteristics of organizational culture that foster radical innovation. Naranjo et al.'s thesis is that adhocracy is the type of

culture that most favors innovation orientation, since it is based on flexibility, creativity and external orientation. Thus, the elements that should be the basis for an innovative culture, are for instance entrepreneurship, risk-taking, creativity, flexibility etc. Some authors applied these elements in more practical and holistic cultural strategies, such as visionary leadership and willingness to cannibalize: G.J. Tellis (2006) finds the main incumbent's survival reason in its availability of developing and implementing a "Visionary Leadership" (Tellis and Golder, 1996), a leadership style that is oriented toward future emergent markets and thus, produce a continuous radical innovation. The orientation toward future at the basis of "Visionary Leadership" has a positive influence on "willingness to cannibalize" (Chandy and Tellis, 1998), which "refers to the extent to which a firm is prepared to reduce the actual or potential value of its investments. It is an attitudinal trait of the key decision makers of the firm and resides in the culture, or shared values and beliefs, of the firm (Deshpandé and Webster, 1989)." (Chandy and Tellis, 1998).

Resource allocation: As already appointed, resource allocation process within an incumbent firm is managed through standardized routines; as a result, the company try to apply these routines also to emerging disruptive projects, that clearly appears financially and economically unfavorable, and the organization is "locked into businesses in which it has accumulated resources" (Christensen, 2006; Lichtenthaler, 2006). Some scholars proposed mechanisms that could foster radical innovation in regard to resource allocation problem. These mechanisms belong all to the concept of separate and independent managing of sustaining vs disruptive innovations (Chao and Kavadias 2007; Hogan 2005), in particular, the management through mini-projects, since each project is seen as unique and requires different resources (Yu and Hang, 2010).

Organizational structure: A more wide stream of literature deals with incumbent's curse by defining some practical organizational approaches that can better lead to innovation. Several organization structures may be adopted to adapt the firm to a new and changing environment. In particular, the solutions offered in literature can be grouped into two approaches: (1) organizational structures adopted by incumbent firms in order to face a changing environment, in term of size of firm and business units, spin-offs vs ambidexterity (Yu and Hang, 2010), and (2) the role of the network of external relationships that can help an incumbent to spot the radical innovation and to develop the necessary competences to exploit it.

Number and size of business units: a large stream of literature starting from 1980s-1990s has focused on firm and business unit optimal size, in order to obtain innovation efficiency and effectiveness (for instance Cohen and Klepper, 1996; Tsai and Wang, 2005). In particular, the most recent trend suggest that innovation activities are better executed in small units, than in larger ones (Lee and Chen 2009; Lejarraga and Martinez-Ros 2008): from empirical researches and surveys, it comes out that incumbents' inflexibility and inertia can be overcome by having smaller business units, "so that it can continue to keep its decision-makers excited and take emerging opportunities seriously" (Yu and Hang, 2010). However, literature presents also some counter-arguments: too small business units imply an higher number of departments that need to be coordinated; thus, the overhead expenses resulting from these activities could be reduced or eliminated when small business units are consolidated in larger entities (Christensen and Raynor 2003).

Spin-offs vs Ambidexterity: some contributions focus on the concept of "autonomous organizations" to develop and commercialize venture (Christensen, 2002). Chandy and Tellis (1998) argue that internal autonomy has a positive effect on the "willingness of cannibalization"; in fact, if the managers of the single business units had the autonomy of making key decisions regarding new potential products, than an hypothetical decision of cannibalizing an investment would be easier. This because, top managers are accused of having an emotional commitment to the established strategy and status quo and often are unable to see things from a different perspective (Burgelmann, 1994; Miller, 1990; Hill and Rothaermel, 2003). On the contrary, middle managers can sound the alarm about opportunities and threats coming from radical new technologies (Burgelman and Grove, 1996). Nevertheless, the strategic autonomy is ineffective if not legitimized and institutionalized (Hill and Rothaermel, 2003; March and Simon, 1958). Autonomy may be applied to values and processes, and it isn't always related to geographical or ownership separation (Christensen and Raynor 2003), except for some extreme solutions like the **spin-off**: Christensen (2002) supports the thesis that an incumbent firm, in order to develop and commercialize radical innovations, should create a completely separate organization from the existing one. The factors that give reason for this argumentation are essentially two: (1) incumbents' resource allocation process usually tends to focus on core activities to serve existing customers, and therefore deprive radical innovation efforts of the effectively necessary resources; (2) radical innovation processes may be completely different from the firm's core processes and thus resources, competences, activities and values of disruptive innovation technology may not fit with the mainstream organization's characteristics. This misfit between the needs of the discontinuous innovation and existing organization renders often necessary to spin out a new business unit (Rice, Leifer, and Colarelli O'Connor, 2002), since "isolation may protect the project from the counterproductive forces within the mainstream, but it also cuts the project off its most important sources of learning, competences and resources." (McDermott and Colarelli O'Connor, 2002). The thesis comes also from an empirical study: Christensen (2002) argues that the majority of incumbent leaders who succeed at radical innovation and maintain their leading positions, set up an autonomous business unit in which there was the freedom to apply a completely different and more appropriate business model.

On the other hand, other organizational solutions are supported in literature as mechanisms to cope with innovation. Tushman and O'Relly (2002) propose **ambidextrous organizations**. The concept of ambidexterity is generically defined as an individual's ability to use both hands with equal ease and has been applied in various organizational contexts (Rothaermel and Alexander, 2009). This approach aims at creating organizations that contemporarily pursue opposite goals: incremental vs radical innovation, exploration vs exploitation activities, flexibility vs commitment, alignment vs adaptation etc. O'Reilly and Tushman (2004) used the metaphor of a juggler, to explain that organizations that are able to balance both exploratory and exploitative activities con produce a continuous stream of incremental and radical innovations.

There are different approaches regarding ambidextrous organizations: structural ambidexterity (Tushman and O'Reilly, 1996; Gibson and Birkinshaw, 2004), contextual ambidexterity (Ghoshal and Bartlett, 1994; Adler et al., 1999; Gibson and Birkinshaw, 2004), and temporal ambidexterity (Duncan, 1976; Volberda, 1998;

Venkatraman, 2006). In **structural ambidexterity** the opposite goals, activities and processes are carried out in separated organizational units within the firm. The main problem of such an organization is separation and isolation: R&D ideas are not accepted because of their lack of linkages to core business. In order to avoid these extreme consequences of separation, other forms of ambidexterity are adopted and studied: contextual and temporal ambidexterity. **Contextual ambidexterity** is based on task partitioning within a single business unit, whereby one group adopts an "organic" structure to pursue flexibility, exploration etc., while another takes on a "mechanistic" structure that lead to efficiency, exploitation etc. (Adler et al., 1999). Temporal separation is another structural solution in which an entire business unit focuses on one set of tasks one day, then on a different set of tasks the next. Bolinao (2008) finds contextual and temporal approaches more sustainable than structural separation at a corporate level, because it facilitates the adaptation of the entire business unit and not just the separate units or functions responsible for innovation development. These two solutions, and in particular contextual ambidexterity, really merge opposite goals in a single organization rather than in a dual structure, and avoid the problems and the costs of inter-functional or inter-organizational coordination. Structural ambidexterity differs from contextual ambidexterity in many different ways, but they can also be seen as complementary in an organization (Birkinshaw and Gibson, 2004).

One problem of ambidextrous organization may be integration between units or roles with completely different objectives, activities, processes etc. Gassmann et al. (2012) identify some mechanisms to overcome the problem of finding an equilibrate integration, e.g. liaison channeling, the concretization of innovation into artifacts (pictures, prototypes etc) in order to overcome cultural inertia, building of communication network, especially between senior and middle management of exploration units and operational business, the involvement of operational business units in radical innovation research at an early point in the process.

External Networks: Starting from 15 years ago, the attention of researchers has been focused on inter-firm relations, in particular on the role of alliances and collaborations and on their impact on firm's innovation performance (Argyres and Silverman, 2004). In literature, different kinds of collaboration are studied, which could be distinguished first for the level of commitment and second for the kind of external actor involved into the relationship, i.e. start-up competitors, suppliers, customers, etc.

In particular, scholars have classified three main level of inter-firm cooperation, derived from transaction cost theory (Williamson, 1975, 1985). At the first level, firm can cooperate through "contract arrangements, such as contract R&D, manufacturing, marketing, and licensing, where the knowledge transactions can be precisely priced" (Chang, 2003). At the second level, companies may establish "a new organizational form, such as equity investment, joint venture and merger and acquisition" (Chang, 2003). In transaction cost theory these two mechanisms are respectively named "market" and "hierarchy" (Williamson, 1985). The third level of inter-firm collaboration belong to the category of "strategic networking and alliance, where partners generate knowledge jointly" (Chang, 2003) . Some mechanisms may be joint R&D collaborations, research consortia, co-development, and at an extreme situation Open Innovation.

With regard to the organizational form, through which the firm can successfully manage transactions and exploitation of external knowledge, is underline in literature the importance of four mechanisms: (1) a

process view is required to manage knowledge transactions (Chiesa and Manzini, 1998; Doz, 1996; George and Farris, 1999; Lichtenthaler, 2006); empirical researchers have been conducted in particular on the case of alliances (e.g. Chiesa and Manzini 1998; Forrest and Martin 1992; George and Farris 1999; Lane and Lubatkin 1998; Lichtenthaler and Lichtenthaler 2004; Reid et al. 2001). Two authors define an explicit process that can be applied and modified for different kinds of external knowledge acquisition. One model, purposed by Mittag (1985) is based on three main phases: planning (i.e. the planning of tasks, activities, objectives, opportunities), realization (i.e. negotiations with external partner and implementation of the agreement), and control of knowledge transactions. Escher (2001, 2003, 2004) proposes a similar process model, with five phases: identification of exploitation opportunities, evaluation, identification of communication channels, negotiations and knowledge transfer. (2) A dedicated external knowledge transaction unit is proposed by several authors (Escher 2003; Ford 1985; Mittag 1985; Tschirky et al. 2000). This idea is also empirically supported: several companies set up a specialized function, termed for example, 'Licensing group' or 'Corporate Technology Transfer Group' (Arora et al. 2001b; Bidault and Fischer 1994; Birkenmeier 2003; Davis and Harrison 2001; Sullivan and Fox 1996). (3) Some authors suggest a "project organization" to manage knowledge transactions (e.g. Birkenmeier, 2003), in which project-teams are responsible for the tasks of a single project (co-ordination, knowledge integration, maintaining of relationships etc.) (Lichtenthaler, 2006). (4) Firms may also use intermediaries (Bidault and Fischer, 1994; Elton et al., 2002; Lee et al., 2010). Intermediaries are specialized companies, that can help firms to find the right partner and to manage the relationship in particular in case of problems during the knowledge transaction process (Birkenmeier 2003).

Following the classification proposed above, to solve Incumbent's Curse literature focuses particular attention on the second and the third levels: "new organizational forms" and "strategic alliances".

First of all, some scholars argue that a possible solution for incumbent's curse may be the creation of alliances with start-up (Chesbrough, 2002; Helfat and Lieberman, 2002; Rothaermel, 2001) . This form of collaboration could be pursued by incumbents through the forms of **corporate venture capital** or **start-up acquisition** and, if well performed, it may overcome incumbents' inflexibility by coupling incumbents and new entrants advantages in a single organization. These mechanisms are considered as means in which incumbents' resource gaps can be filled through the matching of complementary assets (Danneels, 2004; Helfat and Lieberman, 2002; Rothaermel, 2001). In particular, corporate venture capital is "equity investment by incumbent firms in independent entrepreneurial ventures, i.e., relatively new, not-publicly-traded companies that are seeking capital to continue operation" (Gompers and Lerner, 1998). Many incumbent firms report that their primary motivation for investing corporate venture capital is to gain a window onto valuable, novel technologies so as to improve firm innovative efforts (Siegel et al., 1988). Dushnitsky and Lenox (2004) indentify three channels through which corporate venture capital activity facilitates firm learning from entrepreneurial ventures: (1) the due-diligence process provides the firm a unique opportunity to learn about entrepreneurial inventions even prior to committing capital; (2) post investment, an investor may learn about novel technologies by maintaining board seats (or board observation

rights) as well as utilizing dedicated liaisons; (3) a failing venture may also constitute a learning experience to the extent that it offers technological insights, or conversely points at market unattractiveness. Substantially, through CVC investments, incumbent companies may increase the stock of knowledge from which they may base innovation and obtain advantages (Chesbrough, 2002).

Another external mechanism to pursue innovation is the application of **Open Innovation Theory**, that is largely studied by recent researchers. As already stated above, "spin-offs, alliances, market transactions and acquisitions are comparatively optimal for corresponding points at different stages of disruptive innovation (Claude-Gaudillat and Quelin 2006)" (Badir et al., 2009). Furthermore, some empirical researches (IBM, Kodak and HP) show that a combination of different forms of collaboration and a stronger commitment in the relationship bring to successfully manage radical innovations (Macher and Richman, 2004). In this context, Chesbrough (2003), coined the term "Open Innovation", to contrast with closed innovation strategies (Lichtenthaler, 2009). Open innovation has been defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough et al., 2006). At the basis of "Open Innovation" paradigm there is a wide network of collaborations with lead users, suppliers, research centers, universities and with a range of institutions inside the innovation system (von Hippel, 1988; Lundvall, 1992; Brown and Eisenhardt, 1995; Szulanski, 1996). Incumbents establish collaboration and build networking with the purpose of scouting capabilities, knowledge and ideas that came also from external organizations and from specialists (Kirschbaum, 2005; Chesbrough, 2003). To do it, incumbent's organizational structure need to be opened to external environment: "in open innovation processes, organizational boundaries are porous and firms strongly interact with their environment (Gassmann, 2006; von Hippel and von Krogh, 2006; Cooper, 2008)" (Lichtenthaler, 2009). Gassmann, Henkel, and Chesbrough (2010) organized the research streams focused on this issue into some different perspectives. The perspectives that are mainly important for this work are structural, process and tool perspectives:

The **structural perspective** analyzes work division among the different actors of innovation network and the organizational structure required to manage it. About organizational structures, attention is paid to both macro-structural and micro-structural organization. In order to manage open innovation processes, the firm require internal entities to integrating external with internal knowledge. These **macro-structural organizations** vary from

- independent "Open Innovation" business units (Kirschbaum, 2005) dedicated for instance to managing collaborative relationships with universities (outside-in) or development business units that are the basis for external exploitation of proprietary technologies (Inside-out).
- to task forces and dedicated cross-functional teams (Sakkab, 2002).

Moreover, a micro-structural analysis puts emphasis on Innovator roles necessary to correct and successfully implement the Open Innovation Paradigm. The main **micro-structural roles** individuated in literature are: (1) the "Product Champion" who has a strong commitment with new paradigm (Chesbrough and Crowther, 2006; Chiaroni et al., 2010) and foster the innovation project often in addition to their official organizational

position (Gemünden et al., 2007); (2) the Gate-keeper who manages the firm's interface with external environment (Chiaroni et al., 2010; Gemünden et al., 2007).

In a project management view, Open Innovation can be managed by five main figures: the project leader, the **power promoter** who has the necessary hierarchical power to drive the project, to provide needed resources, and to help to overcome any obstacles that might arise during the course of the project; the **expert promoter** who has the technical knowledge for the innovation process, the **process promoter who** links the first two promoter and the human resources necessary for the innovation process, using his soft-skills, and the **relationship promoter** who has the same role of the gatekeeper (Gemünden et al., 2007).

The **process perspective** regards the directions in which firms may open up their innovation processes. In literature three directions are mentioned: outside-in, inside-out and coupled (Gassmann and Enkel, 2004). Outside-in or inbound open innovation "describes the practice of leveraging the discoveries of others because firms need not rely exclusively on their own R&D (Chesbrough and Crowther, 2006)" (Lichtenthaler, 2009). Inside-out or outbound open innovation "refers to outward technology transfer, and it suggests that firms can look for external organizations with business models that are suited to commercialize a technology exclusively or in addition to its internal application. (…) Thus, outbound open innovation points to actively pursuing external technology exploitation, which refers to the commercialization of technological knowledge exclusively or in addition to its internal application, e.g., out-licensing" (Lichtenthaler, 2009).

The **tool perspective** analyzes the mechanisms used to successfully exploit open innovation potentialities. In particular, an adequate KM system is required to foster the transfer, share and diffusion of knowledge. Chiaroni et al. (2010), like other authors, find as necessary KM systems: (1) the use of ICT tools (Tapscott, 1996; Sakkab, 2002; Gassmann and von Zedtwitz, 2003; Dodgson et al., 2006; Piller andWalcher, 2006); (2) the adoption of appropriate intellectual property protection systems (Chesbrough, 2003; Graham and Mowery, 2006; Chesbrough et al., 2007).

In the tool perspective, also the evaluation processes have to be taken into account. For outside-in process, Chiaroni et al. (2010) underline the importance of procedures to scan and continuously monitor the range of technologies available in external environment, as well as new forms for the involvement of external sources of innovation through the strategic use of corporate venturing (Keil, 2002). For inside-out dimension, external exploitation alternatives (like spin-outs and out-licensing) have to be considered since the beginning of the evaluation process as they might have a relevant impact on the potential profits resulting from innovation (Lichtenthaler, 2004).

1.3 Contextual Variables

A stream of scholarly efforts from 1970s on aims at understanding and studying the conditions under which innovation is facilitated or successfully achieved. In these perspective, contextual variables can influence innovation in two different levels (Huizing, 2011). First contextual elements may affect directly innovation

performance, as moderators between an organizational structure and firm's performance; this implies that some specific approaches may be more effective in one context than in another: "e.g., outbound open innovation may be a more profitable strategy in contexts where intellectual property protection is relatively straightforward compared to situations where it is hard to protect inventions." (Huizing, 2011). Second, contextual variables may be related to the adoption level of a specific approach as if they were inputs for the innovation approaches, "e.g., in contexts with a high degree of globalization, companies are likely to use open innovation strategies more often" (Huizing, 2011).

Actually, about the second level of contextual influence, there is a lack of studies on the relationship between contextual variables and firm's strategy and structure: a lower number of studies aims at investigating the influencing role of contextual variables on companies' organizational and strategic approaches to innovation. A limited group of researchers tried to find and describe the correlation that links organizational factors (firm-level, i.e. the size, complementary assets) and contingency factors (market-level, i.e. patent protection, competitive intensity, industrial sector; and technology level) to both strategic and organizational solution of a firm that pursue radical innovations.

The contextual factors that may affect both innovation performance directly and innovation approaches analyzed in literature can be grouped in two main categories (Damanpour, 1996): (1) **organizational factors**, which are *firm-level* variables and may affect both innovation performance and innovation approaches. In literature the relationship between organizational factors (i.e. firm-size, age, complexity etc.) and innovation performance reflects exactly the concept of Incumbent's Curse and its confutation and have thus already been deepened. On the contrary, it is more interesting to analyze the correlation between firm-level variables and organizational and strategic approaches chosen by incumbents, i.e. the second level of contextual influence. (2) **Contingency factors**: these factors are usually extra-organizational factors that have to do with both *market-level* and *technology-level* variable, that are believed to influence both structure-innovation relationships (Damanpour, 1991; Tornatzky and Klein, 1982) and organizational and strategic approaches to innovation.

1.3.1 Organizational factors

Innovative organizational approach is firstly influenced by internal forces, such as age and size that can either facilitate or hindered it (DeTienne and Koberg 2002), or structural complexity and ownership of complementary assets.

Firm-Size: In literature, the firm size and its influence on innovation performance are wide analyzed. Empirical studies and surveys show in fact that the size of the company is negatively correlated to the success of radical innovation (Christensen and Raynor 2003; DeTienne and Koberg 2002;Tushman and O'Reilly 2002; Yu et al., 2010), according to Incumbent's Curse theory. As a result, researchers put a great emphasis on the different organizational approaches that the large company can adopt in order to reduce its disadvantage. In particular, the disadvantage caused by the size is due to the rigidity of the mechanisms needed to coordinate and manage the high number of resources. Some approaches are proposed to reduce

such a rigidity. First, the corporation should create and maintain flexibility, by having **smaller, separated and autonomous business units**. The **organizational macro-structure should be flat**, so that each business unit could have the adequate degree of autonomy to keep its decision-makers exited and take emerging opportunity under control. Furthermore, in order to facilitate the communication of information and thus the developing of new ideas in such a organization, intra-firm vertical and horizontal linkages are required (Kolodny et al., Yu et al., 2010; Brown and Eisenhard). However, other arguments argue that such a solution would increase redundant overheads within the organization, that can be reduced by consolidating the business units in larger entities (Christensen and Raynor 2003) (Yu et al., 2010).

Another stream of literature focuses on the impact that firm size has on innovation governance (internal or external). The researchers who deal with this question, agree that firm size is positively correlated with the creation of external networks in order to pursue radical innovations, sincelarge firms usually pursue a greater number of different R&D projects and the scale of innovation projects (Nakamura and Odagiri, 2005).

Structural Complexity may be defined in different ways: "as the number of locations at which work is performed, as the number of jobs or services performed, or as the number of hierarchical ranks performing different tasks." (Damanpuor, 1996). Some studies show that in general organizational complexity is positive correlated with innovation performance, since complexity facilitates coalitions of specialists in different business units, increases the knowledge base (Aiken and Hage 1971) and cross-fertilization of ideas. Nevertheless, the variance in results of empirical researches about structural complexity-innovation relationship is high (Damanpour 1991).

Complementary assets: the emergence of a new and disruptive technology requires a set of technological and non-technological value chain activities and assets to be successful spotted, developed, and commercialized. According to Incumbent's Curse theory, radical technology are likely to be developed by new entrants (Tushman and Anderson, 1986); thus in a way they own the necessary upstream assets, such as technological competence and creativity, to innovate, but they may lack downstream complementary assets to commercialize it, that belong to incumbent leaders (Yu et al., 2010). Therefore, new entrants and incumbent firms may find necessary to cooperate in order to put the new technology on the market (Pisano, 1991). This organizational approach, that can either pursue by **joint ventures**, **acquisition** of the start-up by the incumbent, or **Open Innovation** (Chesbrough and Crowther, 2006; Paap and Katz, 2004) could bring advantages for both the new entrant and the established company.

1.3.2 Contingency factors: Market Level

Market-level variable in a wide stream of literature are considered the main contextual factor that influence innovation (Damanpour and Gopalakrishnan, 1998); furthermore, environmental uncertainty is often seen as the main reason for organizational innovation.

Industrial sector: The characteristics of industry may influence the organizational and strategic approach to innovation. Damanpour (1996) classify industrial sectors in two macro-groups, manufacturing and service, identifying the main variable that could affect innovation strategy. First of all, service technologies are

considered to be more intangible and variable than manufacturing technologies (Kotler, 1986); furthermore, while in manufacturing industry the outputs can be stored for later usage, in service sectors production and consumption occur simultaneously (Daft, 1992); finally, the interaction between customer and firm is in service industries necessary for the delivery of the output to be complete (Mills and Margulies, 1980). As a result, the organization structure in service sectors should be more horizontally differentiated and their roles more specialized in order to manage innovation, suggesting a weaker relationship between structural complexity and innovation.

Environmental Dynamism: Environmental dynamism can be generally described as "the rate and instability of changes in a firm's external environment (Dess and Beard, 1984)". As numerous researchers since Walker and Weber (1984) have stated, environmental dynamism is linked to two dimensions: market uncertainty, i.e. "the fluctuation and unpredictability of demand" (Stanko and Calantone, 2011), and technological turbulence, i.e. the rate of rapid and disruptive technological change (Jaworski and Kohli, 1993) and is a characteristic of the industrial sector in which the firm operate. Damanpour (1996) extend environmental dynamism concept, by introducing the more general "environmental uncertainty" which is determined by both environmental variability, i.e. "the frequency and predictability of changes in environmental components" and environmental complexity, i.e. "the extent and the variety of environmental components": "the more complex and changing the environment, the higher is the level of environmental uncertainty."

Environmental dynamism and uncertainty can affect the two sides of organizational approaches to innovation: internal organizational structure and external networks creation. In an internal organizational perspective, high uncertain environment requires firstly a structure able to process more information for decision-making. Under conditions of high uncertainty, thus, some organizations respond creating **specialized staff positions and units** to manage and evaluate relevant information (Child, 1977; Damanpour, 1996) and adequate **integrating devices** to coordinate them. Other organizations, may adopt a more **flexible structure**, by creating smaller and **fully independent units** to manage and pursue innovation (Damanpour, 1996). A great emphasis is thus given to **autonomy** (Hill and Rothaermel, 2003). Regarding external networks creation, environmental uncertainty may cause contrasting effects on organizational approaches. Some researchers argue that rapid technological changes support the diffusion of **outbound Open Innovation** paradigm (Lichtentaler, 2009; Gambardella et al., 2007). In fact, the possibility of obtaining high returns from R&D investments by simply developing and applying new technologies inside the organization are limited if external environment quickly change (Gambardella et al., 2007). Transaction cost theory explain that a firm may not be able to become high profits from innovation if the technology frequently change (Harabi, 1995). Furthermore, even a large and established firm can't cover all technological evolution with its internal R&D means in an industry that continuously moves (Cesaroni, 2004). Some others empirical studies support the positive association between environmental, in particular technological, uncertainty external innovation governance (Ulset, 1996; Swan and Allred, 2003; Calantone and Stanko, 2007). Nonetheless, other empirical researchers show that environmental dynamism and in particular technological uncertainty is conducted through internal and closed innovation (Croisier, 1998;

Nakamura and Odagiri, 2005), since uncertainty and turbulence may complicate the process of contracting (Stanko and Calantone, 2011).

Competitive Intensity can be defined as "the degree of competitors that a firm faces within its industry (Grewal and Tansuhaj, 2001; Zhou, 2006)" (Li et al. 2010). If the competitive intensity is high, industry uncertainty increases because the number of components that has to be take into account in the decision-process becomes higher. As a consequence, "the result of a firm's behavior will no longer be deterministic but stochastic, as the behavior is heavily influenced by actions undertaken by competitors (Auh and Menguc, 2005)" (Li et al., 2010). Furthermore, when competition is low, then also technical innovation rate will be lower. Thus, a flexible strategy is importantly correlated with competitive intensity (Dreyer and Gronhaug, 2004). Moreover, under condition of intense market competition, firms are more induced to collaborate ((Uzzi, 1997; Ang, 2008; Wu, 2012). When predictability diminishes in fact and uncertainty increases, "firms have a greater need to collaborate with each other in order to acquire information, reduce competitive uncertainty, and lower risk" (Wu, 2012). On the other hand, competitive intensity can also affect directly innovation performance, at a given organizational structure. In particular, market competition can have negative impact on innovation performance, if the companies had adopted an approach based on technological alliances, due to the higher probability of opportunistic behaviors (Wu, 2012).

Incentives and regulation: In literature there is a lack of contributions regarding the influencing role that innovation incentives and regulation may have on the adoption of a specific organizational approach, except for some examples, i.e. institutional regulation (Antitrust) and mergers (Finkelstein, 1997). However, some works show that the existence or the absence of these variables may influence the strategic perception of radical innovations (Bartel and Thomas, 1987; Dean and Brown, 1995; Leonard, 1984; Marcus, 1988; Marcus and Goodman, 1986; Shaffer, 1994 etc.). Nevertheless, it doesn't exist in literature a general accepted argument on the nature of this influence, since contrasting thesis are supported: some scholars sustain the positive impact of environmental regulation on innovation strategy, some others support the negative correlation and finally other authors provide evidence for no correlation (Sanchez and McKinley, 1998). Those scholars who state that regulation has a negative impact on innovation argue that "the bureaucracy required to comply with environmental regulation restricts firms from pursuing cutting-edge technology (Breyer, 1982). Managers of environmentally-regulated firms argue that it is harder to innovate because regulations often change unexpectedly, and because regulators are unpredictable (Birnbaum, 1984). This increased uncertainty motivates firm to de-emphasize risky strategies such as innovation." (Sanchez and McKinley, 1998). On the other hand, some authors underline that environmental regulation can be viewed as an external jolt that can thus foster innovation (Marcus and Weber, 1989; Meyeer, 1982). If there weren't an external jolt, incumbents would persist in their existing status quo, without innovating.

Recent works (Blind, 2012) articulated the problem of defining the impact of regulation on firms' perception of radical innovation, by identifying three sub-groups of regulation: economic, social and institutional.

Economic regulation is more widely studied and comprises:

- **Competition policies**: if market sector is regulated and competition is high, then innovation is seen as strategic in order to avoid "fierce competition" (Blind, 2012). But if competition becomes too intense, then imitation is seen as more attractive than innovation activities. Thus the relationship between competition regulation and innovation strategic perception follow an inverse U-shape curve (Aghion et al., 2005). As already stated, the existence of competition policies, and in particular of Antitrust regulation may also influence companies' strategies at an adoption level, in particular in shaping merger activities (Finkelstein, 1997). The net effect of Antitrust legislation is to weaken the relationship between companies and particularly mergers.
- **Price regulation**: The effect of price regulation is largely variable. If the regulation secure minimum revenues and protect the company from demand fluctuation, then innovation is seen as strategic.
- **Entry regulation**: it has a positive impact on incumbents' innovation perception. Incumbents are in fact more incentivized to invest in risky innovation. However, entry barriers have a negative impact for the overall innovation performance of entire industry (Blind, 2012).
- **Regulation of natural monopolies and other public utilities**: clearly under condition of regulated monopoly, firms have no incentive to innovate and innovation is not seen as a strategic activity. Starting from 1980s, USA implement regulation to motivate firms to innovate. These regulations initially reduced innovation incentives, since they were based on the limitation of the maximal rents of regulated firms or fixed prices at the marginal costs. This led to the implementation of new regulatory measures: "price cap" regulation (Blind, 2012). Such a regulation lead to a strategic perception of innovation.

About social regulation, its impact is not frequently analyzed in literature. In particular, the main contributions study the impact of environmental regulation due to an increasing importance of environment issue in society (Kemp, 1998). In this situation some innovation technologies are perceived as strategic and fundamental, especially in some industries with a strong social and ethic influence, like energy generation or health sector (Blind, 2012). Finally, institutional regulation is usually connected with liability rules (Blind, 2012). If liability rules are very strict, then firms don't perceive radical innovation as strategic, since the risks are too high and expected revenues decrease; this occurs also because under these conditions the trust of customers in the firm is usually high and thus their self-protection decrease, causing a more frequent rate of accidents. This thesis is also empirically supported by Viscusi and Moore (1993).

Patent Protection: Also the degree of patent protection within an industry can influence a company's innovation approach and strategy, in particular in regard with external networks creation. Some researches show, indeed, that a sufficient patent protection facilitate technology transactions and thus relationships building, in particular **open innovation** (Arora et al., 2001; Lichtentaler, 2009; Yang and Kuo, 2008; Gambardella et al., 2007; Andersen and Konzelmann, 2008). Some empirical studies support this relationship between weak appropriability and internal innovation governance (Veugelers and Cassiman, 1999; Steensma and Corley, 2000; Nakamura and Odagiri, 2005; Gooroochurn and Hanley, 2007). The degree of patent protection and its effect depends also on the characteristics of the industrial sector: patents

have a positive and effective result in technology fields, for instance pharmaceuticals, in particular because transaction costs in such industries are much higher than in product markets. (Fosfuri, 2006; Levin et al., 1987; Arora et al., 2001).

1.3.3 Contingency Factors: Technology Level

Technology intensity: Wu (2012) "argue that the positive effects of technological collaboration on firm product innovation will increase in high-tech sectors". In fact technology intensity causes a higher rate of technological changes. In order to successfully innovate a firm needs to possess different sets of technologies and a broad technology knowledge base (Arora and Gambardella, 1990). In this situation cooperation is a must to enable firm to enjoy economies of scale and other advantages in R&D investment (Ahuja, 2000).

Stages of innovation adoption: In literature exist some stage models of innovation process. Rogers (1983) and Zaltman et al. (1973) proposed a two-stages model, that is advocated also by Damanpour (1996): "**initiation of innovation** is defined as consisting of all activities pertaining to problem perception, information gathering, attitude formation and evaluation, and resource attainment leading to a decision to adopt; and **implementation of innovation** is defined as consisting of all the events and actions pertaining to modification of both the innovation and the organization, the initial utilization, and the continued use of the innovation until it becomes a routine feature of the organization." (Damanpour, 1996). The stage of innovation adoption can have an impact on organizational approach; Damanpour (1996) underline in fact, that the complex and large organizations, such as ambidextrous organizations, facilitate the initiation of innovation, but not the implementation of innovation. On the contrary, when the innovative technology has already passed through its initiation and need to be implemented, a small and not complex organizational structure would be better.

1.4 Innovation Performance

In the empirical studies about innovation theory, the researchers face the problem of defining an adequate set of innovation performance that is worth to be monitored. In literature are shown vary ways to classify innovation performance systems: economic/financial (objective) and non-financial (subjective) indicators, single and multiple innovation measures, innovation inputs, i.e. R&D expenditures (Sofka and Grimpe, 2010), and innovation outputs. As a result of different points of view, in literature there are no generally acceptable indicators monitoring innovation performance, but the set of indicators should be chosen or created by the researcher, on the basis of the contingent factors of the study (aim, type of data, industry sector, etc.) (Jin-ying Liu, 2009).

First, the different innovation performance systems may be grouped into two main categories: economic financial indicators and non-financial indicators, since Innovation performance has been defined by several researchers as the "economic financial and non-financial outcomes of the firms' product innovation efforts" (Bakar and Ahmad, 2010; Cooper, 1984; Cooper and Kleinschmidt, 1987; Gemunden and Heydebreck,

1992; Hise and O'Neal, 1990; Hollenstein, 1996; OECD, 2005). Economic and financial measures directly reflect the firm's result in innovation activities, but an effective performance indicator set should cover more than just economic and financial elements (O'Regan and Ghobadian, 2004) form many reasons: (1) non financial indicators overcome some limitations of financial measurement, such as "low-response rate due to reluctance to share confidential data" (Bakar and Ahmad, 2010); (2) non-financial measurement, such as reputation, public image, commitment, satisfaction, etc. are considered as among the ultimate objectives of entrepreneurs (Bolinao, 2008; Edralin, 1998). Furthermore, for overcoming non-integrality caused by single indicator, innovation performance should be expressed through a multi-perspective set of indicators (Atuahene-Gima, 2005; Chiang Jin-ying Liu, 2009). Nonetheless, in general profitability and sales growth are the most commonly used measurement of performance (Bakar and Ahmad, 2010; Doyle, 1994; Kasim et al., 1989).

1.4.1 Classification of Innovation Performance

Using Schumpeter's (1934, 1939) classification, innovation performance measurement can be divided in five groups: (1) new products, (2) new methods of production, (3) new sources of supply, (4) exploitation of new markets, and (5) new ways to organize business. However, most of the literature has focused on the first two areas (Avlonitis et al., 1994; Cohen and Klepper, 1996; Fagerberg, 2006; Inauen, 2011). Thus, through the classifications described above applied to the two Schumpeter's dimensions of innovation, innovation performance measurement used in literature can be summarized as following:

	Objective Measurement		**Subjective Measurement**
	Financial Indicators	**Economic Indicators**	
Product Innovation	ROI ROE ROA ROS	• Sales of new products • Turnover share due to new products • Operative margins of new products • Number of new products introduced to the market • Number of patents	• Level of newness of the new products • Speed of new product development • Number of new products that is first-to-market • Customer satisfaction • Market share
Process Innovation		• Number of patents • Costs reduction due to process innovation	• Rate of change in processes techniques and technology • Speed of adoption of the latest technology innovation in processes

Table 1.1 - Innovation performance indicators used in literature

1.5 *Effect of Different Approaches on Innovation Performance*

Since in literature there is no systematic comparison between different organizational and strategic approach to innovation, it is difficult to define their impact on the different innovation performance. Nonetheless, some quantitative studies have been conducted to disclose the effect of single approaches on the different performance indicators. A single exception to this statement is O'Reilly and Tushman's (2004) work. The authors examine 35 different attempts at breakthrough innovation. The success in creating and delivering the desired innovation is measured by commercial results of the new product, or by the application of practical market or technical learning. At the same time, the authors monitor the performance of existing business. They find out that ambidextrous organizations were significantly more successful than the other structures.

A similar result is achieved by Bolinao (2008), even if his study hasn't a relative nature, since he analyze the effect of the application of a single organizational design without comparing it with other solutions. The scholar proposes a model based on Ghoshal and Bartlett's (1994) work, to study the performance coming from the application of **contextual ambidexterity**, starting from some contextual variables. The set of performance indicators chosen by the author include both financial measures of performance like return on assets (ROA) and return on equity (ROE), and non-financial outcomes, in particular subjective measures (i.e. the business is achieving its full potential, individuals' satisfaction etc.). The empirical study shows that "superior firm performance and competitive advantage in both the short and long-term can be achieved when firms can manage contradicting structures, skills, and cultures simultaneously" (Bolinao, 2008).

About **external collaboration** a lot of empiric researchers confirm that inter-organizational cooperation ensure higher innovative performance (Chiang and Hung, 2010). Rothwell (1991) states that those firms that have external networks involving other firms, universities and other research institutions have an higher successful rate in developing innovations. Niosi (2000) studies Canadian firms that form alliances with foreign pharmaceutical companies enjoy a more rapid growth in sales. De Propris (2000) finds that firms that cooperate with buyers and suppliers can have better performance in term of number of innovations. In particular, about the relationship between an incumbent and a new entrant firm, Rothaermel (2001) finds that this kind of alliance lead to improved new product development and superior performance. Nonetheless, the majority of these studies focus only on inter-firm relationships and just a few number of scholars analyze the effect of inter-organizational co-operation in a broader sense including relationships between firms and various kinds of knowledge generating organizations (firms, universities, R&D institutions, and governments) (Chiang and Hung, 2010). This is the purpose, for instance, of Chiang and Hung's (2010) work, executed by surveying 800 randomly selected Taiwanese electronic product manufacturing companies. They find that open search breadth and depth are positively associated with innovation performance, measured as "the number of new products" and "the percentage of sales generated by radically new products".

Regarding open innovation approach, empirical results show a positive effect on both financial and non-financial indicators. Outbound open innovation has a positive impact on financial performance; in fact, Lichtenthaler (2009) state that "the effect of **outbound open innovation** strategy on ROS is positive across

all environmental settings", and additionally technological turbulence, transaction rate, and competitive intensity increase the strength of this correlation: "the impact of an open strategy on performance is stronger under conditions characterized by high technological turbulence, high transaction rates, and high competitive intensity."

Whereas **outside-in open innovation**, according to Inauen's (2011) work, show a positive impact on the increase of the number of innovations and on the shares of new products sales. Regarding in particular the openness towards universities, it has a strong positive effect on both financial and non-financial measures (Inauen, 2011). These results, and especially the positive effect that openness of outside-in process towards customers have on the number of new products and on the sales of innovations, is supported also by von Hippel (2007, 2009).

1.6 Incumbent's Curse in Energy Industry

Incumbent's Curse paradigm is in literature also applied to energy industry, though the contributions are still quite limited. Schilling and Esmundo (2009) outline the status of both incumbent and innovative energy technologies, using technology life-cycle model: technologies based on renewable resources (Photovoltaic, Concentrating solar, Wind energy and Geothermal energy) are still in their "fluid phase" (Utterback and Abernathy, 1975) or "era of ferment" (Anderson and Tushman), because it is still unclear whether or when one or more of these technologies will become a dominant design. On the contrary, technologies that use fossil fuels (oil, coal) are well established and mature and they are in their era of incremental changes. During this period the competition among those firms whose success is built on the efficient fossil fuel production and/or utilization, focuses on improving existing components, rather than discovering a new architecture. (Shilling and Esmundo, 2009). Using the S-Curve model for technology life-cycle, it is possible to see that fossil fuel technologies were already mature by the 1990s: the performance peak of coal, petroleum, and natural gas occurred respectively between 1875 and 1925, and between 1920 and 1970. Thus, we are actually experiencing the flat part of S-Curve, where the marginal increasing in benefits in respect with investments is waning. In this situation, because of the shortage of incremental innovations that could improve the technology's performance, the S-Curve is heavily influenced by volatility in fuel prices than by investments in R&D (Shilling and Esmundo, 2009). On the contrary, analyzing wind and geothermal technologies' curves, it is possible to assert that they could become economically comparable or superior to fossil fuels with modest investment, although actually incumbent technology is still less expensive than the renewable alternatives considered. Furthermore, a second consideration coming from Shilling and Esmundo's work is that renewable sources have already passed through the initial phase of S-Curve: what Chandy and Tellis (1998) labeled as "technological breakthrough" have already occurred, at least for the four technologies analyzed. Thus, though they still represent innovative technologies, they have already been spotted, and in some cases developed and introduced in the market; in accordance with this statement, some other authors in the last decade analyze the level of diffusion of renewable technologies (e.g. Jacobsson and

Johnson, 2000; Masini and Menichetti, 2012; Pinkse and van den Buuse, 2012; Richter, 2012; Wüstenhagen and Menichetti, 2012). As a result, Incumbent's Curse phenomenon, in the case of energy industry is in a way more limited than in other industries, where established firms have difficulties in identifying latent needs of non-mainstream customers.

1.6.1 Causes of incumbent's curse

Following Hill and Rothaermel's (2003) framework, it is possible to recognize different causes for Incumbent's Curse in energy industry, rooted in economics, organizational theory and strategy, even if with some limitations in respect with the general situation studied by the two authors.

Economic explanations: one of the main reason for not adopting renewable sources technologies is still their costs. Even if it is usually difficult to estimate the average cost of energy production and thus it is often plagued with a degree of imprecision, as already stated above fossil fuels technology still remains the most economically advantageous solution among the existing technologies for energy generation (photovoltaics, wind, geothermal, concentrating solar and so on, and traditional sources) (Shilling and Esmundo, 2009). In literature, the question of investment disincentives in renewable sources is also analyzed in term of risk and returns (Wüstenhagen and Menichetti, 2012). In these terms, adding renewable power generation assets to a portfolio of traditional generation assets provide a diversification effect. Furthermore, there may be diversification also among different renewable (Wüstenhagen and Menichetti, 2012). Laurikka (2008) labeled this second type of diversification "diversification of plant-specific risk". Incumbents' inflexibility in this field is due to their blindness in respect to this effect: traditional models of valuing power generation used by most electric utilities do not account the diversification effect; as a result, renewables are undervaluated and thus underfunded by those firms that already possess traditional assets (Awerbuch, 2000, 2004). Moreover, Wüstenhagen and Menichetti (2012) give great importance to the role of cognitive aspect, risk perception and bounded rationality in investment decision. Since investment decision are made by human being who act under bounded rationality (Simon, 1955), under uncertainty investor's risk perception influenced by cognitive aspects plays an important role rather than objective risk estimation. This perspective could explain incumbents' disincentive to invest in renewable, though their long-term higher performance. In particular, one important consequence of bounded rationality is path dependence; this theory is relatively studied in depth in recent literature: Wüstenhagen and Teppo (2006) argue that path dependence slow down the flow of venture capital investments into the emerging renewable energy sector. Lovio et al. (2011) study the effects of path dependence in Finland's attempt to diversify power generation technologies. As a result of path dependence, there are relatively little investments in renewable assets, compared to fossil fuel technologies and that investment is fragmented among several contending alternatives (Jacobsson and Johnson, 2000).

In energy industry too, among economic explanations comes out the problem of investments cannibalization. In particular, energy business has a strong capital-intensive nature, so that a huge amounts of capital have been invested in existing infrastructures. As a result, the companies that own these assets enjoy a great

market power, protected by entry barriers (high investments etc.). Thus, they are reluctant to do anything that could change this equilibrium and cannibalize their existing business (Wüstenhagen and Boehnke, 2008).

Organizational theory and strategy explanations: incumbents' strategic and organizational inflexibility is due to the typical structure of oil and gas company. They are, in fact, strong vertically integrated, since in their supply chain both upstream (such as extraction activities) and downstream activities (refining) are crucial for gas and oil industry. Recently, even though there was a trend towards disintegration between 1980 and 1990, gas industries are still strong integrated: for example, recent expansion in natural gas has been carried out by covering the entire supply chain (Pinkse and Van de Buuse, 2012; Grant, 2005). The vertically integrated firm tends to routinize the processes and are based on a conservative approach with bureaucratic control (Pinkse and Van de Buuse, 2012), elements identified by Chandy and Tellis (2000) as causes of Incumbent's Curse.

Furthermore, upstream and downstream activities of oil and gas supply chain requires of course specific resources, competences, routines etc. that don't fit with the ones necessary for renewable energy technologies along the entire supply chain (Pinkse and Van de Buuse, 2012). As a consequence, the introduction of renewable technologies generally needs a change of the whole supply chain of incumbent companies (Kolk and Pinkse, 2008) and thus also a change of strategic networks.

Moreover, in a strategic perspective, incumbents' inflexibility regarding innovations in renewable field is a consequence of the behavior and the attitude of social and economic system of industrial countries. The existing system including end-users, firms, institutions and so on depends on fossil fuel technologies and probably may not look for opportunities outside this traditional area (Jacobsson and Johnson, 2000); this enforces the "carbon lock-in" of industrialized societies (Unruh, 2000; 2002). Unruh identifies some sources of this inertia, that can come from incumbent organization or from the socio-economic system in which it operates and thus from the strategic network identified by Hill and Rothaermel (2003) as a potential source of incumbents' inflexibility; examples of inertia sources might be routines, existence of a dominant design, industry standards, legal fremworks etc. (Unruh, 2000; 2002).

1.7 Strategic and Organizational Approaches in Energy Industry

1.7.1 Business Model

Since renewable energy technologies are considered disruptive technologies, that may cause a break with mainstream fossil fuel-based processes, some authors state that their adoption also requires a rethinking of how utilities produce, transmit and sell electricity (Richter, 2012). In particular, Gordijn and Ackermans (2007), and Duncan (2010) think that creating a new business model is the basis for economic sustainability and large scale deployment in the renewable market. As Wüstenhagen and Boehnke (2008) state,

"appropriately designed business models are an important opportunity to overcome some of the key barriers to the market diffusion of sustainable energy technology".

Richter (2012) shows how utilities shape their business model for renewable energies, applying the business model concept to analyze energy transition from incumbent to renewable technologies. He uses business model as an analytical framework, based on four basic elements, (1) value proposition, (2) customer interface, (3) infrastructure, and (4) revenue model and identifies the largest changes in the third element. In fact, first of all, one of the major challenge for utilities is the replacement or simply acquisition of new key resources, i.e. both competencies and technologies. Also the key activities need a wide change, because of the differences that cover the whole value chain. Finally, key partnerships, i.e. "the network of suppliers and partners that makes the business model work" (Richter, 2012) have to be completely rethought. In particular, new networks of partnerships play a fundamental role for utilities that start entering renewable market.

1.7.2 Organizational solutions

In literature are analyzed two approaches in which oil and gas incumbents may develop and commercialize renewable technology: internal development and external acquisition (Pinkse and Van den Buuse, 2012)., although the contributions regarding organizational solutions are scant.

In fact, incumbents that want to introduce new power generation assets, have to face the challenge of developing new competences and resources, as the can't rely on previous investments in this area. Oil and gas incumbents who enter the new market field of renewable energy can either develop the necessary competences, resources, and scale, but a lot of time is required; alternatively, the large scale and the competences could be obtained through external acquisition, when the external environment has become less risky (Davis, 2006; Levy and Kolk, 2002). Regarding external acquisition, some mechanisms are identified in literature as examples for creating new valuable key partnership: (1) acquisition or collaboration with other utilities, since it could help sharing risks and realizing large projects and the cooperation (Richter, 2012); in particular, outsourcing some activities through collaboration and cooperation may overcome some causes of inertia specific for energy industry (Wüstenhagen and Boehnke, 2008). By outsourcing large parts of the value chain, energy companies could reduce capital intensity, in comparison for example with "old economy" model of doing everything in-house. Cooperation in manufacturing and distributing and co-generation could be strategic configurations that help avoiding incumbent flexibility, due to path dependency. (2) Joint Ventures between an electric utility and independent project developers (Richter, 2012).

On the other hand, Pinkse and van den Buuse (2012) provide evidence for the organizational approaches used to manage these external networks, through the empirical study of the three major European oil and gas incumbent companies: British Petroleum, Royal Duch/Shell and Total. The organizational solution to manage the new technologies, perceived as disruptive and non-complementary, led the firms to build their renewable divisions outside core business activities: two of the three investigated companies created separate business units detached from the fossil-fuel supply chain (Shell Renewables and BP Alternative Energy) and

one managed the separate business through the shared ownership in multiple subsidiaries (Total) (Pinkse and Van den Buuse, 2012). Nonetheless, Shell and BP didn't managed keeping up with the fast growth of specialized solar companies, so this seems not to be the best organizational and strategic solution for developing and commercializing renewable technologies (Wüstenhagen, 2012).

1.8 Innovation Performance in Energy Industry

In literature there is a gap regarding possible innovation performance in energy industry. There is, in fact, a lack of quantitative researches that may study the effect of strategic or organizational approaches on firm performance, regarding renewable technologies. Some authors analyze instead decision making process in investments in renewable energy technologies (Masini and Menichetti, 2012) or the impact of economic environment changes in utilities' strategies (Delmas et al., 2007). As a result, although these studies don't aim at identifying incumbent's curse solutions and their impact on firm's performance, they are based on variables that monitor outputs of innovation activities, i.e. innovation performance. In particular, two measures are adopted: (1) the share of renewable energy technologies in the investment portfolio and investment/disinvestment decisions (Masini and Menichetti, 2012; Pinkse and Van den Buuse, 2012); (2) generation from renewable and yearly change (Carley, 2011; Delmas et al., 2007).

1.9 Contextual Variables in Energy Industry

The majority of scholar efforts regarding the effect of contextual factors focuses on their impact on R&D inputs, i.e. R&D expenses, and outputs, i.e. patents. Thus, these studies mainly analyzed the relationships between some factors and utilities' strategic perception of radical innovations. As a result, the occurrence of some environmental, legislative, institutional, technological elements may increase the perception that the radical innovation could be a strategic advantage and thus incentivize R&D activities. On the contrary, there is a lack of contributions about the effect that the contextual variables may have on the adoption of specific organizational approaches, except for some cases like the relationship between complementary assets and external acquisition (Pinkse and van den Buuse's, 2012). Furthermore, there is a general shortage of explicit moderating effects that these factors may have on utilities' innovation performance.

1.9.1 Firm-level

Size: the literature that analyzes the influencing role of firm-size on innovation in energy industry is almost entirely on the US electricity sector and prior to the reforms in some states (Jamasb and Pollit, 2008). Furthermore, no organizational structures or mechanisms are suggested; on the contrary the perception of innovation, in term of R&D expenses depending on firm-size is largely deepened. Wilder and Stansell (1974), for instance, examine 200 utilities between 1968 and 1970. The authors found out that R&D activities are positively correlated with size, showing that large firms perceive innovation as strategic or at

least important. Delaney and Honeycutt (1976) replicate this analysis, using data of 135 utilities that are part of joint ventures or holding companies from 1970 and 1972. Also this analysis confirmed the positive impact of size on innovation perception and incentive. In literature there are two other studies of US electric utilities, conducted by Mayo and Flynn (1988) and Sanyal and Cohen (2004); these works show again that between firm size and R&D spending exists a positive correlation. Moreover, Rose and Joskow's (1990) work on the adoption of new generation technologies by US electric utilities, shows that large utilities are more likely to adopt new technologies than small firms, though with a non-linear and declining relationship: "A 10% increase in firm size increases the hazard rate by 7–8%." (Jamasb and Pollit, 2008).

Strategy and complementary assets: The starting point of Pinkse and van den Buuse's (2012) work is that firms make their strategic decision on renewable energy technology taking account of firm-specific factors, like complementary assets, business portfolio and core business activities, in order to leverage existing competencies and assets. Following the model proposed by the authors in fact, a utility is more likely to choose those technologies that are more similar to core business activities and capabilities (e.g. bio fuel technologies), according to the concept of complementarily. On the other hand, it is frequent for firms to invest in technologies that are not complementary to core business activities, in order to diversify their business portfolio and explore potential future markets (Bower and Christensen, 1995); as a result, in these cases the most frequent approach is the creation of a separate business units, in which an ad hoc business model can be developed and applied. Furthermore, since the technologies present non-complementarily with mainstream activities, lead to prefer external acquisition (Pinkse and van den Buuse, 2012).

1.9.2 Market-level

An important role is also played by contingency factors, related with industry dynamics. Pinkse and van den Buuse (2012) underline the importance of both old and new market dynamics: the strategic decision to invest in renewable energy technologies and the perception of these innovation as strategic depends clearly on the development of both oil and gas market and renewable energy market. In particular, some economic dynamics may be more holistic and cross-industrial, such as oil price, that foster or discourage utilities' propensity to diversification (Grant, 2005; Pikse and van den Buuse, 2012) and liberalization; on the other hand, other factors may be more industry-specific, like institutional variables.

*Liberalization and privatization reform: e*lectricity sector has been subject to a liberalization reform that involved both firm and market level. Jamasb and Pollit (2008) summarized the main market-level elements that have been affected by deregulation, and their effect on innovation activities:

1. First, one of the main consequences of liberalization policy is the increment in competition intensity. The competitive pressure lead to increase market uncertainty which affects utilities' R&D efforts (Jamasb and Pollit, 2008). However, scholarly contributions on the effect of competition and uncertainty on innovation perception is not always congruent. On one hand, Defeuilley and Furtado (2000) argue that increased competition cause not only an overall reduction in R&D expenditures, but also the diffusion of a short-term oriented strategy. The same has been stated by Sanyal and Cohen (2004): their work show that the

uncertainty associated with the reform of energy industry has a significant negative impact on R&D activities. On the other hand, Jacquier-Roux and Bourgeois (2002) explain that increased uncertainty has a positive correlation with the number of patents obtained by large utilities.

Competition and uncertainty also have an impact on innovation approach: Cohen and Sanyal (2004) find that internal R&D declines with initial uncertainty associated with reform; on the contrary, external spending R&D and collaboration activities increase with uncertainty, but declines when competition arrives. In conclusion, competition caused by deregulation incentivizes internal innovation, while uncertainty positively influences the creation of external collaboration: as a result, in this case liberalization cause conflicting effects.

2. Secondly, privatization changes the characteristics of corporate governance and thus has an impact on innovation strategy (Munari and Sobrero, 2003a). However, as Jamasb and Pollitt (2008) state, "privatization has often been accompanied by the introduction of competition and regulation, making it difficult to separate out the effects of privatization alone". In any case some empirical works tried to identify the impact of privatization on R&D strategy: Munari and Sobrero (2003a) state that R&D expenditures are positively correlated with privatization, but is negatively correlated with the private owners' share in the company. Also a change in innovation objectives is caused by privatization: post privatization goals are characterized by increased focus on applied and short-term research and emphasis on commercialization (Munari at al., 2002; Jamasb and Pollitt, 2008).

Institutional variable: **s**tarting from the beginning of the 21st century, some countries or political blocks (e.g. EU), define policies and targets for renewable energy development (Marques et al., 2010). A great stream of literature considers public policies as external variables that influence the strategic perception of renewable technologies (e.g. Van Rooijen and van Wees, 2006; Wang, 2006; Wustenhagen and Bilharz, 2006; Gan et al., 2007; Johnstone et al., 2010). Public policy include different mechanisms, such as "R&D incentive programs, investment incentives (grants or low-interest loans), incentive taxes, incentive tariffs, mainly feed-in-tariffs, voluntary programs and compulsory renewable targets (production quotas and tradable certificates)" (Marques et al., 2010). The advantages and disadvantages of each of these mechanisms are analyzed in literature (Gan et al., 2007). Although their evident impact on utilities' incentive to innovate through renewable technology, the effect that these instruments may have on the adoption of specific organizational approaches is not deepened in literature, nor their mediating role on innovation performance. Only some generic empirical studies on the effectiveness of renewable policies on national energy generation have been conducted (e.g. Carley, 2009; Menz and Vachon, 2006; Kydes, 2006). In particular, Carley (2009) states that subsidiary programs are positively correlated with renewable energy generation share, while tax incentives are negatively associated with this dependent variable. Moreover, some scholars have identified possible reason for policy ineffectiveness, such as "inadequate policy enforcement, policy duration uncertainty, overly aggressive benchmarks, too many exemptions, or too much flexibility offered to utilities" (Carley, 2009).

1.9.3 Technology-level

Stage of technology development and future perspective: the business model and the organizational approaches adopted by a utility facing the introduction of renewable energy technologies, depend on actual state of both new and incumbent technologies. The curve that emerges from Shilling and Esmundo's work shows that the renewable alternatives are at their initial phase, while fossil fuel technologies don't promise further increase in benefits, in a cost dynamic perspective (Shilling and Esmundo, 2009; Winkler et al., 2009). As a result, although in literature, there are no explicit consideration about how current state of new technologies may influence a utility's business model, clear references about how strategic these technologies may be in the next future abound. In particular, at the basis of the strategic importance of these radical innovation there are two technologic elements: the increasing performance of renewable energy in the next year and the status of current technology and its dependence on resources availability and price.

2. Methodology

2.1 Sample Definition

The exploratory study involved ten European firms, mainly located in Italy, France and Germany.

The first step was an in depth analysis of the European Energy sector, in order to understand which operator could be suitable for the goal of this analysis.

Firstly, in order to correctly evaluate nature and effectiveness of organizational and managerial approaches, just those companies with a full strategic independence have been considered; substantially, no companies fully or partially controlled by other market players have been included in the sample.

Secondly, a second step concerned the necessity of identifying which companies could be considered incumbents. According to incumbents' definition, proposed by Chandly and Tellis (2000) and Danneels (2004), "incumbents are the largest company in a certain industry that have developed a certain experience in a sector and that have commercialized successfully the previous generation of products"; as a result, two main yardsticks were adopted to individuate incumbent energy companies:

1. A time period of operating activities in electricity generation market at least equal to 10 years, i.e. corresponding to the span of time between liberalization (e.g. occurred in Italy in 1999) and 2009, years in which this analysis starts.
2. A market share in terms of electricity production (generated by each firm cluster) from 1999 to 2009 more or equal to 5% of the national electricity production.

By applying these two yardsticks to a list of firms which could be potentially involved in the analysis, the following sample resulted suitable:

Category	Name	Ownership	Business Model	Results in Energy Business (mln €)	Results in Renewables (mln €)
Ex-Monopolist Multinational Utility	A	Public (about 30%)	Energy and Gas generation, distribution and sale; trading of photovoltaic plants.	23.146	2.527
Industrial Group	B	Private	Energy and Gas generation and trading	7.437	86
Ex-Municipalized Multiservice	C	Public	Energy and Heat generation, distribution and sale; management of water services; MSW.	2.440	66

Ex-Monopolist Multinational Utility	D	Public	Energy and Gas generation, distribution and sale.	60.143	1.351
Ex-Monopolist Multinational Utility	E	Public	Energy and Gas generation, distribution and sale.	17.418	986
Ex-Municipalized Multiservice	F	Public	Energy generation, distribution and sale; electrical network management; management of water services; ESCo.	3.072	4,3
National Private Utility	G	Private	Energy generation, distribution and sale.	2.022	76
Industrial Group	H	Public	Oil and Gas production, distribution and sale. Energy generation and sale.	1.359	0,413
Ex-Municipalized Multiservice	I	Public	Energy and Gas generation, distribution and sale. Information & Telco	33.765	349
Ex-Nationalized Multinational Utility	J	Public	Energy and Gas generation, distribution and sale.	5.520	74

Table 2.1 - Classification of firms suitable for this analysis

In particular, a sample as vary as possible has been created: companies belonging to different categories have been included in the sample, in order to evaluate possible differences and peculiarities in the approach adopted to manage renewables.

- **Company A**, **D**, **E** and **J** completely respond to incumbency definition, since they have operated in electricity generation market at least for 50 years, even if with previous and different structures, and chiefly as sector monopolists.

- **Company B** has been considered because it shows some characteristics close to incumbency definition: it is the most ancient Italian energy generator and it developed different energy sources in its business.
- **Companies C**, **F** and **I**: the ex-municipalized company represents a particular case of incumbent, as this firm has usually been active in energy generation since the beginning of XX century, and thus before nationalization process. In particular, companies C and F have been selected, because among all Italian multi-utilities, they owned the most vary energy portfolio, especially concerning alternative electricity sources and renewable technologies, though anyway limited in comparison to great Utilities. Company I represent an important player in German energy sector and has been holding a significant market share for its entire existence, from its foundation on.
- **Company G**, though its recent entrance in energy business (during Italian liberalization process), has rapidly gained an important position in energy market, adopting renewable technologies from its early creation; as a result, its commitment in alternative energy generation and its actual market share entail its addition to analyzed sample.
- **Company H** could be partially considered an outsider, as it is mainly focused on gas & oil market, paying scant attention to renewable energy generation; nonetheless, it has operated in electricity business since 2001 and thus meets incumbency requirements. Moreover, adding Company H to the sample, allowed the analysis to be more complete, but required further cautions to preserve this company peculiarities and differences from the other nine societies.

2.2 Data Collection

Direct interviews with key information are the primary source to gather data regarding three main areas of interest[7]:

1. Business Model and Organizational approaches adopted to manage renewables
2. Main internal and external contextual variables, which could affect the strategy concerning point (1)
3. Main impacts of the strategy concerning point (1) on key operating and economic performance data.

For data collection both semi-structured and non-structured questionnaires have been adopted: the first tool has a fixed number and order of questions, while the second one has been used for those interviews concerning extensive themes.

The interviews were conducted between June 2012 and September 2012, both in person and by telephone, with internal figures who may have an holistic view on the three areas of interest listed above. In particular, managers of the renewable unit or chief financial officers were mainly involved in the research activities:

[7] See Attachment 7 for the general Interview Format.

Company	Date	Interviewed Role	Method
A	05/09/2012	Head of Planning and Control-Renewable spin-off	Phone Call
B	28/06/2012	Responsible R&D activities on Renewables and Energy Efficiency	In Person
C	19/06/2012	Manager "Net" Subsidiary (also resp. for photovoltaic activities)	Phone Call
	06/09/2012	Manager Assistant Environment Subsidiary (also resp. for biomass activities)	Phone Call
D	09/07/2012	Manager of Italian Renewable subsidiary	Phone Call
E	14/06/2012	Manager of Italian Renewable subsidiary	In Person
F	20/06/2012	Responsible R&D activities on Renewables and Energy Efficiency	Phone Call
	11/07/2012		Phone Call
G	11/06/2012	CFO Renewable spin-off	Phone Call
H	16/07/2012	Market Analysis & Business Development Manager	Phone Call
	18/09/2012	Resp. Planning Administration and Controlling-Energy Subsidiary	Written Questionnaire
I	05/07/2012	Responsible R&D activities on Renewables and Energy Efficiency	Phone Call
J	12/07/2012	Head of Planning and Control-Renewable spin-off	Phone Call

Table 2.2 - Interviewed companies and roles

Secondly, data on the management and organization of renewable energies activities were also collected through secondary sources such as internal documentation, financial reports, project reports, public business plans and industrial plans. Moreover, generic databases, such as Lexis-Nexis, have been used to collect a

more complete set of longitudinal data which can't be obtained through direct interviews, mainly regarding external organization, in term of M&A, investments, Joint Ventures, Corporate Ventures, etc.

2.3 Data Analysis

The aim of this research is to provide a qualitative analysis of the mechanisms which allow an energy incumbent to succeed in renewable sector, by highlighting: (i) which contextual forces chiefly affect actual organizational and strategic shape, and (ii) which main organizational levers permit an energy utility to overcome incumbent's curse and consequently obtain higher economic and operating performance.
The choice of offering a qualitative investigation, rather than a quantitative study meets different needs:

1. **Focus on qualitative mechanisms**: the aim of this analysis is to identify qualitative elements, such as organizational mechanisms and levers, and to describe them and their relationships within the specific context, rather than to define mathematic associations between variables.
   Furthermore, some of studied variables couldn't be translated in objective data because of (i) their real complexity, (ii) their strong interconnection with many other different factors and (iii) the difficulty in finding a measurable and synthetic data to represent them; as a result, the possible mathematical modeling of some mechanisms would have meant an excessive simplification and consequently led to limited and in some cases even wrong inferences.
2. **Sample insufficiency:** contingent characteristics of energy sector couldn't allow a quantitative analysis; since energy market has been liberalized about 15 years ago, at least in three considered countries, and renewables still represent an emergent business area because of their evident technological immaturity (Shilling and Esmundo, 2009), the number of possible companies to be included in the sample was relatively limited and in any case non-significant for a qualitative cause-effect statistical analysis.

2.4 Results Presentation

Ultimately, data from primary and secondary sources have been revised, crossed and presented through ten case studies divided by company, including information about society's background, business model, internal and external organization. The ten case studies have been afterwards gathered in different clusters. In particular, two first level clustering has been realized, one by organizational approach and one by contextual variables; the following step has been a second level clustering resulting from the junction of the two outcoming from first level gathering. Finally, the five groups resulting from second level clustering have been used as basis for the following discussions concerning the influence on performance data, divided in sub-variables (costs, revenues, risk, time, etc.), in order to highlight each single impact.

3. Framework

Starting from literature evidence it is possible to structure a general framework with key variables and relationships, in order to analyze incumbents' strategic and organizational approaches adopted to face emergent radical innovations.

The model is built around the innovation process of firms (Pinkse and Van den Buuse, 2012), which includes three main phases: technology perception, technology development, and technology commercialization. A particular emphasis is given to "technology perception" which is at a central position: it is the input for future business model and organizational structure adoption, and it receive as input the current state of both organization and environment.

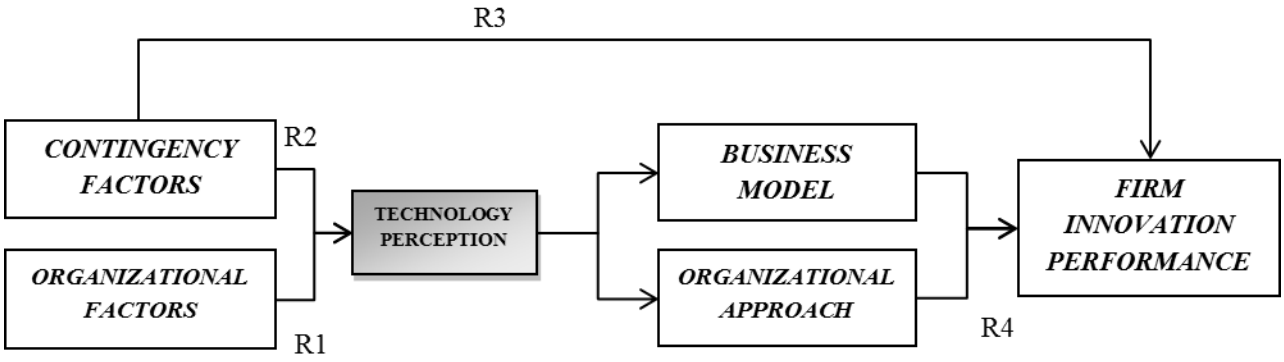

Figure 3.1- Framework used the research and the analysis

3.1 Business model

First of all, this work aims at analyzing in which way an incumbent's business model may be changed to cope with a radical innovation. It is necessary to start from the business model, since scholars agree that the business model is a valuable tool for understanding and analyzing the strategic and managerial level of a company. The business model, in fact, is used by managers "to capture, visualize, understand, communicate and share the business logic" (Richter, 2012).

Changes in business model derive directly from technology perception and are necessary every time a disruptive innovation is introduced in the business portfolio (Rothaermel and Hill, 2003), since the business model is the description of "planned or existing business including the elements of value proposition, configuration of value creation and revenue model" (Stähler, 2001). The degree of this change depends on how the radical innovation is perceived by the incumbent, and thus, on the degree of complementarity, its strategic importance, the existence of synergies in upstream or downstream activities, etc. "A business model tries to give an integrated and consistent picture of a company and the way it aims to generate revenues." (Schweizer, 2005). Therefore, the analysis of a company's business model and its transformation occur

parallel to the study of the organizational approaches, since these are simultaneously part and consequence of the business model.

Despite in literature there is no commonly accepted schemes of a business model, this work will follow Richter's (2012) conceptualization, based on Osterwalder and Pigneur's (2009) work, with some changes instrumental to present analysis; thus, since "the essence of a business model is in defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit" (Teece, 2010), the elements of a business model that worth to be analyzed are: (1) value Proposition: portfolio of products and services that create value for the customer; in particular, this point comprises company's horizontal and vertical diversification, outsourcing and delocalization degree; (2) revenue model: describes how the business generates its sales revenue and includes the relationship between costs and benefits generating by offering the value proposition to the customers. This conceptualization has the advantages that it has already been tested in practice, it is easy to apply and it has already been used in energy industry, in particular regarding renewable energies (Okkonen and Suhonen, 2010; Richter, 2012).

As a result, this work starts with the question: "How do incumbents shape their business model to cope with the emergence of a disruptive innovation?" (Richter, 2012).

Business Model Elements	Variables
Value proposition	Portfolio of products and services that create value for the customer, considering in particular: • Technological Diversification • Vertical Integration/Outsourcing Degree • Delocalization
Revenue Model	How the business generates its sales revenue, including the relationship between costs and benefits generating by offering the value proposition to the customers.

Table 3.1 - Business Model Elements, including Value Proposition and Revenue Model

3.2 Organizational Approach

The central focus of this work are organizational approaches which let an incumbent overcome inflexibility and inertia, while facing the emergence of a disruptive technology. In this framework the organizational approach follows directly the new technology perception: if the innovation is perceived as complementary, strategic, marginal, etc. on the basis of company's initial status quo and environmental factors, then different approaches are followed.

The organizational approach of an incumbent regards two main structures: (1) internal organization and (2) external organization.

3.2.1 Internal Organizaton

Internal structure comprises four main aspects of organizational management, i.e. organizational culture, organizational structure, and human resources (Yu and Hang's, 2010).

1. **Organizational Culture**: Organizational culture can be a useful tool of controlling and coordinating people within a company, without using formal methods (Tushman and O'Reilly, 2002). But, at the same time, organizational culture can be a cause of incumbents' inertia in front of disruptive innovations. Thus, it is important that incumbents create an organizational culture that can foster the advent and the application of radical innovations (Lichtenthaler, 2006). Culture and leadership are, thus, organizational variables which should be monitored, because they represent tools that may shake incumbent's inertia to its foundations. The basis for an innovative culture, are for instance entrepreneurship, risk-taking, creativity, flexibility, adhocracy etc. (Cameron and Quinn's, 1999; Naranjo et al., 2011), so as "Visionary Leadership" (Tellis and Golder, 1996), a leadership style oriented toward future emergent markets, and "willingness to cannibalize", the inclination of an organization of reducing actual incomes in favor of a potential disruptive innovation (Chandy and Tellis, 1998).

2. **Organizational Structure**: this variable regards the organizational structures adopted by incumbent firms in order to face a changing environment.

The key variables that should be monitored in order to study incumbent's flexibility are (1) number and size of business units; the most recent trend suggest that innovation activities are better executed in small units, than in larger ones (Yu and Hang, 2010; Lee and Chen 2009; Lejarraga and Martinez-Ros 2008). (2) The structure in which the new business is allocated; main approaches could concern the establishment of new, dedicated and autonomous units/department to face with radical innovation or the adoption of an ambidexterity approach. In particular, some authors argue that the majority of incumbent leaders who succeed at radical innovation and maintain their leading positions, set up an autonomous business unit in which there was the freedom to apply a completely different and more appropriate business model (Christensen, 2002). On the other hand, organizational ambidexterity is viewed in literature, as a possible approach to cope with innovation: this approach aims at creating organizations that contemporarily pursue opposite goals: incremental vs radical innovation, exploration vs exploitation activities, flexibility vs commitment, alignment vs adaptation etc. (Bolinao, 2008; O'Reilly and Tushman, 2004). (3) Hierarchy degree or autonomy in decision-making processes. For some scholars, middle management of single business units should have the autonomy of making key decisions regarding innovation, because top management is too committed in mainstream business and investments that may cause cultural inertia (Hill and Rothaermel, 2003). (4) Key processes, phases, and activities to develop and manage radical innovation; for instance, the management through mini-projects may be a solution for resource allocation problems, since each project is seen as unique and requires different resources; in this way the incumbent doesn't fall into resource lock-in or standardized resource allocation processes (Yu and Hang, 2010). (5) Necessary coordination mechanisms within the organization and formalized, standardized procedures.

All the aspects cited so far, regard macro-structural elements, but also organizational micro-structure has to be taken into account. Thus, human resources, their roles and competencies and eventual needs of external hiring, are elements that are part of the framework:

3. **Human resources**: In the first place, a radical innovation is discovered and pursued by people with specific characteristic. Thus, an organizational approach can't abstract from the key aspects regarding both managers and employees; these principal aspects are (1) composition of team/unit members responsible for innovation development and commercialization and necessary roles for managing innovation projects. In theory, a great role is played by product champions, project leaders, expert promoters, and gate-keepers and relationship promoters (Gemünden et al., 2007); (2)managers' and employees' competencies and characteristics, and research mechanisms (hiring from extern, training courses, etc.). About employees' perspective, for instance, the researcher team should be composed by risk-takers and flexible, creative people and the firm should recruits outside expertise (Murase, 2003), while managers shouldn't be locked in old business models, but the insertion of an additional and new team at corporate level, responsible for supporting the development of radical innovation ideas and their implementation, may be a possible solution (Christensen and Raynor, 2003); (3) Knowledge Management tools used by the company to enhance existing Human Resources' competences and which enable intra- and inter-functional communication and integration.; (4)Reward/incentive mechanisms and other tools that "prevent disruption from outside due to brain drain of talents and disruptive ideas." (Yu and Hang's, 2010).

Internal Organization Elements		**Variables**
Organizational Culture	Commitment	Visionary Leadership, Commitment, Willingness to cannibalize
	Main Values	Flexibility, Risk-taking, Trial and Error, Adhocracy, Creativity
Organizational Structure	Structure	Spin-off, ambidexterity, new dedicated business unit
	Size	Number and size of business units
	Hierarchy	Hierarchy degree, autonomy in decision making, independent business units
	Processes	Key phases and activities in decision-making, development process, implementation process, commercialization process.
	Coordination	Coordination mechanisms, standardization degree, procedures
Human Resources	Composition of team/unit members	Roles: project leader, product champion, gate-keeper, liaison roles
	Researched competencies and hiring strategy	Creativity, flexibility, experience
		External hiring, internal exploitation

	Reward/incentive	Tools and mechanisms
	Knowledge Management	Tools and mechanisms
Organizational Culture	Commitment	Visionary Leadership, Commitment, Willingness to cannibalize
	Main Values	Flexibility, Risk-taking, Trial and Error, Adhocracy, Creativity

Table 3.2 - Internal Organization Elements, including Organizational Structure, Culture and Human Resources

3.2.2 External Organization

External structure concerns the role of the network of relationships that can help an incumbent to spot the radical innovation and to develop the necessary competences to exploit it, that can be pursued through different levels of collaboration and alliance with research institutions, suppliers, customers, and incumbent or start-up competitors.

About external organization, the attention of some researchers has been focused on inter-firm relations, in particular on the role of alliances and collaborations and on their impact on firm's innovation performance (Argyres and Silverman, 2004). Different kind of collaboration are possible and they may be classified for (1) the level of involvement and collaboration in the relationship; scholars have classified three main level of inter-firm cooperation, derived from transaction cost theory (Williamson, 1975, 1985): (i) "contract arrangements, such as contract R&D, manufacturing, marketing, and licensing, where the knowledge transactions can be precisely priced" (Chang, 2003). (ii) "a new organizational form, such as equity investment, joint venture and merger and acquisition" (Chang, 2003). (iii) "strategic networking and alliance, where partners generate knowledge jointly" (Chang, 2003) . Some mechanisms may be joint R&D collaborations, research consortia, co-development, and at an extreme situation Open Innovation. and (2) for the kind and number of external actor involved into the relationship, which may usually belong to two categories: (1) industrial partners, i.e. i.e. start-up competitors, suppliers, etc. or (2) research partners, i.e. research institutions, universities etc. From these elements it is possible also to deduce the (3) purpose of these networks, that can be mainly classified into two categories: explorative and exploitative, and (4) knowledge and resources exchanged with the partners, due to the level of commitment in the relationship.

External Organization Elements	Variables
Level of involvement	Contract arrangement in R&D, manufacturing, marketing, and licensing; new organizational form: equity investment, joint venture and merger and acquisition; strategic alliance: joint R&D collaborations, research consortia, co-development; Open Innovation

Number and kind of partners	– Industrial partners: suppliers, competitors (incumbent or start-up) – Research partners: research institutions, universities.
Aim of the relationship	Exploration, exploitation
Exchanged resources and knowledge	Type of resources exchanged

Table 3. 3 - External Organization Elements, including the Level of involvement in the relationship, the number and kind of partners, the aim of the relationship and Exchanged resources

3.3 Contextual Factors

Incumbents' perception of new technology mainly depends on contextual factors, that not necessarily are endogenous factors. Contextual factors may in fact has to do with both external environment dynamics and internal organizational characteristics. Thus, contextual variables may be grouped into two categories (Damanpour, 1996): organizational variables and contingency variables.

3.3.1 Organizational factors

Organizational variables are firm-level factors that may affect new technology perception and thus the organizational approach to innovation. Such variables are firm-size, structural complexity, complementary assets, resources, competencies, organizational culture and strategy, etc. An innovation process starts always with current firm's status quo: on the basis of actual resources, assets and competencies that depend on mainstream business portfolio, the radical innovation is perceived as complementary or completely decoupled with current activities. On the other hand, organizational culture and strategy may be built on differentiation paradigm; in this cases, although the new technology is not complementary, it is seen as strategic and hold an important role (Pinkse and van den Buuse, 2012). In a way, current firm's status is always the input for innovation activities and approaches. About firm-size, firm-age, and structural complexity and their impact on innovation perception, in literature there are conflicting contributions: on one hand large incumbents with complex structures have difficulties in spotting and developing innovations that are outside the core business, due to their bureaucratic inertia and commitment to mainstream investments and activities; on the other hand small and young firms may fail at commercializing the innovation, because of some factors: lack of experience, limited network and market resources (Carayannopoulos, 2009). As a result, it would be reasonable to analyze organizational factors in order to point out their impact on innovation perception and, thus on the adoption of different organizational and strategic approaches.

3.3.2 Contingency factors

While defining which is incumbent's new technology perception starting from its initial status, also external factors has to be taken into account. These contextual elements are contingency factors, due to their endogenous nature. They are extra-organizational variable and may regard market-level or technology level

factors. In particular, the perception of a disruptive technology is influenced by contextual factors regarding both mainstream situation and new context. Both elements, thus, need to be studied: for instance, incumbent's perception of a new technology depends on the phase in lifecycle of mainstream technology, the resource prices of core activities, regulation and incentives in current market etc., but also on the same elements regarding the radical innovation. Thus, both mainstream business and new business factors are relevant for this study.

Furthermore, both organizational and contingency factors can influence innovation in two different level (Huizing, 2011). First contextual elements may be related to the adoption level of a specific approach, since these factors directly affect firm's new technology perception (R1 and R2). In a way they are the input for the future business model and organizational approach to develop and commercialize radical innovation. Second, contextual variables may affect directly innovation performance, as moderators between an organizational structure/business model and firm's performance (R3).

In literature it is largely deepened the direct impact of firm-level factors on innovation performance, e.g. the relationship size-innovation, but in studies that don't rely on organizational and strategic approaches, such as those that explain Incumbent's curse phenomenon (e.g. Freeman et al. 1983; Henderson and Clark, 1990; Carayannopoulos, 2009). Thus, all organizational factors have an impact on innovation performance passing through organizational approaches. As a result, only the first level of influence is analyzed regarding firm-level factors. On the contrary, contingency factors may both affect new technology perception and mediate between corporate strategy and organizational approach and innovation performance (Huizing, 2011).

Contextual factors		Variables
Contingency Factors	Market level	– Market dynamism – Competitive Intensity – Incentives – Regulation – Resource availability – Resource Price
	Technology level	– Technology intensity – Stage of technology adoption

Table 3.4 - Contextual Factors, including Market level and Technology level contingency factors

3.3.3 Market-level factors

Market-level variable in a wide stream of literature are considered the main contextual factor that influence innovation (Damanpour and Gopalakrishnan, 1998). Such elements are principally:

- **Market dynamism**, linked with market uncertainty, that in turn depends on market variability and market complexity (Damanpour, 1996), and technology turbulence (Walker and Weber, 1984). This factor may require specific firm structures, such as a flat and organic organization, made of small, specific and autonomous business units, in order to ensure the required flexibility (Damanpour,

1996). Furthermore, market uncertainty and frequent technology changes may have opposite effects on the role of external networks: on one hand, "higher technological turbulence increases a firm's benefits from pursuing an outbound open innovation strategy (Gambardella et al., 2007)" (Lichtentaler, 2009), because even a large and established firm can't cover all technological evolution with its internal R&D means in an industry that continuously moves (Cesaroni, 2004; Ulset, 1996; Swan and Allred, 2003; Calantone and Stanko, 2007). On the other hand, uncertainty and turbulence may complicate the process of contracting (Stanko and Calantone, 2011) and increase opportunistic behaviors; thus, for some scholars market dynamism is more linked to closed innovation and internal R&D (Croisier, 1998; Nakamura and Odagiri, 2005).

- **Competitive Intensity** can be defined as "the degree of competitors that a firm faces within its industry (Grewal and Tansuhaj, 2001; Zhou, 2006)" (Li et al. 2010). Competitive intensity may influence innovation on two levels (R2 and R3): first a flexible strategy is importantly correlated with competitive intensity, because when competition is high the firm has to take into account an higher number of variable and the effect of its strategy are no more deterministic, but stochastic (Dreyer and Gronhaug, 2004; Li et al., 2010). Furthermore, under condition of intense market competition, firms are more induced to collaborate (Wu, 2012). Nonetheless, on the other hand, some authors state that market competition can have negative impact on innovation performance, if the companies had adopted an approach based on technological alliances (Wu, 2012), because high competition increase the fear of opportunistic behavior that may jeopardize the cooperative agreements.
- **Incentives and Regulation:** it doesn't exist in literature a general accepted argument on the nature of the influence that incentives and regulations may have on innovation strategy, since contrasting thesis are supported: some scholars sustain the positive impact, because environmental regulation can be viewed as an external jolt that can thus foster innovation (Marcus and Weber, 1989; Meyeer, 1982); some others support the negative correlation, due to the bureaucracy required to comply with environmental regulation(Breyer, 1982); finally other authors provide evidence for no correlation (Sanchez and McKinley, 1998).

  Different kinds of regulation are studied in literature: economic regulation, such as entry regulation, price regulation, regulation of natural monopolies and other public utilities; social regulation, such as environmental regulation; and institutional regulation, i.e. liability rules. The effect of different kinds of regulation on innovation strategy may depend on industrial sector and on specific situations. For example, under condition of environmental regulation dictated by society, all technologies with low environmental impact are seen as strategic and may bring a competitive advantage (Blind, 2012).

  About incentives, public policy include different mechanisms, such as "R&D incentive programs, investment incentives (grants or low-interest loans), incentive taxes, incentive tariffs, mainly feed-in-tariffs, voluntary programs and compulsory renewable targets (production quotas and tradable certificates)" (Marques et al., 2010). The effect of the public policy, in particular in energy sector, may be

different depending on the specific mechanisms that is adopted: Carley (2009) states that subsidiary programs are positively correlated with renewable energy generation share, while tax incentives are negatively associated with this dependent variable. The different type of incentive and their effect on technology perception (R2) and innovation performance (R3) should thus be monitored.

- **Resources availability and price**

3.3.4 Technology-level factors

- **Stage of technology adoption**: the phase of the S-Curve in which both mainstream and innovative technology are may influence innovation strategy. Following Chandy and Tellis (1998) theory on "willingness to cannibalize", if mainstream technology still present an high rate of marginal benefits growth, then it may not be advantageous and profitable to introduce an innovation. In this case, the new technology may not be implemented immediately. The opposite situation can occur when the current technology has already reached its maturity: thus the introduction of a radical innovation may be the only way to survive and to maintain the market position.

  At the same time, the degree of development of the radical innovation can influence the organizational structures: if the technology only need to be implemented and it has already passed through its initiation phase, then it would require a small, organic and autonomous structure, because "greater complexity leads to a variety of opinions and potential conflicts, and more difficulty in reaching consensus, which could cause more difficulty in implementing innovations (Duncan 1976, Zaltman et al. 1973)." (Damanpour, 1996).
- **Technology intensity**: high technology intensity cause frequent technology changes. This contextual variable may influence the organizational approach to innovation, because the more complex the technology is, the more firms innovate through external relationships (Wu, 2012), since a wide knowledge base is required and neither a large incumbent can own all the competencies.

Contextual factors	Variables
Organizational Factors (Firm Level)	– Firm-size – Firm-age – Structural complexity – Business Portfolio – Strategy – Complementary assets – Resources and competencies

Table 3.5 - Contextual Factors, including Firm level Organizational Factors

3.4 Innovation Performance

In literature, the researchers face the problem of defining an adequate set of innovation performance that is worth to be monitored and that well capture innovator's success or failure.

Since innovation performance has been defined by several researchers as the "economic financial and non-financial outcomes of the firms' product innovation efforts" (Bakar and Ahmad, 2010; Cooper, 1984; Cooper and Kleinschmidt, 1987; Gemunden and Heydebreck, 1992; Hise and O'Neal, 1990; Hollenstein, 1996; OECD, 2005), the variable mainly present in literature belong to two main different classes: objective and subjective measures.

Objective measurement are financial and economic indicators. Economic indicators refers to the share of turnover related with radical innovation, turnover growth, operative margins, etc. However, many authors agree that economic and financial indicators alone are not sufficient to cover innovation performance (O'Regan and Ghobadian, 2004; Bolinao, 2008; Atuahene-Gima, 2005).

However, also non-economic output of innovation activities should be monitored; usually it is expressed in term of frequency of new product introduction or number of new products introduced, etc.

Finally, some scholars argue that also subjective measurement are important, because they represent in a way the ultimate objectives and goals of companies and in particular of innovation activities. Among this qualitative variables, customer satisfaction, image, reputation, market share, position regarding competitors etc. have to be taken into account (Bolinao, 2008; Edralin, 1998).

In conclusion, innovation performance that needs to be analyzed and monitored, ca be classified into four main categories: the first three groups regard objective and quantitative measurements and are (1) economic indicators, (2) innovation outputs (3) subjective measures, qualitatively and indirectly studied:

Performance category	Variables
Economic indicators	Share of Turnover related with radical innovation
	Cost reduction
	Turnover Growth
	Operative margin
Innovation output	Share of renewable energy generation
	Frequency of radical innovation introduction
Subjective measures	Market share
	Customer satisfaction, public image, reputation etc.

Table 3.6 - Performance indicators used in the framework, divided in Economic indicators, Innovation outputs and Subjective managerial measures

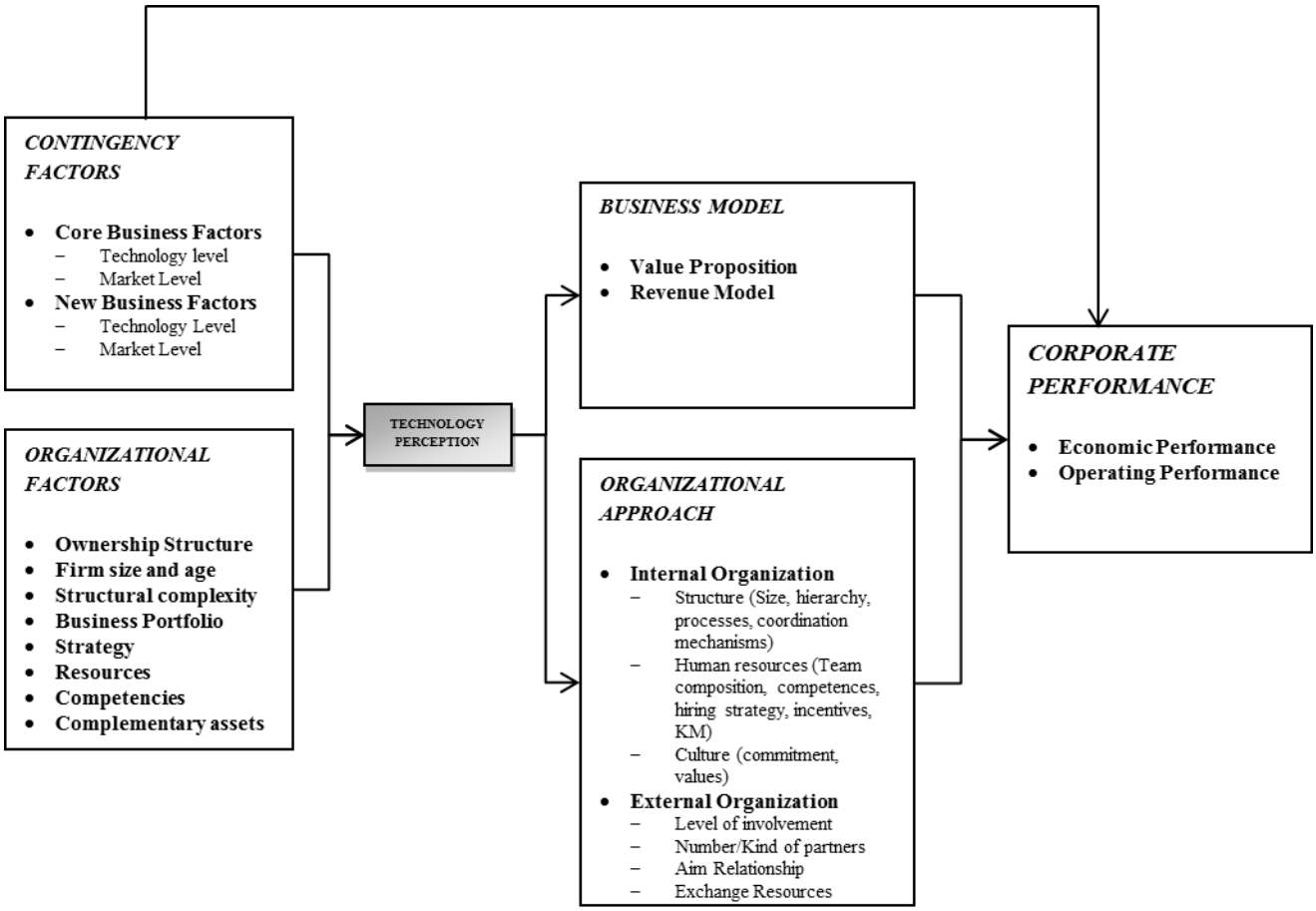

Figure 3.2 – Detailed Framework used for research and performance analysis

4. Case Studies

4.1 Company A

4.1.1 Background Information

Company A, the largest Italian electrical firm, was created in 1962 after the nationalization of energy sector. It resulted from the takeover of about 1.270 small energy firms operating in Italy and it remains actually the leader with a share of 30%. In 2011 Company A operates in energy generation and trading, engineering and construction of power plants, management of electricity infrastructure and networks, and renewable energy generation.

The Company's share is controlled in 2011 by the Ministry for the Economy and Finance of the Italian Republic, which owns 31.24% of the share capital, and by the group controlled by BlackRock Inc. which owns 2.74% of the share capital as asset management; the rest of the capital is owned by small investors (less than 2% each).

The company begins to approach the renewables during the mid of the 70's as a consequence of oil crisis occurred in 1974. After Chernobyl disaster in 1986, a large amount of R&D budget dedicated to nuclear technology was shifted to the renewable energies. Company A, during the '90s, begins to accumulate experience and competences mainly in hydroelectric but also in wind and solar technologies managing these activities first in a dedicated business unit and then in divisions scattered in those countries where it operates. In December 2006, Company A decides to invest about 4 bln € in 5 years in renewable technologies to decrease the CO2 emissions. In 2008 Company A decides to create a dedicated spin-off collecting all people and competences scattered in divisions belonging to different countries. Actually the renewable spin-off operates in 16 countries and owns about 620 operating plants and is the worldwide leader thanks to 22 billion KWh generated from water, sun, wind and geothermal energy.

4.1.2 Business Models

Company A adopts both energy utility traditional business model and energy utility unconventional business model to generate electricity (Richter, 2012).

Traditional business model is carried out by the spin-off created in 2008 and focuses on large onshore wind farms, photovoltaic plants and solar thermal plants with more than 1 MW power, but operates also in biomass and geothermal sector.

The value chain includes the same stages for all alternative technologies managed by Company A; within Italian utility it doesn't exist a pre-configured business model concerning outsourcing degree rather than internal covering of the value chain: the spin-off can choose among different approaches, on the basis of the single opportunity and sometimes the technology and the country. As a result, Company A's value chain and its possible business models concerning traditional value proposition may be summarized as following:

1. Opportunity scouting, project development, plant building: regarding these upstream stages of the chain, Company A usually considers three different models, i.e.
    a. Green field projects: in some cases the company covers the entire value chain, starting from the external authorization, passing through the construction and arriving at the plant management;
    b. Partnership with developers: Company A has a strong network of agreements with different developers, who scout opportunities and begin the authorization process of the project; when Company A takes over, it can immediately start with the operative construction of the plant by opening the site. The choice of creating this kind of partnership depends on two strategic reasons: firstly, the company has pressing bonds regarding the installed capacity, due partially to the fact that it is listed; as a result it needs a critical mass of starting projects, higher than its real financial capacity. Secondly, in the last few years the price of the authorization has increased progressively, in part because of speculative intentions; in order to avoid this mechanism and its negative economic effects, the company created the network of agreements.
    c. Projects in construction or completely built: in this specific case Company A buy the project from the constructor and thus the company enter with just a supervisory role; it starts exercising its ownership after the conclusion of the building stage and the connection to the grid.

    The choice among these three models depends mainly on the contingent opportunity of the moment: the cost of the single authorization, the timing of the regulation, the cost required for the construction agreement, etc. are all decision-making factors.
2. Components procurement: Company A is vertically integrated in cells and modules manufacturing, through a joint venture created in July 2011 with other 2 multinational firms to develop a solar modules; nonetheless, company's demand is not fully internally covered.
3. Plant management
4. Operation & maintenance: outsourcing choices applied on this downstream part of the value chain, concretize in two opposite models: some Company A's subsidiaries draw up global service agreements for O&M with components suppliers; but there are also subsidiaries that carry out directly the whole value chain comprehensive of the operative management; the strategy of doing in house or leaving in outsourcing O&M, is often a consequence of the specific technology: the supplier of the wind turbines often guarantees a service package including two years of free management and maintenance, which is usually extended on payment to the following years; this doesn't happen, for instance, for a geothermal plant, whose maintenance is necessarily carried out internally.

In any case, Company A's strategy, which partially comes from its history, is to internally own all competences and resources to cover all the stages of the value chain; just in some recent and rare cases,

precisely regarding biomass technology, the company decided to leave a great part of the chain in outsourcing because of the lack of necessary resources: for this technology, the utility resorts to EPC contracts, since the procurement of the material and all agricultural and forest activities lie outside Company A's core know-how.

The revenue model regarding traditional value proposition is not too different from the one used for thermoelectric plants: the company may benefit from environmentally friendly produced electricity by offering green electricity tariffs with an "eco" price premium per sold unit (Bird et al., 2002); it furthermore includes feed-in premium, green certificates and all inclusive feed-in tariffs, obtained by building an intensive exchange process with GSE.

Unconventional business model is carried out by the spin-off created in 2000 by the parent organization (and after 2008 located into the new renewable spin-off) and focuses on building energy systems that are located on the property of the customer. This spin-off realizes mainly photovoltaic plants but also residential solar thermal systems and micro-wind plants. The value proposition ranges from simple commodity suppliers to comprehensive energy solution providers, like the joint program with an Italian bank for guaranteeing special conditions to final customers who acquire residential plants. The spin-off uses an interesting (and quite unusual for this sector) channel for commercializing renewable plants: franchising services by paying royalties and initial fees to installers/distributors/system integrators. Actually the company can boast 300 MW of installed capacity in the retail business and a network of more than 700 franchising installers on the Italian area in 2011. Revenues are characterized by selling renewable plants and offering different types of service (from operation and maintenance to administrative and consulting) to the final customer.

4.1.3 Internal Organization

The new spin-off was created in 2008 through a collecting process of human resources, competences and assets already developed in house but spread in different organizations and countries. The aim of this process was the foundation of a flexible and more agile structure to manage renewable technologies, by isolating them from traditional business and by changing formalization and coordination mechanisms already established.

In 2010, the renewable spin-off developed a new organizational model by creating a matrix organization divided by areas (Italy and rest of Europe; Iberia and South America; North America; Developing countries) and functions. The spin-off structure was tailored to replicate the main phases required to build and manage a renewable plant by revolutionising the old business units organization. The functions are: (i) Business Development dealing with activities related to the concept of the project till its realization. It is divided by areas (the countries defined above) to maximize the efficacy of operative developing activities, even if all strategic decisions are centralized in Italy; (ii) Engineering and Construction dealing with operative activities ending when the plant comes into operation. This is divided mainly in two levels: 4 centres of excellence (one for each renewable source except for the biomass that has an own BD function because of the specific competences required by this source) aimed at evaluating renewable source adequacy;

engineering activities are divided by type of technology; (iii) Operation and Maintenance which is organized by countries and manages all plants belonging to a specific area with the aim of maximizing plants performances. The matrix organization allows a delocalized management of the three areas in order to maximize the efficacy of their execution, since in each country-specific subsidiary there are resources for each function, i.e. Business Development, Engineering and Construction and O&M. Nonetheless, the autonomy is not equally distributed among Italian headquarter and country subsidiaries: all strategic decisions regarding the Business Development and the Engineering and Construction areas are centralized, while O&M is more delegated at a country level, except for all consulting aspects.

The spin-off duplicates also staff divisions, among which: (i) the "innovation management" division plays the role of scouting innovative renewable technologies and applications by collaborating with external partners and conveying them to the central R&D function (recently, RE spin-off has developed a solar thermal concentration plan with the intervention of the R&D central function after an evaluation process undertaken by the innovation management division); (ii) the regulatory affairs division aimed at managing renewable policies activities, requiring different kind of relationships with policy management actors (i.e. Gse, Gme, Enea, Aeeg) and different evaluation mechanisms to assess the investment profitability. There is also an head division who has the role of leading the process as a sort of gatekeeper, managing the firm's interface with policy makers.

The establishment of the spin-off instead of the renewable division allows renewable activities to have a certain level of autonomy from traditional business, as it can independently define its own industrial and strategic plans (of course revised by the parent company).

Regarding hierarchical relationship between the spin-off and the parent company, in addition to the almost complete strategic independence of the subsidiary concretized for instance in autonomous investment decisions, the ad hoc organization maintains service agreements for some administration activities, such as legal office, accountability, etc.; nonetheless, the relationship is quite fully limited to these non-core interchanges.

The new structure requires, of course, to define appropriate coordination mechanisms. After the listing on Borsa Italiana's MTA Market at the end of the 2010, coordination procedures became well defined both along horizontal and vertical axes. Though this formalization, coordination mechanisms are obviously more flexible than the ones developed in the parent organization. Few spin-off functions need to periodically interface with parent organization units with weekly meetings aimed at sharing several best practices imported by parent company even if the spin-off needs to re-structure the evaluation performance process and revise the interaction process with medium and small size actors.

Of course, there are several critical processes to be undertaken by the spin-off in order to carry out renewable operations in a more efficient way. One of them is the innovation process that is carried out with an active collaboration between innovation function and central R&D function aimed to: (i) outsource the strategic R&D activities to the parent company R&D function through the "service contracts" instrument after having individuated the main renewable aspects or technologies; (ii) outsource non-core activities to external

partners to reach more quickly the market. The definition of new processes requires also the establishment of new functions: this is the case of the "design to cost" function, a cross unit composed by employees coming mainly from O&M and E&C divisions aimed to verify if the objective of reducing time and cost for managing renewable projects are really reachable and eventually set best suited objectives.

At the same time, new processes require also new organizational skills and thus the establishment of new roles. This is the case of the project engineer that has the responsibility to supervise the project from the concept to the execution supporting the B&D function and O&M activities. On the other hand, the operative stages, i.e. the execution of the project, are entrusted to the project manager, responsible for controlling costs, budget and time of the project and at the same time experts in problem solving especially regarding the relationship with the suppliers. This last figure isn't completely new in the energy sector, since all PM activities are almost the same for both traditional and renewable business, unlike Business Development or the Construction that for traditional or innovative technologies are completely different. The main peculiarities of the "renewable Project Manager" lie in two typical elements of the new business:

- the parallel management of more simultaneous project; photovoltaic and wind projects require, in fact, lower financial resources and can be carried out at the same time; secondly, the company has precise bonds regarding the installed capacity and must reach the previously defined goals; as a result, it starts a number of projects higher than its effective financial availability could allow. The project manager should be able to contemporaneously execute and evaluate and eventually interrupt them.
- the priority of time constraints on cost constraints: photovoltaic and wind plants are usually small and simple projects and don't present a great variability in costs, since their technical execution is standard; in these cases, the most critical factor is the right timing of the project, as some phases, i.e. the authorization, may last 3 or 4 years. A partial exception to this consideration are geothermal plants: their realization imply complicated technical aspects, such as the civil building or geological studies, that may cause further costs; as a result, in these specific cases that in any case represent a low percentage of the entire renewable business, in addition to time constraints also costs have to be considered as important factors.

Concerning hiring strategy, since the spin-off was creating by gathering existing resources spread in different organizations and countries, Company A didn't acquire external HR. On the contrary, the new spin-off required an effective program, in order to successfully manage the merger in a unique structure of different cultures and people who had always worked separately. For this reason, the company established the "Change Management Program" that consists in two global meetings held in Rome and Rio de Janeiro. These meetings aimed at individuating, with a bottom-up approach involving employees organized in team works, ideas and concepts on organizational models, critical competences and key roles that should be established within the spin-off in the re-organization process. Some of ideas emerged by these meetings were implemented by the spin-off: (i) the re-definition of GANTT tools dedicated to wind and solar technologies

and the development of innovative interactive tools aimed at monitoring renewable plant performances; (ii) the definition of a set of training programs for engineering and construction employees.

Among the different ideas, also the definition of ad hoc knowledge management tools crept in; it passed through the development of a pilot project called "4+x" within engineering and construction function for exchanging best practices and skills among team works. This project should widen the application of this platform firstly to the B&D and O&M functions within the spin-off and then to external partners and organizations, with of course adequate information limitation policies.

Regarding reward mechanisms, the spin-off received in heritage from Company A a Management by Objective (MBO) system, that is consistent with the general strategy of increasing the installed capacity. The performance are in fact evaluated at the end of the year on the basis of (i) absolute "production level", i.e. further MW installed per year and (ii) the correspondence between reality and the industrial plan, that for instance forecasts 4.500 MW in addition to existing 7.100 MW within 2016.

Top management commitment on renewables is quite strong: the company decided to spin-out renewable internal activities in a new firm using a bottom-up approach to design new processes and functions in order to stimulate employees focused on renewable activities and avoiding the resistance to change.

4.1.4 External Organization

Spin-off's partnerships can be divided in R&D and industrial relationships according to the aim of the collaboration.

R&D activities are undertaken with about 40 universities and research centres located in Italy (almost 50%) and abroad, already established by the parent company, through two main forms: (i) annual financing contracts to be renewed each year with universities departments or group research focused on renewable sources; (ii) long term partnerships with research centres for developing renewable projects: i.e. the partnership with Enea, revised by the spin-off in the light of the development of solar thermal plants and of pilot projects on concentrated solar technologies. These partnerships also require the spin-off to establish dedicated team works managed by the external relationship business unit of being periodically involved and focused on the exchange activity.

Industrial activities relationships can be split in partnerships aim at:

1. **building renewable plants**: these relationships differ from that established by parent company mainly due to the huge increase of the number of partners that small-size plants and renewables require. In particular, the spin-off created by the parent company in 2000 has established, in the last 10 years, franchising agreements with about 700 small-medium size local installers that commercialize renewable systems. This requires to define both new organization approaches and new roles, i.e. human resources who work as a bridge between Company A and franchisees and who own a mix of commercial and technical competences.

2. **developing industrial projects**: these are undertaken by establishing completely new and stronger types of partnerships. Two examples of industrial partnerships aimed at developing new projects, may be:
    a. the joint venture created by the spin-off in July 2011 with other 2 multinational firms to develop a new solar module (i.e. multi-junction thin film cells and modules) production plant characterized by an open approach sharing IPs owned by one of the company that participates to the JV and creating a contractual model that allow to the participants to exploit innovations developed within the JV program. Each company brings its own competences within the joint venture: (i) the Company A spin-off shares its experience in engineering, construction, maintenance and operation activities on solar plants; (ii) the Japanese multinational company, that designs and manufactures electronic products, brings the multi-junction thin film technology and its experience in commercializing solar modules in Europe countries; (iii) the French-Italian electronics and semiconductor manufacturer, brings its highly qualified staff in the microelectronic field and innovation skills in energy saving applications. The plant has an initial production capacity of 160 MW/year and occupies about 280 employees. The project has been financed through different kind of resources and tools: (i)partially through the equity of all three companies, since the subscribed agreement provides for an equal contribution of 70 million € in cash or material/immaterial assets, (ii) partially (49 million €) through a fund created by CIPE and (iii) using the form of the project financing with three Italian credit institutions, i.e. Banca IMI, Centrobanca and Unicredit.
    b. Strategic collaboration undertaken by the spin-off with Italian agricultural consortia (CAI) to co-develop agro-energy local chains with the aim of create a distributed generation model focused on biomass technology and develop real biomass districts in Italy. The partnership is concretized in an equal Joint Venture (Company A owns 51% and CAI 49% of the new organization) created at the end of 2010. The projects are developed and realized through ad hoc society, completely owned by the new joint venture. Also in this case, each subject brings different and specific competences within the JV: company A exploits its technological leadership in renewable business, while CAI plays on its ability in creating supply agreements for biomass purchase.

Company A			
Background	**Contextual Variables**	Foundation/History	The firm was created in 1962 after the nationalization of energy sector, by Italian Government; it resulted from the takeover of about 1.270 small energy firms operating in Italy.
		Ownership	Shareholders' Structure: • 31.24%: Ministry of Economy and Finance (Italian Republic) • 2.74%: group controlled by BlackRock Inc. • Less than 2%: small investors
		Business Portfolio	Energy generation and trading, engineering and construction of power plants, management of electricity infrastructure and networks, and renewable energy generation
		Market Position/Key Results	Italian leader with a share of 30%
		Introduction of Renewables	The company begins to approach the renewables during the mid of the 70's as a consequence of oil crisis occurred in 1974
Business Model	**Value Proposition**	Value Proposition Diversification	Both energy utility traditional business model and energy utility unconventional business model are undertaken; The Company focuses on large onshore wind farms, photovoltaic plants and solar thermal plants with more than 1 MW power, but operates also in biomass and geothermal sector
		Geographical Diversification	Localized in 16 countries: Italy and rest of Europe; Iberia and South America; North America; Developing countries
		Covering of the Value Chain	It doesn't exist a pre-configured business model concerning outsourcing degree rather than internal covering of the value chain: the spin-off can choose among different approaches, on the basis of the single opportunity and sometimes the technology and the country; Main models: • managing of Green-field projects • Co-development with partners • Acquisition of projects in construction or completely built (rarely)
	Revenue Model	Incentive and incentive-free Revenues	The company may benefit from environmentally friendly produced electricity by offering green electricity tariffs with an "eco" price premium per sold unit; it furthermore includes feed-in premium, green certificates and all inclusive feed-in tariffs, obtained by building an intensive exchange process with GSE.
Internal Organization	**Organizational Structure**	Structure	**Traditional Business Model**: Spin-off created in 2008 through a collecting process of human resources, competences and assets already developed in house but spread in different organizations and countries **Unconventional Business Model**: spin-off created in 2000 by the parent organization (and after 2008 located into the new renewable spin-off)
		Unit/Spin-off Size	2,955 FTEs

		Hierarchy	Almost complete strategic independence of the subsidiary (e.g. autonomous investment decisions)
		Key Processes	Innovation (R&D) Process
		Coordination	Few spin-off functions need to periodically interface with parent organization units with weekly meetings aimed at sharing several best practices imported by parent company
	Human Resources	Hiring Strategy	Gathering of existing resources spread in different organizations and countries; no external resources have been acquired; The new spin-off required an effective program, in order to successfully manage the merger in a unique structure of different cultures and people ("Change Management Program")
		Composition of team/unit and Key Roles/Competences	**Project Engineer**: • responsibility to supervise the project from the concept to the execution supporting the B&D function and O&M activities **Renewable Project Manager**: • parallel management of more simultaneous project • priority of time constraints on cost constraints
		Reward and Incentives	**Management by Objective (MBO) system:** performance are evaluated at the end of the year on the basis of (i) absolute "production level", i.e. further MW installed per year and (ii) the correspondence between reality and the industrial plan
		Knowledge Management	Pilot project called "4+x" within engineering and construction function for exchanging best practices and skills among team works

		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	40 universities and research centers located in Italy (almost 50%) and abroad	• Franchising agreements with 700 small-medium local installers • Joint Ventures (e.g. joint venture created by the spin-off in July 2011 with other 2 multinational firms to develop a new solar module) • Strategic Collaborations with Italian Agricultural Consortia (CAI)
	Level of Involvement	• annual financing contracts to be renewed each year with universities departments or group research focused on renewable sources • long term partnerships with research centers for developing renewable projects	
	Aim of the Relationship	Exploration of new solutions	• Building renewable plants • Developing Industrial Projects

Table 4.1 - Synthesis of Company A's Case Study

4.2 Company B

4.2.1 Background Information

Company B is the Europe's oldest energy company, as it was created in January 1884 in Milan, for energy generation and distribution. Today, it's one of the most important Italian operators in procurement, production and marketing of electric power, natural gas and crude oil. The company is is the second player in Italy in electricity production activities, with a share of 10,7% in 2010. During the 60's and '70s with the nationalization process, Company B diversified its product portfolio in other industries (chemical, electromechanical, textile). In 1991, following the transposition of EU directive about the liberalization process, Company B scheduled a long term investment plan focusing on building combined cycle power plants and cogeneration plants and acquiring the shares of firms that generate electricity both with traditional and renewable sources.

The Company's controlling shareholders are: Transalpina di Energia (61.3%), Company D Group (19.4%) and Tassara Group 10%. Transalpina di Energia is owned in equal shares by Delmi (A2A 51%, Enia 15%, SEL 10%, Dolomiti Energia 10% and financial shareholders 14%) and Company D. Company B's shares are traded on Borsa Italiana, having a free float of 9.3% of the Company's share capital.

The first Company B's important approach to renewables occurred in 1998, when Company B decided to acquire an Italian industrial company operating in the production of wind turbines. This action was the consequence of two main contextual changes: first, the liberalization process started at the end of '90s and second the European directives that ratified the necessity for utilities to produce a share of energy from renewable sources. As a consequence of this external dynamics, Company B decided to refocus its business on energy generation and renamed the holding in order to concretize this strategic change. During the first year of 2000, Company B started acquiring participation in small companies that owned in their portfolio biomass plants. These companies were owned completely by a subsidiary (a vehicle firm) located into the "energy systems" business unit that reported to the company COO. In 2005, after the enactment of a clearer regulation regarding the different renewable sources Company B decided that renewable technologies could be a "stand-alone" business and established a new business unit, "Fonti Rinnovabili", within the traditional organization.

4.2.2 Business Models

Company B has a strongly focalized value proposition, as it adopts traditional business model focusing on generation and production activities of electricity in large scale renewable energy projects (i.e wind farms for about 400 MW, biomass plants for about 6 MW and solar plants for about 5 MW) and subsequently delivered to the end customer. Consequently, Company B offers no energy efficiency consulting to final customers or sale of small renewables plants: company experienced these markets in 2009, but then abandoned them because of the difficulty in managing a widespread commercial network and since they weren't coherent with a focalized portfolio.

The company controls the entire value chain for the three technologies, through different organizations within the hierarchical structure of the holding:

1. Site scouting: the only exception regarding this stage is photovoltaic technology, since solar parks are built on owned lands, so that the first phase is limited to irradiation studies;
2. Components procurement: regarding vertical integration, the company was firstly operating in the production of wind turbines, but it abandoned the activity almost immediately by selling out the company it acquired in 1998. This choice is due to both technical and economic problems: first, the mono-blade wind turbines developed by the company didn't prove to be successful, since the majority of wind parks were and are based on tri-blade technology; in addition the managerial complexity for building turbines was too high and the company didn't manage to change the project and the product; finally, that business guarantees lower margin in comparison to downstream activities. The same strategy has been followed for vertical integration in solar business: although Company B considered the possibility of entering cells and modules production market, it has never found the sector attractive. The reasons of this "non-entrance strategy" are mainly two: firstly because of the high entrance barrier and secondly because the presence of Chinese producers was too challenging for a company that wasn't downstream integrated in the sale of modules to end customers. The sold out of these activities is consistent with the strategy of Company B of focusing on electricity generation activities.
3. Project development, external authorization and construction of the plant: the praxis is to cover also the central part of the whole value chain; this is the reason that explains why in the last 15 years, the utility acquired already developed plants, in the core sector, i.e. wind business, just in two cases: (1) in 1998 Company B acquired an Italian company operating in the wind sector, mainly by building wind blades and turbines; at the time, the company owned in portfolio some not yet realized wind projects, that Company B developed and built, even if they actually represent an insignificant portion of the entire installed capacity. (2) In 2010 the acquisition of a society gave Company B control over a wind park which included 13 turbines (26 MW). Considering recent years, in some other cases, in order to exploit temporary opportunities Company B chose to acquire already authorized projects (100 MW starting from the beginning of the business) although this is the alternative that guarantees a lower margin.
4. Management: large-scale plants are usually built for internal management (no unconventional business model application), since this is the core business of the holding: no renewable plants have been sold out in last years; on the contrary, some thermoelectric and hydroelectric plants have been disposed in the last period, in order to obtain financial resources for new investments.
5. O&M.

Company B's revenue model still remains heavily dependent on governmental incentives in all renewable technologies: in 2010 incentives and Green Certificates still represented about the 70% of total revenues from renewables.

4.2.3 Internal Organization

In 2005 Company B created a dedicated business unit to manage renewables. In 2011, the business unit still exists and is composed by about 105 people (25 employees on biomass field, 10 on mini-hydroelectric field and 70 in wind and solar fields). The business unit comprises all activities, know-how and assets concerning photovoltaic, wind, biomass and mini-hydroelectric, divided in:

- One company, subsidiary of Company B, responsible for solar and wind plants and activities; in 2011 the company owns 470 MW of wind plants and 8,3 MW of photovoltaic.
- Corporate "box", named "Servizi Di Energia" and 80% owned by Company B, which controls mini-hydroelectric (6 million € of turnover) and biomass (8 million € of turnover).
- Two photovoltaic plants (4,3 MW) owned directly by Company B; these were the first investments in renewable technologies, developed and built by the holding.

The business unit, led by a manager who report directly to the group strategic committee, is divided in four main functions: (i) development function dealing with individuation activities of plant location, preliminary analysis (i.e anemometric studies for installing wind plants), authorization processes and projects validations (realized at a corporate level by the Head Office); (ii) operation function that is divided among geographical areas and technologies and manages operation and maintenance activities; (iii) market function dealing with economic analysis activities and new investment projects evaluations. This function interfaces directly with the commercialization and marketing group function; (iv) CO2 function that deals with the transferring process of CO2 emission credits and energy efficiency certifications.

Concerning structural hierarchy, the quite limited autonomy left to the business unit causes a continuous handover of processes from one structural level (corporate) to another (business unit); in fact, Development function (i) is responsible for internal validation, even if it is actually realized at a centralized level, by the head office: an internal committee approves the project, provided that it respond to some specific financial criteria. The same autonomy limitation occurs for the construction: the project is followed by those human resources of the "Fonti Rinnovabili" business unit who developed it, but time and costs of the job are operative controlled by the central engineering function, responsible for both renewables and traditional plants construction. When the installation is completed and the plant is connected to the grid and operating, then its management passes again to the business unit and exactly to the operation function (ii), that is responsible for the O&M processes. This further handover is always necessary, since operative management of a renewable park is completely different from the one of a thermoelectric plant: although the construction project is similar and the conjoint execution at a central level allows the holding to exploit several synergies, O&M follows a substantially different process, due to technical differences: a thermoelectric plant is usually concentrated in 2 hectares and has its control room exactly under the installation: if a breakdown occurs, the technicians notice it and operate immediately, since the malfunction may jeopardize the working of the whole plant. A wind plant usually comprises 20/30 turbines extending over dozens of km: the possibility of breakdown is monitored by a control room centralized for all wind plants and located in a single city for all Italian installation; time and modality of operating are clearly different.

The other processes that Company B has centralized are the common staff functions (i.e. procurement division, finance division, human resource division) and energy trading, that allow this company to avoid duplicated employees, working instruments and competences. This affects the efficacy that dedicated procurement and finance functions may have on firm operating activities and results, since human resources working in the procurement function alternate their activities both on traditional and renewable procurements with a de-structured process that does not allow to split the competences.

Another process that had to be revised in the light of the new organizational structure is the innovation process. R&D and innovation activities are carried out by both the central R&D function and a dedicated team located in the development function within the renewable business unit. The central R&D function comprises only 23 members and usually follows and controls external relationships with other research centres, universities, etc. The team within the business unit has the role of individuating and analysing promising innovative applications and technologies in photovoltaic and wind fields. They also have the role of writing periodic reports giving a picture on the state of art of technologies and their applications. The key driver used by the renewable business unit and the strategic committee for assessing the new potential renewable projects is the IRR indicator. Company B also exploits an internal research centre, that never explores radical new sectors or solutions: it aims at testing eventual new technologies developed by other organizations; the most frequent tests regard photovoltaic modules and concentrated pv technologies.

Regarding human resources, no particular new competences were researched, since many processes were shared between renewable and traditional business. As a result, people recruitment has been undertaken mainly by reallocating internal employees working in traditional functions. External recruiting was limited to turnover and retirement cases. In these cases young figures were preferred, because of the low cost of their skills and the ease of training their competences. Within renewable business, just a new figure has been created: the renewable business developer aimed at scouting and assessing potential investments and new projects. On the basis of the company renewable project portfolio it defines the priorities and potential areas that company might cover by acquiring already developed plants or by building new ones.

Finally, the strong managerial commitment on wind activities is dictated by the fact that wind plants average dimensions are higher and wind electricity production costs are lower compared to other renewable sources. The other renewable sources presents several problems, due to higher risks, difficulties and costs of raw material purchasing (biomass) and finally to the excessive dimensional fragmentation of the plants. All these peculiar characteristics explain Company B's substantially different level of economic effort in the three main technologies.

4.2.4 External Organization

Company B's external relationships are undertaken both with industrial partners and companies.

Industrial partnerships don't aim at developing innovative and breakthrough technologies, but rather at managing operating activities left in outsourcing. Type of partnerships, level of involvement and aims of the relationships, change according to the specific technology:

- For wind and biomass fields, Company B enters into agreement with technical designers, agronomists and geologists for managing local plant authorizations and feasibility studies and with electrical and renewable specialist engineers for analysing plants technical requirements (these technical issues are seldom managed by the internal R&D function). It doesn't establish long term contracts with strategic partners that are normally fixed for wind, biomass and mini-hydro activities: these relationships are activated ad hoc for single projects but contract conditions are well defined and standardized.

  Industrial collaborations are also undertaken through active and passive acquisition processes. On the one hand, Company B in order to enlarge the renewable business portfolio in the shortest time, acquired existing society, but it happened, as already said above, just in some specific cases. For this reason, Company B established the "merger and acquisition" business unit aimed at managing the aggregation process within the firm. On the other hand, the company itself has been the target of an acquisition process started in 2001 and led by Company D. During the last 10 years the exposition in the capital of Company B gradually increased and thus also the sharing of resources: the big French utility gives at Company B's disposal in 2011 about 2.000 researchers.
- For photovoltaic source, Company B uses tenders for engineering and construction activities in order to minimize the overall costs involved in a project. In particular, solar module and inverter costs fall down significantly during the last two years causing a strong drop of photovoltaic system costs at all. For this reason, Company B tries to benefit from this contingency situation avoiding to create stable and long term relationships with EPC or solar model producer companies. This has obviously the problem of decreasing the efficacy and efficiency of overall building processes but at the same time has the advantage of decreasing overall costs.

Renewable collaborations with universities are represented by: (i) long term contracts with few technological departments to develop new applications or improvement in existing technologies; (ii) sponsorships for market and technical studies carried out by university energy departments for assessing renewable sources potentialities: i.e. the company commissioned a study on Italian market potentialities for concentrated solar photovoltaic technologies to Politecnico di Milano; (iii) sponsorships to university business school for letting their top employees to participate in high training programs focused on energy and renewables.

Regarding these collaborations one of the main interesting change is related to the way the company collaborates with universities. In recent years, a greater openness came from both the company and universities. Company B understands that is more useful to collaborate with universities through an intense exchange of information and competences in order to allow them to make research projects much more complete and using them for understanding the market. The main difficult is related to the presence of two different functions that deals with renewables R&D activities: the function belonging to renewable business unit, which is the interface with universities, and the central R&D function, involved for more technical aspects.

			Company B
Background	**Contextual Variables**	Foundation/History	Created in Milan in 1884 for energy generation and distribution in the town; during the 60's and '70s with the nationalization process, Company B diversified its product portfolio in other industries (chemical, electromechanical, textile)
		Ownership	Shareholders' Structure: • 61.3%: Transalpina Energua • 19.4%: Company D • 10%: Tassara Group • 9.3%: Free Float
		Business Portfolio	Procurement, production and marketing of electric power, natural gas and crude oil
		Market Position/Key Results	
		Introduction of Renewables	In 1998 Company B decided to acquire an Italian industrial company operating in the production of wind turbines
Business Model	**Value Proposition**	Value Proposition Diversification	Focalized value proposition in Traditional business model
		Geographical Diversification	No Geographical Diversification (the Company is localized in Italy)
		Covering of the Value Chain	Covering of the entire value chain: Site scouting, components procurement, project development, plants management, O&M
	Revenue Model	Incentive and incentive-free Revenues	Heavily dependent on governmental incentives in all renewable technologies (in 2010 incentives and Green Certificates still represented about the 70% of total revenues from renewables); Costs are largely shared with traditional organization.
Internal Organization	**Organizational Structure**	Structure	Dedicated Business Unit (created in 2005)
		Unit/Spin-off Size	105 people (25 employees on biomass field, 10 on mini-hydroelectric field and 70 in wind and solar fields)
		Hierarchy	Quite limited autonomy is left to the business unit for investment decisions, construction and project management
		Key Processes	**Operating Processes**: Engineering and Construction are shared with the traditional organization; O&M is specific for renewable technologies. **Staff processes** are executed within the holding. **R&D and innovation** activities are carried out by both the central R&D function and a dedicated team located in the development function within the renewable business unit

		Coordination	-
	Human Resources	Hiring Strategy	Reallocating internal employees working in traditional functions; external recruiting was limited to turnover and retirement cases. In these cases young figures were preferred due to lower costs.
		Composition of team/unit and Key Roles/Competences	No particular new competences were researched, since many processes were shared between renewable and traditional business
		Reward and Incentives	-
		Knowledge Management	-

		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	• long term contracts with few technological departments to develop new applications or improvement in existing technologies; • sponsorships for market and technical studies carried out by university energy departments for assessing renewable sources potentialities • sponsorships to university business school for letting their top employees to participate in high training programs focused on energy and renewables.	Depending on the specific technology: • For **wind** and **biomass** fields, Company B enters into agreement with technical designers, agronomists and geologists for managing local plant authorizations and feasibility studies • For **photovoltaic** source, Company B uses tenders for engineering and construction activities in order to minimize the overall costs involved in a project
	Level of Involvement		
	Aim of the Relationship		Management of operating activities left in outsourcing.

Table 4.2 - Synthesis of Company B's Case Study

4.3 Company C

4.3.1 Background information

Company C is a multi-utility firm born in 1909 in Rome as a municipal firm aimed to furnish electricity for developing illumination town services.

Company C currently operates in: (i) electricity production, distribution and sale (is the third Italian operator in electricity distribution activities); (ii) hydro services management (it is the first operator in Italy that offers hydric services); (iii) waste treatments (it is the fifth Italian operator in waste managing activities).

The company share is owned for more than 50% by the Rome municipality, for about 27% by market, for about 13% by an Italian industrial company that has activities in cement, finance, housing and publishing market and for about 10% by a France energy utility. At the end of the 90's Company C becomes a s.p.a and listed the 49% of its share on Borsa Italiana.

At the beginning of the 2000, Company C acquires by the ex-monopolist the distribution network in Rome and in 2002 creates a joint venture with a Belgian company in generation and trading of electricity to final customers.

Company C entered renewable business in 2006, through the acquisition of a company which operated in WTE sector. The company actually owns renewable power plants divided in: about 25 MW of biomass plants, 12 MW of wind and 25 MW of photovoltaic.

4.3.2 Business models

Company C adopts both traditional and unconventional business models according to the type of renewable source: the first one is focused on both photovoltaic and biomass technologies, while the second one exclusively on photovoltaic installations.

Concerning traditional value proposition, significant differences exist in value chain management according to the type of source; regarding biomass, the spin-off owned by the first level subsidiary "Ambiente" controls in 2011 four lines of WTE plants for a total installed capacity of 40 MW. The company was traditionally focused on downstream activities in WTE business: 10 out of 40 MW were obtained through the acquisition of a company which operates in the WTE sector (in 2006); Company C has thus been active just in O&M and energy trading, until 2009 when it started the realization of three new lines dedicated to the treatment of Refuse Derived Fuel (RDF) in S. Vittore for a total installed capacity of 30 MW and an authorized volume of 300.000 T/year. Anyway, even if the company gradually shifted its control towards upstream activities in last years by controlling the realization and construction of biomass plants, it doesn't cover these stages through fully internal resources, but rather it leaves them in outsourcing, anyway by maintaining the project management of all phase. Regarding the revenue model of the biomass field, the spin-off obtain returns from (i) the sale of electricity and (ii) the supply of collecting waste services: as a result it can be considered particular in comparison with the other technologies, even if it is classified as "traditional value proposition".

The same initial approach of acquiring existing companies and focusing on the last part of the value chain was adopted to manage wind business: starting from 2002 the company entered wind area, by creating a joint-venture with a Belgic society responsible for the management of middle-large wind parks realized in Campania; anyway, this technology and its business model were abandoned on March 2011 when Company C disposed its share in the JV.

As far as photovoltaic technology is concerned, industrial-scale are managed through a more widened business model, similar to the one adopted in last year to manage biomass: in this field the company never acquired existing plants or societies, but started its activities in 2008 through the realization of ground solar installations on owned sites, by covering thus the following value chain:

1. Project development: development of the project including both acquisition of already authorized and internally authorized projects
2. External authorization
3. Supervision of construction, left operatively in outsourcing to EPC companies; when Company C decided entering the solar sector, it had to take a "make or buy" decision and to acquiring the consequent necessary resources; the company chose not to invest in internal human resources, i.e. workers and constructors, but to left this stage in outsourcing.
4. Management and O&M

Company C begins to approach the unconventional business model in 2007, when the Italian Government defined interesting photovoltaic feed-in tariffs and long term objectives, by building photovoltaic systems on owned industrial facilities roofs. Actually, the value proposition of the company regarding unconventional business model includes: (i) turnkey plants including O&M services financed and owned by the final customer; (ii) turnkey plants including O&M services financed by the spin-off. These are remunerated through feed-in tariffs and energy services offered to the final customer; (iii) turnkey plants including O&M services financed by the spin-off on facilities leased by the customer with a remuneration contract. What characterized this business model is plants size: the spin-off only realizes medium-large size photovoltaic plants for industrial customers (i.e. firm that operates in the automotive sector or that have industrial warehouses), investment funds and other private/public investors who want to finance high return renewable investments: Company C doesn't build plants for small private customers (residential segment market), although the company initially entered this market in 2009. However, the activity of building photovoltaic plants for third parties is not considered a strategic activity and it is limited to build 25-30 MW per year.

The company obtains revenues from the unconventional business model by: (i) selling turnkey plants to retail market; (ii) obtaining feed-in tariffs from plants built on final customers propriety; (iii) obtaining incomes from energy services offered to the customer (a sort of the ESCO business model).

4.3.3 Internal Organization

Actually it doesn't exist a single subsidiary or business unit completely dedicated to renewables, but each technology is managed within a spin-off that refers to a specific business area. Company C is, in fact,

structured as an holding that owns 22 companies, grouped in four industrial areas: (i) water, characterized by companies managing the integrated water cycle; (ii) energy and network composed by companies that manage the generation, production and distribution of electricity; (iii) environment characterized by companies that manage waste cycle activities; (iv) other services composed by a company that operates in engineering, research and consulting activities on environment and water fields. Each business area correspond to a first-level companies which are leaded by a sole director and own shares of second-level companies.

Renewable technologies are thus distributed on two different business areas:

- Biomass plants are allocated in a first level spin-off belonging to the environment area that was created in 1997. The spin-off "Environment" includes three second-level subsidiaries: the first one is responsible for WTE activities and manages the three lines of the biomass plant located in S. Vittore (30 MW), one installation in Terni (10 MW) and an additional plant, that doesn't have electrical potentiality, but produces fuel form waste; the second one includes two societies responsible for composting plants and mud treatment and one transport society; the third one owns the authorization for the construction of a regasification plant.
- Photovoltaic activities and energy efficiency services are allocated under the business area "Network" in a partially owned (51%) spin-off also responsible for energy efficiency activities and created in 2005. For each business area, i.e. photovoltaic and energy efficiency, it exists a single manager, led by the manager of the firs-level subsidiary "Network".
- wind plants are no longer managed by Company C after selling the Belgian company acquired in 2002. These activities were run in a spin-off (with the inclusion of the Belgian company) for building and managing medium-large sized wind farms and turbo-gas plants.

As far as hierarchical structure is concerned, both units responsible for WTE and photovoltaic are flat, lean and characterized by a low degree of formalization, as they gather respectively about 20 people.

Concerning the photovoltaic organization it comprises two areas, i.e. project realization and operation activities; the first one includes a middle manager responsible for the coordination of many projects; the second area gathers one middle manager and some employees who supervise and control the plants and define O&M, plants controlling, insurance agreements. The biomass spin-off defines only two hierarchical levels (and not several roles as in traditional organization) characterized by: (i) a responsible that supervises operation activities and reports to the sole administrator; (ii) operative employees that supervise and monitor plants with the role of carrying out maintenance, monitoring, insurance and warranty contracts.

As a result the number of hierarchical levels within the single spin-off is really limited making vertical coordination mechanisms among project managers and operative roles quite flat. Horizontal coordination mechanisms assumes more importance and are managed by carrying out periodical meetings leaded by the responsible area: this is often used by solar spin-off employees for developing and analysing business opportunities.

Regarding the decisional process and the communication with the corporate level, the first-level spin-off enjoys an elevate level of autonomy, but not the second-level subsidiary or renewable business units. Concerning in particular photovoltaic, investment projects don't have to pass always at a corporate level, but are evaluated by the "Network" society, firstly because of the technical specificities of these technologies and secondly in order to guarantee the necessary speediness in the renewable business. For these reasons projects may overcome some formalized procedures of evaluation and just need a formal authorization from the holding. Thus the selection of the investment initiatives occurs within the renewable operative spin-off, so as the first economic feasibility evaluation; the business plan is then passed to the first- level subsidiary and finally signed by the holding. Once the project is authorized, it is initially financed by the holding in order to avoid bottlenecks for the research of external capital and then by bank debt.

Moreover, each spin-off communicate with the corporate organization for staff activities, purchased through service agreements. In each subsidiary there are some human resources responsible for communication and coordination with corporate staff roles, in order to improve the efficacy in several areas such as: procurement, finance and human resource activities. For what concerns procurement activities, for instance, they share information about: (i) types of components to be acquired; (ii) components suppliers; (iii) EPC companies to be approached.

Regarding the change of some processes, the innovation process in photovoltaic and energy efficiency fields is carried out by the scouting business unit within the first-level spin off in order to: (i) identify the more relevant topics that has to be explored. Inputs can came from renewable spin-offs that require focus or verification on a specific technology as in the case of micro-wind technology (some years ago) or from the business unit itself; (ii) a continuous exchange process with external partners (universities, research centres and renewable districts) to catch interesting information.

Regarding recruitment of new human resources and researched competences, external hiring occurred just in limited cases: the majority of the figures working in photovoltaic field comes from inside the organization, especially from energy efficiency area but also from traditional business; within the spin-off just a few people, less than ten employees, were researched outside and they are responsible for site and projects evaluation and for communicating with customers, etc. These employees are skilled young people. The same could be stated for biomass field: about 80% of employees is reallocated from traditional business units. In any case, Company C promoted some training courses in order to fill the gap between real and needed competences; the main problem concerning this gap was the lack of figures with and integrated know-how on technical, managerial, commercial and bureaucratic aspects.

4.3.4 External Organization

Since Company C manages the two renewable technologies in separate organizations and with different business models, also external networks for biomass and photovoltaic can be distinctly analysed.

Regarding biomass field, Company C establishes only industrial relationships, which may be grouped into two categories: (i) EPC partners for outsourcing operating activities in building biomass plants, identified

through public tenders; (ii) middle farms and institutional entities for promoting the diffusion and development of biomass sector; in particular, a new interesting collaboration on this field is with an Italian farm bureau (Coldiretti) aimed at incentivizing and supporting biomass plants by using animal, agricultural and forestry wastes. Company C also develops an internal team focused on biomass European energy projects for partnering small and medium Italian farms (mainly located in the centre and south of Italy) to define a bid for European tender: the company participated with small local farms to an European tender, expired at the mid of April, that incentivizes the building of biomass plants for a total amount of 100 € bln. This kind of relationships requires a process of exchanging cross-sectorial competences. Small firms can contribute more on single technical aspects while multi-utility has to collect the scattered competences among firms and carry out the final bid for applying the tender.

For what concerns photovoltaic activities, the spin-off establishes both industrial collaborations and R&D partnerships.

Industrial relationships are created with: (i) industrial component suppliers (i.e. producers of inverters, panels support structures etc); (ii) EPC partners; (iii) research centres (i.e. Enea, Italian National Agency for New Technologies, a public body supervised by the Ministry for Economic Development) and universities (i.e. La Sapienza and Politecnico di Milano); (iv) renewable districts located in the South of Italy.

Regarding the first category, i.e. components suppliers, Company C doesn't establish multi-year agreements but depending on each specific situation the contract is discussed and the conditions are defined; the main reason for this strategy, that may appear inconvenient for the company, is the impossibility of elaborating sure forecast plans, due to the rapid evolution of the context, regarding both regulative aspects and the change of the costs structure of panels. Even if the agreements is newly defined every time the company need to build a new plant, the supplier is not chosen in the market with a spot contract; the partner belongs to a short list that is defined by the spin-off and is managed by the central procurement function. The resulting process is completely different from the traditional one conducted within the holding: it is more agile and several contracts are evaluated on the basis of prices that suppliers set out and the warranty conditions they settle in order to obtain the better economic conditions. These procedures are completely new for the firm and are more similar to that used by private companies in procurement activities.

As far as the third category of external partners is concerned, R&D collaborations in photovoltaic field are established by the spin-off mainly with Enea and a few of university departments that are involved in renewable research activities. For example, the spin-off tries to individuate interesting renewable applications and spot processes improvements (i.e. the photovoltaic plant installation activities on buildings) and products improvements (i.e. the development of new CPV systems) through the use of the scouting business unit within the first-level spin-off. These scouting activities have led Company C to develop a collaboration with Italian CPV component producers to test the efficiency of these systems. Moreover, the spin-off had evaluated, after an in depth analysis on photovoltaic modules technologies, to acquire a thin film module producer. This has not been done because prices of traditional modules and systems changed during the last months. The former is a long term collaboration with Enea aimed to test and validate several

photovoltaic components. They installed photovoltaic pilot plants based on poly-crystalline, mono-crystalline and thin film technologies in order to have several examples for realizing benchmark analysis.
Regarding finally the fourth category of external partners, the spin-off also establishes a long term collaboration with an industrial district located in Lecce that deals with energy efficiency and photovoltaic activities aimed at incentivize the relationships among large firms and local industrial operators to "support a local industrial chain with favourable conditions".

Company C			
Background	**Contextual Variables**	Foundation/History	Created in 1909 in Rome as a municipal firm aimed to furnish electricity for developing illumination town services.
		Ownership	Shareholders' Structure: • 50%: Roman Municipality • 13%: Italian industrial company that has activities in cement, finance, housing and publishing market • 10%: France energy utility • 27%: Free Float
		Business Portfolio	(i) electricity production, distribution and sale (is the third Italian operator in electricity distribution activities); (ii) hydro services management (it is the first operator in Italy that offers hydric services); (iii) waste treatments (it is the fifth Italian operator in waste managing activities).
		Market Position/Key Results	Electricity Market Share (2011): 1.5%
		Introduction of Renewables	Company C entered renewable business in 2006, through the acquisition of a company which operated in WTE sector.
Business Model	**Value Proposition**	Value Proposition Diversification	Both traditional and unconventional business models are undertaken, according to the type of renewable source: the first one is focused on both photovoltaic and biomass technologies, while the second one exclusively on photovoltaic installations.
		Geographical Diversification	No Geographical Diversification (the Company is localized in Italy)
		Covering of the Value Chain	Building and installation are left in outsourcing to EPC Companies. In some cases, already built plants have been acquired (10 out of 40 MW were obtained through the acquisition of a company which operates in the WTE sector in 2006)
	Revenue Model	Incentive and incentive-free Revenues	The company obtains revenues mainly from the unconventional business model by: (i) selling turnkey plants to retail market; (ii) obtaining feed-in tariffs from plants built on final customers propriety; (iii) obtaining incomes from energy services offered to the customer (a sort of the ESCO business model).
Internal Organization	**Organizational Structure**	Structure	Actually it doesn't exist a single subsidiary or business unit completely dedicated to renewables, but each technology is managed within a spin-off that refers to a specific business area: Biomass plants are allocated in a first level spin-off belonging to the environment area, while Photovoltaic activities and energy efficiency services are allocated under the business area "Network" in a partially owned (51%) spin-off also responsible for energy efficiency activities
		Unit/Spin-off Size	Biomass: 20 FTEs Photovoltaic: about 30 FTEs

		Hierarchy	The first-level spin-off enjoys an elevate level of autonomy, but not the second-level subsidiary/renewable business unit
		Key Processes	**Staff processes** are executed within the holding. **R&D and innovation** processes are just realized for photovoltaic field: the activities are carried out by the scouting business unit within the first-level spin off
		Coordination	Horizontal coordination mechanisms are managed by carrying out periodical meetings leaded by the responsible area
	Human Resources	Hiring Strategy	**Photovoltaic**: less than ten employees, were researched outside and they are responsible for site and projects evaluation and for communicating with customers **Biomass**: about 80% of employees is reallocated from traditional business units
		Composition of team/unit and Key Roles/Competences	No particular new competences were researched; nonetheless, Company C promoted some training courses in order to fill the gap between real and needed competences
		Reward and Incentives	-
		Knowledge Management	-
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	For **photovoltaic** field, relationships are created with: (i) research centres (i.e. Enea, Italian National Agency for New Technologies, a public body supervised by the Ministry for Economic Development) and universities (i.e. La Sapienza and Politecnico di Milano); (ii) renewable districts located in the South of Italy.	Depending on the specific technology: • For **biomass** fields, Company C establishes relationships, which may be grouped into two categories (i) EPC partners for outsourcing operating activities in building biomass plants, identified through public tenders; (ii) middle farms and institutional entities for promoting the diffusion and development of biomass sector • For **photovoltaic** source, relationships are created with: (i) industrial component suppliers (i.e. producers of inverters, panels support structures etc); (ii) EPC partners;
	Level of Involvement	Long term collaboration with an industrial district located in Lecce that deals with energy efficiency and photovoltaic activities aimed at incentivize the relationships among large firms and local industrial operators to "support a local industrial chain with favourable conditions".	No multi-year agreements with component suppliers;
	Aim of the Relationship	Launch of pilot projects concerning new technologies.	Management of operating activities left in outsourcing.

Table 4.3 - Synthesis of Company C's Case Study

4.4 Company D

4.4.1 Background information

Company D is the second largest electric utility in the world, founded in April 1946, as a result of the nationalisation of around 1.700 smaller energy producers, transporters and distributors by the French Minister of Industrial Production. The monopoly of Company D ended in 2000, when the holding was forced by the EU Directive to open up 20% of its business to competitors.

Until November 2004, Company D remained a state-owned company, then through a change of the statute, it became a limited-liability corporation under private law. The French Government partially floated shares of Company D on the Paris Stock Exchange in 2005, though it maintained almost 85% ownership until the end of 2008.

Company E specialises in electricity, from engineering to distribution: its operations include (i) electricity generation and distribution, with a generation portfolio primarily occupied by nuclear, followed by hydroelectric, thermoelectric and wind power and other sources. (ii) power plant design, (iii) construction and dismantling, (iv) energy trading and (v) transport, from the different technologies, such as nuclear, hydropower, marine engines, wind, solar, biomass, geothermal energy and fossil-fired energy. The company entered a part of its actual businesses through acquisition of smaller companies; an example is the British energy sector: Company D is today one of UK's biggest electricity supplier because of the acquisition of a number of British energy companies.

Same M&A strategy was applied to enter renewable business: in 2000 Company D acquired 35% of a French power producer, through which it realized between 2002 and 2003 its first wind park (8 turbines for a total energy generation of 45 GWh per year). The company gradually increased its ownership on the renewable society, till 2004, when D renamed it creating a real spin-off.

Company D started its interest in renewable activities in 1992, when it formed an organization (with other 6 Energy Utilities) called the "E-7" to create an investment fund for development of non- or low-polluting electric projects in developing countries.

Company D actually has its headquarter in Paris, but its generation capacity is distributed in Europe, South America, North America, Asia, Middle East and Africa, for a total amount of more than 120.000 MW.

4.4.2 Business models

Company D bucks for operating in all renewable technologies and in both traditional and unconventional businesses, though the most developed sector is wind (85% of total installed capacity), followed by photovoltaic (10%) and biomass (1.5%).

Concerning traditional value proposition, the company tries to cover the entire spectrum of renewable business, executing the whole value chain inside the organization, even if the company doesn't avoid to turn to external organizations if necessary. Although in fact its most preferable alternative is internal control of the value chain, Company D's history in renewable sector is full of acquisitions and collaborations with

external partners, chiefly due to the necessity of a rapid entrance in the market and generation capacity development. As a result, a peculiarity of Company D's business model is that its value chain is not completely defined a priori, but is enough flexible to exploit different opportunities depending on the change of contextual conditions. The resulting value chains and business models adopted by the company are:

1. Development and authorization: both internal development and acquisition of external projects are part of the strategy of Company D; clearly advantages and disadvantages of the two alternatives correspond to the balance between costs and rapidity: the trade-off between these two elements lead to the acquisition, when the regulation context imposes too short time spans; in these cases it is better to acquire an external project, rather than losing an opportunity if the return rate is positive. this frequently happens in Italy: by leaving both doors open, the company can exploit every time the best opportunity. Although Company D actually prefers internal organic development, in many cases it had recourse on Joint Ventures, since the society didn't own the necessary competences at the beginning of its operation in renewable business. In Italy it preferred being supported by local developers and installers, who already had in portfolio some authorized or partially developed renewable plants. This business model was applied mostly at the beginning of the business, when the priority was being prompt and not efficient: though the costs, the company wanted to enter the market with a certain share and position. Actually the majority of the projects are developed autonomously by Company D, that has expanded its know-how; nonetheless a consistent portion of plants are still developed through some Joint Ventures in several countries: *in 2011*, Company D owns 4.225 MW of gross installed capacity, equivalent to 3.892 MW net and the difference still correspond to the shares of the different partnerships.
2. Building and installation: Company D operates as Project Manager, keeping the control of the process and supplying all necessary resources.
3. O&M

Concerning unconventional business model, even if the majority of realized plants are internally managed and enhanced through the incentives and energy sale, Company D has started selling out in the last year a number of built plant, in particular in France, but also in Italy; plant disposal (mainly industrial-scale wind plants) is a recent option, that the company started considering for many reasons, sometimes opportunistic reasons: i.e. the company want to limit its CAPEX in a specific period, the investment doesn't respect profitability bonds of initial evaluation anymore, etc..

Company D also operates in retail market through a specific subsidiary which autonomously operates in different countries with an owned commercial network including sale-agents. It realizes small (3 KW) and medium (20/40, 100 or 200 kW) plants respectively for households and firms. Finally Company D supplies energy efficiency services through another subsidiary, that is an ESCO and has no relationships with the renewable subsidiaries.

4.4.3 Internal Organization

Company D's general strategy is based on long-term sustainability development of carbon-free technologies. The technology on which the company focuses is nuclear, followed by hydroelectric and then by renewables. As a result, investments in renewable technologies has been led laying down many resources within the organization, as a mark of the strong managerial commitment to this business. This strategy concretizes in the organizational internal structure of the company, where renewable activities are managed by a first level subsidiary, 100% owned by Company D.

The initial approach of the company in renewable business was the partial (35%) acquisition of an existing French society in 2000, after some isolated investments in wind power in 1999. The participation in the capital of this company gradually increased: in 2002 Company D reached a share of 50% and in 2011 the target society is completely controlled. The same happened in some of the other ten countries where Company D operates: in North America the company acquired the leader of the US wind power market in 2002, in Italy it partially entered the capital of Company B in 2001 and more in 2005 and it acquired two wind farms with a total capacity of 46,1 MW in 2007, in Germany it acquired a society that owns solar and wind plants in 2008; although with different time and importance, the same strategy was applied in Turkey (2008), Spain (acquisition of a solar energy company, active in the development, construction and maintenance of ground- and roof-based photovoltaic power plants in 2008), France (acquisition of a French society that markets and installs photovoltaic solutions in 2010) and Canada (acquisition of a society that enable Company D to obtain complete ownership interests in seven Quebec wind energy projects in 2011).

As a result, in 2011 the company comprises the following subsidiaries responsible for renewable activities:

- a fully owned first level subsidiary, "Renewables", active in plants development, construction and management, located in Paris;
- a first level subsidiary (50% owned by Company D and 50% owned by the subsidiary "Renewables"), which manages renewable activities regarding small plants and operates autonomously and through an owned commercial network;
- a fully owned first level subsidiary, dedicated to O&M activities of all European renewable plants;
- a first level subsidiary (50% owned by "Renewables" subsidiary and 50% by a solar power focused external company), dedicated to the construction of ground and rooftop photovoltaic plants, for firms and agricultural societies in France;
- a 100% owned first level subsidiary, dedicated to the development, construction and management of biogas plants.

Renewable activities in the other ten countries where Company D operates, among which the most important is US, followed by France and Italy, are managed through a widespread network of other societies, partially or completely owned by the spin-off "Renewable" or directly by Company D:

- In Portugal, Company D operates through a 100% owned subsidiary, responsible for all renewable (in particular wind) processes;
- In Spain, activities are managed through two subsidiaries: the first one 100% owned by Company D is dedicated to the management of RES (especially Biomass) projects; the second one, 90% owned

by the first one, is responsible for development, management and O&M of Spain ground and rooftop photovoltaic installations;

- In Italy, Company D operates through two subsidiaries, one responsible for development of RES installations (100% owned), and another dedicated to rooftop small-scale photovoltaic plants (controlled by the first one for about 65%);
- In Greece, D is active with a 100% owned subsidiary;
- In Turkey, the Company controls a 50% owned subsidiary;
- In Bulgaria D just controls hydroelectric activities through a fully owned society;
- In UK there is an important subsidiary (50% controlled by Company D English subsidiary and 50% by "Renewables"), dedicated to development, construction and management of wind installations;
- In USA, Canada and Mexico, Company D had progressively obtained control of existing companies and is actually operating through three different fully owned subsidiary.

The hierarchical structure and the autonomy degree of each entity should be analyzed regarding two different levels:

1. The country subsidiary as regards the spin-off "Renewables": the first one is completely autonomous in the opportunity scouting stage and can propose possible investment projects, as it has visibility on the chance of its specific geographical territory, i.e. possible acquisitions. Each country subsidiary must be subordinate to the holding rules: for each investment is necessary the approval of the shareholder, at different levels depending on its financial commitment.
2. "Renewable" spin-off as regards Company D: the spin-off refers to the holding for investment approvals; however, the projects are usually passed and evaluated at a corporate level only if they pass over a value threshold (50 million €); in all other cases the investment is completely decided inside the ad hoc society.

Financing process may vary case by case, but anyway two different levels must be distinguished. First, it is always necessary the shareholder's approval for the specific effort of each investment (in terms of CAPEX). After that, how this defined CAPEX may be financed is not always decided a priori: as a general rule, renewable projects tend to be financed through a structured bank financing, that depending on the type of the project, may be (i)project financing, usually for wind projects, as they are characterized by greater dimensions, (ii) leasing for photovoltaic projects, that have smaller dimensions and need lower amounts.

For project financing, Company D separates the time horizon of the project in two segments: firstly the company starts financing renewable projects through equity, when the investment is still in its embryonic stage and cash needs are limited; then, during the construction phase, when the plant starts acquiring a shape, banks are involved.

The majority of all other processes are conducted at a country level, even if some are centralized for many reasons:

1. Opportunities scouting is a responsibility of the country subsidiary, at least at the beginning stage; the possible project is then developed and when it is mature and within the subsidiary the interest for

the investment is confirmed, then the financing needs start being more and more important and the responsibility is passed at an higher level. Anyway, each country subsidiary refers only to its sole shareholder.

2. Development: generally conducted at a county level, but for some specific studies the subsidiary asks for the consulting of the headquarter of "Renewable", i.e. for a solar park productivity or for wind studies. Although the data collection, i.e. anemometric tests, is executed by the country entity, specific analysis are led by a centralized function in Paris, as they need technicians and experts who use sophisticated models.
3. Engineering: is centralized in the spin-off, but separated from the traditional one, i.e. for thermoelectric and nuclear; furthermore, for each renewable technology there is a specific engineering function.
4. Procurement: is centralized within "Renewable" for all technologies.
5. Project Management and Plant Management: delegated at a country level.

A final important process concerns R&D: Company D bet a lot of resources in research, both through internal activities and external partnerships; the company has an internal centralized function that includes 2.000 researchers with an annual budget of about € 400 million.

As a consequence, no activities except for staff and financing processes exploit synergies with traditional organization. This is the general rule, but in the recent past occurred cases in which traditional and renewable experiences influenced one another: an example is Wind off-shore: this technology is still new and "Renewable" doesn't have the necessary know-how; in this case "Renewables" subsidiary referred to the corporate level that have more technical resources and with higher experience. In any case, the collaboration between the two hierarchical levels happens rarely and just for specific type of technology.

Concerning process management, Company D decided for a decentralized organization firstly because renewable problems are clearly country-specific and in some cases even site-specific. The person responsible for a definite project should immediately understand the coherence between the project and the evolution of contextual environment, and which type of contact should he/she involve; the local manager must be able to communicate and negotiate with local supplier and installer, and this is even more effective if he/she directly knows the interlocutor. Company D sacrifices an efficient centralized structure, based on synergies and costs sparing, for a more effective spread organization, to prioritize a rapid development. As a result, considering the time necessary for the execution of each stage, the most critical process is external authorization, as Company D still have open projects waiting for the authorization for 7/8 years; all other steps rarely last overall more than one year.

Coordination mechanisms applied for the communication inside the subsidiary and with the holding vary depending on the type of technology and subsequent dimension of the plant: compared to non-renewables projects, for nuclear plants the subsidiary must write frequent reports containing specific and standardized data and sell them to the holding in Paris; on the contrary, for a wind project, that is smaller and requires less financial resources, the communication is more direct and informal.

Concerning the specific communication between "Renewable" spin-off and the holding during the authorization process, it follows all standard procedures of all technologies, also traditional ones: a business plan is written down and sold to the deciding subjects. Nothing specific has ever been developed for renewable business regarding communication and coordination.

The main competences necessary within the new business are both technical and legal-economic skills: the greater part of our resources are engineers, but each project also includes an economic, finance and legal aspect that should be managed. Renewable business isn't a labour intensive sector, in particular with the business model adopted by Company D: the structures are focused on the project management and not on the executive realization of each process. As a result, the majority of the efforts are concentrated on three poles:

a. Project Development: that rarely needs high financial resources;
b. Project Management: the costs are due to the necessity of numerically limited, but highly skilled employees;
c. O&M: the majority of the employees are concentrated in these phases, although in comparison to traditional business the number of resources still remain low.

Concerning Human Resources, starting from the top manager, the majority of managerial roles, except for some isolated cases, comes from external companies. Some other resources come from Company D's traditional organization and have been reallocated in the spin-off; finally some other middle managers or technical experts are allocated in a country subsidiary and then, every 3 or 4 year pass in another country subsidiary, but maintaining the same role, in order to spread competences and know-how.

Regarding knowledge management tools, no new and specific platforms have been introduced for the management of renewable processes: each subsidiary uses the IT platform shared with the whole Company D.

4.4.4 External Organization

Company D's relationships with external industrial may be grouped in three main categories, depending on the type of the partner and commitment in the relation.

Firstly, Company D started and developed its activities in renewable business through an high number of acquisitions of external subjects: the progressive M&A with SIIF started in 2000, marked out its entrance in French business, as well as the already mentioned participations in companies in other countries. This happened in the past, but is still a part of Company D's strategy: in 2011 the Canadian subsidiary succeed in acquiring seven Quebec wind energy projects and in 2012 "Renewable" spin-off acquired a French filed company that develops technologies for solar power generation. As a result, the policy of Company D is to remain always open to external opportunities, but it concretizes the relationships with highest commitment possible: though complete acquisitions and not with co-development agreements, Joint Ventures or other intermediate forms.

Secondly, Company D declares to be a Project Management society that requires frame agreements for all executive activities. The realization of both components and plant are in fact left in outsourcing and managed

through frame agreements. The supply of components is followed by the holding and is usually contracted to global suppliers (i.e. Repower); on the contrary the installation has a more local nature: it is executed by local societies and managed by the country subsidiary.

Third group of industrial partners aims at co-developing new solutions and technologies; key partners are spread all over the world and include EPRI (United States), ETI (Great Britain), SINTEF (Norway), KEMA (Netherlands), CESI (Italy) and other power companies, i.e. Hydro Québec (Canada), ENEL (Italy), Iberdrola (Spain), TEPCO (Japan).

Concerning R&D networks, external research is led through relationships with the academic world, Joint laboratories and institutes and research organizations. Among academic supports, Company D counts universities from several countries: Manchester University (Great Britain), Karlsruhe Institute of Technology (Germany), Politecnico from Milan (Italy), Polish university network, Ecole Polytechnique Fédérale de Lausanne (Switzerland), Tsinghua University (China), TPRI (China), Imperial College (London), The University of Edinburgh, etc. with which it strikes up long-term agreements aimed at developing radical solutions.

Company D's interest in research activities concretizes also in a great number of joint laboratories, such as ECLEER, created with the Ecole des Mines in Paris and the Ecole Polytechnique Fédérale in Lausanne, with the support of Company B. Research projects are undertaken at the centre to improve the energy efficiency of all electricity applications and to develop new alternatives to fossil fuels to supply electricity to the residential, tertiary and industrial sectors. Research programmes will mainly focus on the design of new generations of environmentally-friendly induction heating, the integration of innovative building systems (e.g. solar panels,insulation, etc.) and the development of new energy diagnostic tools. Other examples of renewable laboratories are the EIFER, a joint research Institute with the University of Karlsruhe, located in Germany and the IRDEP with the École nationale supérieure de chimie de Paris, mainly focused on photovoltaics.

The greatest part of the efforts are focused on nuclear technology, in particular regarding security and increase of life length of plants, although an even higher attention is given to renewables. A recent developed project regards wind off-shore: the Astom Group started construing first prototypes of a 5MW machine, that will be set up on Company D's plants.

One of the main problems of external research is the time necessary to obtain a marketable solution, mainly due to the fact that different subjects have different objectives. In the case concerning Company D, this problem is largely mitigated by the context: the major shareholder of all great industrial partners in France is always the State and research activities of Company D are principally concentrated in the headquarter in Paris. As a result the coordination in France works well and usually the development time are narrow, since there is a *super partes* entity that controls and direct all activities.

			Company D
Background	**Contextual Variables**	Foundation/History	The firm was created in April 1946, as a result of the nationalisation of around 1.700 smaller energy producers, transporters and distributors by the French Minister of Industrial Production
		Ownership	Shareholders' Structure: • 85%: French Government
		Business Portfolio	(i) electricity generation and distribution, with a generation portfolio primarily occupied by nuclear, followed by hydroelectric, thermoelectric and wind power and other sources. (ii) power plant design, (iii) construction and dismantling, (iv) energy trading and (v) transport, from the different technologies, such as nuclear, hydropower, marine engines, wind, solar, biomass, geothermal energy and fossil-fired energy
		Market Position/Key Results	French leader
		Introduction of Renewables	In 1992 Company D formed an organization (with other 6 Energy Utilities) called the "E-7" to create an investment fund for development of non- or low-polluting electric projects in developing countries. In 2000 Company D acquired 35% of a French power producer, through which it realized between 2002 and 2003 its first wind park (8 turbines for a total energy generation of 45 GWh per year)
Business Model	**Value Proposition**	Value Proposition Diversification	Both energy utility traditional business model and energy utility unconventional business model are undertaken; The Company bucks for operating in all renewable technologies, though the most developed sector is wind (85% of total installed capacity), followed by photovoltaic (10%) and biomass (1.5%).
		Geographical Diversification	Renewable activities in the other ten countries where Company D operates, among which the most important is US, followed by Italy, then UK, Portugal, Spain, Greece, Turkey, Bulgaria, Canada and Mexico.
		Covering of the Value Chain	It doesn't exist a pre-configured business model concerning outsourcing degree rather than internal covering of the value chain: the spin-off can choose among different approaches, on the basis of the single opportunity and sometimes the technology and the country; The company often adopts M&A strategies.
	Revenue Model	Incentive and incentive-free Revenues	The company may benefit from environmentally friendly produced electricity by offering green electricity tariffs with an "eco" price premium per sold unit; it furthermore includes feed-in premium, green certificates and all inclusive feed-in tariffs, obtained by building an intensive exchange process with GSE.
Internal Organization	**Organizational Structure**	Structure	**Traditional Business Model**: Spin-off created through the progressive acquisition of an existing French Company **Unconventional Business Model (Retail Market)**: first level subsidiary (50% owned by Company D and 50% owned by the subsidiary "Renewables"), which manages renewable activities regarding small plants and operates autonomously and through an owned commercial network **Unconventional Business Model (ESCo)**: fully owned first-level subsidiary, separated from other renewable activities
		Unit/Spin-off Size	2,028 FTEs

		Hierarchy	Large strategic independence of the subsidiary from the Holding (e.g. investment decisions passed to the corporate level only in case the pass over a specific threshold)
		Key Processes	**Opportunity Scouting**: Country level **Development**: country level **Engineering**: Centralized **Project Management**: Country level **Innovation Process**: annual budget for R&D: € 400 million
		Coordination	Few spin-off functions need to periodically interface with parent organization units
	Human Resources	Hiring Strategy	The majority of managerial roles, except for some isolated cases, comes from external companies; Some other operative resources come from Company D's traditional organization and have been reallocated in the spin-off
		Composition of team/unit and Key Roles/Competences	**Project Engineer**: • responsibility to supervise the project from the concept to the execution supporting the B&D function and O&M activities **Renewable Project Manager**: • parallel management of more simultaneous project • priority of time constraints on cost constraints
		Reward and Incentives	-
		Knowledge Management	-
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	Universities and research centers located in France and abroad	M&A strategy with small-medium companies and large utilities
	Level of Involvement	• Many Joint Laboratories and institutes of research • Long Tem agreements with universities	
	Aim of the Relationship	Exploration of new solutions, mainly in nuclear field	Increase installed capacity and scale

Table 4.4 - Synthesis of Company D's Case Study

4.5 Company E

4.5.1 Background information

Company E is one of the world's largest investor-owned power and gas companies. It comes into existence in 2000 from the merger of two important German industrial and energy companies, respectively founded in 1929 and 1923. The first company was an energy holding owned by the state of Prussia and then privatized in 1965; the second was an holding company operating in different industrial divisions regarding energy production and its industrial utilization in several sectors (Aluminium industry, Elektro-Chemistry, etc.) and created by the German Reich after the First World War. In 2003 the company also entered gas market through the acquisition of an important German gas company. Company E's presence in foreign energy markets is chiefly due to a number of acquisitions made in Sweden, United Kingdom, Russia and United States. In Italy Company E acquired about € 10 billion of assets, ex-monopolist was required to divest under liberalization rulings.

The Group is led by a Group Management in Düsseldorf and is segmented into Global Units (by function) and Regional Units (by country): five Global Units manage (i) the generation portfolio, (ii) renewable business, (iii) optimization and trading, (iv) new-build projects and innovation technology, and (v) exploration and production business. The eleven Regional Units manage the retail operations, regional energy networks, and distributed-generation activities, in the United Kingdom, Sweden, Italy, Spain, France, the Netherlands, Hungary, Czechia, Slovakia, Romania, and Bulgaria, besides Germany.

In order to leverage its expertise in conventional and renewable power generation to regions where energy demand is growing rapidly, Company E has created a new unit, "International Energy". Centralized entities deliver staff functions like IT, Procurement, HSSE, etc.

Today the company is one of the 30 members of the DAX stock index of major German companies and a member of the Global Titans 50 index. It operates in more than 30 countries, with about 26 billion customers and nearly 79.000 employees and generates just under 113 billion € in sales in 2011, that corresponds to € 5.3 billion of net profit. In 2011, Company E owns a generation capacity of 68 GW: 28 GW coming from oil and gas plants, 19 GW from coal plants, 11 GW from nuclear generation, 6GW from hydroelectric and 5 GW from wind and other renewable sources, i.e. solar and biomass.

In August 2011 Company E announced a possible jobs cut of 10.000 employees, due to the German decision to close all of the country's nuclear power stations by 2022, and this will require for next year a completely reorganization of the company.

4.5.2 Business models

Company E adopts both traditional and unconventional business model, mainly depending on the dimension of the plant and on the specific source, but assign them to two different and separated structures within the holding.

"Industrial-Scale" plants of wind, biomass, solar energy, wave power plants and carbon sourcing, are managed by the spin-off "Climate and Renewables", that is centralized in Düsseldorf but operates through some local business units, i.e. Nordic, Central Europe, Iberia, Italy, UK and North America. The society follows the value chain entirely, with different stages of commitment and responsibility. This value chain includes the following macro-phases:

1. Origination & Development: in this stage the project is developed after having analysed all site opportunities. This first step may follow three different strategies, depending on contextual elements: (i) the subsidiary of Company E starts a new initiative autonomously, scouting the right site, developing a technical project and writing down a business plan; this strategy is usually called organic development, since all activities are led and executed within the subsidiary; (ii) Company E stipulates a contract with one or more local developers, who already own authorized opportunities and give Company E the space for a co-development; (iii) A&M, i.e. Company E acquires already authorized and developed opportunities on the market and then carries on the project internally. According to Company E's strategy and culture, the first alternative would be the most coherent, but not always feasible, as it require a long time. In fact, the main decision driver is the span of time in which a specific chance may be taken. If the market is already mature and there is no space for an organic development, then the trade-off between time and costs lead to the third alternative. On the contrary, if the technology is new and there are no competitors in a determinate geographical area, then Company E prefers developing the whole project internally in order to obtain the highest margin, though longer times: for photovoltaic projects 3 years are necessary to obtain external authorization; for wind plants even 4 or 5 years. But because of these long times also the cost of "paper" is really high.
2. Engineering: in this phase of the technical execution of the project and is centralized in "Climate and Renewables" in Düsseldorf, but divided by technologies.
3. Construction: it is internally managed by "Climate and Renewables", but contracted out to external companies, following a "shopping around" model: depending on its technical characteristic, the specific part of the plant is left in outsourcing to a civil, electrical or mechanical engineering company and then all systems are assembled together. In this way Company E succeed obtaining materials and services with the highest trade-off between quality and cost for each single part, maximizing the margin of the whole investment.
4. Management: the plants are finalized to both internal management and disposal to third parties. In case of internal management, all assets are monitored and controlled by a centralized division, located in Düsseldorf. The case of external disposal is applied to obtain cash for new investments; although the mission of Company E is to follow the entire value chain until the internal working of the plant. A peculiarity and success factor of this company is to be a "Full-Equity" society. Selling out a renewable plant is usually easier and more profitable than a traditional thermoelectric installation, for three main reasons: (i) a solar or wind park is smaller (20 MW) than a combined

cycle plant (800 MW) so the amount necessary for the investment is lower, so as market risk; (ii) the renewable plant isn't affected by the source-risk, since wind and sun don't have a price or supply problems, fundamental differential from the fuel-based plant; (iii) there are no technical difficulties in managing a solar or wind park, as it works autonomously. Thus, selling out the plant is easier and the usual acquirer is an investment fund, since having technical know-how is not important. Investment funds hope in an investment return of about 6%, while Company E obtains a return from the contraction of 15%: the difference is the cash gathered for new investments; renewable assets are like a bank cheque, as they can be acquired and placed on the market almost immediately.

5. Operation & Maintenance is locally managed by the business unit of "Climate and Renewables".

"Small-scale" plants (biomethane, biogas, mini-hydro, solar and roof-top photovoltaic and geothermic) are, on the other hand, managed by those Regional Units also responsible for power trading and energy efficiency services; actually this division of renewable business is included in the traditional organization and exploits its local commercial network. A new centralized structure within "Climate and Renewables" is going to be built in next future: this new organization, called "Decentralized Energy" will gather all small-plants activities, from the construction to installation and after-sale maintenance.

4.5.3 Internal Organization

Two years ago, Company E defined a new strategic focus, summarized by the words "Cleaner & Better Energy". These new social values group the commitment of the entire holding in the renewable business, that became even more strategic. The new strategic direction concretizes in two main points: (i) low emissions and (ii) development of renewable business. As a result, in the last few years an even more attention was given to renewables. This is concretized by the creation of a new ad hoc society, called "Climate and Renewables" in 2009, operating through local business units in Italy, UK, Nordic, Central Europe, Iberia and North America. The company is a Global Unit, i.e. a first level 100% subsidiary of the Holding.

"C&R" is vertically organized, i.e. it is internally divided by technologies in two divisions: Wind Power and Non-Wind Power, underlining which is the technology the society focuses on. The Wind Power division includes an Onshore and an Offshore unit; the first one is itself divided by geographical region: North Europe, South Europe and North America. The Non-Wind Power division comprises the units responsible for Biomass, Photovoltaic, CSP and Carbon sourcing. The large hydro is indeed managed by the Generation Global Unit.

The Global Unit "C&R" is autonomous regarding the choice and the development of investment projects, as well as for O&M and operating activities, but not for the validation and authorization of investments. All projects of Company E are in fact full equity and the holding has thus specific standards for each investment. As a result, the internal authorization process is the unique strongly formalized process within the organization. Each project needs to pass through two gates, before being realized:

1. An internal development gate: it is a first feasibility evaluation, conducted within the Global Unit "C&R";

2. An investment authorization gate: it consists in the presentation of the business plan to a centralized committee within the Holding. The committee evaluates the project on the basis of the target values of some parameters, i.e. the IRR and the WACC. If the investment passes over a specific amount, it is evaluated by a Board of Finance. This usually takes two weeks at the longest, since the organization is flat and one of corporate values is the development of renewables.

All other processes are non-formalized, and may be executed at different levels of centralization: corporate level, Global Unit "C&R" and regional business unit of "C&R". The Holding is responsible for all staff processes, i.e. HSSE, asset management, IT, business development, finance, legal and corporate affairs, procurement and HR. Centralized activities executed by the headquarter of "C&R" are Engineering and Construction, though these are contracted out to external supplier. In this way, Company E can exploit the synergies coming from its multi-location in several countries. Finally each local division manages the Origination & Development, in case it doesn't require an acquisition strategy, and the practical part of O&M, since all assets are monitored by a centralized office in Düsseldorf. The coordination between the different business unit and the central Global Unit, as well as the relationship between "C&R" and the corporate level are really frequent for managerial figures: many team building and training moments are organized periodically in the central headquarter. Regarding the coordination within the spin-off and the local business unit, it occurs through direct communication, since each unit is small and it doesn't require formalized and standardized tools.

Regarding Human Resources, the Global Unit C&R counts in 2011 804 employees, in comparison with 703 in 2010 and 653 in 2009. In Italian business unit actually work 51 people, while in the central headquarter in Germany 239. A differential element compared to traditional thermoelectric business is that in renewable sector there is no oversizing regarding HR: each business unit is small and flat and the roles are well-defined, in order to guarantee the organizational flexibility necessary in this business area. Although the number of workers is lower than in traditional organization, HR still represent about 30% of total operating costs, exactly the same percentage of thermoelectric. This happens chiefly because of the higher employees' expertise necessary for renewable technologies: for managing a 600MW carbon-plant at least 400 direct workers and about 500 external people are required; on the other hand, for a 30 MW photovoltaic park we need 4 indirect and 1 direct employees. However, the workforce cost is higher because the people have more competences. In comparison to traditional business, no new figures have been created within the spin-off, as engineering, construction an O&M have the same executing processes of thermoelectric sector. The most important roles is again Project Manager, since all development and construction activities are internally controlled and monitored. The employees working in "C&R" are evaluated with a grading executive system, defined by the centralized staff function HR: no specific reward mechanisms for renewable business are applied. Same consideration may be done for the knowing management tools: all employees, included "C&R" an "academic" IT platform, where different figures, i.e. managers, professors, researchers, can enter or consult practical experiences and know-how. Anyway, no particular tools have been developed specifically for renewables.

4.5.4 External Organization

Company E doesn't close the door on any level of commitment with its partners, starting from the co-development of solutions to the complete M&A of societies.

Industrial partnerships may be thus categorized according to the level of commitment in the relationship in:

- Cross-industry Joint Venture with other incumbents: for instance, in 2009 Company E invested about 100 million € in a joint venture company with Schüco, dedicated to producing state-of-the-art solar thin-film modules, then abandoned after a few years due to the market dynamic.
- M&A category gathers many examples: in 2007 Company E acquired a Spanish electricity utility, that generates energy in Spain and Portugal from renewables with a net capacity in operation of about 260 MW. The acquisition enables Company E to further expand its wind power business, since with its acquired wind farms, it is increasing its installed wind power capacity to approx 700 MW. The transaction is in line with the company's expansion strategy following its recent acquisition of Viesgo and Endesa assets that Company E has agreed to acquire from Company A and Acciona. In 2008 the British Regional Unit of Company E agreed to acquire a further 16.7% minority stake in London Array Ltd, a British offshore wind farm project, from Royal Dutch Shell, reaching a share of 50%.

Regarding the relationships with the academic world and research institutions, they have the aim of analyzing the current stat of the art of technology, exploring and developing new solutions. Main partners are first of all German Universitites (i.e. University of Munich,), but also universities of those countries where Company E is delocalized: University of Cagliari for Italy, etc. The research is directed by a centralized function, Technology & Innovation, integrated within the Engineering function, and the coordination with each Regional Unit or local business unit is assigned to the country manager of Engineering.

An annual budget of dozens of millions is assigned to research and innovation activities: 50 million € have been allocated on Italian projects in 2011. Examples of projects regard the installation of a HCPV concentrator in Trapani, the development of energy storage, the testing of mono-axis trackers in Sardinia.

Company E			
Background	**Contextual Variables**	Foundation/History	The firm was created in 2000 from the merger of two important German industrial and energy companies, respectively founded in 1929 and 1923.
		Ownership	Shareholders' structure: • 79%: Institutional Investors • 21%: Retail Investors Geographical distribution of shareholders: • 35%: Germany • 19%: USA and Canada • 10%: France • 13%: UK • 5%: Switzerland • 14%: Rest of UE • 4%: Rest of the World
		Business Portfolio	(i) the generation portfolio, (ii) renewable business, (iii) optimization and trading, (iv) new-build projects and innovation technology, and (v) exploration and production business
		Market Position/Key Results	One of German leaders; it controls a share of 5.5% in Italian Electricity Market
		Introduction of Renewables	-
Business Model	**Value Proposition**	Value Proposition Diversification	Both energy utility traditional business model and energy utility unconventional business model are undertaken;
		Geographical Diversification	United Kingdom, Sweden, Italy, Spain, France, the Netherlands, Hungary, Czechia, Slovakia, Romania, and Bulgaria, besides Germany, divided in Nordic, Central Europe, Iberia, Italy, UK and North America Local Units
		Covering of the Value Chain	It doesn't exist a pre-configured business model concerning outsourcing degree rather than internal covering of the value chain: the spin-off can choose among different approaches, on the basis of the single opportunity and sometimes the technology and the country; Main adopted models: • Organic Development: the company starts from the beginning of the value chain • Co-Development with local developers • A&M: acquisition of authorizations
	Revenue Model	Incentive and incentive-free Revenues	The company may benefit from environmentally friendly produced electricity by offering green electricity tariffs with an "eco" price premium per sold unit; it furthermore includes feed-in premium, green certificates and all inclusive feed-in tariffs, obtained by building an intensive exchange process with GSE.
Internal	**Organizational**	Structure	**Traditional Business Model**: 100% Spin-off created from an existing Business Unit in 2009

Organization	**Structure**		**Unconventional Business Model (Retail Market)**: managed within traditional organization by Local Units also responsible for energy trading
		Unit/Spin-off Size	804 FTEs (239 in German Headquarter)
		Hierarchy	Limitedstrategic independence of the subsidiary from the Holding (e.g. investment decisions always have to pass to two formalized gates)
		Key Processes	**Project Validation:** highly formalized and always centralized at a corporate level **Staff Processes**: supplied by the Holding **Engineering and Construction**: Centralized in the German Spin-off Headquarter
		Coordination	Frequent interface with both German Headquarter and Corporate Level, for business evaluation and projects validation
	Human Resources	Hiring Strategy	The majority of managerial roles come from internal reallocation
		Composition of team/unit and Key Roles/Competences	Higher employees' expertise in comparison with thermoelectric personnel; No new figures have been created within the spin-off, as engineering, construction an O&M have the same executing processes of thermoelectric sector; The most important roles is again Project Manager.
		Reward and Incentives	-
		Knowledge Management	No specific tools for Renewable Business: employees use "C&R", an "academic" IT platform, where different figures, i.e. managers, professors, researchers, can enter or consult practical experiences and know-how, shared with all other Global Units.
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	Universities and research centers located in Germany and abroad	• Joint Ventures with other incumbents • M&A strategy with small-medium companies and large utilities
	Level of Involvement	Long term agreements directed by a centralized function, Technology & Innovation, integrated within the Engineering function	
	Aim of the Relationship	Exploration of new solutions	Increase installed capacity and scale

Table 4.5 - Synthesis of Company E's Case Study

4.6 Company F

4.6.1 Background information

Company F is a multi-utility firm born the 1st July 2010 from the merger of two holdings, which both result, in turn, from the union of ex-municipalized companies operating respectively in Turin and Genoa unified in 2006, and in Reggio Emilia, Parma and Piacenza, merged in 2005.

The ex-municipalized companies left in heritage to Company F all assets and competences developed from the beginning of '900 on, regarding especially electricity, district heating and other public services.

Concerning energy generation, a great production capacity was developed by the company operating in Turin, to supply energy firstly to several local industrial plants and then to households. In particular the company developed in 1907 its first thermoelectric plant and then from 1910 on other hydroelectric installations. Then in 1940, also the company operating in Genoa and mainly focused on the management of hydric services, started investing in energy generation capacity essentially through hydroelectric plants. Between 1997 and 2000 all the society are converted in S.p.A. and listed in Borsa Italiana.

Both the history and current ownership situation of the holding show the great importance and influence of local public administration in Company F's business: in 2011 the company share is owned for about 36% by a society (Finanziaria Sviluppo Utilities) owned by Torino and Geneva municipalities, for more than 8% by the Reggio Emilia municipality and for about 6.6% by the Parma municipality. The resting shares are owned by Banca Intesa San Paolo (3%), by Fondazione Cassa di Risparmio di Torino (2.5%), by Pictet Asset Management (2%) and by the market.

Company F currently operates in: (i) electricity generation, distribution and sale, with a share of 1,9% in 2010; (ii) district heating (production and sale); (iii) waste collecting and treatment; (iv) hydro services; (v) gas distribution and sale and (vi) services for public administration, i.e. cleaning of public areas and parks. The company is the sixth operator for traded energy in Italian market.

Company F' effective access into renewable sector occurred in 2008, when it created an ad hoc business unit with about 20 employees.

4.6.2 Business models

Company F operates in renewable sector with different approaches, both traditional and unconventional, depending on the type of renewable sources and plant size.

Concerning traditional value proposition, Company F realizes exclusively industrial-scale photovoltaic plants for internal management. Company F leaves a great part of the value chain in outsourcing; in particular, company's value chain includes following stages:

1. authorization process, fully realized by the company since the consolidated relationships with local institutions and Company F's ownership structure play a fundamental role;
2. purchase of modules, inverters and supporting structures,
3. planning and controlling of building and installation,

4. building and installation stages are, instead, left in outsourcing and managed internally by the Engineering function of Company F. This choice is also partially due to context evolution: in the last two years photovoltaic sectors' future was completely unknown; acquiring constructors and installers would have been a too risky strategy in 2008 and outsourcing could be a form of risk-externalization.

Regarding unconventional business model, different considerations may be done depending on the size of disposed plant; as far as industrial-scale plants are concerned, Company F only dispose biomass installations, because of the lack of internal competences to manage them. In the biomass sector, the company cover the value chain starting from the authorization process, until the construction of large plants (1MW). These installations are then disposed to purposed societies with an agricultural profile created specifically for this aim: this approach put on the first line the environmental aspect than energetic one and therefore highlights a multi-utility's peculiarity in comparison with other companies. The revenue model of biomass business is actually completely uncertain, due to the absence of a clear and stable regulation.

Company F also adopts unconventional business model by selling small plants for rooftops and sheds. In this case, the company operates as interface between customer and installer, by covering all upstream activities and leaving in outsourcing construction and installation. Considering the revenue model of this area, Company F is active and operating in this sector just for a matter of image and customer loyalty, since the great marginality is guaranteed by great plants, typically of 1MW; nonetheless the company is described to have an ethic relationship with the area in which it operates, and thus realizes also domestic plants of 3,5kW: its mission is to give back to the territory what it had previously received from it. The revenue model of the domestic area is thus still totally dependent on the level of incentives, that permit the survival of this business.

4.6.3 Internal Organization

Company F is a holding which comprises many different subsidiaries operating in the different businesses of its diversified portfolio. Renewables are managed within a second level society, "Rinnovabili", born in 2008 as a business unit and then spun off in 2010 and transformed in an ad hoc organization lead by a single administrator. The structure gathers in 2008 just 5 people, focused on the scouting of market opportunities. In 2011 the organization counts 20 resources, dedicated to the different phases of the value chain, highlighting the growing prospective of the company: the future plans consider to continue increasing the number of workers in order to manage a higher volume of projects. It is actually controlled by the first level spin-off "Ambiente".

The structure is consistent with Company F's strategy explained in the business model, since the ad hoc structure is collocated under the subsidiary "Ambiente" rather than under "Energia": the concept itself of energy is different between renewable and traditional businesses which are thus managed separately. Considering as possible organizational models the structure by divisions (in this case renewable sources) and the structure by processes (i.e. scouting, development, external authorization, internal validation, planning,

construction, o&m), Company F's internal organization may be defined an "hybrid". In fact, spin-off's internal structure is theoretically divided by technology: there are three internal divisions responsible for photovoltaic, one division focused on biogas/biomethane and one other division operating in energy efficiency business. In the praxis, this systematic separation is crossed with an organization by processes: among the different divisions exists a sharing of resources due to both economic and strategic reasons, which leads toward a management by phases. After the first stages of opportunities scouting and project development executed within each division, the procedure for external authorization is centralized for all technologies: it would be senseless to have so many different interfaces with local administration, as the number of renewable sources. In order to obtain a consolidated relationship that may facilitates information interchange and execution of the long procedure, a single person is responsible for explaining all investment projects to the service committee: in this way this figure has developed during the years the competences and the soft skills necessary to make the communication as effective as possible. After this stage, engineering and construction so as the O&M can't prescind from the differences among technologies: these processes are thus conducted by the human resources divided by renewable source, as no synergies may be exploited. Regarding the presence of Company F in the business of rooftop and domestic small plants, no specific societies have been created to manage the processes. Within Rinnovabili there is a task-force dedicated to this sector, focused on development, construction and, if request, also post-construction management of small photovoltaic plants. The in loco construction is realized through the same installers of big plants. The interface with customers is based on a counter network realized for all front-office processes of Rinnovabili and operates through a strong marketing campaign done in schools and among small and medium firms.

Regarding the hierarchical structure within the holding, Company F has the classical box structure of big multi-utilities, with first level and second level subsidiaries. The first level subsidiary which directly controls renewables, "Ambiente", has mainly a coordinating and controlling role: "Ambiente" manages all projects conducted by its subsidiaries, controlling that an eventual delay doesn't affect all other second level organizations, by moving some resources or deferring some stages. Its role aims at limiting the risk and is particularly important in renewable business, where external risk is a fundamental component of each process that should not be handed over other businesses. The second level subsidiary responsible for renewables is "Rinnovabili"; it has mainly an operative role and should always report to higher levels for every strategic matter. This strong hierarchical structure can cause difficulties in the frequent handover of some processes: for instance, notices are legally managed by the holding, but are developed within the spin-off; this doesn't permit to always have a clear and holistic vision of the project and becomes particularly complicated when the context quickly changes.

Another instance concerning hierarchical structure and coordination mechanisms regards the internal validation process; renewable subsidiary, after having developed each project, should pass it to "Ambiente", that presents all investment proposals to the holding. This structural complexity should cause the same strategic and time problems; nonetheless, these are in this case partially solved through the application of adequate coordination mechanisms at two levels:

1. “Rinnovabili” and “Ambiente”: “Ambiente” has a coordinating role and thus assigns to “Rinnovabili” specific financial and technical requirements for each developed project. The spin-off developed in these years the competences necessary to understand which projects may respond to these standards or not and avoid passing projects that may have no future.
2. “Rinnovabili” and the holding: communication and coordination mechanisms are mainly guaranteed through service systems between the subsidiary and staff functions of the holding company. During the development of the project, each division within “Rinnovabili” can ask the consulting of financial or legal staff function, in order to avoid projects that may present problems for a future concretization. The consulting represents a simply non-binding opinion for the subsidiary, that may change, abandon or maintain the project.

Concerning remaining significant processes, project financing is usually done through bank debt. A request of financing occurs at the end of internal validation process, but doesn’t cause delay problems because “Rinnovabili” has developed internal competences and usually know which projects may risk to be rejected. For sure projects pre-agreements are done, so that once the holding formally approves the investment, the spin-off can start with operative activities. Company F usually doesn’t have problems in finding external capital, mainly because of its strong brand and the image it has in its operating area: in comparison to local competitors Company F enjoys a longer history and greater dimensions which represent a guarantee for local credit institutions.

Concerning Human Resources, the most important figures are 1° and 2° level project managers. About first level project managers, they should have coordinating, controlling and supervising skills. Furthermore, as in the biomass sector both managerial and agricultural know-how need to be combine, those figures should present totally new competences in respect with traditional project managers. For this reason, the gap has been largely filled through the training of resources. Regarding second level project managers, he/she has operating tasks like leading resources and suppliers; the gap caused by the necessity of these figures has been filled mainly by reallocating internal employees working in traditional functions, but with tasks similar to the new ones. These persons also need a technical background, since they have to evaluate technical characteristics of different suppliers. Performance evaluation for these high level figures is more qualitative than quantitative and depends on the complexity of the specific project.

4.6.4 External Organization

Due to its approach mainly based on construction and installation outsourcing, Company F has a wide external network of industrial partners. The partnership with industrial subjects is global, since Company F has often to share its strategic plans with installers, in order to obtain a perfect integration and a performance alignment along the value chain between suppliers and Company F’s standards. Generally the utility tends to have partnerships with local operators, to maintain the same territorial vocation that characterized all its activities. Regarding the partners for O&M of big plants, the main choice drivers are experience and past performance levels.

Regarding R&D activities, relationships with research centres and universities are tighter than those created within traditional business. The main goals of these partnership are (i) to understand technological state of the art, regarding both radical and incremental solution, and (ii) to develop new solutions; the network is globally more orientated towards development rather than exploration.

The relationship with several universities is built around the concept of Open Innovation: the collaboration is bidirectional and has the aim of obtaining information about new technological solutions, but also of communicating to academic world the market development direction in order to create professional figures responding to Company F's necessities. The company will collaborate for the development of "Tecnopoli", a network of research centres located in Reggio Emilia and is a member of "Federutility", a corporation strongly oriented towards innovation, research and technological training. Through the membership in this confederation, Company F has access to technological innovations, radically far from market or not, not yet patented.

As a result, R&D activities are almost completely conducted outside the organization, following an Outside-In approach. The advantage of this solution is to have always access to the most updated technologies, competences, know-how. The disadvantage is that Company F is not the owner or the single owner of this discoveries and can't manage them in total autonomy. Coordinating external subjects and obtaining the necessary information may be more managerially difficult and onerous, and even more Company F's current situation, since it doesn't take into account the possibility of creating an internal R&D function for renewable sources.

Company F			
Background	**Contextual Variables**	Foundation/History	Created the 1st July 2010 from the merger of two holdings, which both result, in turn, from the union of ex-municipalized companies operating respectively in Turin and Genoa unified in 2006, and in Reggio Emilia, Parma and Piacenza, merged in 2005.
		Ownership	Shareholders' Structure: • 36%: Society owned by Torino and Geneva municipalities • 8%: Reggio Emilia municipality • 6.6%: Parma municipality • 3%: Banca Intesa San Paolo • 2.5%: Fondazione Cassa di Risparmio di Torino • 2%: Pictet Asset Management and Market
		Business Portfolio	(i) electricity generation, distribution and sale, with a share of 1,9% in 2010; (ii) district heating (production and sale); (iii) waste collecting and treatment; (iv) hydro services; (v) gas distribution and sale and (vi) services for public administration, i.e. cleaning of public areas and parks
		Market Position/Key Results	Sixth operator in Italian electricity Trading Market, with a share of 2.6% (2011)
		Introduction of Renewables	Company F entered renewable business in 2008, when it created an ad hoc business unit with about 20 employees
Business Model	**Value Proposition**	Value Proposition Diversification	Both traditional and unconventional business models are undertaken, according to the type of renewable source: the first one is focused on both photovoltaic industrial-scale technologies, while the second one on photovoltaic small-installations on biomass plants
		Geographical Diversification	No Geographical Diversification (the Company is localized in Italy)
		Covering of the Value Chain	Building and installation are left in outsourcing to EPC Companies; Company F keeps Project Management activities. External authorization is always internally managed.
	Revenue Model	Incentive and incentive-free Revenues	Incentives are actually fundamental for company's survival in Retail Business
Internal Organization	**Organizational Structure**	Structure	Renewables are managed within a second level society, "Rinnovabili", born in 2008 as a business unit and then spun off in 2010 and transformed in an ad hoc organization lead by a single administrator
		Unit/Spin-off Size	20 FTEs
		Hierarchy	"Rinnovabili" is collocated under the first-level subsidiary "Ambiente"; The first level subsidiary has mainly a coordinating and controlling role, by choosing investment projects and moving resources from one subsidiary to another. The second level subsidiary responsible for renewables is "Rinnovabili"; it has mainly an operative role

			and should always report to higher levels for every strategic matter
		Key Processes	**Staff processes** are executed within the holding. **Operative processes**: the spin-off is theoretically internally divided by technologies, but in reality many processes are shared among different alternative sources (external authorization, procurement, etc.); in loco building and installation left in outsourcing to external companies
		Coordination	Vertical Coordination between two different levels: 1. "Rinnvabili" and "Ambiente": "Ambiente" has a coordinating role and thus assigns to "Rinnovabili" specific financial and technical requirements for each developed project; the communication if informal and frequent; 2. "Rinnovabili" and the holding: communication and coordination mechanisms are mainly guaranteed through service systems between the subsidiary and staff functions of the holding company ("Rinnovabili" can ask for consulting to holding staff function also in a non-formal and non-binding way)
	Human Resources	Hiring Strategy	Internal Reallocation of resources
		Composition of team/unit and Key Roles/Competences	Most important figures: 1° and 2° level project managers. • **1° level project manager**: coordinating, controlling and supervising skills; for Biomass field the gap in existing resources has been largely filled through the training of resources • **2° level project manager**: operating tasks like leading resources and suppliers; the gap caused by the necessity of these figures has been filled mainly by reallocating internal employees working in traditional functions
		Reward and Incentives	Performance evaluation for these high level figures is more qualitative than quantitative and depends on the complexity of the specific project
		Knowledge Management	-
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	Research centers and Universitites	Local Installers and EPC companies
	Level of Involvement	Long term collaborations according to Open Innovation paradigm (mainly in an Outside-In approach)	Global partnerships: Company F has often to share its strategic plans with installers, in order to obtain a perfect integration and a performance alignment along the value chain
	Aim of the Relationship	Development of Radical New Technologies; Exploration..	Management of operating activities left in outsourcing.

Table 4.6 - Synthesis of Company F's Case Study

4.7 Company G

4.7.1 Background information

Company G is the only private and non-listed holding of the sample. The company was created in 1999, as an electricity trader from a totally private entrepreneurial initiative, after the liberalization of the sector through the "Decreto Bersani". In December 2000 after the "Decreto Letta" which ratifies the liberalization of gas market, the company defines a long-term agreement for gas importation from Libya, which decrees company's entrance in this sector. In 2000 starts the energy supply to first customers and in 2002 Company G acquires its first three hydroelectric plants (mini-hydroelectric) in North Italy and obtains the authorization for the construction of its first combined cycle plant in Termoli, starting officially being an energy generator utility.

Company's capital is controlled by the Holding (79.7%), itself owned by CIR Group (65%) and by an Austrian electricity company (35%). This last society controlled also directly a share of about 17%. The resting shares are owned by the management and by the group Monte dei Paschi di Siena.

Company G currently operates in (i) electricity generation, distribution and sale, with a share in 2010 of 2.2%, and occupying the 13° position among energy generators in Italy, (ii) natural gas distribution and sale and (iii) energy efficiency services. Company G is structured as an holding and the different activities are grouped in four business areas:

- Energy supply, responsible for the sale of energy and gas; it comprises the holding function dedicated to these activities and two other societies that manage thermoelectric generation;
- Renewables: it comprises all the societies operating in energy generation from renewable sources, except for biomass, controlled by the thermoelectric area;
- Exploration & Production and Gas: it gathers all the companies part of the gas supply chain;
- Other Activities, that comprises Venture Capital activities, energy efficiency services and the buying and selling of emission certificates.

After a progressive improvement in its installed capacity, in 2005 Company G creates an internal business unit focused on the development of photovoltaic solutions and starts being operative also in the wind business. After the rename in 2006, the company starts construing in California an investment fund aimed at researching innovative technologies regarding renewable sources, energy efficiency and environmental protection. In 2007 Company G applies new sales channels and starts offering new solutions for energy efficiency that permit it to triple its customers, reaching in December 2007 the number of 400.000 contracts and exceeding 500.000 clients in 2009.

4.7.2 Business Model

Company G expresses a strong commitment in renewables business starting from its very beginning, then concretized in 2005 with the creation of an ad hoc society 100% owned by the holding.

The business model adopted from 2005 on to manage this sector varies depending on the source; in particular the company applies a dichotomous separation, isolating solar activities from all other technologies (wind, biomass and mini-hydroelectric). Though a structural separation, business models adopted to manage solar and other wind plants coincides.

Company G adopts both traditional and unconventional value propositions, but applies different value chains depending on plant-size. For industrial-scale installations, Company G adopts the following models along the value chain:

1. external authorization: always internally controlled by the company;
2. project development and management: the decision of keeping in house this stage though the briefer experience of the company in comparison with other operators, depends on the history of the company: the first investments in solar sector, were 20 photovoltaic plants (20 MW globally) completely realized by Company G, starting from the cells production and including the realization. In this way, the company developed internal know-how regarding solar projects, internally exploited then for next installations: it would have been senseless to have recourse to a development consulting like other start-up, if the company could execute internally those processes.
3. Components procurement: Company G's initial vertical integration was almost completed, since the society controlled also upstream activities of cells and modules production. Between 2005 and 2006, in fact, the company acquired some small cells producers: this m&a processes led Company G to a installed producing capacity of about 10MW/year. The business was then abandoned in 2006 chiefly because of contextual dynamics: the massive entrance of good quality Chinese producers caused an offer surplus, that led to a progressive decrease of prices and thus margins. Like others Italian firms operating in this business area, Company G decided to focus its efforts on the downstream parts of solar value chain.
4. realization as General Contractor of plants for internal management and for external disposal;
5. management and O&M: since the company applies both traditional and unconventional value propositions for wind and photovoltaic plants, the following business models are adopted:
    a. Plants could be internally managed; in this case, O&M is mainly contracted to the partners responsible for the construction and installation; this always happens for wind technology: O&M is managed indirectly by the company, but effectively executed by the supplier of wind turbines (Simens, Repower, etc.) through long-term agreements.
    b. Realized plants may be disposed to third parties. The offer in photovoltaic sector concerns turnkey installations, since a completed package including the authorization, a working plant and, in some cases, the post-construction O&M is most desirable by customers. For instance, in 2011 12 photovoltaic parks were disposed for a total amount of 19MW by the Solar subsidiary of Company G to RTR Capital, in order to obtain cash investible in the market of distributed generation. On the other hand, concerning wind sector, until last year no wind plant had been disposed to other companies: the construction was finalized just to internal

management, but in 2011 Company G sold out the 50% of its subsidiary responsible for French wind business to KKR investment fund, creating an equal join venture. Only in this case, the company disposed the half of 153MW of operating plants and 95 MW of authorized projects.

Regarding finally small photovoltaic plants for retail market in which Company G has operated since 2010 after a diversification strategy, the dedicated structure within Company G proposes two main offers: (i) the sale of small plants to households or small-medium firms, for which the company follow the same business model described above and to which is imputable the merit of having guaranteed a positive result in 2011, and (ii) the sale of a combined product with the electricity contract: the plant is owned by Company G that received the incentives and leave the consumption of the electricity to the customer; the owner of the building where the plant is installed can in every moment enjoy his right of ransom on the plant and however at the end of the span of time in which the incentives are active. In this second case, the Solar-Structure is responsible for the realization and installation, but all commercial activities are executed and controlled by Trading function within the holding. With this approach Company G had an installed capacity of 6MW in 2010 and preview to reach 20MW by 2013.

About the revenue model, the bigger the photovoltaic plant is, the lower are the profitability, because in these cases the interlocutors are usually investment funds, expert subjects that guarantee a contribution margin of about 10%; for small plants the company succeed in exploiting a margin of about 20% on the revenues. On the other hand, in wind business, the marginality completely depend on the level of incentives: with the old tariff of 15 MWh a plant producing 2.000MWh/year guarantees a margin of about 200.000€/year out of a revenue of 300.000€/year. With this level of incentives this is the most profitable renewable business in Company G's portfolio.

Finally for Biomass no plants are actually working, although a new pilot project regarding the generation of electricity from food industry waste materials. It will come into operation in 2012.

4.7.3 Internal Organization

The first structured approach to manage renewables activities is the creation of an internal team within Engineering function in 2005, then developed in size and competences. The organizational model has remained the business unit until 2011, when in July the structure responsible for renewables was formalized in an ad hoc company, since the commitment in renewable technologies was high and even more growing. The spin-off actually counts about 100 employees and gathers many different societies diversified for technology and geographical localization:

- a 50% subsidiary for wind sector in France; the company is a joint venture with an investment fund, resulting from the selling out of the half of the shares of an existing and totally owned society in 2011;
- a 100% subsidiary for wind business in Romania;

- two companies owned respectively for 100% and 75% by Company G and responsible for wind sector in Italy.
- a 100% subsidiary for bioenergy that actually doesn't include working plants;
- a 100% subsidiary responsible for the solar business and including 35 people who collaborate daily with other 5 external partners experts in security and project management. The subsidiary is led by two managers and comprises six units: (i) "Administration and Services", responsible for economic and financial management of the society; (ii) "Logistics" for material transfer, warehouse management and purchasing of non-core material; core elements, i.e. modules, inverter etc. are acquired through corporate agreement by the holding "Purchasing" function; (iii) "Development" that collaborate with (iv) "Technical Direction" for the development of single projects; the first unit is responsible for the definition of technical requirements, while the second one is composed by the "Engineering" office and the "Construction" office, where two project managers and three project controllers work; they supervise and manage the operative activities of construction and refer directly to the manager of the subsidiary. (v) "Commercial" unit comprises come front-office activities and (vi) "After-sale" follows o&m processes, in particular for small plants sold in the retail market.

  Within this society there is a structure focused on retail market. It doesn't exist yet a full dedicated company for this business and the market in Italy hasn't required yet a strengthening of existing structures. Thus the supplier and the installer network are the same for small and big photovoltaic plants: Company G exploits external installers who represent a sale force themselves, although the margin on the final price is lower for the company, the longer get the value chain. Different is the approach for the complementary product that comprises energy contract and small plant, that is distributed through the sale network of the holding, since it is part of the core business of Company G (sale and not generation of electricity).

This high disaggregation is chiefly due to financial reasons; the investments of Company G are financed through bank debt or by investment funds. This subjects usually ask that the plant is delivered within a small vehicle company, in which all cash flows, plant profitability, margins, responsibility etc. are more clearly identifiable. The organizational structure thus derives from a financial necessity, partly due to the fact that Company G is still non-listed and must look for capital among external institutions.

Concerning hierarchical levels, the structure is globally flat, with direct reports to the managers of each subsidiary and between those and the leader of the Renewable spin-off. The validation of the investment projects is conducted at a corporate level by an Investment Committee, but only when the projects passes over a specific amount.

Concerning main processes managed within the renewable spin-off, project management and O&M are centralized for different renewable sources; on the contrary, the development is executed within each subsidiary, because the technical differences don't permit to exploit synergies. Synergies and economies of scale may be exploited, however, among different subsidiaries for the development, construction and

maintenance stages: the subsidiary responsible for wind sector in France and the one responsible for wind sector in Italy share the same resources, although it doesn't exist yet a common function and though the two structures are managerially and geographically separated.

Concerning Human Resources and their roles, the spin-off itself comprises the team "Engineering and Construction" responsible for the first investments of Company G in the renewable business and then merged into the ad hoc society. This team is composed by figures with technical competences regarding mechanical, electric and civil engineering and focused on the development of geothermal and hydroelectric projects. With this team operate a Project Management structure, whose experts are responsible for coordination and control of construction projects of wind and hydroelectric plants, and an Operation & maintenance unit.

Regarding human resources recruitment, Company G entered biomass and hydroelectric businesses by acquiring other society operating in these sectors; in these two cases the company included also the competences developed within the acquired organizations. Concerning the wind sector, the company entered it through the recruitment of a figure operating by another energy utility that had this source in its portfolio. This person has been assigned an engineering team and then internal and external resources increased this initial group. The creation of a Solar subsidiary required the external recruiting of specific figures who could collaborate with the starting team of "Development and Engineering". At the beginning experts and professional figures were researched, but then the subsidiary focused on young people, whose training was led internally and concerned specific internal problems.

The main problem regarding human resources is to keep them working for Company G, also after the training programs. The renewable business is in fact expanding and the risk that those trained figures may look for better opportunities lead Company G to choose effective rewarding mechanisms: plans of stock-options are largely applied to increase workers' loyalty.

4.7.4 External Organization

Company G's external organization includes both industrial partnerships and R&D relationships.

Industrial partnerships may be divided into two sub-groups depending on goal and commitment of the relationship:

1. Industrial partners for construction, installation, O&M or for component purchasing; these are usually installers and specialized suppliers who locally operate in the area where the plant is going to be built and with whom Company G has long-term contracts. In some cases these subjects are involved in other projects located outside their usual geographical area, if they have demonstrated good performances or own a particularly specialized know-how. A difference with traditional thermoelectric business is that the partners may be chosen by the single operative subsidiaries, that know the necessary standards and technical requirements. Regarding purchasing partners, Company G usually refers to big market leaders, i.e. Siemens or Repower and the purchasing process is realized by a centralized function created in 2010.

2. investment funds for the creation of joint ventures with different scopes, such as the one created in France in 2011 for the management of wind business. Company G's partners are often investment funds, i.e. KKR, and the competences within the new society are clearly defined and separated: Company G is responsible for all operative activities, while the partner has financial duties. Other examples are the partnership with J&P Avax in 2010 for electricity generation and distribution in Greece, the joint venture with Clifford Chance for the development of photovoltaic business, etc.

Also concerning R&D network, Company G establishes two different kinds of relationships:

1. Venture Capital in start-ups for researching radical innovation, like the one created in 2006 and located in California. The renewable projects regard radical solution, far from actual market, such as: (i) thin-film photovoltaic panels, CIGS technology, (ii) small wind plants with vertical axis, for retail market, (iii) cultivation of alga for the production of an innovative biofuel. This investment funds has the aim of financing small and innovative start-ups; if the developed technology proves to be successfully and marketable, Company G may seize it by acquiring the start-up.
2. Universities in order to obtain consulting regarding specific and concrete projects chosen by the holding or by the operative subsidiaries, i.e. the University of Pisa, CNR, the University of Florence, etc.

The internal function "Institutional Affair" has the task of researching and scouting normative evolutions and direct R&D activities towards those opportunities.

Company G			
Background	**Contextual Variables**	Foundation/History	Created in 1999, as an electricity trader from a totally private entrepreneurial initiative, after the liberalization of the sector through the "Decreto Bersani"
		Ownership	Non-Listed Company Shareholders' Structure: • 79.7%: Holding Company - 65%: CIR Group - 35%: Austrian Electricity Company • 17%: Austrian Electricity Company • 1.9%: Management of the Company • 1.4%: Bank Group Monte dei Paschi di Siena
		Business Portfolio	(i) electricity generation, distribution and sale, (ii) natural gas distribution and sale and (iii) energy efficiency services
		Market Position/Key Results	Share in Italian Electricity Market: 2.2%
		Introduction of Renewables	In 2005 Company G creates an internal business unit focused on the development of photovoltaic solutions
Business Model	**Value Proposition**	Value Proposition Diversification	Both traditional and unconventional business models are undertaken, but the company applies different value chains for the two models (depending on plant-size). For Retail Market the company proposes two offers: (i) sale of small plants to households or small-medium firms, (ii) sale of a combined product with the electricity contract: the plant is owned by Company G that received the incentives and leave the consumption of the electricity to the customer.
		Geographical Diversification	**Photovoltaic**: No diversification (plants are located in Italy) **Wind:** Geographical Diversification in France and Romania
		Covering of the Value Chain	**Industrial-scale plants**: all activities are internally managed (external authorization, project development and management; procurement, O&M), except for construction, left in outsourcing to EPC companies **Small-scale plants** (PV): installation is left in outsourcing
	Revenue Model	Incentive and incentive-free Revenues	**Photovoltaic**: the bigger the plant is, the lower are the profitability (20% of marginality for small installations, to 10% for industrial scale plants) **Wind**: Greater marginality due to scale effects and high level of incentives
Internal	**Organizational**	Structure	Creation of an ad hoc spin-off in 2011, which includes many different subsidiaries divided by technology; previously renewable activities have been gathered in a Business Unit since 2005

Organization	**Structure**	Unit/Spin-off Size	About 100 FTEs
		Hierarchy	The structure is globally flat: direct reports to the managers of each subsidiary and between those and the leader of the Renewable spin-off; the validation of the investment projects is conducted at a corporate level by an Investment Committee, but only when the projects passes over a specific amount
		Key Processes	**Staff processes** are executed within the holding **Project Development**: technology-specific and executed separately within each subsidiary **Project Management and O&M**: Centralized and non-technology-specific
		Coordination	-
	Human Resources	Hiring Strategy	**Photovoltaic**: external recruiting of specific figures that could collaborate with the starting team **Biomass** : Company G entered the businesses by acquiring other society operating in this sectors; no further recruiting has been necessary **Wind**: recruitment of a figure operating by another energy utility
		Composition of team/unit and Key Roles/Competences	**Existing "Old" Figures**: team composed by figures with technical competences regarding mechanical, electric and civil engineering and focused on the development of geothermal and hydroelectric projects **New Hired Figures**: At the beginning experts and professional figures were researched, but then the subsidiary focused on young people who could collaborate with the starting team
		Reward and Incentives	Specific Incentives and Rewards Mechanisms to keep HR working for Company G, also after the training programs
		Knowledge Management	-

		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	• **Start-ups**: Creation of Venture Capital for researching radical innovations • **Universities** (University of Pisa, CNR, the University of Florence, etc.): Relationships for consulting regarding specific and concrete projects	• Industrial Partners • Investment funds for creating Joint Ventures (KKR, J&P Avax)
	Level of Involvement		
	Aim of the Relationship		• Construction, installation, O&M and component purchasing • Creation of Joint Ventures (due to Company G's lack of financing resources)

Table 4.7 - Synthesis of Company G's Case Study

4.8 Company H

4.8.1 Background information

Company H is an Italian multinational oil and gas company, present in 79 countries, currently Italy's largest industrial company, and fifth bigger oil group in the world.

Company H was founded in 1953 by the Italian Government as a national entity for oil and gas business, then transformed in a S.p.A. in 1992 and partially privatized in five subsequent stages, between 1995 and 2001. In 2011 Italian State still owns a share of more than 30% and thus the effective control of the society.

The company operates in electricity business through a dedicated society and the reasons for approaching this market are connected to the core business: by generating energy the company could "unfreeze" the gas percentage it could import in Italy, due to government regulation.

The core business of the society is oil and gas production, transport, transformation and commercialization, but it also operate in (i) electricity production business through natural gas plants (4,719 MW in 2011) and photovoltaic parks (30 MW in 2011), (ii) petrochemical business, and (iii) engineering and construction. In 2011, Company H is organized in five main operative divisions:

- Exploration & Production, responsible for research and production in oil and gas business;
- Gas & Power: sale of natural gas, generation and sale of electricity (with a share in energy market of about 10%);
- Refining & Marketing: refining and commercialization of oil products;
- Engineering & Construction;
- Petrochemical Division.

Company H approaches renewables at the beginning of '80s, when it started using geothermal fluids for household heating and industrial purposes. Until some years ago the effort in renewables remained limited, as the company still focused on its core business, Oil&Gas. The interest in the dynamics of this business grew up and required in 2006 internal reorganization of the company, in order to efficiently deal with renewable activities and to carry out strategic collaboration agreements following an Open Innovation paradigm, rather than simply outsourcing.

4.8.2 Business Model

Company H's approach towards renewables is almost uniquely limited focused on research activities, mainly regarding solar energy and biomass/biofuels.

In fact the peculiarity of the business model of Company H, is that it doesn't follow the common value chain, by building and managing renewable plants: the only renewable plants it developed are photovoltaic systems built on the roof of our industrial buildings (30 MW). On the contrary, the company tries to develop innovative renewable solutions on: (i) Concentrated Solar Power (CSP) technologies; (ii) building integrated photovoltaic (BIPV) products; (iii) bio-fuels systems.

In addition to all research activities, Company H partially adopts the unconventional business model, by selling small photovoltaic installations for households and firms; it is also active in upstream activities, by producing and distributing silicon mono and multi-crystalline modules (with a power of 110 Wp and 240 Wp) and small photovoltaic systems, to small and medium firms (from 10kW to 300kW). Initially the business model was focused on upstream activities, but then it gradually shifted on the commercialization of products, since this business guarantees higher profitability. Company H works side by side with the customer starting from the authorization process to the installation and the grid connection. Besides the pure sale activity, the business model of the group regarding renewables includes also different services that the society responsible for electricity business offers to the customers, such as:

- Consulting regarding technical and economic evaluation of renewable projects;
- Assistance for the execution of bureaucratic and financial processes;
- Feasibility studies;
- Know-how transfer;
- International cooperation.

Thus, besides operative services, Company H guarantees consulting services and financial services, mainly through and agreement with an Italian Bank, that fully finance the acquisition of a photovoltaic plant to the customer.

Generally, the business model used to manage renewables is consistent with corporate strategy: photovoltaic and all other renewable sources still remain support activities for the traditional business; Company H isn't an energy utility and thus all these activities help the group being "Environmentally sustainable". As a result, if some existing plants of Company H need to add a share of sustainability to their assets, than the company answers installing photovoltaic panels on the roof. Renewables are not important as a business, they are important as a source of possible opportunities: that's why Company H concentrate on R&D.

Regarding the revenue model, Company H did not approach the renewables dictated by the thrust of the feed-in tariffs: its aim is to successfully develop at least one of breakthrough technologies it has in its R&D portfolio, as it could guarantees significant revenues also with a low level of incentives.

4.8.3 Internal Organization

Company H approaches renewables by establishing in 2006 a new function within the "Strategy and Development Direction", focused on R&D activities. This function is aimed at managing research activities and internalizing external results that come from strategic collaborations on solar and biomass technologies, without influencing Company H's other businesses. This unit has the role of developing disruptive renewable technologies with top universities and research centres.

In June 2011, the company eliminated this direction and included the research activities regarding renewables in the "Research and Technological Innovation Unit", in order to obtain a flatter and more flexible structure.

Actually the structure of "Research and Technological Innovation Unit" includes:

- Technological planning division;
- A unit responsible for the evaluation and monitoring of R&D projects. This division has three main tasks: (i) the definition of budget, forecast and research activities; (ii) all control activities; (iii) the evaluation of the value added through R&D activities.
- A unit responsible for management and control, including Intellectual Property Management.
- A unit for the research in non-conventional energy sources;
- An "External Collaboration" division, that should manage the more operative activities in establishing external relationships (i.e. the management of intellectual property rights and licenses among firm and universities);
- A division responsible for the applicative development and cross-business projects.

The autonomous degree of the Research Unit is enough high, since it has the power of deciding the direction of the research. The coordination with this branch of the company and the corporate level occurs in the planning stage, during which all financial efforts are defined depending on costs and time of the projects.

Regarding the introduction of new processes or the change of existing ones, in the research the procedures remain globally the same: the same reports, deliverables, milestones and time-scheduling in comparison with traditional business. The main difference is the focus of each milestone and the respective goal: in renewable projects the attention is concentrated on technical and engineering aspects and the benchmarking corresponds to a technological roadmap realized by International Energy Agency and has the aim of understanding if the company has been able to develop best innovative technological solutions, comparing all licences. A change of existing processes occurs also for the management of external networks: partnerships established with MIT and Politecnico of Milan are managed by creating new procedures such as the use of weekly team meeting with a responsible that has the task of organizing the meeting, summarizing the main points emerged during the meeting and supervising the work in progress: each partner, researcher or university professor, is able to provide excellent knowledge on a single filed, so their activities must be constantly re-aligned and coordinated.

Finally, concerning Human Resources, in order to effectively manage the new activities, new roles have been created within the company, such as the Project Manager, who should (i) guarantee the coherence among all projects considering a long-term strategy and (ii) allocate the economic resources for the development of each project depending on their contribution to general goals, i.e. creating radical innovations. In this process is the Program Manager the figure responsible for evaluating the contribution of each project to the implementation of a breakthrough technology.

For the necessary new figures, the company defines also recruiting programs focused on selecting multi-disciplinary human resource profiles. This was easier for Company H thanks to its well-known international brand and to the corporate HR function that support Renewable business unit to find and train high skilled and young people motivated to make research in renewable field. This company does not put particular attention to the renewable policies and incentive systems, except for an annual award assigned by the top management in the R&D field. The prize was established in 2007 to develop new and innovative ideas

regarding renewables, to promote the environmental research and to enhance young researchers. The prize is assigned once a year and has the aim of incentive and monitor best researches and researchers; it is divided in four categories: (i) New frontiers for hydrocarbon, (ii) Renewable and non-conventional energy, (iii) Environmental protection, and (iv) Debut in research.

Regarding coordination mechanisms, they remained unchanged after the introduction of renewable activities: each business has a Research Manager, who is responsible for the interface with the Technological Planning Division; he/she communicate the technological plan and the boss of the division verify the coherence with all other plans.

The resources dedicated to renewables activities are physically concentrated in a specific location in Novara; as a result, the company doesn't require a great number of specific tools to manage knowledge sharing. Anyway, some examples of applied mechanisms are: (i) the creation of an "innovation community", where researchers can share their experience, (ii) an IT platform dedicated to R&D, in which employees may interchange information about scientific, technical and economic feasibility of new solutions and about participation to meetings and conferences, and finally (iii) Knowledge Owner figures, distinguishable for their experience and knowledge about specific areas.

4.8.4 External Organization

Due to Company H's strategy, external network is exclusively composed by R&D relationships. External research through knowledge interchange with universities and research institutions play for Company H a great role. The external collaboration network has already existed before the entrance in renewable business in 2006, but from that point on it followed an alternative direction to traditional areas. The reasons that explain why Company H needed to create a strong external network of research must be analysed considering its history. During the decade 1985-1995 the company was subjected to a profound reorganization and rationalization, mainly concretized in a re-focus on the core business of the society. The meaningful consequence of this strategy was a strong reduction of R&D activities on two different levels:

1. At corporate level, was created in 1985 a technological company, in which H focused all research activities. The number of researchers was halved and many research fields abandoned. At the same time the company developed a strong interest in new research areas, such as renewable technologies, sustainability and environmental protection, but due to internal cuts it has no more resources to manage all activities autonomously. As a result, both lack of competences and onset of new goals, led H to create in 2000 a widespread research network outside its boundaries. Some examples are relationships established in a complete Open Innovation paradigm with Massachusetts Institutes of Technology, Politecnico of Milan and Turin, Stanford University, CNR.
2. At divisional level the rationalization was so strong, that a few resources were available. As a result each division applied an outsourcing model, by externally acquiring new technological solutions.

Recently, the top management realized how ineffective this model was and applied a new reorganization of research activities. After the elimination of the technological society, considered far from real market, the

research was reported to a divisional level, so that all R&D activities were more orientated towards real business. As a result, the new research strategy is based on two main concepts:

1. the linkage between external research through collaboration partnerships and internal development of high competences and skills to direct the research towards marketable solutions;
2. the establishment of a network that includes different fields, so that the cross-fertilization among vary scientific disciplines may lead to radical innovations. For instance, the contamination among optic, organic and inorganic chemistry, electrical engineering and physic has been fundamental to develop the first organic solar cells.

As a consequence, the goals of this specific strategy may be summarized in the following concepts: (i) development of R&D projects that may lead to breakthrough technologies in the long-term; (ii) reduction of development times of projects, through the optimization of in-house and outsourcing activities; (iii) increase of internal competences and know-how, finalized to R&D projects; (iv) monitoring and controlling the development of technology in renewables and other fields.

The agreement between the two parties usually have the aim of developing radical innovative technologies, that may completely change energy market; this kind of strategy is consistent with the business model of Company H: the company mainly operates in oil and gas business and just partially in the energetic one. As a result, a great investment in internal research regarding renewable sources wouldn't have been sensible, as the company focus its efforts on the core business or related areas.

However, an Open Innovation approach isn't exempt from problems. The difficulties faced by Company H regard the communication area. Firstly, the company encountered problems in bargaining aspects because of the legal differences between the two countries of origin of the two partners. Secondly, another difficulty regards the impossibility to find a sole interlocutor within each organization, to whom the company could speak and explain the technological matter at the basis of the partnership. As a result, each problem requires a division in sub-problems, so that different referents could be found for each part, abandoning thus a more holistic vision of the matter. What happened is that the single professor responsible for a sub-part, is an expert of his/her field, but doesn't own competences in all other disciplines. As a result, it isn't possible to completely externalize the research; the company should have internal competences to monitor, step by step, the progress of the project: this is one of main aspects and Company H can't ignore it and all depending structural elements, i.e. Intellectual Property Management, management of possible conflicts with the partners, etc. In fact, all research activities regarding solar energy are parallel conducted also by the internal Research Centre, located within the corporate organization since 2007. The problems cited above don't happen for every external partnerships: in some cases, i.e. with Politecnico of Milan, the relationship have already existed for dozens of years and the collaboration has become so narrow, that a continuous communication flow can guarantee a rapid identification of the resources that may solve the technological problem.

Emblematic is the alliance with the MIT of Boston, created in 2008 and based on high flexibility regarding research areas and resources. The central aspect of the partnership is research program aimed at developing

advanced solar technologies with a budget of $ 25 million for the next five years. In 2010, Company H inaugurated a new Research Centre within the MIT campus to promote and accelerate the multi-disciplinary research, regarding in particular new photovoltaic materials and production of hydrogenous from solar energy. In the field of concentrated solar, Company H is testing with this alliance usage of some materials for the realization of mirrors that concentrate the sunlight. Some problems occur when the company, after the development and the testing of new solutions within the external Research Centre, must evaluate the marketability of the technologies. As already said above, in fact, the researchers are experts in their field, but may ignore all other aspects, such as the economic feasibility of a new product. For instance, in the case of concentrated solar, MIT developed the new technology concerning mirrors for light concentration, but Company H left to Politecnico of Milan its economic and technical evaluation, in order to define the feasibility of the new technology. As a result, the solutions didn't appear to be advantageous and Company H finally abandoned the project.

Regarding other fields, i.e. biomass, Company H focuses on the development of new biofuels, with high efficiency and low environmental impact, based on micro-organisms such as micro-alga, yeasts and bacteria, and in the research regarding new processes for biofuel production. Another interesting research stream regards the conversion process of biomass in bio-oil and bio-diesel. The activities in this area are conducted through both the internal and external R&D, following the Open Innovation approach used for solar technologies, and the recent (2012) Joint Venture between the petrochemical subsidiary of Company H and the European leader in the production of bio-plastic from renewable sources.

In the wind energy sector, Company H is mainly active through a Belgian Company acquired in 2011: the society produces 4.5 MW of electricity through renewable sources (included wind): wind energy is not an object of R&D activities; what Company H owns, regarding wind plants is "accidental" and is due to the acquisition of a society that had in portfolio wind activities.

Company H			
Background	**Contextual Variables**	Foundation/History	The firm was created in 1953 by the Italian Government as a national entity for oil and gas business, then transformed in a S.p.A. in 1992 and partially privatized in five subsequent stages, between 1995 and 2001
		Ownership	Shareholders' Structure: • 30%: Ministry of Economy and Finance (Italian Republic)
		Business Portfolio	(i) electricity production business through natural gas plants (4,719 MW in 2011) and photovoltaic parks (30 MW in 2011), (ii) petrochemical business, and (iii) engineering and construction
		Market Position/Key Results	Italian leader in Oil&Gas Industry
		Introduction of Renewables	Establishment in 2006 a new function within the "Strategy and Development Direction", focused on R&D activities
Business Model	**Value Proposition**	Value Proposition Diversification	Energy utility traditional business model (just rooftop small installations for owned building) and unconventional business model are undertaken (in form of small PV plants and energy efficiency consulting/financing services)
		Geographical Diversification	R&D activities also carried in USA (MIT University)
		Covering of the Value Chain	The company covers the value chain from the manufacturing of panels to plants installations; R&D is the real core process in Renewable field
	Revenue Model	Incentive and incentive-free Revenues	Incentives are not perceived as important
Internal Organization	**Organizational Structure**	Structure	**R&D activities** have been included in 2011 in the "Research and Technological Innovation Unit", in order to obtain a flatter and more flexible structure. **Operative activities** are managed within the Energy Subsidiary in a dedicated Business Unit
		Unit/Spin-off Size	-
		Hierarchy	Almost complete strategic independence of the subsidiary in R&D projects
		Key Processes	Innovation (R&D) Process
		Coordination	Unchanged after the introduction of renewable activities: each business has a Research Manager, who is responsible for the interface with the Technological Planning Division

	Human Resources	Hiring Strategy	Recruiting programs focused on selecting multi-disciplinary human resource profiles; easy for Company H thanks to its well-known international brand and to the corporate HR function that support Renewable business unit to find and train high skilled and young people motivated to make research in renewable field.
		Composition of team/unit and Key Roles/Competences	
		Reward and Incentives	No particular attention to the renewable policies and incentive systems, except for an annual award assigned by the top management in the R&D field (established in 2007); The prize is assigned once a year and has the aim of incentive and monitor best researches and researchers; it is divided in four categories: (i) New frontiers for hydrocarbon, (ii) Renewable and non-conventional energy, (iii) Environmental protection, and (iv) Debut in research.
		Knowledge Management	• Creation of an "innovation community", where researchers can share their experience • IT platform dedicated to R&D, in which employees may interchange information about scientific, technical and economic feasibility of new solutions and about participation to meetings and conferences • Knowledge Owner figures, distinguishable for their experience and knowledge about specific areas
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	Universities located in Italy and USA	• Joint Ventures with other Incumbents in many field (biomass, bio-oil and bio-diesel) • M&A in wind field (Belgian Company acquired in 2011)
	Level of Involvement	• Long-Term agreements with MIT of Boston (created in 2008) and Polytechnic of Milan • Research Centers created in Campus of many Universities (one created by MIT in 2010)	
	Aim of the Relationship	Exploration of new solutions through an Open Innovation approach; adaptation of developed solutions for marketable aims.	Developing Industrial Projects

Table 4.8 - Synthesis of Company H's Case Study

4.9 Company I

4.9.1 Background

Company I, created in the 1920s and located in the north-eastern region of Germany, is one of the largest utilities of its country: in terms of annual revenue it is the fifth largest German energy provider.

Despite some efforts to internationalization in Poland and Turkey, Company I is mainly considered a regional municipal utility. This means, Company I is a mainly publicly owned company: the majority of its shareholders are local authorities and municipalities of the region. They are organized in two associations, together holding a share of 74% in the company. The remaining 26% of the shares are owned by another major German utility.

The company is a multi-service provider, active in three business areas: gas supply, information and communications technology, and energy. The supply of energy is the largest field of business and the most important one in terms of revenues. In 2010 the Group generated revenues of € 6,970 million, in 2009 revenues accumulated to € 5,798 million.

Company I has been involved in renewable energies very early: the first renewable energy projects were initiated more than 20 years ago, but the strong expansion of the activities and the positioning as an environmentally friendly energy supplier is been realized more recently. In 2006 the company held a conference on the challenges of the future energy supply and developed a strategy paper highly ten major development trends: this paper lied the ground for a clearer positioning of the company. Since then, Company I strives to strengthen its position as an innovator and forerunner in the field of renewable energies. Regarding the strategic direction of the Group, renewable energy is considered complementary to the core business. Company I is committed to further developing renewable energies for energy generation, complemented by conventional power plants that are efficient and flexible. These conventional power plants provide the control energy required to compensate for fluctuations in the supply of wind and solar power.

Company I has, in 2011, about 1,4 million electricity customers and produces electricity in about 150 plants which use renewable energy sources; the focus of the company is on using wind energy, biomass, as they are widely available in the north of Germany, and solar energy. The Group considers itself as one of Germany's technology leaders in the area of renewable energies.

As a predominantly municipal company, Company I considers itself particularly responsible for helping to shape a sustainable energy supply. Furthermore, Company I is researching new solutions for integrating the constantly increasing number of wind, photovoltaic or biogas facilities into the energy supply. The utility has broken new ground with its decentralized energy management system.

4.9.2 Business Model

Company I covers the entire value chain from generation to distribution, sales and services, as a one-stop supplier, for the three renewable business areas in which it operates: wind, solar and biomass energy. It

adopts just traditional value proposition without disposing neither industrial-scale plants nor small rooftops installations or systems. Company I's value chain may be described through the following three steps:

1. Projects Development and authorization
2. Plant construction and installation: as a diversified company, I doesn't own internal competence to build renewable plants; as a result it is responsible for timing and costing, by leaving in outsourcing operative processes.
3. Management and O&M: since the company doesn't apply unconventional business model, all plants are internally managed; this choice could be a consequence of Company I's portfolio: the company's strong position in the area of natural gas rounds out the company's portfolio and financially support renewable business area.

Company I is currently undertaking a strategic realignment of its renewable energy activities. The goal of this process is to better integrate all activities concerning renewable energies, although the precise outcome of the process is not yet known.

4.9.3 Internal Organization

Company I established a wholly owned subsidiary called "Company I Energy" in July 2010, which includes all energy generation activities of the group, i.e. renewable and non-renewable energy sources and all parts of the value chain from generation to distribution, sales and services.

Company I has no separate subsidiary for renewable energy activities: all renewable energy activities are located in the Company I Energy subsidiary, within a department called "Energy and Environmental Technology", established to bundle the renewable energy activities.

The department for "Energy and Environmental Technology" includes three groups: project development onshore wind energy, project realization offshore wind energy, and operations. It currently employs about 25 people, purely focused on renewable energy projects. All support functions like finance, accounting, human resources etc. are provided by the Group and centralized at a corporate level. This means that actually more people from other departments are also involved in renewable energy activities.

In addition to the renewable energy activities within the department, Company I has recently acquired another medium-size utility from the region which has a large portfolio of renewable energy assets, especially in onshore wind energy and biomass. These two businesses are operated separately so far, but after the acquisition Company I started the conduction of a strategic realignment process to include the renewable energy activities of the new subsidiary into the group's activities. The strategic process will provide a new corporate structure and new formalized processes for all renewable energy activities.

As the department includes three groups and 25 employees, "Energy and Environmental Technology" unit is relatively small; thus the hierarchy is very informal and the work is characterized by direct contact between the employees. Globally, there is no difference between the renewable energy team and the conventional energy teams: renewable activities are integrated within the unit.

The degree of autonomy of the "Energy and Environmental Technology" department is relatively high, since this structure has relatively freedom about which projects may be chosen and regarding how to do business in the renewable energy sector: the corporate organization is generally flat and most renewable projects have been initiated inside the department.

As far as formalization of procedures regarding the everyday work is concerned, the degree of formalization is rather low in the "Energy and Environmental Technology" department, and the working habits in the unit are described as hands-on: the everyday work is rather characterized by the people involved, their skills, contacts and experiences, than by formalized procedures.

As hierarchies in the renewable energy department are rather low and procedures are not very formalized so far, large parts of the decision making takes place within the department: decisions have been made on a rather technically driven perspective within the renewable energies team. However, it is expected that the strategic realignment process will reduce the freedom and low formalization of the "Energy and Environmental Technology" department in order to better adjust the activities to the overall strategy of the Group. Decision making in the field of renewable energies shall than be more in line with the overall strategic goals of the group and its strategic framework.

Regarding the internal validation process, the hierarchical level on which decisions are taken, depends on the investment volume of the project: Company I has defined clear guidelines about who may decide an investment that requires a specific financial effort. If volumes are too large for the head of the energy and environmental technology department, the management of the Company I Energy division has to be included. For very large sums, the management of Company I has to be included as well.

An important internal process concerns R&D, since Company I as a modern multi-service company, Company I is convinced that innovation is an integral driver of growth. The path to the sustainable, environmentally friendly energy supply of the future involves intensive research, particularly in the areas of storage technology and in the construction and management of intelligent electricity networks. The research activities are focused on finding solutions which allow decentralized renewable energy to be integrated into the existing energy system.

Concerning Human Resources and roles, project organization depends on the technology and size of the project. In the field of onshore wind energy the company has experienced and skilled experts who are qualified to handle all sorts of projects. As a result, sufficient know-how is available and projects can be realized with internal resources, except for rare cases, when experts from other departments, such as grid management, are included in the project team for certain tasks. Generally, concerning this technology, there is only limited need for external support or additional external know-how. On the contrary, projects in the area of offshore wind energy require more external resources. In this business, Company I has a major stake in the first German offshore wind farm which is under operation since 2010, and a second project is currently being developed by the company. As a result, the company has low technical competences and thus, the project team for the second offshore wind farm has been staffed with both internal experts from the renewable energy and resources from other departments. Moreover, it was necessary to include some further

experts from outside the company to provide some specialized know-how. Although Company I already has some experiences from its first offshore wind farm, new know-how is constantly required with the progress of the second offshore wind energy project. Therefore, it is constantly tried to build up new know-how internally and to find experienced and skilled experts to join the company. Moreover the structures and processes are redesigned to meet the challenges.

Regarding human resources, for the growth of the renewable energy activities, Company I has two main approaches: either qualified personal is recruited on the market, when no internal colleagues have the necessary qualifications, or it is decide to build the required competencies internally by sending employees to trainings and conferences to acquire the needed know how.

Finally, Company I has no specific knowledge management tools for the field of renewable energy: as the department has grown rapidly and applies a rather hands-on approach, the everyday work is based on the interaction of the team members. First ideas concerning very basic versions of knowledge management, such as IT platforms, have been discussed recently, but no concrete actions have been planned yet.

4.9.4 External Organization

External partners may be grouped depending on two dimensions: the type of partner, i.e. industrial or scientific organization, and the form of collaboration, i.e. basic, applied and joint research.

Industrial partners include other utilities and a range of suppliers, Company I works closely with for long time, while concerning R&D, Company I has built up a highly capable research network, comprising numerous external research partnerships, its own Research and Development department and a separate Research Centre for Energy Technology at the University of Oldenburg. As far as the forms of collaborations are concerned, the partnerships have different levels of commitment and different goals:

1. Basic Research: Company I is involved in basic energy technology research, mainly through its Research Centre for Energy Technology and the relationship with other manufacturing companies. One example of the company's commitment is fuel cell technology, which has been advancing in field tests for years together with manufacturers of fuel cell heating systems. Company I is an active partner of the nationwide largest field test of fuel cells for privately owned houses.
2. Applied Research: Company I is also involved in applied research to advance new technological applications to market maturity. For example, at the end of 2007, the company opened one of the first biogas purification plants in Germany. The plant processes the biogas that they produce in such a way as to achieve the quality of natural gas and then feed it directly into the local network. This allows biogas to be used elsewhere as a fuel as well as to create electricity and heat.
3. Joint Research: Company I is finally involved in collaborations with business partner to advance certain technologies and realize pilot projects that are too large or risky for one individual company. For example, Company I strives to be a forerunner in the field of offshore wind energy. Therefore, the company established the joint venture offshore wind farm alpha ventus - the first German offshore wind farm. The project is a test field for offshore wind energy in Germany, comprising

different turbines and foundation structures. Company I holds a 47.5% stake in the joint venture company, partnering with the two competitors Company E and Vattenfall.

As already stated above, the different forms of collaboration have different purposes:

1. Basic Research on new technologies is pursued in order to be at the front position to develop future applications and lay the ground for a quick and successful applied research.
2. Applied Research is conducted to develop new products and services and bring them to market maturity. Bringing new products and services to the market is supposed to strengthen the company's position as an innovative energy supplier.
3. Joint Research with business partners is pursued in order to realize pilot projects and share risks of these projects. Constructing, operating and integrating alpha ventus provides crucial experience for the future commercial use of offshore facilities and useful study data on its impact on the marine environment. For this reason the project is being accompanied by a research initiative to gather experience and information to help with the construction and operation of future offshore wind parks.

The company strives to be an innovation leader in the field of renewable energy and energy efficiency. It is involved in several research projects with external partners to gain knowledge, develop new technologies and find new applications. Germany's Federal Ministry of Economics and Technology named the company "Best Innovator" in 2010 for its sustainable innovation management.

Although Company I is very active in research in particular through external collaborations, it appears as if there is little exchange between research and operative structures. The innovation management process is located in the corporate development department and the research institute is mainly working with the R&D department. At least "Energy and Environmental Technology" department, which includes all renewable energy activities, has limited exchange with the other departments conducting the research. The "Energy and Environmental Technology" is rather process oriented: its task is realizing the projects and there is no established procedure to foster knowledge exchange and create spill-over effects.

Company I			
Background	**Contextual Variables**	Foundation/History	Created in the 1920s and located in the north-eastern region of Germany
		Ownership	Shareholders' Structure: • 74%: Local authorities and municipalities in the region, organized in two associations • 26%: German utility
		Business Portfolio	gas supply, information and communications technology, and energy generation and trading
		Market Position/Key Results	Fifth Largest German energy provider
		Introduction of Renewables	First renewable energy projects were initiated more than 20 years ago.
Business Model	**Value Proposition**	Value Proposition Diversification	Focalized value proposition in Traditional business model
		Geographical Diversification	No Geographical Diversification (the Company is localized in north-east Gemrany)
		Covering of the Value Chain	Covering of the entire value chain: Site scouting, components procurement, project development, plants management, O&M; Building is left in outsourcing to external companies.
	Revenue Model	Incentive and incentive-free Revenues	Heavily dependent on governmental incentives in all renewable technologies (in 2010 incentives and Green Certificates still represented about the 70% of total revenues from renewables); Costs are largely shared with traditional organization.
Internal Organization	**Organizational Structure**	Structure	Dedicated Business Unit, called "Energy and Environmental Technology", within a fully owned subsidiary responsible for Energy Industry (created in 2010)
		Unit/Spin-off Size	25 FTEs
		Hierarchy	Quite high autonomy is left to the business unit for investment decisions, construction and project management; nonetheless, the hierarchical level on which decisions are taken, depends on the investment volume of the project: Company I has defined clear guidelines about who may decide an investment that requires a specific financial effort
		Key Processes	**Operating Processes**: Engineering and Construction are shared with the traditional organization; **Staff processes** are executed within the holding. **Innovation Process**: focused on finding solutions which allow decentralized renewable energy to be integrated into the existing energy system

		Coordination	-
	Human Resources	Hiring Strategy	Reallocating internal employees working in traditional functions; the know-how gap has been filled for radical new technologies (e.g. Offshore Wind) it was necessary to include some further experts from outside the company to provide some specialized know-how by sending employees to trainings and conferences
		Composition of team/unit and Key Roles/Competences	No particular new competences were researched, since many processes were shared between renewable and traditional business; there is no difference between the renewable energy team and the conventional energy teams: renewable activities are integrated within the unit (especially in onshore and offshore Wind projects)
		Reward and Incentives	-
		Knowledge Management	No specific knowledge management tools: the everyday work is based on the direct interaction of the team members; first ideas concerning very basic versions of knowledge management, such as IT platforms, have been discussed recently, but no concrete actions have been planned yet.
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners** **Level of Involvement** **Aim of the Relationship**	• **Basic Research**: relationship with other manufacturing companies for exploration of possible future solutions • **Applied and Joint Research**: collaborations with business partner to advance certain technologies and realize pilot projects that are too large or risky for one individual company (exploitation or exploration of near-to-market technologies)	Partnership with EPC Companies Management of operating activities left in outsourcing.

Table 4.9 - Synthesis of Company I's Case Study

4.10 Company J

4.10.1 Background

Company J is one of Europe's five leading electricity and gas companies, and the second largest energy producer in Germany after Company E.

The company is located in Essen, North Rhine-Westphalia and was founded in 1898, when the city of Essen signed a contract with an electrical engineering company to build a power plant in Essen, which went on line in 1900 with an output of 1,2 MW. In 1902, when the share capital was increased to 108 million marks, the municipalities became the majority shareholders in Company J for the first time.

Company J's share is controlled for about 63% by institutional shareholders (German institutions own 34%, while the rest reflects company's multi-country nature), for 15% by a municipal German energy company, for 13% by private shareholders, 5% by BlackRock Financial Management and 3% by Mondrian Investment.

The utility is active in (i) oil, gas and lignite production, (ii) construction and operation of conventional and renewable energy power plants (iii) commodities trading as well as electricity and gas transmission and sales. Concerning energy business, in 2011, the majority of Company J's plant used hard coal (29%), followed by gas (22.5%), lignite (21%), nuclear (12.1%), pump storage and oil (9.9%) and renewables (5.6%). The renewable energy portfolio comprises 2.9 GW of operational renewable assets, which equal 5.6% of the group's overall installed capacity, divided in Onshore wind energy (54%), Offshore wind energy (5%), Hydro (27%) and Biomass (14%).

The Group includes several first level subsidiaries, divided by business area and countries: Company J Germany, Netherlands/Belgium, Great Britain, Central Eastern and south Eastern Europe, Renewables, Upstream Gas & Oil, Trading/Gas Midstream.

More than 72,000 employees supply about 16 million customers with electricity and nearly 8 million customers with gas. In the fiscal year 2011 the company recorded more than €51 billion in revenue.

4.10.2 Business Model

In 2008 Company J established a fully owned subsidiary which bundles basically all activities concerning energy generation from renewable energy sources ("RE subsidiary"), that follows the entire value chain for managed technologies (photovoltaic, onshore and offshore wind, biomass, and solar thermal) and for both traditional and unconventional business models. Company J covers installation and operation of renewable energy assets, starting from the authorization and passing through the project development and realization. The business model of the RE spin-off also include both sale and acquisition of realized plants, as explained in the description of external organization.

Concerning the revenue model, as the main value proposition is generation and sale of electricity from renewable sources (traditional business model), the revenues mainly arise from the sale of electricity. The market structure for electricity from renewable energy sources varies according to the EU country. In Germany, most renewable energy assets are operated under the Feed-In-Tariff of the Renewable Energy

Sources Act (EEG), which provides a fixed price per kilowatt hour produced from renewable sources. As a result, the subsidiary and the majority of its revenues are prone to the turbulence and variability of regulations. One of the main measures to reduce political risk is international expansion. By increasing the presence in foreign markets outside Germany, the company strives to become less vulnerable to changes in legislation. Therefore, internationalization is a core element of company J's strategy. As a result, the RE subsidiary targets selected European markets for its activities, i.e. Germany, UK, Italy, Spain and Netherlands. The main technology focus will be on- and offshore wind energy, hydro and biomass.

Activities concerning other "green" activities such as smart home, demand side management, electric mobility, energy efficiency are not involved in the RE subsidiary, but are organized in different units with close ties to the sales department.

In terms of financial performance the renewable energy subsidiary has to reach the same minimum returns as other divisions of the group. There are different risk premiums for certain technologies and certain countries, but there are no specific differences between renewable and non-renewable investments.

The renewable energy subsidiary has a fixed minimum limit for investments in renewable energies agreed by the board of the Group, corresponding to € 1.3 billion per year. The RE subsidiary is thus one of the business areas with the largest investment volumes and it is expected that the subsidiary soon will contribute substantially to the overall results of the group.

4.10.3 Internal Organization

Company J established a fully owned subsidiary ("RE subsidiary") in February 2008 to bundle all renewable energy generation in one place. The RE subsidiary is responsible for managing industrial-scale renewable power generation business, while small-scale plants and other "green" activities are not included; these activities are located in other units close to the sales department.

RE subsidiary has a pure focus on building up renewable generation capacities and on managing the built plants. It currently counts about 1,500 employees and is active in different European markets such as Germany, UK, Italy, Spain, Netherlands, France, Poland, Czech Republic, Switzerland and Portugal.

The RE subsidiary is further structured according to the different technologies pursued. It includes five separate business units: Wind Onshore, Wind Offshore, Hydro, Biomass, and new applications. Every unit has a responsible manager who is head of the unit and is directly subordinated to the board of directors. The formal hierarchy of the renewable company is not different from the organizational structure in the rest of the utility. On the working level, however, the hierarchy of the RE subsidiary differs from the hierarchy in the conventional power business, since the renewable energy business is much faster and much more different than the conventional power business; moreover, it is much more international than the conventional power business which is Germany focused. As a result, the hierarchy on the working level is much more project based.

As a 100% subsidiary, the RE subsidiary is depending on the mother company for some specific areas and processes, such as administrative services and investment approval. The autonomy of this structure is

anyway almost full within defined boundaries: the board of Company L has guaranteed the RE subsidiary a minimum annual budget, € 1.3 billion in 2011, that shall be invested in renewable energies.

The decision making on the upper levels does not differ very much from the traditional decision making procedures in other subsidiaries of Company J. The department heads and the management board, composed by three figures, are the two main decision bodies. Regarding in particular the management board of the structure, the subsidiary is led by three board members, i.e. the CEO, the CFO and the COO, who form the highest decision body in the company. The CEO is responsible for hydro power & new applications, communication, markets and political affairs, human resources, strategy and new ventures. The CFO is responsible for information management, legal affairs, M&A, Finance, Procurement, Tax, accounts and treasury. The COO is responsible for Wind energy, Biomass, and operational safety.

Formal processes in the renewable energy subsidiary do not differ substantially from procedures in the rest of the company. Most management tools are taken over from the group and are slightly adjusted to the needs of the renewable business. As the RE subsidiary is a comparatively young enterprise, procedures are in some areas not yet as standardized as in the mother company: the spin-off is still working on establishing formal procedures, even if in many administrative issues, such as human resources, the RE subsidiary uses the formal procedure of the mother company.

The main differences between conventional and renewable business lay in the operative level. Whereas in the conventional power business the company has several decades of experience, the renewable energy sector is very young and rapidly developing. Moreover, the structure of the business into different projects is not so systematic and rigorous. As a result, inside the single project, as far as the teams keep the timeline and budget, the employees are relatively free to decide the organization of the work and tend to apply informal and unstandardized mechanisms: on the working level, decision making is more decentralized than in the conventional business.

The operative execution of the processes within the RE subsidiary vary depending on the nature of renewable energy projects and “project management” plays a major role in the RE subsidiary. A project team is set up for the time of the project and includes specialists from different fields, in different number and differently structured, according to the requirements of the project. For example, onshore wind energy plants are usually realized through a few experienced specialists, whereas offshore wind energy project are much more complex and new for the company and thus requires project teams of 40 to 100 employees.

Regards project management competences, a great deal of experience and tools, i.e. PM software, are transferred from the conventional power units to RE subsidiary; nonetheless, since many operative differences exist between traditional and renewable power business, new approaches to project management have to be developed or conventional processes have to be adjusted. In particular, since renewable energy still is a new technology, (i) it comprises more technical challenges and therefore, project teams need to be more flexible to include the necessary specialist in the project; (ii) the company and external contractors have limited experience and thus the project teams need to be more innovative to be able to develop new approaches for upcoming problems; (iii) the renewable business is faster and project teams need to be able to

find a way to work and react quicker than conventional teams; (iv) the project teams have to be more international to address the challenges, since renewable business is developed in many different countries, in comparison with traditional energy sector.

The different nature and requirements of renewable energy projects has advantages and disadvantages in terms of coordination. For example, the renewable energy business in Company J is more international than the conventional power business, which is mainly focussed on Germany. This requires more internationally staffed project teams, that may cause positive and negative effects: first, the multi-nationality allows the company to draw on a large pool of skilled employees, but on the other hand the multicultural project teams present managerial difficulties, and as a result more communication skills are required from the employees.

The competences required to execute renewable activities partially exist within the traditional organization and are partially researched outside it. As reported by the RE subsidiary, in fact, project teams need to include a large set of experts on different issues, because of the complexity of the technologies; for example, in the field of offshore wind energy the company needs experts from marine engineering, offshore logistics and meteorology. These skills and know-how are only partly available within the Group: some experts for offshore wind energy are recruited from the offshore oil and gas business. On the other hand, other experts, for example for the field of offshore logistics, have to be found outside the company, because this know-how has not been part of the traditional energy business. Thus, the RE subsidiary tries to recruit from inside the group when possible, but this usually happens only in classical functions such as accounting, finance, human resources or marketing. Also some engineers changed their subject, but renewable energy specialists, however, are rare in the conventional energy units. In these cases, when specialized renewable energy know-how or experience is required, people often have to be recruited from outside the group. In particular, external recruitment has been applied for different hierarchical levels: most of the senior management of the RE subsidiary has been recruited from other renewable energy companies. This way, it was tried to ensure that the senior management personnel has the right skills and experience in the renewable energy sector. For instance, the CEO of the RE subsidiary has been the CEO of an international wind turbine manufacturer before he joined Company J. In some cases whole teams have been recruited from other companies: the head of construction has been recruited from a major German construction company and motivated several of his team members to join him in working for Company L. Furthermore, the company has no problem to attract young and well educated graduates to apply to the company, because the field of renewable energies is seen as attractive field to work in as it offers better possibilities for careers than the conventional sector and Company J, as a major utility, provides a decent salary and benefits package. However a challenge for the group is to attract skilled and experienced personnel with 10 to 20 years of experience for the middle management, firstly because several technologies, such as offshore wind energy, are still very new.

The incentive system of the RE subsidiary is similar to that used in the traditional organization. In addition, it has been experienced by the subsidiary, that the dynamic of this business itself and the possibilities it includes, i.e. know-how development and careers, are an incentive to employees.

4.10.4 External Organization

At the basis of Company J's policy there is the concept that, at current stage of industry, developing external collaboration plays a vital role in the advancement of the technology, because the challenges are often too big for one individual company.

Concerning industrial partnerships, the level of commitment generally depends on the specific technology and its stage of maturity; by following these drivers, actual industrial partnerships may be grouped into three categories:

1. Collaborations for project realization: the company teams up with other companies in joint ventures to realize certain projects. For example, Company J founded a joint venture to realize larger onshore wind farms in collaboration with a group of small and medium-sized municipal utilities. Furthermore, J founded the first German offshore wind farm, Alpha Ventus, has been realized by a consortium of three major German utilities. The aim of this partnership is sharing both risk concerning the new technology and financial effort. Finally, in 2008 the British subsidiary of RE spin-off entered a 50:50 Joint Venture partnership to develop offshore wind parks with a professional service company providing engineering, construction, PM and maintenance.
2. Collaboration with small new ventures. The RE subsidiary has its own venture capital unit which invests in innovative renewable technology start-ups. This approach is rather unique in the German utility landscape. The RE subsidiary knows that many of these ventures will fail, but it is seen as great opportunity to learn about different new technologies. This way the utility created a channel through which the latest technology developments find their way into the company. As many new ventures apply for funding, Company J gets to see and analyze several new technologies per year. Providing evidence, since its creation, RE subsidiary acquired three small and medium companies: in 2008 it acquired a Hungarian energy company focused on alternative energies; in 2009 the subsidiary entered the capital of a Swiss company that develops and manufactures rechargeable zinc-air batteries.
3. Complete or partial acquisition of external companies to quickly increase both installed capacity and know-how. This approach started in 2002, when Company J acquired a Spanish company based in Barcelona that offered construction and operation of wind power plants; in 2008, the RE subsidiary acquired the complete control of a British energy company, that owned the rights for the development and operation of a gross capacity 73MWe (65MWe declared net capacity) renewable electricity plant at Stallingborough in North East Lincolnshire; in 2009, the RE subsidiary acquired a 26 % minority interest in an offshore windfarm set up by a consortium of Belgian and international shareholders; recently, in 2011 the spin-off acquired 47% shares in a Spanish company to expand its wind portfolio to 447 megawatts, holding after the transaction a 95% majority stake in the society. More rare in Company J's history are cases of divestiture: only in 2004 an investment bank acquired a 66% stake in a company including 13 onshore wind farms and owned by the Group.

Also R&D is conducted by Company J to find incremental improvement of existing technologies through external networks; in particular, the company sees a real need to bring down technology costs and thus requires external collaborations in order to access new competences. Research collaborations with both other companies and research institutions/universities are a very important part of the partnership strategy. More than in the conventional energy business, companies in the renewable energy sector are willing to cooperate with competitors to advance the technologies and furthermore, the company is actually involved in various research projects with external institutions and gives order for many experts' studies.

The purpose of the collaborations has both exploitative and explorative forms: some collaboration like the venture capital activity are designed to explore new technological developments; others, like the joint venture with the small and medium-sized municipal utilities are designed to exploit business opportunities. Due to the fast development of the renewable energy sector, finding new partners for new challenges is an important task. Since the RE subsidiary itself was only founded in 2008 the company is still constantly working on expanding its collaborations.

Company J			
Background	**Contextual Variables**	Foundation/History	The firm was created in 1898, when the city of Essen signed a contract with an electrical engineering company to build a power plant in Essen, which went on line in 1900 with an output of 1,2 MW
		Ownership	Shareholders' structure: • 63%: Institutional Investors • 15%: Municipal German Energy Company • 13%: Private Investors • 5%: BlackRock Financial Management • 3%: Mondrian Investment
		Business Portfolio	(i) oil, gas and lignite production, (ii) construction and operation of conventional and renewable energy power plants (iii) commodities trading as well as electricity and gas transmission and sales
		Market Position/Key Results	One of German leaders
		Introduction of Renewables	-
Business Model	**Value Proposition**	Value Proposition Diversification	Both energy utility traditional business model and energy utility unconventional business model are undertaken;
		Geographical Diversification	active in different European markets such as Germany, UK, Italy, Spain, Netherlands, France, Poland, Czech Republic, Switzerland and Portugal.
		Covering of the Value Chain	It doesn't exist a pre-configured business model concerning outsourcing degree rather than internal covering of the value chain: the spin-off can choose among different approaches, on the basis of the single opportunity and sometimes the technology and the country; M&A strategy is largely adopted
	Revenue Model	Incentive and incentive-free Revenues	The company may benefit from environmentally friendly produced electricity by offering green electricity tariffs with an "eco" price premium per sold unit; it furthermore includes feed-in premium, green certificates and all inclusive feed-in tariffs, obtained by building an intensive exchange process with GSE.
Internal Organization	**Organizational Structure**	Structure	**Traditional Business Model**: fully owned subsidiary which bundles basically all activities concerning energy generation from renewable energy sources ("RE subsidiary") in 2008
		Unit/Spin-off Size	1,500 FTEs (239 in German Headquarter)
		Hierarchy	Limitedstrategic independence of the subsidiary from the Holding; nonetheless, the hierarchy of the RE subsidiary differs from the hierarchy in the conventional power business, since the renewable energy business is much faster
		Key Processes	**Decision Making Process:** not much differ very much from the traditional decision making procedures in other subsidiaries of Company J **Project Validation:** quite formalized and in some cases centralized at a corporate level

			Staff Processes: supplied by the Holding
		Coordination	Frequent interface with both German Headquarter and Corporate Level
	Human Resources	Hiring Strategy	Partial external recruiting and partial internal reallocation
		Composition of team/unit and Key Roles/Competences	Competences required to execute renewable activities partially exist within the traditional organization and are partially researched outside; project teams need to include a large set of experts on different issues, because of the complexity of the technologies
		Reward and Incentives	Similar tools to that used in the traditional organization. In addition, it has been experienced by the subsidiary, that the dynamic of this business itself and the possibilities it includes, i.e. know-how development and careers, are an incentive to employees
		Knowledge Management	No specific tools for Renewable Business
		R&D Relationships	**Industrial Relationships**
External Organization	**Number and Kind of Partners**	• Long term agreements with Universities and research centers located in Germany and abroad; • Joint Ventures with small and medium-sized municipal utilities	• Collaborations for project development in Joint Ventures with other incumbent utilities • Collaborations with small Ventures • M&A strategy with small-medium companies and large utilities
	Level of Involvement		
	Aim of the Relationship	Exploration of new solutions; Exploitation of existing technologies	Increase installed capacity and scale

Table 4.10 - Synthesis of Company J's Case Study

5. Clustering

The empirical analysis, formalized in the case studies reported above, in the light of up-to-date literature, allow us to identify the main organizational approaches applied by the energy utilities to manage renewable business and to explain their adoption in relationship with contextual variables.

In particular, by applying the research framework to the ten analyzed cases, it is possible to divide the sample in five cluster, identified by crossing two main dimensions: (i) the **strategic and organizational solution** adopted by the company, in terms of business model, internal and external structure, and (ii) the **firm-level contextual variables**, i.e. organizational factors such as organizational size, age, mainstream core business, business portfolio, complementary assets and traditional ownership structure.

For each of the two dimensions a first clustering is necessary to separately identify the main approaches and contextual elements, but it is not sufficient to analyze in depth the sample. In fact, the two dimensions used for the segmentation aren't completely independent, but rather connected in some cases by a cause-effect relationship. As explained in the framework, in fact, literature suggests many examples in which the corporate contextual factors may have an impact on technology perception of the innovation and thus on the strategic and organizational approach adopted to manage it.

On the other hand, a qualitative analysis demonstrates that, in some other cases, the relationship between organizational factors and approaches, though existing, is not so linear and systematic: for instance, some companies applied the same approach, although starting from completely different organizational factors; while in other cases, similar initial conditions may lead to different solutions.

As a result, the empirical analysis suggests that the different strategic and organizational solutions are worth to be discussed by crossing the two dimensions. A double level clustering is thus conducted: firstly the case studies are separately grouped by approach and by contextual factors; secondly the two dimensions are crossed and five clusters with similar organizational approaches and contextual characteristics are defined. These final clusters are then the basis for the second step of this work, i.e. the analysis of relationships between approach and company's performance.

5.1 Clustering by business model and organizational approach

The solution adopted by energy companies to manage renewables can be analyzed at different levels and by different perspectives. The approach includes in fact a strategic level, defined **business model** in literature, and an organizational level, in turn including **internal** and **external organization**.

In order to identify clear and systematic clusters, each of these three levels is simply connected to some elements, emerged by empirical analysis as discriminating factors:

- The **Business Model** comprises two elements: (i) the value proposition, (ii) the delocalization of the business, i.e. geographical diversification, (iii) technological diversification.

Regarding the *value proposition* which describes the offered products and services, it can generally belong to two categories: conventional or unconventional value proposition. The conventional value proposition "comprises production and delivery of electricity for a fixed price per kilowatt hour" (Richter, 2012); it can be seen as the classical utility's business model, represented by the following value chain: generation, transmission, distribution, retail, consumption. The progressive commodization of electricity pushed energy utilities to "develop a new value proposition, to maintain competitiveness in the changing energy landscape" (Richter, 2012). As a result, unconventional value proposition changes the role of the customers, who become "active energy partners rather than passive rate-players"; this new business model in fact requires the involvement of the consumption side in the demand-response program, by both the simple sale of energy plants to the customers or the stipulation of partnership agreements in which the customer makes, for instance, his roof available for solar devices owned by the utility (Richter, 2012).

Regarding *geographical diversification*, it can be defined as the dislocation of the business in different countries and the consequent level of decentralization of the different activities of the value chain: some energy companies of the sample delocalize only R&D, others limit the dislocation to operative activities and maintain all upstream and downstream processes centralized in the headquarter and finally the last solution is the creation of totally autonomous subsidiaries responsible for the whole value chain of a specific country.

Finally, *technological diversification* may be considered as company's aptitude for contemporaneously managing many different alternative energy sources, i.e. photovoltaic, offshore and onshore wind, biomass, WTE, geothermic energy, etc.

- **Internal organization** may be described in a simply way as the kind of *organization responsible for the renewable business*. In this field, the literature provides the same evidence of the empirical analysis; the solutions applied by the companies may be (i) business unit within traditional organization, (ii) second level subsidiary and (iii) autonomous spin-off. In some cases a mixed approach is applied, since in realty the distinction between one model and another isn't always discrete, but present some overlapping.
- **External organization** can be connected to the level of covering of the value chain and thus to *outsourcing solutions* adopted by each organization, as this influence both external organization extent, number and type of partnerships. The different approaches in this field can be represented as a set belonging to a continuum, which has as extremes:
  1. simple application of all Project Management activities, realizing a "shell company" which leaves in outsourcing the realization of upstream components, the building of the plant and its operation & maintenance;
  2. vertical integrated company, which starts from components manufacturing, passes through plants construction and finally manages the energy park or disposes it in an unconventional value proposition perspective.

Clearly the models applied by the utilities of the sample are intermediate solutions and don't always present clear and pre-configured boundaries, since the strategic decision of doing in house or leaving in outsourcing depends on the contingent situation and factors. Anyway, each company states to have a predominant model that is used for the clustering (Figure 5.1).

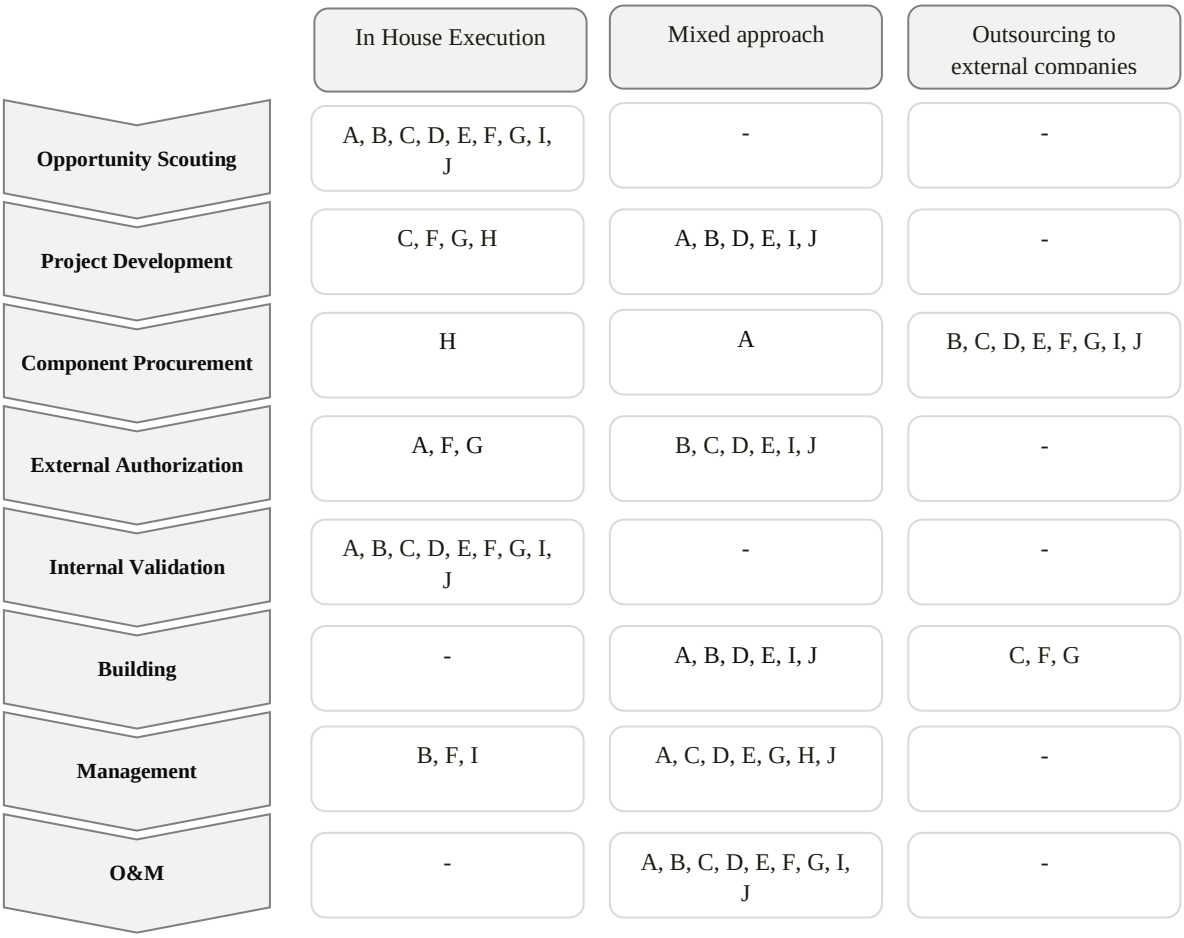

Figure 5.1 - Models, adopted by the different companies for each stage of renewable value chain, concerning Outsourcing choices

The covering of the value chain needs to be crossed with another dimension: the *level of commitment in the relationship*. In particular, scholars have classified three main levels of inter-firm cooperation, derived from transaction cost theory (Williamson, 1975, 1985). At the first level, firm can cooperate through "contract arrangements, such as contract for manufacturing, marketing, and licensing, where the knowledge transactions can be precisely priced" (Chang, 2003). At the second level, companies may establish "a new organizational form, such as equity investment, joint venture and merger and acquisition" (Chang, 2003). In transaction cost theory these two mechanisms are respectively named "market" and "hierarchy" (Williamson, 1985).

The third level of inter-firm collaboration has to do with another kind of activity, usually parallel to the value chain, i.e. Research and Development. Also in this case the firm may choose between different models, that may have as extreme solution the "strategic networking and alliance, where partners generate knowledge jointly" (Chang, 2003). Some mechanisms applied by the company of

the sample may be joint R&D collaborations, research consortia, co-development, and at an extreme situation Open Innovation.

Anyway the two dimensions, i.e. outsourcing strategy and level of commitment, aren't independent, since the typology of activity left in outsourcing is usually linked with the kind of collaboration: for instance, regarding purchasing or O&M activities, the majority of the sample refers to external suppliers, with strategic long-term agreements, in particular for wind business.

Company	Value Proposition	Delocalization	Level of Outsourcing	Internal Organization
A	Traditional + Unconventional	Multi-country	Internal/Mixed Approach	First level Spin-off
D	Traditional + Unconventional	Multi-country	Mixed Approach	First level Spin-off
E	Traditional + Unconventional	Multi-country	Mixed Approach	First level Spin-off
G	Traditional + Unconventional	Multi-country	Mixed Approach	First level Spin-off
J	Traditional + Unconventional	Multi-country	Mixed Approach	First level Spin-off
F	Traditional + Unconventional	Non-delocalized	Internal/Mixed Approach	Second level subsidiary
B	Traditional	Non-delocalized	Internal/Mixed Approach	Business Unit
C	Traditional	Non-delocalized	Internal/Mixed Approach	Business Unit (within existing spin-off)
I	Traditional	Non-delocalized	Internal/Mixed Approach	Business Unit
H	Traditional	Multi-country	Internal/Mixed Approach	Business Unit

Table 5.1 - Classification of the ten companies along the main axes used for the Clustering by Organizational Approach

5.1.1 First level Spin-off and Multi-Country approach

The first cluster gathers Company A, D, E, G and J, since they adopted a similar approach especially regarding business model and internal organization.

The similarities among adopted approaches may be summarized in three basic points: (i) establishment of a dedicated spin-off, though different for size, age and level of autonomy; (ii) adoption of both traditional and unconventional business model, by building industrial-scale and small-scale plants for internal management or external disposal; in this case, differences exist among the vary approaches, mainly concerning the centralization or decentralization of the two business model; (iii) multi-country, in some cases multi-continent, presence of the five companies, though having their headquarter in three European states (Italy for companies A and G, France for D and Germany for E and J); (iv) technological diversification, partially depending on country diversification at point (iii).

Although the cluster is composed by those companies which created ad hoc organizations in order to guarantee the necessary isolation to manage a new business and to protect it "from the counterproductive forces within the mainstream" (McDermott and Colarelli O'Connor, 2002), the five incumbents applied different ownership structures, which influence spin-offs' autonomy degrees. As a matter of facts, Company A, which gathered all renewable activities and assets in a spin-off in 2008, actually presents the most autonomous structure, as the society responsible for renewables is listed on Borsa Italiana since 2010; the organization, which employs about 3.000 people is in fact the unique organization within the sample that has a complete autonomy regarding investment project choice and approval, as a consequence of its ownership structure. On the other hand, the other four companies, i.e. D, E, G and J, established fully owned subsidiaries, respectively in 2011, 2009, 2005 and 2008. The main consequence of this kind of structure is the necessary dependence from the Holding, concretized in the lack or limitation of autonomy regarding the choice of future investments. In any case, different firm polices concretize in more or less formalized procedures for investment projects evaluation, which are inclined respectively to centralization and strategic integration of all business areas or to increase new business autonomy. Thus, building an hypothetical ranking by level of autonomy of the four ad hoc organizations, Company D's renewable spin-off, more recent than the rest of the cluster, and Company G's organization maintain the highest decisional power on a defined percentage of projects: the projects are usually passed and evaluated at a corporate level only if they pass over a value threshold (50 million € for Company D); in all other cases the investment is completely decided inside the ad hoc society. On the contrary, the German society E chose for a centralized solution, guaranteed by high formalized procedures; each project, in fact, must pass through two gates: the first is within the spin-off and the second consists in the presentation of the business plan to a centralized committee within the Holding, which evaluates projects on the basis of target values of a set of parameters, i.e. the IRR and the WACC. Furthermore, if the investment passes over a specific amount, it is submitted to an additional evaluation by a Board of Finance. Finally, Company J lies at an intermediate position between Company E and D/G. The German utility applies in fact the traditional decision making procedures within the renewable

subsidiary. This means that the two main decision bodies inside the spin-off are the management board, composed by the CEO, the CFO and the COO; all projects are firstly evaluated by these figures and then passed at a corporate level for a formal approval, but they are not submitted to a standardized authorization *iter*.

The application of a more or less formalized procedure for investment approvals may be a consequence of the financing systems used by each company. Company E is in fact the only full equity society of the cluster; as a result an organization which finances all its projects through equity has more pressing requirements regarding both return parameters and strategic integration of all investment in order to maintain a long-term financial equilibrium. On the contrary, Companies D, G and J finance the investment through structured bank financing (at least at the starting phases of the projects), that depending on the technology and thus on the dimensions of the investment, may be project financing or leasing or other tools.

Regarding the second common point of the cluster, i.e. the business model, all five companies adopt both traditional and unconventional value propositions, though, also in this case, with different structures. The business model dimension should in this case be crossed with the structural approaches, in order to identify specific similarities and differences within the cluster. In fact, only Companies A and D created an *ad hoc* society which offers exclusively the unconventional value proposition and in particular small-scale photovoltaic plants. Company A's spin-off received in heritage the society responsible for small plants from the holding with all other renewable assets. This society is characterized by a widespread network of installers in franchising, which allows at the same time cost flexibility and extension on the national market. Company D created the small-scale society to be more effective in this business area by concentrating all resources and efforts in an *ad hoc* organization: it reproduces the same paradigm used for renewables in respect with traditional energy generation to the business of small plants. On the other hand, Companies E, G and J applied a kind of ambidexterity approach to manage the small-scale business. The organizations responsible for small photovoltaic plants within Company E are, in fact, the Local Unit, also operating in energy trading and energy efficiency services; this choice depends on the evident downstream synergies existing between all these business areas, but gathers in the same organization a part of the traditional value chain, i.e. energy trading, and innovative activities, i.e. energy efficiency and small-scale plants disposals, which in literature is defined "contextual ambidexterity". Company G manages retail business within the same structure responsible for industrial-scale plants, since its effort in the business hasn't required yet an *ad hoc* organization. Finally Company J manages small-scale plants with other "green activities", such as energy efficiency services in other units of mainstream structure, close to the Sales Department.

The third common point regards the dislocation of renewable activities. The cluster gathers those companies which delocalize their business model in other countries, by adopting a more or less centralized approach. Company A is actually operating in 16 different countries, but nonetheless it prefers maintaining a centralized model: in each country there is a specific subsidiary with resources for all functions, i.e. business development, engineering and construction, and operation and maintenance; however, the autonomy left to these organizations is limited to operative activities and all strategic decisions, such as investment decisions,

choice of the projects, etc., are centralized in Italy. Different is the model adopted by Company D, which is actually active in 11 countries: the country-specific subsidiaries are completely autonomous in opportunity scouting stage and can propose possible investment projects, as they have visibility on the chance of its specific geographical territory, i.e. possible acquisitions. Company J is active in 10 European countries and partially replicates the model adopted by Company D, by leaving sufficient autonomy to foreign subsidiaries. Company E is less present outside its native country, as it operates in 6 other nations where it locates "Local Divisions" of the Global Unit "C&R"; regarding their autonomy degree, it applies an intermediate model in comparison to Companies A and D: each local division manages origination and development activities, but just in case it doesn't require an acquisition strategy, and operative stages (O&M), but always under the control of the Global Unit, since all assets are monitored by a centralized office in Düsseldorf. Different is Company G's situation; the Italian energy utility is delocalized just in France and in Romania and the activities of each of the two countries are managed through particular organizations. French wind business is managed through an equal Joint Venture with an investment fund; as a result, the subsidiary is necessary autonomous from Company G's headquarter, since an external entities partially controls it. Romanian wind business is on the contrary managed by a fully owned subsidiary, and all strategic processes and decisions are taken by the central Italian spin-off.

As a consequence of geographical diversification, the companies of the cluster may generally access a wider set of technological solutions: Companies D, E and J developed a significant share of offshore wind plants and Companies A and G, unlike all other Italian companies of the sample, enjoy a great diversification in onshore wind technology, largely permitted by the dislocation in countries with wide free lands and low population density like France or emerging states (i.e. Romania for Company G, South America for Company A).

5.1.2 Second level Spin-off Mono-Country approach

This cluster's characteristics locate it in an intermediate position in comparison to the Spin-off Multi-Country and next cluster (Business Unit approach). For many reasons the unique company included in this cluster has a lot of similarities with the first cluster, but it is subject to some limitations which predominate and exclude it from this gathering. The resulting cluster is thus quite singular and its particular characteristics are the reason why it comprises just one company, i.e. Company F. The common points with the Spin-off Multi-Country approach are: (i) clearly the establishment of an *ad hoc* organization for renewables management, separated from all traditional activities and characterized by specific processes, human resources, competences, assets, etc. (ii) the adoption of both traditional and unconventional value proposition.

Nonetheless, regarding the first point, even if the innovative business is managed within a separated subsidiary, it can't enjoy the necessary independence from traditional business, because of company's governance structure: all renewables activities are allocated in a second-level subsidiary, "Rinnovabili", fully owned by the first level Spin-off "Ambiente". As a result, the second-level subsidiary has mainly an

operative role and should always report to its shareholder for each strategic decision. "Ambiente" has a complete power regarding renewable investments choice, but coordinates and controls other subsidiaries operating in traditional business (e.g. waste treatment, drainage, etc.). The strong autonomy limitation concretizes in some processes: (i) internal authorization for investment projects, (ii) management of the notices, legally administrated by the holding, (iii) human resources allocation, decided and coordinated by "Ambiente", etc. As a result, even if the first intention was the establishment of a spin-off, Company F's organization gathers some of ambidextrous structure's typical problems: resource allocation, underestimation of efforts, etc.

Furthermore, as far as the second point (value proposition) is concerned, even if Company F adopted both traditional and unconventional business model, its motivations and results are completely different from first cluster. Company F has "*an ethical relationship with the area in which it operates, since its mission is to return to the region what the society has received from it".* For this reason the company decided to operate also in the sale of small-scale plants (unconventional value proposition), even if with its know-how, limited territorial capillarity, financial resources and organizational structure, this business area doesn't result profitable. In particular, for this sector, incentives are considered by the company fundamental for its competitiveness: *"in this business we are still totally dependent on the level of feed-in tariffs, that may influence the survival of this area."*

Furthermore, Company F lacks a solid know-how and technological background in renewable field, compared to main competitors. In order to fill this gap the company acts in three directions: (i) it focuses on internal human resources by defining new continuous internal training programs which consists of periodic seminars on policy regulation laws and regulatory changes and technological innovations; (ii) it leaves in outsourcing the central and operative part of the value chain to EPC companies: *"trying getting the leader in each stage, isn't a successful strategy […]Company F focuses on the authorization process and for all contacts with GSE, since it has consolidated relationships with the local institutions"*; (iii) it defines strategic collaborations with research centers i.e. University of Parma, Reggio Emilia, Piacenza and industrial associations like "Federutility" and "Tecnopoli network", in order to understand the possible evolution of current technologies; the level of commitment with these partners is really strong, since the goal of Company F is to create long-term collaborations in an Open Innovation paradigm: *"[…] this is a two-way relationship: we provide information on market developments and professional needs, the universities provide us technology competences".*

5.1.3 Business Unit approach

This approach is undertaken by those companies, i.e. B, C and I, which don't create a separate and autonomous society to manage renewables, but rather merge it with an existing business often with the aim of complementing an existing value proposition. Organizational ambidexterity is thus the element that unites the three companies, and it is linked with some other common elements: (i) similar governance models, characterized by a parent company operating with several subsidiaries, whose boundaries are not always

defined by function or technology, but rather by value proposition; (ii) flat organizational structures (within the subsidiaries), with informal coordination mechanisms and frequent direct coordination with traditional organization; (iii) outsourcing of all construction activities to EPC companies, because of both the lack of resources for building plants in house, and the choice of focusing on other business areas/parts of the value chain without revolutionizing the entire organization; (iv) necessity of creating external networks and alliances for R&D activities, due to the lack of internal competences and know-how, in some cases led by an internal organization which gives the guidelines.

Though these shared elements, each company of the cluster applies a specific solution, adapting the theoretical "ambidexterity" model to its contingent needs.

Company B adopts a sort of "hybrid model" between structural/contextual ambidexterity (Tushman and O'Reilly, 1996, 2004; Gibson and Birkinshaw, 2004) and the spin-off approach; the company in fact established a new renewable business unit within traditional structure; nonetheless, by analyzing the governance of Company B, it is evident that the model applied can't be defined as pure ambidexterity, since the new business unit owns, in turn, two sub-companies under which are allocated renewable plants and all concerning activities. Considering then a more operative level, such as the execution of everyday processes, a strong integration between corporate structure and new business unit is evident: "*For both the traditional business and renewables, we use the same work-spaces and practices, […] the distinction in two different business units may be considered rather formal*". In particular, this company adopts traditional processes used for building and managing thermoelectric plants; the unique difference is the interface mechanisms with Public Administration, since this subject plays a more important and influencing role in renewable business: "*We didn't find so many differences in our daily work, except for the heavy role the Public Administration assumed in this new business[…]we were forced to define new ways of managing the relationship with different local institutions*". As a result, *"the two theoretical structures, spin-off and business unit, are partially overlapped in Company B's organization […] In this way all downstream delegations are facilitated and some formalized procedure is lightened, since the head of each subsidiary may sign the authorizations for the projects, but at the same time the company can exploit the existence of similar activities with the traditional business."*

Company C approaches renewables allocating concerning activities, assets and resources on existing spin-offs fully owned by the parent organization. First of all, Company C is a multi-utility operating in different businesses, ranging from water cycle services and waste management services, to the production, distribution and sale of electricity and gas in regional and multi-regional areas; as a result, what is defined "traditional business" doesn't necessary have to do only with electricity value chain, as for Companies B and I, but also with all other areas (water, waste and gas). The solution applied by this multi-utility consists in the disaggregation of renewable activities by technology and the allocation of each technological area under an existing function, operating in one of the over mentioned traditional businesses: biomass is thus allocated in the spin-off "Environment" responsible for waste treatment, photovoltaic plants are managed by a second-level spin-off (created in 2007) which is partially owned (50% of shares) by the first level spin-off involved

in energy efficiency activities and energy trading called "Nets", and finally wind plants are no longer managed by Company C after selling the Belgian company acquired in 2002, but were run in a spin-off also responsible for turbo-gas plants. As a result, even if Company C adopts the spin-off approach to manage renewables, this kind of model is more similar to an ambidexterity organization for two reasons: (i) renewables are often seen as the continuation of an existing value proposition; in fact, *"electricity generation from biomass is a way to treat waste and as a direct consequence of waste collecting […] photovoltaic completes the offer of Company C's ESCO regarding energy efficiency and spearing"*; (ii) the second level spin-offs don't enjoy any autonomy for what concerns budget/objective allocations. In fact, the holding defines first level sub-companies' budgets and medium term objectives which are negotiated with the sole directors of first level spin-offs, who is the direct manager of the second-level spin-offs and allocates his available budget on them.

Company I gathers all renewable activities within a department, "Energy and Environmental Technology" allocated within a fist-level fully owned subsidiary responsible for energy generation and trading from both renewable and non-renewable sources. The approach applied by this company respects the pure definition of "structural ambidexterity", since within the mainstream organization a group of employees, in particular 25 people, is responsible for innovative business and no difference between renewable and conventional energy teams are applied: renewable activities are completely integrated within the unit, although conducted by a theoretically separated organization, i.e. "Energy and Environmental Technology" department. The communication within this flat organization is thus conducted through informal and direct contacts, in particular between new and traditional business. The choice of keeping the two business areas integrated belongs to a precise strategy and isn't just a consequence of lack of resources or unwillingness of revolutionizing the entire organization. In fact, in 2011 the company acquired another medium-size utility which had renewable energy assets in its portfolio; although the business was efficiently managed within this external organization which owned all competences and resources to carry on its activities separately, Company I decided not to keep in life the new subsidiary but to realign all practices into the group's activities, even if this process required more time and effort.

Finally, regarding the last common point, these companies need to establish new external collaborations. Company C defines a dedicated partnership with Enea (the Italian Government's research center), focused on solar technologies activities aimed to improve traditional products and find new solutions for second and third generation photovoltaic cells. These activities are undertaken by a new unit within the solar spin-off called "scouting unit" aimed to: (i) co-develop renewable projects that require dedicated and complex technological competences; (ii) monitor and assessing technical and economical characteristics of new products on solar, wind and mini-hydroelectric technologies; (iii) search strategic partners to develop new internal projects. Company B has, on the other hand, strong collaborations with universities, through long term contracts and sponsorships for market and technical studies carried out by university energy departments for assessing renewable sources potentialities. Finally, Company I establishes different forms of collaborations with vary levels of commitment for basic, applied and in particular joint research. For

instance, the company established a joint venture with two competitors, Company E and Vattenfall, in order to develop and test offshore wind energy technology. Anyway, the companies of the cluster are united by two elements regarding the management of external networks and its aim: firstly, in each of the three cases the external research & development isn't completely left in outsourcing, but is led by an internal direction respectively through the "scouting unit" and the Research Centre for Energy Technology of Company I; just Company B lacks a specific internal R&D unit, but anyway created specific figures within the "Renewable" Business Unit; secondly, the scope of partnerships is mostly focused on finding the most suitable and "close to the market" technologies, or improving existing solutions instead of generating disruptive innovations.

5.1.4 Research & Development approach

This cluster is composed by just one company, because of its singular approach towards renewables: Company H doesn't generate energy from renewables and doesn't follow the common value chain by building and managing renewable plants. On the contrary it focuses its attention on "*disruptive innovation in renewable energy sector we are developing with top universities*" by conducting research activities and developing industrial projects in leading edge renewables technologies.

Company H approaches renewables by establishing a new function within "Strategy and Development Direction". It is not a business unit since this company is focused on R&D activities and not on renewables value chain. This function is aimed at managing research activities and internalizing external results which come from strategic collaborations on solar and biomass technologies: *"because of the newness of the field, we decided to include renewables in a strategic function, to minimize the influence of other businesses*". This unit has the role of developing disruptive renewable technologies with top universities and research centers. Within this function, Company H also creates the "External Collaboration Unit" which should manage the more operative activities in establishing external relationships (i.e. management of intellectual property rights and licenses among firm and universities). In particular, partnerships established with MIT and Politecnico of Milan are managed by creating new procedures such as the use of weekly team meeting with a responsible that has the task of organizing the meeting, summarizing the main points emerged during the meeting and supervising the work in progress.

Company H adopted this business model because it doesn't consider renewable energies as complementary activities to its traditional business, unlike other companies of the sample, but as support activities for its actual core business: *"we define a new function with several sub-units; we don't establish ad hoc spin-offs because it requires too much effort for a support business*". Although in fact, Company H adopts partially the unconventional business model, since it is also active in upstream activities, by producing and distributing silicon mono and multi-crystalline modules and small photovoltaic systems, these activities are always seen as *"support to the core business: if within the Group, some traditional plants need to increase their "Sustainability" share, the Renewable unit intervenes by installing, for instance, photovoltaic modules on the rooftop of the building".*

This specific strategy has two other main consequences, which separate Company H from the rest of the sample: (i) complete lack of internal competences concerning renewables; as a result, the organizational structure could be realized just thanks to recruiting programs focused on selecting multi-disciplinary human resource profiles, since no internal replacements, as all other companies did, were possible; (ii) company's non-interest in the renewable policies and incentive systems: Company H didn't approach renewables because of the possibility of increasing margins through the feed-in tariffs, but rather because of the probability of developing a successful disruptive technology.

5.2 Clustering by contextual variables

Starting from empirical analysis, firm-level contextual factors which mainly affect organizational structure and business model choice in renewable energy business are a subset of those deepened in literature and are contained in the framework presented in Chapter 3: ownership structure, firm size, firm age, business portfolio, strategy, resources, competences, complementary assets.

On the basis of these factors, a second clustering may be done. Nonetheless, before moving on to this analysis, another element should be considered, since it discriminates a priori one of the ten companies: historical and actual core business. By considering this contextual factor, in fact, Company H should be clearly considered separately from the rest of the sample as it is the sole company which operates in Oil & gas industry as primarily business. For this reason and for its consequent history, the holding will be considered as an independent and unitary cluster.

For clustering the other nine companies are firstly used three main factors among those listed above: (i) ownership structure, (ii) firm age and (iii)business portfolio, mainly in terms of diversification degree. These three elements have been adopted for a first gathering because of two reasons: on one hand, on the basis of empirical analysis, they are more discriminating than other factors, and on the other hand they partially summarize other firm-level elements: for instance firm age and business portfolio are often linked with firm size.

Actually, also these three contextual factors are connected one another, chiefly because of energy market specific dynamics of last century, at least in the three considered countries.

Beginning from 1960s, in fact, a nationalization process started in the most part of Europe; as a result, those companies existing before 60s (considering the sample, companies B, C, F, I) survived just if they diversified their business (e.g. as Company I did, entering Information and Communication Technology market) or if they were already diversified in other services (like companies C and F). Consequently, if a company was created before 60s, it experienced in past or still experiences a certain degree of diversification and furthermore it is private or municipalized. On the contrary, if a company was created during or after liberalization process (Company G), it is rather private and focalized on energy production. Between the span of time from 60s to 90s, just state-owned companies were created, focalized on energy generation as they enjoyed monopolist status for about 30 years.

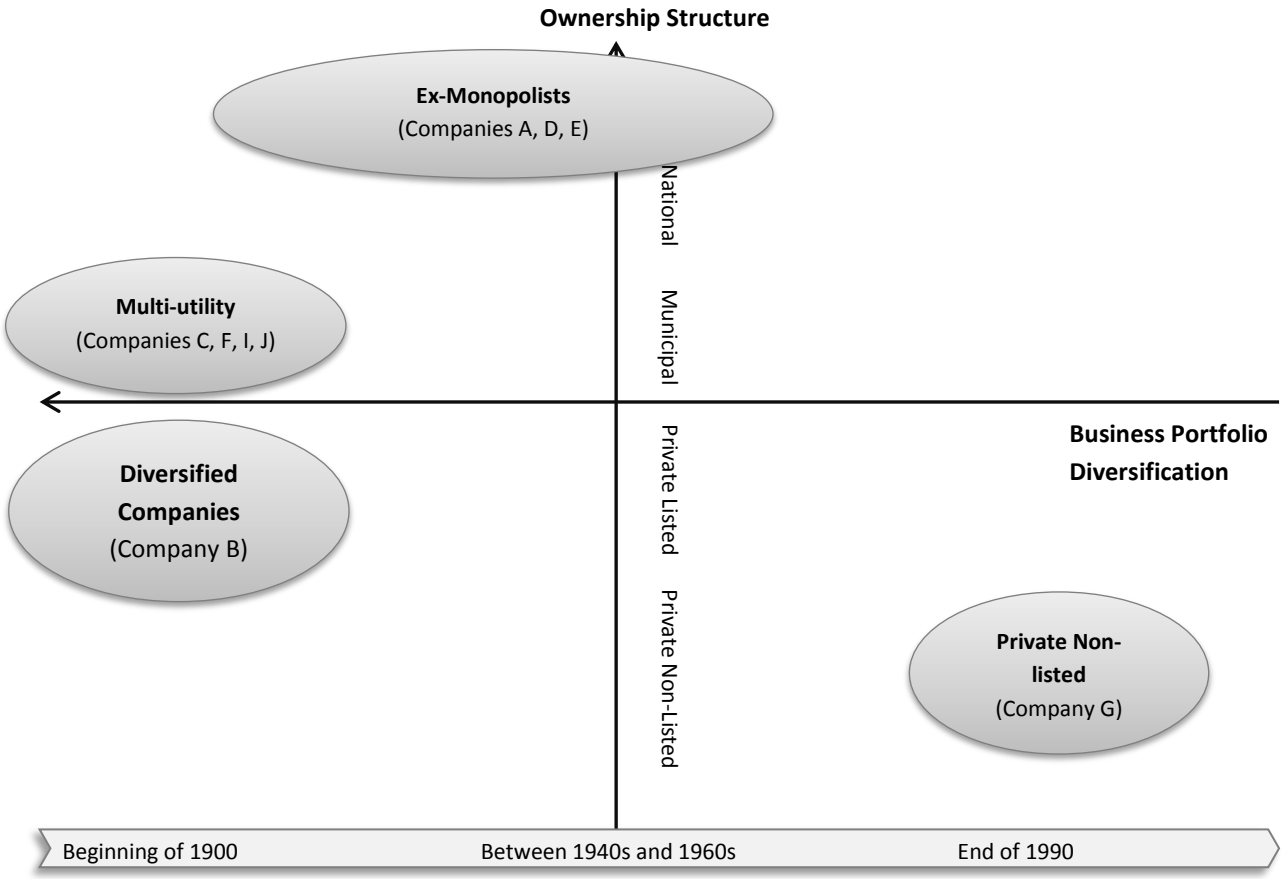

Figura 5.2 – Clustering by three key contextual (Firm-Level) variables: Firm Age, Business Portolio and Ownership Structure

In addition to the three discriminating factors explained above, other firm-level elements (i.e. complementary resources, assets, strategy, etc.) are included in this clustering, in order to provide a more complete picture of the situation.

5.2.1 Ex-monopolists

This first cluster gathers ex-monopolist and state-owned companies, i.e. Companies A, D, E and J.

Company A was created when Italian energy sector was nationalized and kept the market monopoly until the liberalization process in 1999; it actually gathers about 3.000 employees and it's controlled for less than 70% by Company A's Holding (i.e. indirectly for 30% by Italian Government) and for the rest by private spread investors.

Same considerations may be done for Company D, created in 1946 and monopolist until 2000. It counts 160,913 employees and its shareholder capital at 31st December 2011 was split as following: 84.4% controlled by French State, 3% by Institutional French investors, 8% by foreign institutional investors and the rest by individual shareholders.

Partially different is the situation for Germany: unlike a multitude of other industrial countries in Germany there has never existed a broad government monopoly in the electricity sector, compared with Italian

Company A or French Company D (Monstadt and Naumann, 2003). Instead the electricity economy in Germany is shaped traditionally by a coexistence of public, private and mixed-economy enterprises (Dieckhaus and Dietz, 2004), creating an highly fragmented market with over 900 electric utilities. As a consequence, before the liberalization process started in 1998 there was the following division of labour (Renz, 2001):

- The supra-regional level was represented in 1997 by eight network energy supply companies, which produced 79% of the electricity. They had been active only in the framework of their territorial monopoly. Company J and Company E's precursors belonged to this category;
- At the regional level around 80 regional energy supply companies with a production share of 10%, total took over the electricity from the large network energy supply companies.
- At the local level in 1997 around 900 municipal utilities supplied end consumers in their municipalities with electricity, gas, water or district heat. They produced 11% of the electricity in Germany.

Company J, created at the end of XIX century, gathers at the end of 2011 70,860 FTEs and its share is controlled for about 63% by institutional shareholders (German institutions own 34%, while the rest reflects company's multi-country nature), for 15% by a municipal German energy company, for 13% by private shareholders, 5% by BlackRock Financial Management and 3% by Mondrian Investment.
Finally, Company E was born by the merge of two state-owned companies of the '20s and it gathers 78,889 FTEs.

5.2.2 Multi-utility

The multi-utilities of the sample are Companies C, F, and I, since they undertake a wide portfolio of different activities, comprising: (i) hydro services, regarding the entire water cycle management, (ii) waste management services, i.e. waste collecting and treatment and (iii) production, distribution and sale of electricity and gas in regional and multi-regional areas.
The strategy of the three companies is connected with an ethic value of offering services to the collectivity living in the respectively municipalities. As a result, renewable business is perceived as complementary to existing areas, in some cases because it is the natural conclusion of an offered value proposition (e.g. generation of electricity from biomass and waste treatment) and anyway it respects the general strategy by guaranteeing green energy with low emissions.
All three firms are public listed municipal companies and this means that municipalities or governmental institutions still control the majority of their capital: Company C's share is owned for more than 50% by the Rome municipality, while Company F's share is controlled for about 36% by Torino and Genoa municipalities for more than 8% by the Reggio Emilia municipality and for about 6,6% by the Parma municipality. Company I is a public non-listed company; the majority of its shareholders are local authorities and municipalities in the Regierungsbezirk of Weser-Ems. They are organised in two associations, which

respectively hold a stake of 59% and 15%. Together these associations build a third energy company, holding a 26% stake in the company.

In the specific case of Italian multi-utilities, i.e. companies C and F, both the business portfolio and the ownership structure provide to the two companies a particular complementary asset, moreover fundamental for renewable business: an historical and tightly relationship with local institutions. Public Administration is in fact an important stakeholder of all utilities which enter the renewable business, since it can influence the upstream stage of the value chain, i.e. the authorization phase that the interviewed companies defined as the most critical phase of the entire process. Business portfolio and the history of the two multi-utilities may overcome some problems, thanks to the consolidated relationships with the PA, not because they can avoid some bureaucratic and standardized procedures, but because the communications and exchanges result more frequent, informal, facilitated, etc. On the other hand, the ownership structure can boost this mechanism, since stakeholders (local institutions responsible for the authorization process) and shareholders in this specific case coincide and this overcomes all problems defined by "Stakeholder Theory" (Freeman, 1984) concerning conflicting goals.

All three companies can enjoy a long history, started at the beginning of XX century: Company C born in 1909 in Rome, Company F was created in 2010 but from the merge of multi-utilities that developed their assets and competences during the '900 and Company I was created at the end of 1920s. The three firms actually count respectively 7,050, 4,752 and 8,828 FTE (average of 2011).

Finally, though the three companies could be all classified as municipalized or ex-municipalized societies and thus present significant shared points, they could be sub-gathered in two subgroups considering an important discriminating factor: country localization. This contextual variable is even more significant if we consider the different role which municipalities play and played in Italy in comparison with other EU countries and in particular with Germany; during Italian History, in fact, municipalities have always represented a strong and powerful institution, both politically, economically and culturally. As a result, Companies C and F are highly linked with their referential territory, so that in many cases though their size and possibilities they still identify as main competitors, small local firms and keep focusing on a specific and limited market niche corresponding to the municipality or the region. Furthermore, another common point of the two Italian multi-utilities is their market position: they can be both defined "late follower" in Italian energy market, as they own respectively 1.5% and 2.6% in 2011, even if they have a long experience in the electricity generation activities as municipal companies.

5.2.3 Non-listed private company

Company G is the only non-listed private society of the sample. It was created in 1999, after liberalization process in Italy through the "Decreto Bersani". Its business portfolio is thus very focused on energy generation, distribution and trading, because of many reasons coming from its history: (i) the company is still developing the adequate know-how in order to be competitive in an energy market populated by hundred-year-old or ex-monopolist companies; as a result, a diversification would mean a waste of resources and

efforts and a reduction of effectiveness in energy market; (ii) company's ownership structure entails a lack of financial resources, which doesn't allow a portfolio diversification.

Concerning the other firm-level contextual factors contained in the framework, in comparison with the rest of the sample Company G generally lacks complementary resources, in terms of R&D partnerships and relationships with local institutions and Public Administration, and company's main strategy in last years aimed at overcoming the consequent possible problems. Furthermore, the company would theoretically suffer brand and image issues, because of its short history; nonetheless, the society tried to appeal to its relative youth to spread an image of "sustainable company", focused on alternatives energy sources, close to final customers and to their needs.

Company G actually counts about 460 employees; it is a private company owned by an Italian industrial group, an Austrian Company for 41%, company's own management and Banca Monte dei Paschi di Siena: currently, Italian Group has a 65% stake in Company G Holding, with the Austrian society holding 35%. Company G has the following shareholders: Company G holding (80%), Austrian Company (16.9%), Own Management (1.9%) and Banca Monte dei Paschi di Siena (1.2%).

5.2.4 Diversified companies

Company B is the Europe's oldest energy company, as it was created in January 1884 in Milan, for energy generation and distribution. Company's history is characterized by successive focalization and diversification stages, mainly set out by external contingent factors:

1. "Energy Focalization Stage": between 1884 and 1950s, Company B focalized its activities in electricity market, creating a strong know-how on electricity transmission;
2. "Strategic Diversification Stage": starting from 1950s, Company B invested in portfolio diversification in order to obtain access in some other sectors, i.e. chemical business area. This first diversification was thus dictated by internal strategic reasons;
3. "Imposed Diversification Stage": following the nationalization and resulting sale of its electric assets to Company A in 1963, Company B downsized its energy business, producing power only for self-consumption and operating only the power plants that supplied Group's industrial facilities; Company B rather get stronger in other businesses, in which it was already diversified;
4. "Partial Energy and Gas Re-focalization Stage": starting in 1999, the new laws that gradually deregulated the energy market reintroduced competition in the electric power and the natural gas industries. Company B began to supply electric power to eligible customers and expand its downstream presence in the natural gas area. As a result, the company re-focalized its business in electricity generation and distribution, but keeping its typical diversification in other businesses, such as natural gas purchase and trading.

As a result, the company can enjoy competences in energy market, which have been created since one century ago, so as external partnerships for R&D, relationships with Public Administration, financial

resources, assets and facilities, all coming from a diversified business portfolio which allowed Company B to survive nationalization period.

Finally, concerning market position, the company may be considered a "medium follower": it is not sector leader but owns the 19.5% of the total energy production in Italy (in 2011).

5.2.5 Oil&Gas Company

Company H is market leader in the oil and gas sector in Italian market and is actually present in other 79 countries, that makes it the fifth bigger oil group in the world. Although the core business of the company is oil and gas production, transport, transformation and commercialization, it competes also in electricity markets with the use of dedicated assets (i.e. oil refining plants, thermoelectric plants, etc) without having complementarities with renewable business. As a result, the company doesn't own complementary assets with renewable business, nor complementary competences, since the business are technically completely different except for some isolated case: "*the most promising sector in we operates concerning renewables is the production of bio-oil/bio-diesel from the treatment of some organic waste; the company decided entering this specific sector for two reasons: (i) first, it already owns basic knowledge in chemistry and want to apply it also in bio-chemistry; (ii)second, this may be one of the most profitable business area, since market inclination is gradually going towards "low emissions" solutions and the costs of petroleum is strongly increasing. […] Anyway, the "green chemistry" still remain a research field and Company H isn't industrially operating."*

The unique asset that Company H owns and can be exploit for renewable business is the network of external collaborations: during the decade 1985-1995 the company was subjected to a profound rationalization, mainly concretized in a re-focus on the core business of the society, and as a consequence in a strong reduction of R&D activities. The more recent interest in new research areas, i.e. renewables in 2000, made the problem of the lack of internal research evident. In order to compensate for this lack, Company H created a widespread research network outside its boundaries, by establishing a complete Open Innovation paradigm with many universities and research centres, i.e. the Massachusetts Institutes of Technology, Politecnico of Milan and Turin, Stanford University, CNR, etc.

As a consequence of the above described contextual factors, i.e. business portfolio, complementary assets and competences, is the perception of the renewable technologies as non-strategic for the company, but rather supportive, as they can add a "green image" to the core business. Renewable business isn't seen as a diversification from existing businesses, oil&gas and engineering&construction, but just a staff area for them.

Regarding the ownership structure, Company H is an ex-monopolist in gas and oil market, created by the Italian Government in 1953 after the nationalization of the sector. Although the liberalization process of the business started in the 90s, Italian State still owns in 2011 more than 30% of the total share. It actually counts 78,686 employees and generates revenues for K€ 109,589.

Although Company H is considered a "medium follower", as it owns the 12.2% of the total energy production in Italy in 2011, Energy business still remains a simply diversification in respect with oil and gas business area. Renewable business is less than marginal in this picture: the Energy spin-off that generates the 1.2% of total revenues (2011), owns 4,719 MW; within this subsidiary, photovoltaic parks have a capacity of just 30 MW. It is clear that, this company does not put particular attention to the renewable policies and incentive systems and it did not approach the renewables dictated by the thrust of the feed-in tariffs.

5.3 Second level Clustering

Second level clustering is realized by crossing the two dimensions explained above: organizational approach and contextual variables.

By analyzing the links between the two dimensions, two main kinds of consideration appear: (i) cause-effects relationships, in some cases evident and (ii) the different priorities assigned by each company, coming from the arbitrariness of each specific strategy or from "soft" factors (commitment, corporate values, culture, etc.), which may explain why same contextual starting points could lead to different organizational solutions.

5.3.1 Utilities Cluster

This cluster gathers all companies, i.e. A, D, E and J, which show a similar strategy with a strong focus on renewable energies, mainly due to **firm dimensions** and **competitive positions** in the market. For all these reasons, they approach both the conventional and unconventional business models and establish spin-offs to manage these activities. Though these evident similarities, it is necessary to highlight that these four companies arrived to analogous organizational approaches, despite completely different histories.

First of all, Company A, with more than 80,000 employees in 16 different countries established one spin-off, characterized by a matrix organization divided by countries and renewable sources; the spin-off was created by collecting all functions, assets, resources created for managing renewables spread in several countries during the last 10 years. On the other hand, Company D created the ad hoc renewable subsidiary, by progressively acquiring control on an external French firm, active in energy generation from alternative sources: as a result, this approach is more similar to a M&A process than to the spinning off of an internal strategic business area. Finally, Companies E and J's approach is more linear, as the two companies gradually separated an internal part of existing business portfolio as it was considered advantageous and strategic.

Thanks to **firms' histories** in terms of bargaining strength with industrial partners and thanks to the **market position** (the companies are leaders or first followers in the sector), the four companies define a completely new business model to manage and commercialize renewable plants: for instance, Company A adopted a franchising approach, manageable thanks to the dense network it had with small and medium Italian retailers. In order to concretize this strategy, it defines a dedicated company, completely owned by the parent

company, which offers this service only for the residential market, becoming the first system integrator in Italian photovoltaic market. Company D divided the three business areas concerning renewables, i.e. industrial-scale plants, retail market and ESCo activities, and manages them within three autonomous business models.

Four companies' **market positions** respectively in Italy, France and German, and their strong relationships with industrial partners, also allow them to establish strong partnerships with other multinational firms: both Company A and E created joint ventures for producing photovoltaic modules, Company D established strong partnerships with important universities for R&D, Company J built many JV for onshore and offshore wind development.

Furthermore their position in the market and their brand allow the companies to recruit both young talents and external senior managers for covering higher positions. In some other cases, **image**, **firm size** and availability of **financial resources** also allowed M&A activities (in particular for companies D and J).

On the other hand, the experience and the **complementary competences** developed in traditional business make the companies to cover all the supply chain activities in renewable sources by developing new internal procedures and best practices in operation and maintenance services and by creating cross functional processes to improve the efficacy and efficiency of renewable activities.

5.3.2 Multiservice Cluster

Although Companies C and F don't present the same organizational structures, they need to be analyzed in a unique cluster because of (i) evident similarities in their contextual variables, i.e. in the business portfolio, history, strategy, ownership structure, etc. and (ii) the resemblances in the relationships between contextual variables and strategic/organizational approach, even if with different results.

The **history** of the two multi-utility may be considered as similar, since with the advent of the liberalization process and the introduction of regulatory normative (i.e feed-in tariff and green certificates), both companies developed a new organizational context in order to guarantee the ability of dynamically adapting themself to frequent changes of the new environment represented by renewables. As a result, in order to exploit this favorable situation and to expand their production shares, the two firms took the decision of adding a new business model. The characteristics of the renewable business models are influenced by two contextual variables, similar for the two firms, i.e. the **business portfolio** and the existence of **complementary assets**. First of all, since energy generation from alternative sources was coherent and complementary to existing business portfolio, the choice was to undertake the traditional value proposition, in order to guarantee "green energy" to the collectivity and to gain in this way the loyalty of existing customers, which is one of the main strategic goals for multi-utilities. Furthermore, the existence among complementary assets of good and consolidated relationships with local authorities influenced the decision of covering the entire value chain, starting with the authorization phase defined critical by many competitors (mainly for Company F): *"having a consolidated relationship with local administration doesn't allow us to have technical advantages on competitors, since we have to respect all bureaucratic norms; the pro is to*

have an easier, more frequent and informal communication, to know the future decisions of Public Administration, to obtain clarification regarding a specific line of action, etc." (Company F) *"In any case we never enjoy preferential treatment."* (Company C). Secondly, the decision of undertaking also unconventional value proposition is a consequence of complementarity: "*the company exploits all front-office assets in order to reach the customers of the retail market, as we are used to offer different services to the final customer*" (Company F). Hence, since contact channels and counters were already part of companies' assets they can be considered complementary resources exploited for the application of the unconventional business model to the retail market. Nonetheless, both companies apply just a partial unconventional value proposition and with significant differences, coming from dissimilar contextual variables (mainly concerning **geographical localization**). Company C in fact doesn't offer small-scale photovoltaic plants as Company F does, since it is mainly focused on Roman municipality, as already stated above, where particular building limitation are in force: about 77% of Roman area is constituted by protected historical buildings. On the contrary Company F is active in retail market, but doesn't dispose industrial-scale plants (except for biomass), as a consequence of its history and strategy: the company was created by merging small existing local firms, and thus (i) offers small-scale plants to retail market, with an ethic rather than economic aim, (ii) ensures to its territory particular guarantees concerning plants management (i.e. in terms of emissions and pollution degree) by avoiding renewable park disposal to external organizations, and (iii) have an open and strategic relationship with local agricultural societies to which biomass plants are disposed: *"it is as if the value chain naturally continues from Company F to its agricultural partners; each entity covers its area of expertise, so that the territory could extract as value as possible by this technology."* (Company F).

In addition to the dissimilarities regarding the value proposition, there are also some differences in the revenue model, mainly coming from different elements in the **history** of the two companies. Company F uses incentives indirectly for making sustainable the commercialization of renewable plants and directly for generating energy from owned renewable plants: *"we realize also small plants (3,5 kW) just because of our ethic relationship with customers. The marginality in this business is so low that we have a complete dependence on incentives".* It doesn't have enough experience in the renewable market, as it created a renewable business unit just in 2008, so its costs are quite high and incentives are a pre-requisite for covering renewable activities mainly in relation to the unconventional business model. On the other hand, Company C, which has more experience in renewables than Company F and which undertook an energy efficiency business unit at the beginning of 2000, uses green incentives with a more "financial" approach since it has been able to obtain interesting margins (i.e. internal rate of returns are more or equal to 10% in relation to the size of solar plants) through the commercialization of photovoltaic plants on industrial markets (i.e. 1 MW power plants or more). It undertook the unconventional business model only in photovoltaic industry since has higher incentives in Italy comparing to the other renewable sources and required less technical competences than other renewable sources by establishing an ad hoc solar spin-off. This company, in line with its approach, defines also ad hoc figures to manage the authorization and "incentive" processes.

Regarding internal organization, the different approaches implemented by the two multi-utilities don't derive from dissimilar contextual variables, as the diversity may be defined as more formal than effective under many points of view. Company C allocates biomass and photovoltaic in two existing spin-off responsible respectively for waste treatment and energy efficiency, while Company F creates a separate organization for renewables, focused on industrial and small-scale solar plants and biomass. At a first glance, the two solutions seem to be opposite, but in reality present many common points coming from a common basis of same contextual factors, i.e. **business portfolio** and complementarity with mainstream business areas, **ownership structure** and **internal complexity**. Even if the approach applied by Company F can't be categorized as ambidexterity, in term of autonomy, standardization an human resources may be compared with the solution decided by Company C. The spin-off "Rinnovabili" in fact, is a second level spin-off controlled by a first level subsidiary "Ambiente", which coordinates all processes and resources concerning alternative sources, limiting thus its autonomy. The organization consists thus of having many society boxes, constituted by a first level traditional subsidiaries and eventual new spin-offs under them. The resulting hierarchy is clearly similar to Company C, if the main problems of an ambidextrous solution are taken into account: resource allocation problems, dependence on a traditional organization, autonomy limitation, etc. Furthermore, both firms state that the most critical process is internal authorization process, since a diversified business portfolio and organizational complexity require an high level of standardization and all projects have to pass through many gates, as the vary hierarchical levels are: *"the spin-off draws up the business plan that already respects all economic parameters, standard for the whole company; the BP is then passed to the shareholder, "Ambiente" that takes a decision considering all investment proposals coming from the different subsidiaries (first formal gate). Finally, the project is launched by a conference of internal services at a corporate level (second formal gate) […] The criticism is that more projects coming from different business areas with dissimilar priorities have to pass through the same gate."* (Company F). The formalization of this and other procedures is required within a diversified organization, as a multiservice is, and with the hierarchical complexity adopted by both structures.

As far as the human resources are concerned, the complementarity of renewables with existing business portfolio and thus the existence of **complementary competences**, concretizes in speeding up recruitment systems, since both companies find the required resources and competences completely (Company F) or partially (Company C) through internal dislocation of existing employees; the eventual know-how gaps are filled through technical training courses. In any case, a diversified organization like a multiservice is not able to internally develop all competences for all business areas, also because this is not strategically convenient. This is the reason why both firms search for specific capabilities also outside the company, by establishing agreements. In particular, Companies C and F completely leave in outsourcing all operative activities regarding construction and installation of plants to EPC societies, maintaining in house the project management activities, i.e. relationship with authorities, purchase of resources, controlling of timing and costing, etc.. This has an impact also on internal organization, since the skills internally required may be defined "hybrid competences", including both technical and managerial aspects.

5.3.3 Private Non-listed Company

Company G's recent **history** is the main firm-level contextual factor, which affects all three organizational elements: business model, internal structure and external organization.

First of all, Company G's recent foundation led to a strong commitment towards renewable technologies, i.e. mainly solar and wind in order not to waste financial efforts. Nonetheless, company's **market position** ("Late follower", because of its share of 2.2% on the national electricity production in 2011) pushes it to progressively increase its commitment in renewable business which is moreover evident by observing its recent trend towards two directions:

1. Internationalization: in 2008 the Company created a subsidiary in Romania, while in 2011 it entered a JV for management of wind activities in France.
2. Value Proposition Diversification: the Company diversifies the business in both unconventional value proposition in both industrial-scale and small-scale plants by progressively increasing its offer with new products, and in ESCo activities.

Furthermore, its "late follower" **market position** in addition to **corporate mission** concerning renewables affect Company G's revenue model: it uses additional revenues that come from the incentive systems to invest in the spin-off for enlarge its business "*our mission is increase the dimension of the renewable spin-off in order to have at least in Italy the same market share of the firm leader in renewable*".

Concerning the impact on internal structure, Company G's recent creation and current **ownership structure** dictate the necessity of easily obtain external financial resources. Since in fact external credit institutions enjoin the handover of energy plants through small companies before giving credit, Company G created an holding structure composed by several small vehicle subsidiaries. In addition, **firm size** and **ownership** model (it is a private company owned by an Italian industrial group for 65% of the total share) allows it to create a very flexible structure. One of the main point derives precisely from the private ownership, characteristic that makes this company an exception in comparison with other utilities. This characteristic allows the spin-off to have autonomy towards the parent company: the general manager of the "green spin-off" takes the great part of decisions without the parent company consensus (excepting for large development processes): this allows an higher level of adaption to external environment, which is extremely turbulent. The proof of this is that the solar spin-off begins to cover downstream activities in the photovoltaic field by producing solar cells and modules (a factory with about 40 MW of modules capacity per year) abandoned two years ago by re-focusing on system integrator activities for large photovoltaic plants. Large plants were penalized by Italian policies last year, so the spin-off started to focus on photovoltaic activities for the residential market.

Furthermore, the company suffers the evident lack of **complementary competences and resources** in comparison with the rest of the sample, which affects both internal and external structure:

- Internal Structure: since Company G approaches renewables during the liberalization process, i.e. quite in the same period of its actual creation, renewables are seen as a strategic business:

"*renewables will represent our future business*"; as a result, the most consistent organizational approach was the creation of an ad hoc structure to manage the new business, i.e. a spin-off.

in order to compensate know-how and resource gap, Company G acquired all renewable human resources from outside company's boundaries: the society entered biomass and hydroelectric businesses by acquiring other society operating in these sectors, including also the competences developed within the acquired organizations. Concerning the wind sector, the company entered it through the recruitment of a figure operating by another energy utility.

One of main problems for a young company which can't enjoy a strong brand power could be the danger of losing acquired human resources after acquiring and training them; this has another consequence on internal structure: a significant focus on controller's activities, performance measurement and adequate reward mechanisms.

- External structure: because of the lack of financial resources and internal know-how, Company G created a network of relationships aimed at providing necessary credit to financing R&D activities, also supported by external organizations, such as American start-ups. As a result, relationship form adopted by the company mirrors these needs: Company G is mainly active in researching Joint Venture or Corporate Venture with investment funds, which provide financing tools, and foreign research organizations, that on the other hand offer know-how and competences.

  Finally, since Company G still remain a "late follower" in comparison with the majority of the sample because of its brief history and limited financial resources, one of its sub-goals is to keep a low risk concerning new business: as a consequence, the company avoid to immobilize capital in unsure activities and thus creates external partnerships for outsourcing of construction and installation activities. At the same time, Company F for its dimension and internal activities is not able to cover the entire renewable supply chain. It outsources building and operation and maintenance activities of wind plants by operating as general contractor.

5.3.4 Industrial Groups Cluster

Both Companies B and I established a new business unit with the aim of developing renewable plants for generating electricity without modifying internal coordination mechanisms and processes, as a consequence of two firm-level common factors: **business diversification** and **market position**.

First of all, companies' history is characterized by a strong **business diversification** in many sectors. As a result, renewable business isn't considered as a strategic complimentary sector, but rather as a further technology within energy business area: "*renewables could be seen as a diversification within a diversified portfolio, i.e. a kind of "diversification of the diversification". It doesn't worth a dedicated structure with dedicated processes and figures*" (Company B). This reason has an impact also on the adopted business model: the choice of avoiding an additional diversification in ESCo activities or in unconventional value proposition, could be considered as a way to reduce a further spread of resources and efforts.

The establishment of a new business unit instead of a spin-off or an external company is also the result of companies' **market position** in energy sector: Company B is the second generation utility in Italy with a share of 19.2% of the Italian electricity production, while Company I owns about 20% of German energy generation. For this reason, the **market position** combined with firms' **history** (in terms of internal activities it covers in the traditional business) has two effects: (i) do not stimulate the companies in competing in new markets with a strategic approach since they have an interesting amount of electricity that come from traditional sources; (ii) create the phenomenon of investment cannibalization since these companies have a strong capital-intensive nature and an huge amount of capital has been invested in existing infrastructure: they are reticent to change this equilibrium and cannibalize their existing business. This is easily visible also in the coordination mechanisms and processes adopted by the companies. They have a strong integration with traditional and staff business units and the development of new projects has to be evaluated by the strategic committee composed by internal managers. Both firms approached the renewables mainly for two reasons: (i) satisfy the mandatory limits of "green energy" requested to energy utilities that overcome a quote of energy electricity production; (ii) increase the revenues by accessing to "green incentives".

Some differences exists concerning external organizations, mainly coming from some peculiarities in the **histories** of the two firms. Company B doesn't enjoy in fact an internal R&D center or unit responsible just for renewable technologies, but it is mainly dedicated on testing disruptive solutions and consequently has to rely on external partnerships (such as the one with Company D). This could be the consequence of mergers and separations occurred in Company B's last 60 years of history. In 1966, in fact, the company merged with the most important Italian chemical firm, losing its name and identity within the great holding. The resulting society invested a lot in R&D activities and resources, since they represents an important competitive advantage in chemical sector. In 1990s, the huge holding re-separated Company B from the rest of the organization, as the "spin-off responsible for energy business". When finally B re-obtained its autonomy in 2002, it completely lacked internal R&D resources, as they had always been a part of the holding structure. On the contrary, Company I had the opportunity of creating a strong internal center for basic research.

5.3.5 R&D Based Company

The peculiarities in both Company H's history and organizational approach render it incomparable with the rest of the sample and require a specific cluster.

First of all, Company H's **business portfolio** has no similarities with the rest of the cluster: the company is a leader in gas & oil sector and renewable business isn't strategic nor complementary for the group. This contextual variable has evident and implicit consequences on both the business model and the internal structure:

- Concerning the impact on the business model, and thus on the value proposition and on the revenue model, Company H is the unique organization that didn't apply a traditional value proposition, since considering its definition, the company isn't active in authorization, construction of plants and generation of energy from renewable sources. On the contrary it is really active in all Research and

Development activities, considered strategic for a future evolution of the business. A possible explanation of Company H's focus on R&D may be exactly its leadership in a different sector. According to literature, in fact, incumbents of a specific areas tend to underinvest in research because of the "unwillingness of cannibalizing" current technologies and thus current stream of rents (Chandy and Tellis, 1998; Hannan and Freeman 1977; Henderson and Clark 1990; Nelson and Winter 1982). Even if Company H can be defined an incumbent of energy sector, its presence in electricity production can be considered a diversification from the core business and thus the company doesn't really experience the fear of cannibalization, as the greatest part of rents is guaranteed by oil & gas revenues. This makes the company more engaged in the research of innovative solutions regarding renewable technologies. Furthermore, in some cases, the research is permitted by the knowledge background in fields completely different than typical renewable technologies; thus, according to literature, the **structural complexity** of the organization, i.e. the number of areas in which the company operates and the number of services performed (Damanpuor, 1996), facilitates coalitions of specialists in different business units, increases the knowledge base and cross-fertilization of ideas (Aiken and Hage 1971) and as a result pushes the company towards a business model focused on R&D activities. An example of this statement is the case of "green chemistry" research, in which the company is strongly active through a joint venture, thanks to its background in oil-chemistry.

As far as the unconventional value proposition is concerned, also in this case the contextual variable "Business Portfolio" has a strong impact. The main reasons for which Company H's unconventional business model can't be compared with the rest of the sample, can be summarized in three points: (i) the organization sells small photovoltaic plants because it is vertically integrated in cells and modules production; the integration in upstream activities is a direct consequence of the perception of the renewable technology: since the company is active in a different core business, it tries improving its image of "sustainable company" by installing photovoltaic panels on the oil and gas plants. In order to apply this strategy, the company decided to enter the business of cells and modules production and, as a consequence, started the trading of these products also outside the company's boundaries. This is a peculiarity that makes Company H's business model unique in Italian renewable business, firstly because it is rare that a company integrates in upstream component production, because of the concurrence of low cost and good quality Asiatic firms, and even if a company has the resources to integrate (Company A), it do the vertical integration with the opposite goal: it produces panels to install/sell them. (ii) The sale of photovoltaic plants still represents a less than marginal part of the entire business of the company. (iii) Since the company is a leader and ex-monopolist in another business area (gas & oil), it has a different revenue model in respect with energy utilities, as it doesn't perceive incentives and feed-in tariffs as fundamental or even important.

- Regarding the impact of the business portfolio on internal structure, the most evident consideration concerns the organizational approach. Company H decides to gather the renewable activities within a business unit, also responsible for energy generation from traditional sources. At first reading, the Company B's decision of creating a new function could seem different from what the literature suggests: large incumbents with highly structured processes have to establish spin-offs and/or new external organizations in order to separate the core competences of the firm from the know-how that is structured for treating radical innovations (Christhensen, 1993; Kolodny et al., Yu et al., 2010; Brown and Eisenhard, 1995).

  Substantially, Company H's strategy regarding renewables and their economic marginality in respect with corporate revenues make clear that the solution of creating a dedicated spin-off was the less appropriate in this specific situation. The traditional business portfolio has an impact also on human resources and on their management policy; first of all, because of the lack of competences regarding this completely new business, the company defines recruiting programs focused on selecting multi-disciplinary human resource profiles. After the external recruitment of employees, the company also created new roles, such as the Project Manager, since in an ambidextrous organization, the management of the innovative business through projects is a way to overcome the problem of resource allocation, since each project is seen as unique and requires different resources (Yu and Hang, 2010).

Secondly, the **ownership structure** of the company is quite particular, since it is still owned by Italian State for more than 30% of total share. This element together with the governance model applied, has a strong impact on internal organization. As an ex national monopolist that maintains a strong participation of the Government, the company is characterized by a very rigid structure with standardized processes, formalized coordination tools and mechanisms.

Another important contextual variable that had a fundamental impact particularly on external structure is the **history** of the company, that is in this case tightly linked with the existence of **complementary assets**. The firm history, in terms of the already established relationships with top universities, contributes in fact in defining strong and open external partnerships. It uses the "historical" universities' relationships but changes the approach by opening the partnership in order to co-develop innovation. These are characterized by a continuous process of exchanging information.

6. Discussions

6.1 Performance Measuring

The indexes used to analyze the companies' performance may be grouped on the basis of a main axis, i.e. the kind of measured performance; measured values belong, in fact, to two categories: operating indexes, which track the innovative capacity of the firms depending on installed capacity and energy generation, and economic indexes, based on economic data contained in the balance sheet, revenues, EBITDA and EBIT, at different levels, i.e. corporate, energy and renewables.

In order to catch the different perspectives concerning both instantaneous values and dynamic evolution of the indexes, the defined performance indicators are analyzed on two different temporal levels: mono-period analysis focuses on the last three years considering separately the values of each specific period, while multi-period analysis puts the emphasis on the dynamic progress of renewable performance.

The table XX supplies an overview of the indexes developed starting from the gathered data, to measure the companies' performances.

		Time horizon for the analysis	
		Mono-period	*Multi-period*
Measured Performance	*Economic index*	• EBIT from Renewables/ Energy EBIT • EBIT from Renewables/Total EBIT	• % increase of revenues from renewables
	Operating index	• Energy Generation Renewable/Total Energy Generation	• % increase of renewable installed capacity

Table 6.1 - Picture of used performance indicators

The performance analysis is based on the comparison of the four groups of indexes on two different levels, with two different degrees of coarseness: (i) the comparison among clusters and (ii) the comparison among companies, also within the same cluster.

In fact, the clustering is the result of the previous analysis based on common points regarding business model, organizational structures (internal and external), and contextual variables. Anyway, since each company has specific characteristics depending on its history, external factors and discretion of each strategic and organizational decision, the resulting clusters are not completely homogeneous. Consequently, the analysis among clusters allows the impact of the common points on the different performances to be understood, but it needs to be completed through a more detailed analysis among single companies, so that the effects of each particularity may also be studied.

Finally, since the comparison is made among clusters and companies with different starting conditions, size, possibilities, etc. all chosen indicators are relative indexes, expressing the renewable performance in terms of percentage values compared with the performances of the whole company or of the entire energy unit.

6.1.1 Multi-period operating indexes

This analysis investigates the percentage increase of renewable installed capacity is considered to be a performance indicator, focusing on the time necessary to develop a new plant from one year to the following.

	A	B	C	D	E	F	G	H	I	J
Δ Renewable Installed Capacity	27,39%	13,97%	83,67%	17,47%	16,18%	68,77%	-34,78%	n.a.	0,00%	37,09%

Table 6.2 - Percentage increase in renewable installed capacity from 2010 to 2011

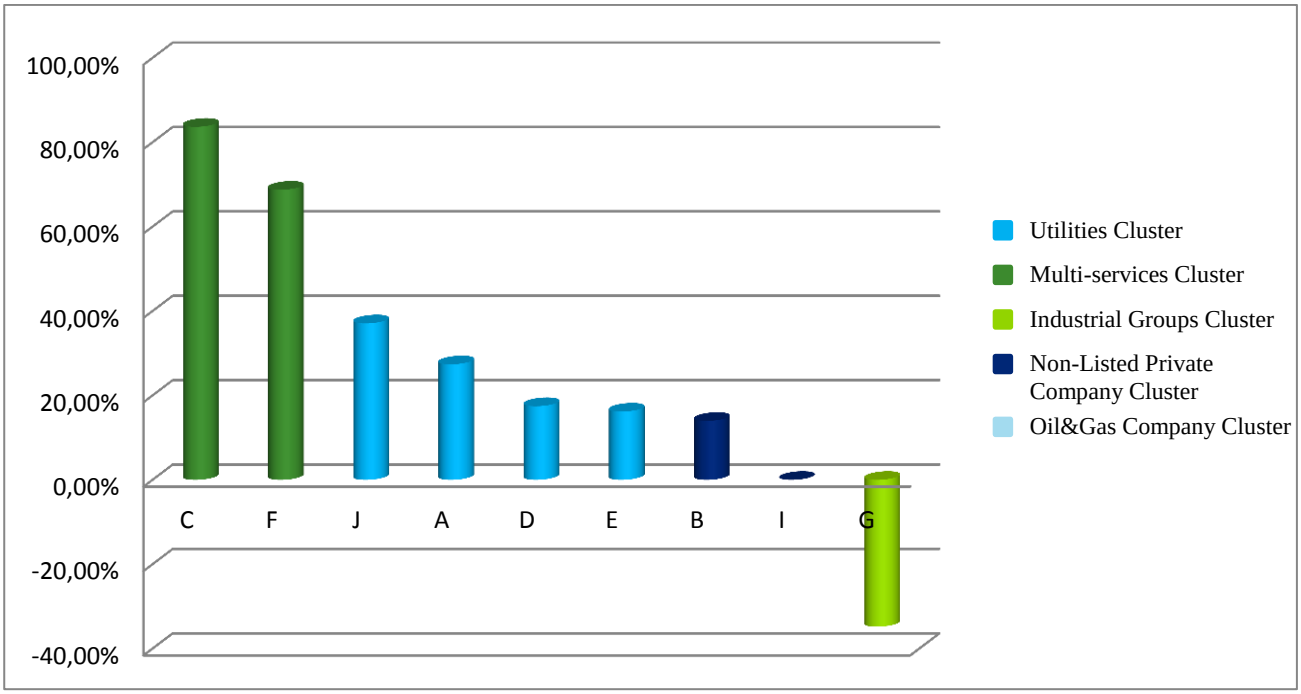

Figure 6.1 - Percentage increase in renewable installed capacity from 2010 to 2011

The clusters show quite homogeneous results concerning multi-period operating performances and it is possible to isolate the results of each of them. The multiservice cluster outperforms if compared with all other clusters. The second cluster's good multi-period operating performance partially confutes scholars' hypothesis concerning internal structure: innovation literature suggests in fact that innovations are better achieved in small and separated units (Lejarraga and Martinez-Ros 2008; Lee and Chen 2009), with an adequate degree of autonomy (Miller, 1990; Burgelmann, 1994; Hill and Rothaermel, 2003), better if creating a completely separate organization from existing ones, i.e. a spin-offs or subsidiaries (Christensen,

2002; Rice, Leifer, and Colarelli O'Connor, 2002; McDermott and Colarelli O'Connor, 2002). The multiservice cluster is, in fact, composed of companies which don't apply (Company C) or partially apply (Company F) a spin-off approach, but anyway have high performance.

Besides literature contributions, the multiservice cluster's results might be empirically explained and the causes could be researched in both contextual and organizational factors. First of all, the marginal increment of installed capacity depends on the age of the renewable unit within the company and thus on the span of its time of activity in this area. Companies C and F entered the renewable energy market respectively in 2002 and 2008, and thus far more recently than all other clusters (except for Company G). As a result, the marginal increase per year in installed capacity is largely positive as the firms introduced the business less than a decade ago.

Secondly, the renewable organizations have just been created and are still small, flat and flexible: this reduces for instance non-value added activities for internal communication, human resources coordination, etc.

Finally, the chosen index puts the emphasis on development time; the approaches adopted by the multi-utilities, even if different, aim in many cases to improve precisely this dimension, by reducing the time necessary for long upstream activities, particularly external authorization; in particular, the business model adopted by Company C results in even more effectiveness, than the one adopted by Company F: its better performance could be due to the choice of acquiring already authorized projects, rather than exploiting good relationships with local institutions, as Company F does.

The multiservice cluster is followed by the first cluster, which records high multi-period operating performance. The reasons for the good results may be ascribed to two categories: contextual firm-level factors and organizational strategy; firstly, the cluster is strongly diversified along three main axes: country, technology and value proposition diversification. Geographical and technological diversification allow the four companies to have more possibilities of increasing installed capacity, each time exploiting the better opportunity. On the contrary, value proposition diversification partially diverts companies' efforts from operating performance, since the sale of small-scale plants doesn't affect installed capacity and energy generation. As far as contextual elements go, the first cluster gathers ex-monopolists, with important brands, images, longer histories, and significant financial resources; this directly affects firms' performance, but also the adopted model: a shared approach within the cluster is the predominance of "buy" over "make", through the acquisition of already realized plants, small firms, authorizations, etc. which clearly positively affects multi-period performance.

The fourth cluster records medium multi-period operating performance; this could be considered a consequence of organizational inertia, due to the structure adopted to manage renewable, or even a strategic choice: in Companies B and I's empirical case, scholars' considerations are fully confirmed, since renewable business newness and risks bring the top and middle management to define cautionary and limited targets for renewable capacity growth. As a result, negative multi-period operating values are fully on the line to these limited and underestimated targets.

The last cluster consists of Company G, the only firm which reports a decrease in installed capacity. Such performance is due to a large application of an unconventional business model: *"the disposal of photovoltaic and wind plants instantaneously reduces the company's installed capacity"*; an explication for this model may be identified analyzing Company G's contextual factors: *"we are a non-listed firm and a way to increase equity in the short-term is plant disposal, even if it causes negative multi-period operating performance"*.

6.1.2 Mono-period operating indexes

This analysis investigates the ratio between energy generation from renewables and total energy generation on mono-period base (year 2011), as it represents a proxy of the company's effort put into the new business compared with the one in traditional business.

	A	B	C	D	E	F	G	H	I	J
Energy generation renewables/ Total energy generation	13,81%	2,69%	1,45%	1,50%	4,78%	0,71%	3,25%	0,0031%	5,88%	2,92%

Table 6.3 - Ratio between energy generation from renewables and total energy generation in 2011

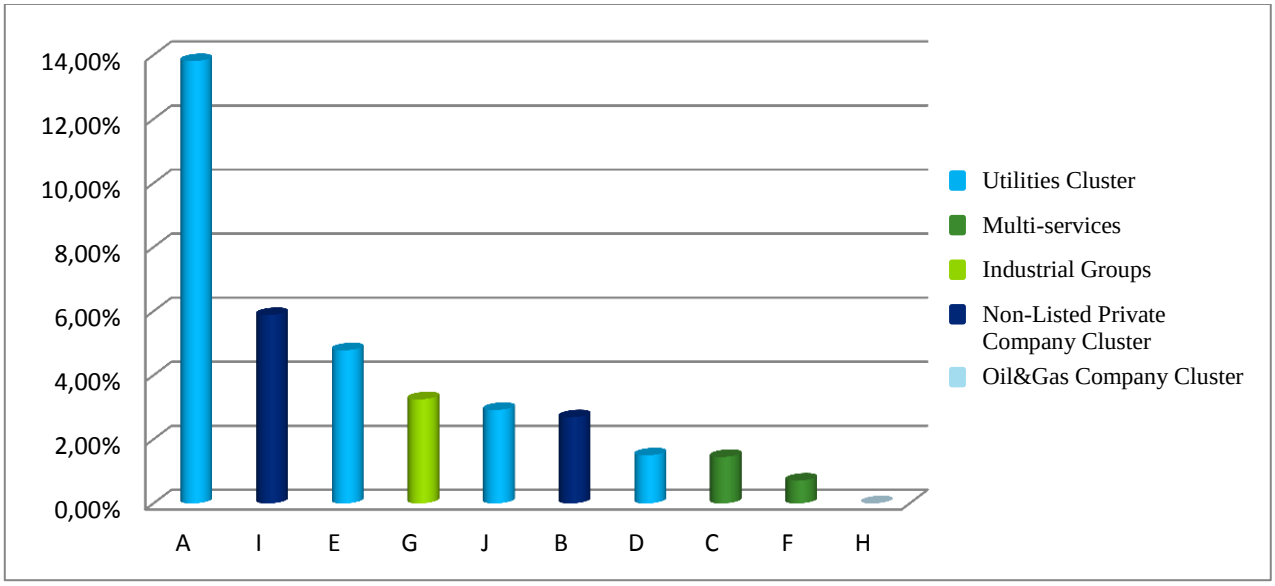

Figure 6.2- Ratio between energy generation from renewables and total energy generation in 2011

The first consideration regarding mono-period operating performance comparison is the partial upheaval of the results presented above. The multiservice cluster's performance, in fact, is far below the average value, even if its speediness in developing new projects is higher. Furthermore, by observing the data, this second analysis highlights the non-homogeneity within each cluster and thus puts the emphasis on the necessity of a company-level examination which could consider each firms' peculiarities and their effects on performance.

The highest performances are registered by some companies belonging to the Utilities Cluster, i.e. Company A and Company E, even if with significant differences between them (Company A more than doubles Company E's results). The differences within this first cluster may be caused by both contextual variables and structural approaches. Regarding the contingent factors, in fact, Company A is less differentiated, in particular in traditional business, in comparison with French and German utilities, due to geographical and normative peculiarities. In fact, regarding traditional technologies, the last referendum about nuclear energy generation eliminates from Company A's energy portfolio the possibility of developing this electricity source; in particular, Company D has a generated capacity coming from nuclear technology of about 79% in 2011, 75% in 2010 and 72% in 2009: this increases the denominator of used index, causing a worse performance in general.

The second best performance is recorded by Company G, whose creation is more recent than the rest of the sample and thus has a lower rooting in traditional energy generation and a stronger commitment in renewable business. Company G is then followed by the fourth cluster and finally by the multiservice cluster, at a first glance confirming the considerations expressed by the literature regarding internal structure. Nonetheless, the fourth cluster's better performances are partially "deceptive": in order to obtain cash for financing internal projects, both companies periodically dispose of a share of owned plants; as the business model adopted by the firms doesn't consider the sale of renewable plants, in order to obtain the required equity the unique solution is the disposal of traditional installation, i.e. thermoelectric and hydroelectric: as a result, the ratio between renewable installed capacity and total installed capacity increases, even if this is just an apparent improvement. However, both the second and fourth clusters suffer resource allocation problems, due to their organizational approach: the four companies don't create external subsidiaries, but keep renewable activities within mainstream structure for cost, image or strategic reasons, with evident negative impacts on performance.

Finally Company H records the worst performance, because of both its business portfolio which is clearly focused on oil and gas and because of the strategy adopted by the firm of concentrating almost only on R&D activities.

6.1.3 Multi-period economic indexes

Also in this case, the chosen indicators are largely influenced by the speediness in obtaining revenues from the new business, which is a significant but partial component of renewable performance. The index is calculated as the percentage increase of EBITDA from renewable business from one year to the following.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Δ Renewable EBITDA	20,56%	2,65%	86,14%	25,20%	21,68%	11,65%	65,93%	n.a.	0%	60,19%

Table 6.4 - Percentage increase in renewable EBITDA from 2010 to 2011

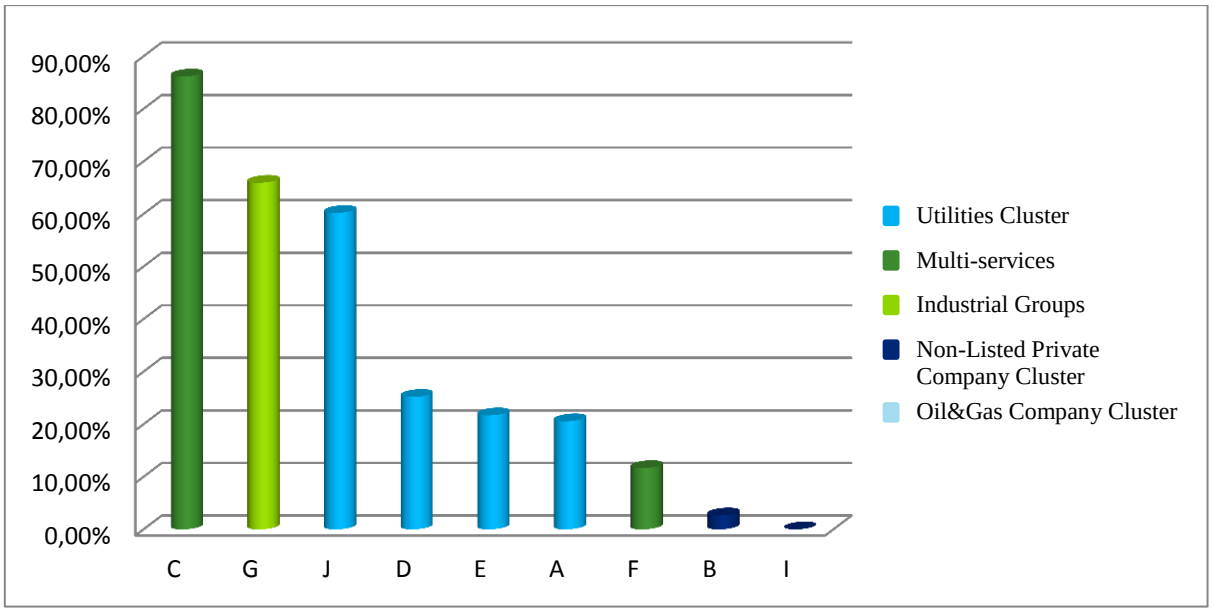

Figure 6.3 - Percentage increase in renewable EBITDA from 2010 to 2011

This analysis allows a cluster-level examination, as each group records general homogeneous performance, except for the multiservice one.

Company C is in fact the most effective and efficient firm concerning this analysis, unlike Company F, whose performance is far below the average value. The reasons for this non homogeneity is in part explained by different value propositions. Both firms partially lack internal competences for managing renewable plants. Unlike Company C, F is not used to sell industrial-scale plants due to image and strategic reasons. As a consequence, the marginality coming from Company F's internal management is far below the rest of the sample, while Company C makes up for this economic disadvantage by selling a percentage of its renewable parks.

Company C is followed by Company G, whose economic performance is generally very high: these results could be the other side of the coin of renewable plant disposal, at least in a short time; furthermore, the company can shift from one value proposition to another depending on market dynamics, thanks to (i) its recent and thus small and flexible structure, (ii) resource sharing between unconventional and traditional value proposition (small-scale photovoltaic plants are managed within the solar spin-off also responsible for the traditional business model), which allows a rapid interchange in case of changed context (e.g. solar incentive reduction in 2010), (iii) the lightness of the managed value chain: leaving in outsourcing a great part of downstream activities (O&M, installation), it can avoid capital immobilization in resources (HR, sites, competences, etc.) and fixed costs, easing a rapid value proposition change. In some sense, Company G adopts an approach which seems targeting to increase short-term performance: *"we have a strong strategy in renewables, focused only on few sources; we have a short history in energy business compared to our main competitors and thus we are trying to lay the foundations for a future leadership"* (Company G).

Company G is then followed by utility cluster. The cluster's "medium" performance may be partially due to the penchant of the whole category for "buy" instead of "make", as already highlighted above; if, in fact, this

strategy increases multi-period operating performance, the other side of the coin is a general worsening of economic results. At a first glance, Company J and D's approach, mainly based on M&A of small existing firms, seems to lead to better performance; anyway, the adopted index, based on EBITDA, can just point out the effects on operating costs, but it isn't able to consider also contingent acquisition expenses: this could be one explanation for J and D's highest performance. In particular, in order to compensate this lack of information, a further analysis, based on the comparison of EBIT data within the first cluster may be done. The choice of EBIT answers in this case to the necessity of synthesis: this economic item includes in fact both revenues and expenses components and also considers the costs of assets management, as they could depend in particular on the application of specific approaches, i.e. M&A. As represented by the graphic below, this further analysis confirms D and J's worse results, due to contingent costs caused by the merging and acquisition of existing organizations.

	A	**D**	**E**	**J**
Δ Renewable EBIT	14,99%	-66,50%	22,92%	-3,30%

Table 6.5 - Percentage increase/decrease in renewable EBIT from 2010 to 2011 for Utility Cluster

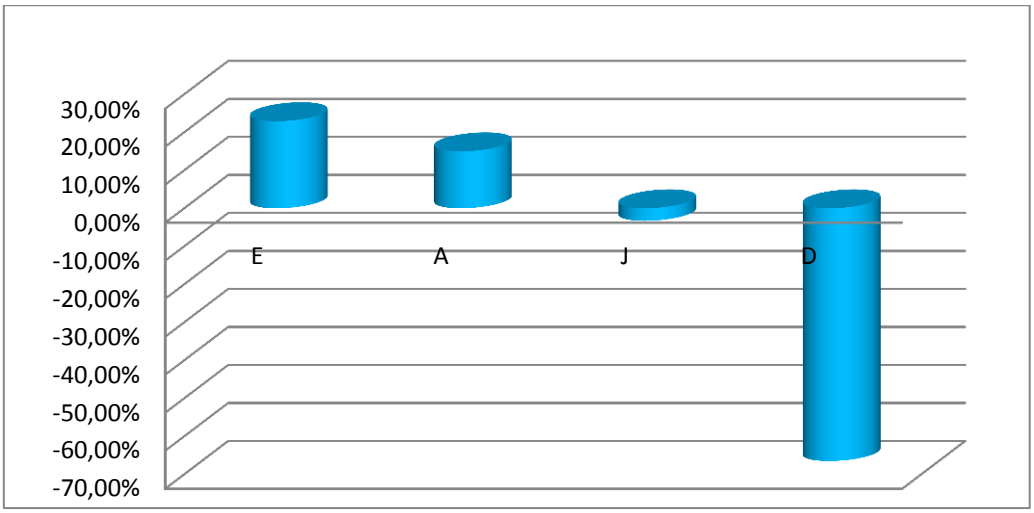

Figure 6.4 - Percentage increase/decrease in renewable EBIT from 2010 to 2011 for Utility Cluster

Finally, Company A's worst result in EBITDA analysis may be the consequence of strategic and organizational factors: (i) as regards the business model, vertical integration causes capital immobilization in an economically disadvantageous business area and doesn't allow the exploitation of market dynamics concerning procurement costs; (ii) concerning organizational structure, being a separate, listed spin-off entails many differential costs in comparison with the rest of the cluster (administration, control, legal expenses, etc.).

The fourth cluster reports the worst EBITDA percentage increase; *"this is mainly an effect of reduced revenues, rather than increased costs"*: this result mirrors exactly the consideration already expressed above concerning underestimated renewables targets, because of the lack of top management commitment.

6.1.4 Mono-period economic indexes

For this analysis two indicators have been used:

1. the ratio between EBITDA from renewables and EBITDA from energy generation business,
2. the ratio between EBITDA from renewables and total corporate EBITDA,

as both may represent a proxy of economic results of the renewable area in comparison with the traditional one.

	A	B	C	D	E	F	G	H	I	J
EBITDA renewables/ EBITDA energy	72,55%	12,18%	13,55%	10,31%	15,39%	2,55%	40,40%	0,14%	7,53%	13,38%
EBITDA renewables/ total EBITDA	8,93%	6,99%	4,71%	3,78%	5,92%	0,23%	33,28%	0,0015%	6,80%	3,14%

Table 6.6 - Ratio between EBITDA from renewables and EBITDA from total energy generation (and corporate EBITDA) in 2011

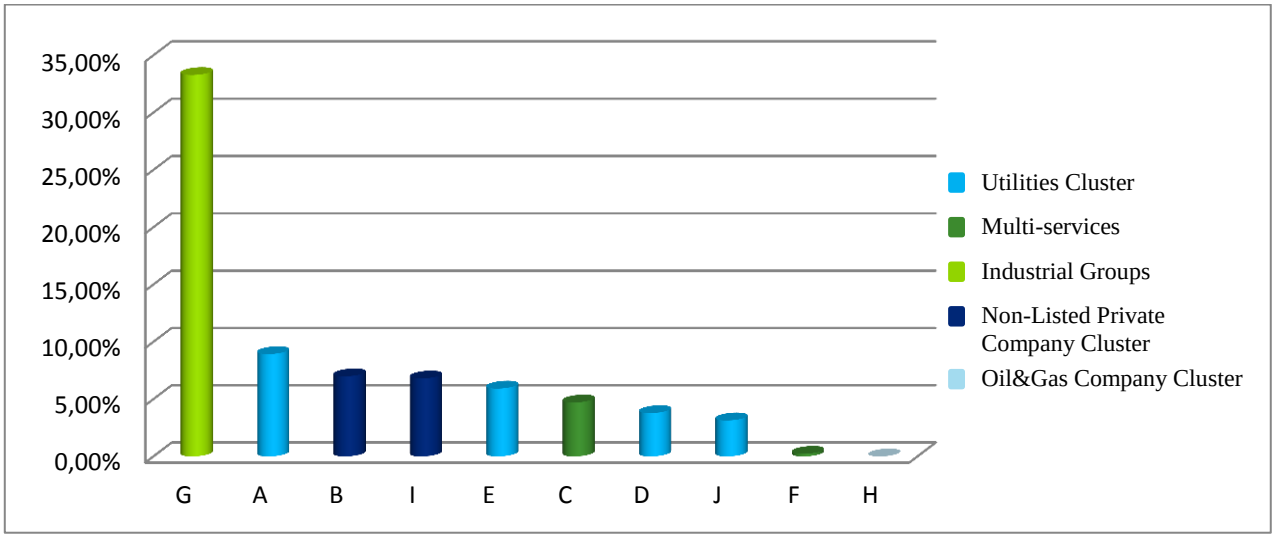

Figure 6.5 - Ratio between EBITDA from renewables and corporate EBITDA in 2011

In this case a double level analysis is required as the clusters are not completely internally homogeneous.

In mono-period economic analysis, the best performance is recorded by Company G, whose rooting in traditional energy generation is far lower than the rest of the sample and has a stronger commitment in renewable business. Furthermore, because of firm-level contextual elements (reduced equity and lack of financial resources), G adopts an organizational approach which aims at reducing short-term costs, operating lever and thus risk, by (i) avoiding acquisition of authorized or developed projects, (ii) leaving in outsourcing downstream activities, (iii) diversifying the value proposition, but keeping the activities within a shared structure, (iv) delocalizing a part of the business in emerging countries where operating expenses are

generally lower. Furthermore, its youngness renders the structure more flat and lean, so that it doesn't suffer from organizational inertia effects (e.g. resources under-allocation in renewable business).

As far as the first cluster is concerned, Company A's better performances are due to the contextual elements already explained above: Company A is less differentiated in traditional business, in comparison with French and German utilities, due to some geographical and normative peculiarities and thus reports higher relative results. In addition to this consideration and regarding the impact of operating costs, Company D shows the lowest performance because of the strong impact of some administration costs, due to the choice of decentralizing almost all activities in local autonomous subsidiaries and of creating different spin-offs for each kind of value proposition.

Industrial Group cluster reports medium performance. The utilities' organizational approach allows in fact a large exploitation of synergies between traditional and renewable activities, in particular in engineering and project development; for instance, Company B boasts a ratio between EBITDA and revenues in the renewable business area higher than the rest of the sample: its average over the three years is about 70%, while even the first cluster shows a ratio between 55 and 65%. The resulting costs are thus partially shared with the existing organization, allowing the cluster to have higher relative EBIT in comparison with the majority of the sample. In this case, the reasons for a medium performance are thus due to limited revenues, caused by the lack of commitment in renewable business which confirms scholars' contributions about organizational inertia (Burgelmann, 1994; Miller, 1990; Hill and Rothaermel, 2003; Christensen, 2002; Rice, Leifer, and Colarelli O'Connor, 2002; McDermott and Colarelli O'Connor, 2002).

Finally, the multiservice cluster gathers conflicting performances: Company F's worse results are mainly generated by the diversification in small plants of the unconventional business model, which causes economic disadvantages justified by image goals; furthermore, it doesn't dispose of industrial-scale plants (except for biomass), unlike Company C. In conclusion, external organization also has an impact on F's economic performance: the company applies a kind of outside-in open innovation approach, but without implementing the necessary internal change for managing incoming knowledge; as a result, instead of reducing risk and increasing revenues (Lichtenthaler, 2010; Inauen, 2011; Von Hippel, 2007, 2009), the partial application of this model generates negative economic consequences.

6.1.5 In Synthesis

Table 6.7 summarizes the results presented above, divided by cluster and company; performances have been gathered in five comparative and qualitative groups, labeled as "very high", "high", "medium", "low" and "very low", based on their relative position within a hypothetical ranking, and not on the basis of their absolute value.

Cluster	Company	Operating performance		Economic performance	
		Multi-period	***Mono-period***	***Multi-period***	***Mono-period***
Cluster 1	A	High	Very High	Medium	Very High
	D	High	Low	Medium	Medium/Low
	E	High	High	Medium	High/Medium
	J	High	Medium	High	High/Medium
Cluster 2	C	Very high	Low	Very High	Medium
	F	Very high	Low	Low	Low
Cluster 3	G	Low	Medium	High	Very High
Cluster 4	B	Medium	Medium	Low	Medium
	I	Medium	Medium	Low	Medium
Cluster 5	H	Very Low	Very Low	Very Low	Very Low

Table 6.7 - Synthetic picture of operating and economic performances divided by cluster and company

6.2 Performance Tree

Each cluster's and company's performance could be analyzed in depth through the Analytic Hierarchical Process (AHP)[8] method. This study doesn't aim to identify the most suitable strategic and organizational approach to manage renewables, but rather to analyze the effects of each model on goals and sub-goals; for this reasons the first step of AHP model help us to build a hierarchical tree. In particular, the final goal is represented by long-term economic performances, i.e. both mono-period and multi-period economic indexes, which could be divided in intermediate sub-goals: costs reduction, revenues increase, risk management and operating performance improvement; these intermediate objectives, are in turn split in further sub-sub-goals, thus building a hierarchical tree (See Figure 6.6).

In the next section each cluster and each company, if it presents firm-level peculiarities, will be analyzed, in order to identify the effects of the strategic and organizational approaches on the different leaves of the goal-tree, and consequently their impact on the defined performance, i.e. economic and operating performance.

[8] The AHP is a multi-criteria decisional method, developed by T.L. Saaty at the end of the '70s. This model approaches decisional process with three steps:

1. Hierarchical breaking down of the final aim: the end goal is considered the root of a tree and is decomposed through a top-down method in sub-goals each of which can be analyzed independently, and in turn split in other sub-sub-goals, and so forth, finally arriving to alternatives for the initial problem;
2. Judgment of alternatives through the couple comparison;
3. Hierarchical recomposition (bottom-up) and synthesis of the evaluation.

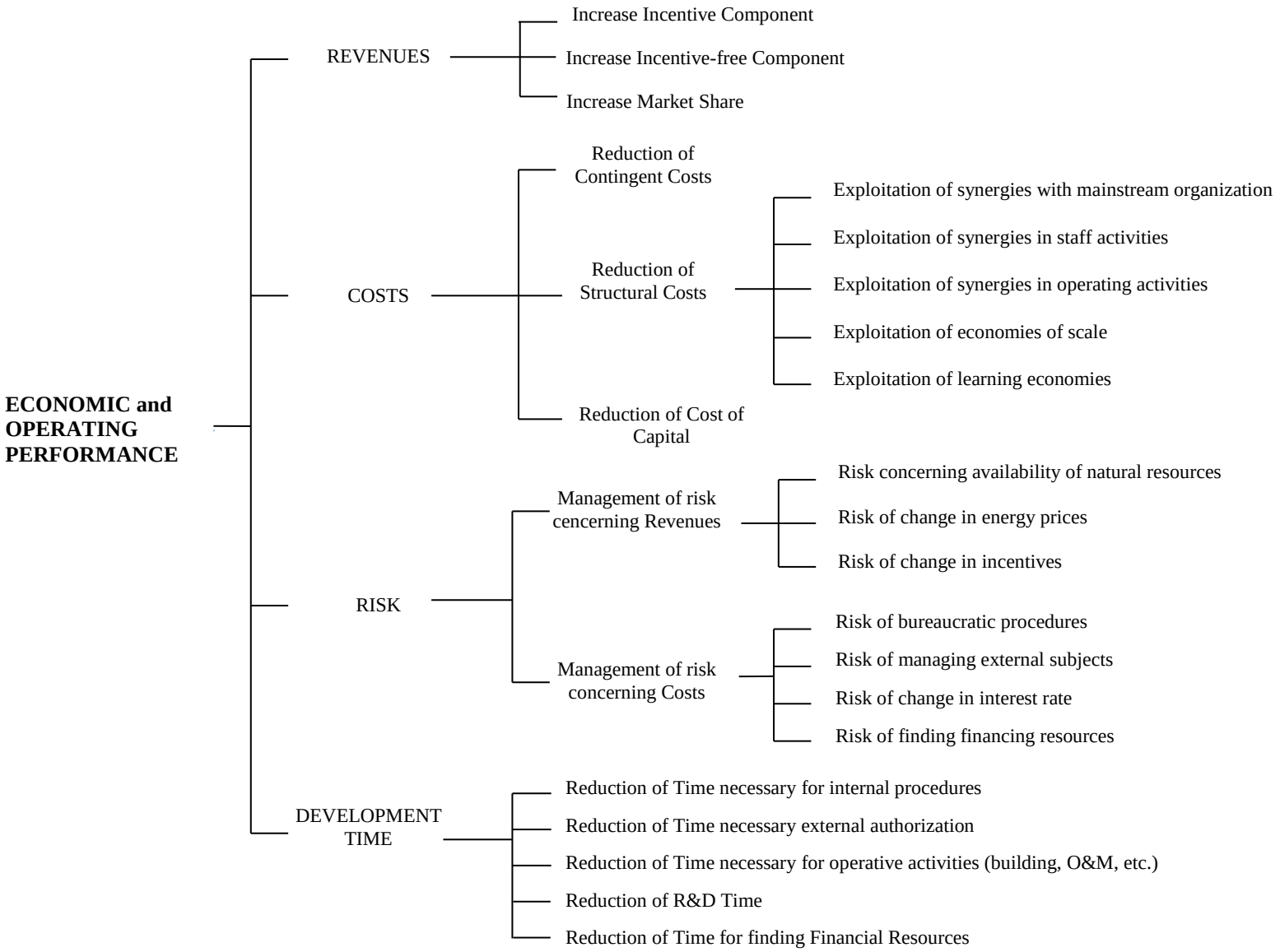

Figure 6.6 - Hierarchical goal-tree used as basis for Performance Analysis

6.3 Utilities Cluster

6.3.1 Business Model

Concerning the business model, the common points of this cluster may be summarized in two elements, whose impacts on the sub-goals are examined in the following analysis:

1. the diversification of the business, along three axes: (i) geographical diversification, (ii) technological diversification and (iii) diversification of the value proposition.
2. the adoption of a "buy-strategy" instead of the internal management of the entire value chain, even if with different degrees of application: Company A prefers non-greenfield projects, Company E acquires already developed projects and finally companies E and J apply a M&A strategy with small and medium firms.

Costs Reduction

1. Diversification strategy

The **multi-country diversification** allows to exploit synergies, economies of scale and learning economies existing within the same technological business area; this depends on the degree of centralization adopted by the company. Some activities of the same value chain are in fact more repetitive than others and thus a centralized management may be suggested; in other cases, a greater attention to site or country-specific aspects should be given and thus the decentralization is more effective.

All companies within the cluster centralize engineering, construction and management activities in renewable spin-offs or subsidiaries. This entails to evident economies of scale and learning economies, in the execution of all project management procedures: *"We can extract value from the building stage, since our competitive advantage is in managing great volumes: we have an higher marginality in this phase in comparison with smaller competitors; that's why the company has never acquired already realized plants.[…]the same happens for internal assets management: our IRR is about 15% for solar parks, while external investors usually extract no more than 10%" (Company E)*, and *"the experience developed within the group, guarantees an high efficiency" (Company D)*. Some differences exist as regards the centralization of upstream activities, i.e. opportunity scouting and project development; nonetheless, these stages are much more effective-oriented than efficiency-oriented, due to (i) the continuously changing characteristics of external context, (ii) the peculiarities of each specific project, (iii) the importance of country-specific elements in upstream stages don't allow the exploitation of economies of scale and learning effects.

Table 6.8 summarizes the different models adopted by the companies, in term of centralization or delocalization of single stages of the value chain, and their impacts on the cost structure:

	Characteristic	Centralization	Decentralization
a) **Opportunity scouting**	• Country-specific and site-specific	- Opportunity cost: possible loose of opportunities because of the lack of a precise quadro of each country. Company: A	+ Exploitation of the opportunity that guarantees the lowest costs in each country/region. Companies: D,E, J
b) **Project Selection**	• Repetitive • Based on the calculation of standardized indexes (IRR, WACC, etc.)	+ Exploitation of synergies of scale and apprendimento, due to the standardization of activities. Companies: A, E	- Multiplication of resources. Company: D, J
c) **Development**	• c.1) Country-specific for the normative and the interface with local institutions	- Lack of consolidated relationship with local institutions and thus of potere contrattuale; - Longer procedures for obtaining information from the PA. Company: A	Companies: D,E, J
	• c.2) Repetitive for the execution of some specialized studies regarding the productivity of the plant through sophisticated models	+ Exploitation of economies of scale regarding the application of technological models and skilled resources; gathering of experience regarding different situations and input data and consequent improvement of the model. Companies: A, D	- Multiplication of skilled resources and experts that uses sophisticated models. Company: E, J
d) **Engineering**	• Repetitive	+ Economies of scale regarding projects of the same technology; + Creation of expertize; + Lack of consulting costs: + Non-duplication of skilled resources; Companies: A, D, E, J	
e) **Construction**	• Repetitive		
f) **Assets Management**	• Repetitive		
g) **Operation & Maintenance**	• Site-specific for the necessity of being present at the plant		Companies: A, D, E, J

Table 6.8 - Centralization/delocalization strategies of Utilities Cluster divided by the different phases of renewable Value Chain

Weighting both positive and negative effects of geographical diversification on costs, it is possible to define the following qualitative rank, which partially reflects quantitative multi-period economic performances:

	Positive effects		**Negative effects**	
	Exploitation of economies	*Exploitation of advantageous opportunities*	*Multiplication of Resources*	*Loss of Effectiveness*
E	Process b)	Process a)	Process c.2)	
A	Process b)			Process a) Process c.1)
D		Process a)	Process b)	
J		Process a)	Process c.2) Process b)	

Table 6.9 - Positive and negative economic impacts resulting from centralization/delocalization strategies of Utilities Cluster

Geographical diversification has another important economic effect, depending on the countries where each company decides to delocalize its activities. In particular, the geographical areas where the utilities of the sample operates, could be grouped on the basis of country maturity in renewable business in three groups: (i) developed renewable countries, (ii) developing renewable countries and (iii) emerging countries. The unique large utility which delocalizes solar, wind and geothermal businesses in last two kinds of nations is Company A: the firm has invested large amounts in South America (Brazil, Chile and Mexico), Africa and East Europe Countries, i.e. nations "at their beginning and with enormous growth potentialities, where photovoltaic is going to develop in next two or three years". For what concerns short-term horizon, this strategic choice has positive impacts on operating costs, particularly for country-specific expenses, i.e. HR expenses, contracts, legal costs, taxes, etc. but contemporaneously, also incentive and feed-in tariffs are actually lower than developed countries. Nonetheless, it is clear that such strategy aims at increasing long-term performance, which are not fully caught by this analysis.

On the contrary, the second kind of diversification, i.e. **technological diversification**, doesn't permit any synergy due to the operative differences reported by the companies, except for all staff activities. *"Regarding the renewable value chain, the company can exploit synergies till the external authorization: we have the same interface with PA for all sources; for what concerns the project development, the construction and O&M too many technical differences exist to unify procedures and human resources; furthermore we still enjoy a great scale for each technology, and an eventual unified management could bring to an excessive*

dimension and thus to diseconomies, i.e. inefficiencies." (Company E). Furthermore, in some cases, technological diversification rather generates higher costs, as it is motivated by strategic drivers, rather than economic reasons. An example could be the diversification in offshore wind technology, which entails higher costs in comparison with other technologies to Companies D and E, because of many reasons: (i) each project has its own development different from all others, due to geographical and structural factors (i.e. distance from the shore, type of the ground, etc.); (ii) the newness of the technology; (iii) higher costs caused by longer time and more difficult logistic procedures (i.e. transportation, pre-assembly, installation in water). As a result, Companies D and E's diversification in offshore wind could be another cause of economic inhomogeneity within First cluster; in particular the newness of the technology could explain Company A's best performance, at least in short time: because of the project lengthiness the two companies have experienced cash outflows, but still low revenues.

The same can be stated for the **value proposition diversification**, particularly because of the internal organization, analyzed in the following section. Nonetheless, the application of the unconventional value proposition has an important positive effects on the degree of capital costs: the disposal of realized plants allows the companies to frequently have cash for new investments. Company E applies the non-traditional business model more often than other competitors and it is indeed a full equity society.

6.3.2 Buy Strategy

As far as the "Buy strategy" is concerned, it usually have a strong impact on costs as this solution promotes the development time rather than costs rationalization in the trade-off between efficiency and effectiveness. Nonetheless, the effect on expenses may be contingent or structural and may affect more or less cost items, depending on the extent of the value chain stage bought externally:

1. **Co-development** with local developers, who already own authorized opportunities: this approach entails both contingent and structural costs; the contingent expenses are constituted by the costs of accessing a specific opportunity owned by the developer; anyway, this cost is much lower than the amount necessary for acquiring an authorization on the market, mainly for two reasons: (i) the authorization could be responsibility of the sole energy utility, depending on its time and financial availability, or at least co-developed, but not completely left in outsourcing; (ii) on the spot market the prices for external authorization suffer from a speculation, diffused in last years (especially in Italy) because of the *"run for the piece of paper"* (Company A).

   While the structural costs are caused by the necessity of coordinating the network of local developers, in order to scout every time the best opportunities; with these external subjects the companies create strong partnerships with a frequent communication to be quickly informed when a new chance arises. *"Company A has a widespread network that guarantees an important inflow of projects, in order to maintain a critical mass of projects "ready for the construction"; the management of this network requires a dedicated structure within the business development function of the spin-off."*

2. **Acquisition of externally authorized projects**: the second approach entails just contingent expenses, as it is represented by the simple "buy-strategy" on the spot market; anyway, even if no structural costs are caused by this model, it brings about high outbound cash flows, because of the speculative dynamic explained above.
3. **Acquisition of already built plants**: it causes the same consequences as the second approach, mainly represented by contingent costs; clearly, the expenses for the acquisition of a built plants comprises the costs for all upstream activities, i.e. opportunity scouting, authorization, project development and construction.
4. **M&A** of companies that already own operating renewable plants: this is finally the most expensive solution in term of both contingent and structural costs; regarding contingent costs, they are clearly due to the costs of acquisition: *"if the company has at its disposals great financial resources, this approach guarantees the most rapid development"* (Company D). Furthermore, also the merge of the new reality within mainstream organization is important to exploit the potentialities offered by the acquired business: *"Concerning integration problems, it is necessary to progressively merge the two entities; at the beginning the original structure of the new organization is maintained and just few top managers are inserted in it."* (Company D). As a result, all costs concerning staff activities are duplicated, at least at the beginning of the M&A process, and constitutes (i) diseconomies, as for these activities possible synergies may be exploited, (ii) useless costs, since these figures are duplicated in both organizations. Companies D and J's approach RISPECCHIA in this case, both multi and mono-period economic performance.

		Contingent Costs	**Structural Costs**
Co-development	A, E	Low: acquisition of opportunities and co-development	Medium: coordination of external network
Acquisition of authorizations	E	Medium	-
Acquisition of plants	A	Medium/High	-
M&A	J, D	High	High

Total Costs

Table 6.10 – Impact on Contingent and Structural Costs of the four models adopted by Utility Cluster

Operative Performance and Development Time

On the other hand, the second side of the coin concerning "buy strategy" is clearly process effectiveness and thus the new project development time. Starting from the first and arriving to the fourth approach, the time required to improve operative performances reduces instantaneously; in particular, the time saved through

the application of each approach is quantified by means of empirical analysis. i.e. companies' quotations and summarized in Table 6.11:

		Quotation	Saved time
Opportunity Scouting	A, E	*"The opportunity scouting and the screening of all possibilities usually require just one or two months. […] The more the people responsible for the area know local subjects, geography and other characteristics, the more the lasting approach to some weeks."* (Company E)	From 3 weeks to 2 months
External Authorization	E	*"In Italy, the most onerous process, in term of time lengthiness, is chiefly the external authorization, that could even last some years: Company D owns some projects which have been blocked in this phase for 7/8 years, because of both internal and external factors."* (Company D)	From 2 to 5 years, depending on country and technology
Plants Construction and Connection to the grid	A	*"After obtaining the external authorization, projects rarely last more than one year, as technical procedures are usually managed without other hitches."* (Company D)	About 1 year

Table 6.11 – Companies' quotation about time saving concerning the application of each model in Italy, for large photovoltaic plants (5MW) and onshore wind plants (20MW)

Companies D and J's penchant for M&A approach may be a cause for their higher multi-period operating performance, in comparison with Company E.

The technological and country diversification generally allows the companies to have better operating performances. The possibility of being operative in more countries gives the companies of the cluster the chance of accessing different technologies, which require particular geographical conditions: onshore wind parks require, for instance, wide lands, a solid ground, a wind potential for 2000 full load hours, while offshore wind plants could be built just in marine areas (especially in North Sea and Atlantic), at a specific distance from the shore with a wind potential for 4000 full load hours, with a particular soil condition (sand, clay or rock). As a result, the technological diversification partially depends on the country diversification, i.e. from the nation where the company decides to replicates its business model. Companies D and E delocalization respectively in Denmark, UK, German and in others countries of north EU gave them the access to both onshore and particularly offshore technologies. The effect on the operating performances are given by some contextual elements concerning particularly offshore wind technology. It is, in fact, a relatively new technology, and it is thus characterized by companies' great enthusiasm and commitment; as it occupies marine areas, it has two important advantages in comparison to the rest of renewables that foster and accelerate its development: on one hand it still have an high availability of appropriate sites in comparison with photovoltaic, wind and biomass; on the other hand its installation doesn't compete with

other renewable sources, as it may happens between photovoltaic and wind when a wide land is available. Furthermore, it can guarantee an higher installed capacity per farm, i.e. from 50 to 1000 MW. For these reasons this technology enjoys a rapid development: in the last two years its total installed capacity duplicated. As a result, just those companies that delocalize in particular in UK, Germany, France, Netherlands and Denmark can exploit this rapid development concerning this new technology. Consequently, the diversification in more countries open some possibilities regarding specific technologies that in Italy, due to the lack of wide free lands or sites, can't be exploited; in this way the companies have more opportunities to develop contemporaneously different plants and thus to increase their operating performances.

Anyway, another consideration should be done, regarding particularly offshore wind; since it still remains an immature technology, it requires greater logistic times in comparison with photovoltaic, wind and biomass whose construction stage lasts no more than a few months. Offshore wind requires a complex project management that includes many different aspects: in addition to the technical planning, much more difficult and longer than normal wind, also the receiving of construction material, the environmental impact, the securing of grid connection, the pre-assembly of some components, etc. need to be planned. *"The realization time of an offshore wind park, from the first idea to the start of the project, might require up to 8-10 years of continuous work and requires a complex project management" (Company E)*: it means that the development of offshore wind farms needs about 4-5 years more than other sources. As a result, the increase in installed capacity and generation enjoyed by Companies D and E in last three years, depends on a business model decided a decade ago.

In conclusion, the country diversification allows the companies to have more available geographical areas for photovoltaic and wind farms, and contemporaneously gives them the possibility of accessing different and in some cases radical new technologies (offshore wind), which don't compete with photovoltaic and onshore wind for the same resources (e.g. wide free lands); this brings to positive impacts on operating performance, also because the commitment and enthusiasm in this new technology is high and even if technological immaturity entails longer development time.

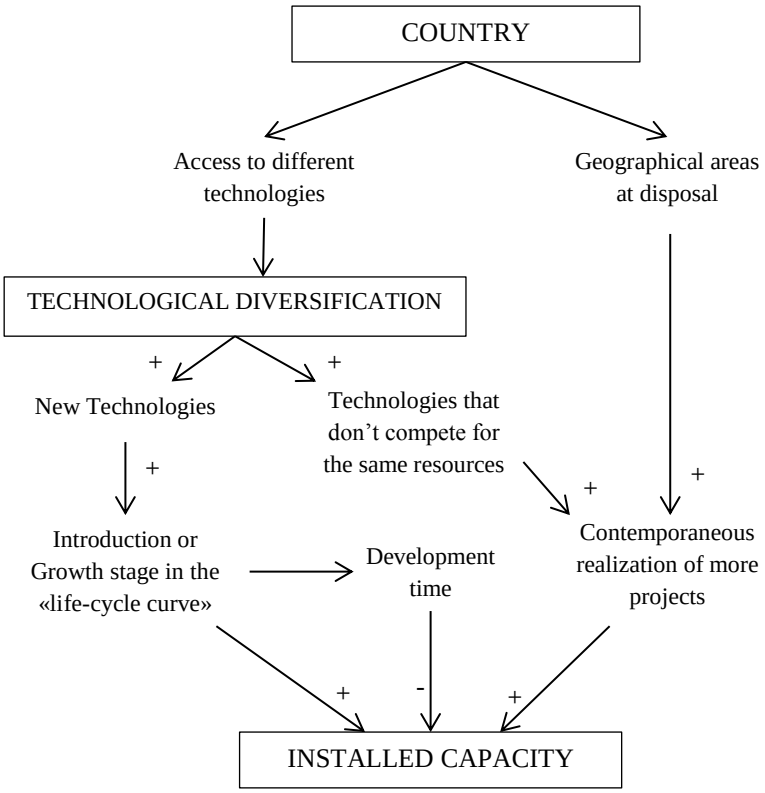

Figure 6.7 – Map of the impacts on Operating Performance coming from Country Diversification Approach

Increase Revenues

The technological, country and value proposition diversifications have a direct impact on the revenue model, if we consider the revenues as composed by two components: feed-in tariffs and the incentive-free revenues. The diversification in more renewable sources and countries affects the level of perceived incentives, since the company may shift its investment on the more advantageous source every time the country decides to draw up a new normative. Furthermore, the country diversification may also influence the incentive-free share of revenues, because electricity tariffs are state-specific; for instance, Company A decided to increment the installed capacity in the geographical areas "Iberia and South America" (+13,7% mainly through wind installations) because of the average increase in the electricity price in these countries (the revenues increased in this geographical areas of about +53%): *"residual variation of Company A's revenues, equal to 75 billion € (+3,3%) is due to a greater energy generation and to the growth of the average prices in Iberia and South America"* (Company A).

Finally, the value proposition diversification can affect both incentive and incentive-free revenues: by playing on energy efficiency services and unconventional business model the company can generate revenues free from feed-in tariffs. As a result the diversification, provided that it doesn't cause a dispersion of efforts, might increase contemporaneously both revenue components.

Risk Management

The diversification among the three dimensions causes a general reduction of the risk, since:

1. the country diversification can clearly reduce all risks concerning country-specific elements, i.e. the variation of incentives and energy price, the variability due to the lengthiness of bureaucratic procedures and the access to financing tools. Both incentives and energy prices are, in fact, completely or partially fixed by the Government and fragmenting the activities in more continents means for the company reducing the impact of a bear change and exploiting the bull change. *"Furthermore, our geographical diversification can preserve the company from the natural variability of resource availability, i.e. chiefly sun and wind."* (Company A)
2. Similarly, the technological diversification can reduce the dependence of the company on (i) government incentives concerning a specific technology, (ii) availability of natural resources, (iii) access to financial resources (because of the different marginality guaranteed by different levels of incentives) and (iv) the length of bureaucratic procedures for external authorization: *"for photovoltaic projects 3 years are necessary to obtain external authorization; for wind plants even 4 or 5 years." (Company E).*
3. Finally, the diversification of the value proposition has both positive and negative impact on risk management. This cluster of companies applied both traditional and unconventional value proposition; the latter includes the sale of industrial-scale and small-scale plants and the offer of supplementary services, i.e. energy efficiency consulting, post-sale services, etc., which reduces the dependence from incentives; anyway, even if these businesses guarantee completely or partially incentive-free revenues, their demand on the market still depends on previous and future trend of feed-in tariffs. Consequently, this kind of diversification has just a limited positive impact on risk management: *"for instance, the stall between 2010 and 2011 caused by the introduction of a new Conto Energia in Italian photovoltaic sector, reduced the revues coming from both traditional and retail market"* (Company A). On the other hand, the offer of the unconventional value proposition, in particular for retail market, increases the risk linked with the management of many external subjects, i.e. installers: the model adopted by Company A, for example, requires a strong integration with external network of franchising installers; the risk in this case is due to all problems concerning the coordination of entities with different goals.

The Table 6.11 summarizes the effects of diversification (country, technology and value proposition) on the management of many risk-sources, considered as cause of both costs and revenues variability.

	Diversification / Risk sources	Country	Technology	Value Proposition
Impact on revenues	**Change of incentives for a specific technology**	++[9]	++	+
	Change of energy price	++	/	+
	Different availability of a natural resource	+	++	/
Impact on costs	**Lengthiness of bureaucratic procedures for external authorization**	++	+	/
	Finding of Financial resources	+	+	++
	Change in interest rate	+	/	+
	Management of externals subjects (installers, EPC, etc.)	/	/	-

Table 6.12 – Qualitative Impacts of Country, Technology and Value Proposition Diversification on different Risk Source

6.3.3 Internal Organization

The common elements considered in this analysis are:

1. **Organizational structure**, i.e. spin-off or first-level subsidiary, even if with different degree of autonomy, that mainly affects the development time;
2. Internalization of competences through both external acquisition or internal reallocation of **human resources**, that has an impact on costs reduction;
3. Organizational **approach adopted to manage the unconventional value propositions**, that affects the cost structure.

Development Time

1. Organizational Structure

All companies create spin-offs to manage renewables with different degrees of autonomy; this may affect in dissimilar ways their flexibility and thus the time necessary to complete the upstream stages of the value chain:

[9] Since this kind of impact is not always quantifiable, a grade of four levels has been defined:

- ++: the diversification has a clear theoretical and empirical effect on risk reduction,
- +: the diversification has an empirical but just qualitative effect on risk source,
- /: no effects have been identified, both in theoretical and practical evidence,
- -: the diversification increases the risk source, even if with a non-quantifiable effect.

- Company A: the entire value chain is covered by the spin-off as it is quoted on Borsa Italiana and has a large decisional autonomy. As a result, the mechanism for project evaluation is relatively flexible and doesn't need to pass at an higher hierarchical level causing possible slowing down. Furthermore, since the top management doesn't have to allocate the financial resources on different business areas, i.e. traditional energy generation, oil & gas, renewables, etc., the company doesn't experience allocation-problems. On the contrary, the resources regarding renewable initiatives are usually over-estimated, in order to guarantee the forecasted installed capacity: *"Company A has in its portfolio more projects than those that it could financially realize, in order to have a critical mass that in any case would guarantee the achievement of operating performances.";* as a result, Company A outperforms in both multi and mono-period operating performance: the multi-period indicators are in fact positively affected by the relative flexible structure and consequent lower development time, while mono-period indexes reflect the lack of resource allocation problems between traditional and renewable business.
- Company E is full-equity and thus has a strongly formalized procedure for obtaining internal investment authorization. However, the possibility of financing all project through equity compensate this worse operating performance, as Company E doesn't need to research for external capital.
- Companies D and J create subsidiaries to manage renewables which must propose to the customer level an investment project that pass over a specific upper limit (50 million € for Company D): *"in some cases this process lasts more than a month, even if the top management's commitment with renewables is usually strong; anyway, after the formal approval of the project, we can immediately start with the construction of the site, as the initial stages are financed through equity"* (Company D). Company D's development time is thus higher in comparison with A, but still lower than E's result, because of a partial greater flexibility in internal authorization, as reflected by multi-period operating performance. Furthermore, the possibility of an initial financing through internal resources and the execution in parallel of building stage and research of external capital remove the time necessary for researching external creditors: the effects of looking for financing tools on operating performance is differential just for Company J, which in fact shows worse multi-period values.

Costs Reduction

Concerning internal costs, i.e. operating costs, the cluster shows homogeneous results for three companies, i.e. A, E and J; in fact, the ratio between EBIT and revenues from renewable business fluctuates averagely between 55 and 70% for the three similar companies, while Company D shows a worse performance, i.e. between 30 and 40%:

	2011	2010	2009	Average
A	62,64%	57,82%	67,28%	62,58%
D	41,45%	35,92%	28,49%	35,29%
E	55,78%	67,87%	62,88%	62,18%
J	76,30%	57,65%	n.a.	66,98%

Table 6.13 – Ratio between EBIT and Revenues for Utility Cluster for 2009, 2010 and 2011

The different weight of operating costs on revenues could partially derive from (i) different ways to acquire new figures and competences, as it has been defined "the most significant cost item" by the majority of the cluster; (ii) the organizational approach adopted to manage the value propositions different from traditional one.

1. Human resources and Competences

The creation of ad hoc organizations entails the duplication of some administration figures, in particular regarding top and middle management, CFO and all controlling resources. Those figures come from a reallocation of existing resources on the new business for companies A, E and J, while Company D mainly looked for these figures outside the traditional organization, incurring all consequently costs of HR research, integration, training, etc. and the successive expenses deriving from the change of the management. Furthermore, also operative figures of companies D and J chiefly come from outside the mainstream structure: the growth of the two firms occurs through M&A strategies; the resources of the acquired companies are kept within the structure in order to guarantee a gradual integration. On the contrary, for A and E these costs doesn't represent differential expenses as no new or external figure has been hired.

2. Organizational approach for unconventional value propositions

By crossing the two unconventional propositions with possible organizational approaches, it is evident that Company D applies a disaggregate model: the company creates a separate organization respectively for small-scale photovoltaic plants realization and trading and energy efficiency activities, separated from the renewable subsidiary.

	BU within the holding	BU within the renewable spin-off	Ad hoc spin-off
Retail market	E		A, D, J
ESCoactivity	E	A	D, J

Table 6.14– Organizational structure created to manage unconventional business model, i.e. Retail Market and ESCo (Energy Service Company) activities

In particular, each business model and thus organization is independent as regards the others, as no communication, information or resource exchange occur. As a result the company doesn't exploit the possible synergies regarding (i) the front-office activities and the channels for interfacing with final costumers (common for energy efficiency and small-scale plants); (ii) upstream project development and engineering between industrial and small-scale plants of the same technology. Furthermore, all administrative and staff costs are replicated, i.e. controlling costs, structure costs, legal costs for maintaining a separate society, etc.

6.3.4 External Organization

The external organization created by each component of the cluster includes R&D partnerships and industrial relationships. Regarding the second kind of external agreement, the partners of the cluster could be under-grouped in two categories, according to the level of commitment in the relation and its aim, each of which has different effects on costs, risk management:

1. Internalization through Joint Ventures programs or externalization through agreements with suppliers of upstream activities;
2. Strategic collaboration and exchange of knowledge with local firms.

Costs Reduction

1. Internalization or Externalization

The management of upstream activities may be led through three different models, according to Transaction Cost Theory: (i) outsourcing in competitive market, (ii) collaboration market and (iii) vertical integration. Even if Companies A, D and E adopt each one of the three proposed approaches depending on contingent opportunities, each of them tends to have one predominant model, so that it is possible to conduce a comparison among them and their effects.

The competitive market may affect two cost items: the expenses for researching and selecting the partner every time a new order should be done, and the concrete costs for the purchased materials. In this sector, due to the maturity of some technologies, in particular photovoltaic panels, this approach causes the lowest expenses concerning both costs: the specificity and differentiability of the products are in fact really low and this area's competitiveness is quite high, also because of the entrance of Asiatic producers. As a result, the costs for researching a supplier and the price of the component have experienced in last years a descending trend. Company E underlines the advantages of undertaken a complete outsourcing approach: *"The corporate strategy concerning renewables includes a "shopping around" purchase and construction: all materials are divided by typology, i.e. electrical, civil and mechanical area, and then the best supplier for each part […] due to our volumes we can obtain great advantages because of our bargaining power."*

Company D and, for a certain share, Company A mainly adopt the collaboration market approach, which includes the creation of long-term agreements for the purchase. This solution causes high opportunity costs

due to the decreasing market price of components, for the same reasons expressed above: those companies that create long-term partnerships can't exploit the trend of the market because they are bound by contract to the agreed price. Furthermore, this solution entails also all expenses caused by the management of relationships, i.e. coordination, communication, integration costs, that required specific human resources, switching costs in case of substitution of the existing supplier, if the relationship has lasted for long time, which is the case of companies A and D.

Finally, the vertical integration approach is particularly undertaken by company A though the creation of a joint venture with two others incumbents. In comparison with the two previous approaches, the internalization of upstream activities entails all structural costs, i.e. personnel, partial amortization of the site, coordination and communication with renewable spin-off and all production costs, that don't enjoy scale effects because of the limited production volume of the company.

Anyway, in comparison with a complete integration, the joint venture approach allows Company A to exploit external resources: the Japanese partner provides its experience in commercializing and the French-Italian firm its know-how in microelectronic manufacturing; the resulting approach can be considered as a middle course between complete vertical integration and collaborative market. Furthermore, the JV model eliminate all structural costs regarding the choice and evaluation of possible partners, the communication, the negotiation, agreement, controlling and management of eventual contentious, etc., i.e. all "transaction costs".

	Company A	Other Utilities	
		D	E
Personnel costs/Operating costs	About 50%	Between 30 and 35%	
Depreciation and Amortization/ Installed Capacity (million€/MW)	148	60	112

Table 6.15- Company A presents higher Personnel costs and Depreciation/Amortization costs (per installed MW) in comparison to Companies D and E, because of the adoption of a vertically integrated model

2. Strategic collaboration with local firms

Collaboration with local firms may be useful for great multinationals to keep the contact with local customers and maintain the attention on local problems. This approach is mainly undertaken by companies A and D, the first by using franchising installers for unconventional value proposition (downstream activities) and the second for managing some plants (upstream activities).

In addition to the consideration regarding transaction cost theory and to evident reduction of internalized margin, both approaches affect the cost structure mainly by increasing the efficiency, because of the higher specific competences of both kind of subjects. *"A key success factor in achieving operational excellence and making clean energy better is close collaboration with our partners. For example at our wind farm La*

Victoria in Andalusia (Spain) we have partnered with Vestas to achieve an exceptionally low Lost Production Factor of only 1.1% last year and a monthly best of 0.6 percent in October 2011" (Company E).

"Company A could have never decided to internalize the installation activity, because of a lack of competences, at least at the beginning of its activity. […]Even if installing panels doesn't require highly skilled workers, it still represent a knowhow that Company A doesn't own; doing it in house would mean (i) acquiring the necessary human resources, (ii) doing the stage with a lower efficiency than competitors could do it".

Risk Management

1. Internalization or Externalization

The other face of the coin regarding Transaction Cost Theory regards risk management. Considering renewable energy production and its value chain, particularly important is the diversification of the risk, by operating with different renewable sources or even though different value proposition; the vertical integration reduces the possibility of a diversification because increases the investments within the same value chain (photovoltaic in Company A's instance). On the contrary, the outsourcing rises the share of variable costs on fixed costs, by reducing the effects of the operative lever and thus the variability of operating results. Anyway, the risk concerning the ratio between variable and fixed costs is not so relevant in the upstream stage of renewable value chain, as it is considered by the companies *"a business area where variable costs, even if existing, are not significant in comparison with fixed costs, i.e. personnel expenses, amortization and depreciation of plants and other assets." (Company A)*.

Other possible risks concerning transaction cost theory are the possibility of partners' opportunistic behaviors, the spill-over effects, particularly if the same supplier purchases materials for two competitors, and the possible failure of the supplier/partner; the importance of these possible sources of risk within renewable business changes depending on the technology: *"for mono and polycrystalline silicon modules, the competitiveness in the market is really high because of the maturity of the technology and thus the risk of spill-over effects is quite limited; the same may be stated for onshore wind and biomass. […] On the contrary, there is an higher risk concerning the choice of the right supplier, as the share of European photovoltaic manufacturers' failure is relatively high because of the new entrance of Asiatic firms"* (Company D). Finally, regarding thin-film modules and offshore wind, the innovativeness of the technologies renders spill-over and opportunistic behaviors risks quite important. *"The Shopping Around model also allows to avoid knowledge exchange with supplier: this reduces the risk of know-how transfer, which would be really high as supplier of renewable business (in particular in wind and solar areas) enjoy an oligopolistic position and thus the same manufacturer supplies almost the 100% of our competitors."* (Company E).

Lastly, the co-manufacturing of some innovative technologies, like thin-film photovoltaic, within a joint venture, allow the company to reduce the technical risks concerning the development of the new product, by sharing it with external companies or shifting it outside company's boundaries.

As summarized by Table 6.15, Company E generally has higher costs in comparison with E and J, and could better exploit the change of context (dynamism in cell/modules/components price) from one year to the following, as reflected by multi-period economic performance.

		Shopping Around	**Long-term Agreements**	**Vertical Integration through JV**
		Company E	Companies E, D, J (partially A)	Company A
Cost Reduction	Transaction costs			
	Research and selection of partners	Low	Medium/High	-
	Management of the relation	-	High	Medium/High
	Price of the purchase material	Low	Medium/High	-
	Structural Costs			
	Personnel Costs	Low	Low	Medium/High
	Depreciation and Amortization	Low	Low	Medium/High
	Production Costs	Low	Low	Medium/High
Risk Management	Business Diversification	High	High	Medium/Low
	Increase of invested capital	Low	Low	Medium/High
	Spill-over effects	Low	Medium/High	Medium
	Opportunistic	Low	Medium/High	Medium

Behaviors			
Selection of wrong partner	Medium	Medium/High	Medium/Low

Table 6.16 – Qualitative impacts of the three model (from Vertical Integration to Shopping Around) on Costs and Risks

Table 6.17 – Synthesis of the impacts of Company-Specific and Cluster-Specific elements on Performance Indicators, for Utility Cluster

	Operating performance		Economic performance		Comments	
	Multi-period	***Mono-period***	***Multi-period***	***Mono-period***	**Company-Specific Elements**	**Cluster-Specific Elements**
A	High	Very High	Medium	Very High	• **Business Model** + *Mono-Period Eco and Oper.*: Non-diversification in off-shore technology increase both economic and operating mono-period performance, even if just in short-time horizon. ○ *Mono and Multi-period Eco*: focus on emerging countries reduces the costs necessary for development and construction, but also causes a reduction of perceived incentives. ○ Penchant for Co-development or acquisition of authorizations reduces the costs in comparison with plants acquisition and M&A approach (*Mono and multi-period eco*), but implies longer development time (*Multi-period Oper.*) • **Internal Organization** + *Mono-Period Oper.*: the autonomy and relative flexibility of a listed spin-off allow lower internal costs and development time; furthermore, no resource allocation problems exist between renewable and traditional business, so that development time are even more reduced. • **External Organization** - *Mono and multi-period Eco*: vertical integration through JV reduces the possibilities of exploiting market dynamics, increase internal costs and partially risk (increase of operating lever)	• **Business Model** + *Multi and mono-period Eco*: geographical diversification with centralized engineering and construction allows to exploit economies of scale and learning economies. + *Multi and Mono-period Oper.*: country diversification allows to have access to new technologies and to have more resources (spaces, lands, etc.) ato companies' disposal.
D	High	Low	Medium	Medium /Low	• **Business Model** ○ Penchant for M&A approach reduces economic *mono-period* performance, but allows speeder results, both economic and operative (*Multi-Period*). • **Internal Organization** + *Multi-Period Oper.*: internal higher flexibility in investment authorization stage reduces development time. - *Mono and Multi-Period Eco*: Separated structures for different Value Propositions increase coordination and communication costs, reduces the possibility of synergies exploitation and thus economic performance. • **External Organization** + *Multi-Period Oper.*: lower development time thanks to a more coordinated external research, because of the important presence of French Government in both company's equity and universities and centers' financing	
E	High	High	Medium	High/ Medium	• **Business Model** + *Multi-Period Eco*: by adopting a "shopping around" flexible model, it can exploit positive market dynamics. • **Internal Organization** - *Multi-Period Oper.*: High internal standardization in investment approval increases development time and partially reduces capacity growth.	
J	High	Medium	High	High/ Medium	• **Business Model** ○ Penchant for M&A approach reduces economic *mono-period* performance, but allows speeder results, both economic and operative (*Multi-Period*). - *Multi-Period Oper.*: Research of external capital (non-parallel with other phases) significantly increases development time.	

			1. Cost Reduction																2. Increase Revenues			3. Risk Management								4. Development Time				
			A. Reduction of Structural Costs							B	C	D. Reduction NVA activities					E	F	G	H. Risk conc. Revenues				I. Risk conc. Costs				J.	K.	L.	M.	N.
			A 1	A 2	A 3	A 4	A 5	A 6	A 7	B 1	C 1	D 1	D 2	D 3	D 4	D 5	E 1	F 1	G 1	H 1	H 2	H 3	H 4	I 1	I 2	I 3	I 4	J 1	K 1	L 1	M 1	N 1
5. Business Model	O	O1		++	-	-	-										+	++			+	+			-	+	++					
		O2		++	-	-	-										++	++		++		++		+			+					
		O3		++	++	+	+										++			+	++	++		-		+	+					
		O4		++	++	++	++										++	++		+	++	++		++	+	+	+					
	P	P1								+			-																			
		P2								+														+					+			
		P3								-														++				+	++			
		P4								-														++				++	++	++		
		P5		-		+				--		-	--	-					+									++	++	++		
6. Internal Organization	Q	Q1		-	-																						+	++				++
		Q2		++	+																						+	+				++
		Q3		--	--																											
	R	R1																										++				++
		R2																										+				+
		R3																										-				++
	S	S1																														
		S2																														
7. External Organization	T	T1						+	++							++							+		+							
		T2						+	-							--							+		--							
		T3						--	-														--		-							
	U	U1																														

Table 6.18 – Synthesis of qualitative impacts of Organizational Elements on Hierarchical Performance-Tree, for Utility Cluster. For Elements Codification see Attachments 1 and 2

- ++: strong positive impact of the Organizational Element on Performance Element,
- +: positive (not always quantifiable) impact of the Organizational Element on Performance Element,
- -: negative (not always quantifiable) impact of the Organizational Element on Performance Element,
- - -: strong negative impact of the Organizational Element on Performance Element

Common result for the whole cluster

6.4 Multiservice Cluster

6.4.1 Business Model

The multiservice cluster's business model is characterized by two elements which affect economic and operative performances:

1. the application of a mainly undifferentiated model, in terms of technological sources, geographical areas and value proposition; in particular, both firms are focused on photovoltaic and biomass industrial-scale plants installed in Italy. They partially adopt the unconventional business model, even if with many differences and dissimilar effects on performance;
2. the outsourcing of operative stages of the value chain, more applied by Company C than F.

Costs Reduction and Development Time

1. Partial adoption of unconventional value proposition

Company C and F adopt the unconventional business model, since both dispose the realized plants to external users. The main difference between the two multi-utilities regards the size of the disposed plants and thus the target of acquirers: Company C, build just industrial-scale plants, i.e. usually 1 MW, and dispose them to private subjects (investment funds or institutional entities), while Company F took the decision of entering in the retail market with small-scale photovoltaic plants (3.5 kW). The differences in the application of the unconventional approach influence in different ways the costs structure of the two companies. The realization of small-plants mainly for rooftops or for firms is affected by the scale, as it reduces the price of the purchased panels and decreases the fixed costs per plant necessary for marketing, transport, installation. *"The main competitive advantage should be searched in the purchase, since at least at the beginning of our activity, panels, inverters and structures weighted on the costs structure for about 70%."*(Company F). It is clear that, Company F that covers a niche of the entire retail market, can't obtain real scale effects on the main share of total costs and as a result doesn't perceive this business area as profitable. On the other hand, industrial-scale generation parks guarantees greater margins, since their size necessarily creates economies of scale. Furthermore, the unconventional business model applied by Company C may result more suitable to the context of the firm: the multiservice hasn't developed yet all competences to extract great value from the management stage and its return on internally managed plants is about 10-12%; on the contrary, if the plant is disposed to an extern entity, the profit increases to 13-15%.

Another important cost item influenced by the partial adoption of unconventional value proposition is the cost of capital. Companies C and F are still more focused on traditional value proposition compared to unconventional one. Thus, they obtain lower margins and returns much more deferred in time. In addition to contextual elements, such as the size of the company and the availability of financial resources, the two multi-utilities don't have at disposal great amounts of cash to make the investments in renewable plants. The form used to finance the projects, is thus the bank debt that implies interesting costs usually higher than the opportunity cost of using equity.

2. Outsourcing of operative stages of the value chain

Finally, as far as the management of the value chain is concerned, the two companies took different decisions regarding the covering of upstream activities which lead to different impacts on the costs. Company C resorts to external societies to obtain already authorized projects; this is usually the result of a trade-off between costs and time for gaining access to limited opportunities: *"the authorization usually costs about 300.000 €/MW for the photovoltaic business, but in time the process may last 4 years if realized in house. Acquiring a developed project allow the company to build a plant with an advantageous tariff, but implies an highest initial cash flow" (Company C)*. If Company C, with its approach, earns time but doesn't save cash, Company F can exploit its resources in order to save both time and cash. For the company the praxis is to cover the entire value chain, starting from external authorization, as it can exploit the existence of strong and traditional relationships with local authorities, and as a result, it can save the 30% of the whole length of the procedure and thus the resulting costs. *"Having a strong and consolidated relationship with local institution eases frequent communication, information and documents interchange, so that we are immediately informed about a possible change in governmental policy (incentive change, new service committees, etc.)"* (Company F). These results reflect the high multi-period operative performance, considered a proxy of development speediness from one year to the following, but can't be considered a relevant explanation for economic performance, since Company C outperforms far better than F in both multi and mono-period analysis.

On the other hand, same results may be drawn regarding the management of the rest of the value chain, as both companies leave in outsourcing the operative realization of the energy plants. The effects of a "buy-strategy" on the cost structure are mainly linked with the lack of some internal resources, i.e. personal, assets, etc. The cost of human resources is in fact considered by the majority of the competitors among the most significant costs, and the business model adopted by Companies C and F aims partially at reducing this voice: *"the renewable unit is more orientated towards "buy" instead of "make" if compared with traditional energy generation unit; thus, the consequent proportion of required human resources is less than ¼: for the same installed capacity, the traditional organization within Company C requires from 80 to 90 employees, while the renewable unit just 20."* (Company C).

Risk Management

1. Application of undifferentiated business model

Generally, the differentiation of the business model along different axes may reduce the risk perceived by the company. By focusing on Italian area, the possibility of developing different technologies is limited, because of geographical problems for onshore and offshore wind plants and the lack of necessary resources for geothermic energy generation. In this way, a possible reduction in incentive system concerning a single technology could affect the greatest percentage of the companies' revenues, as it depends mainly on two renewable sources: photovoltaic and biomass. Generally, the risk may be evaluated considering two elements: the frequency of occurrence and the impact in case of occurrence. The risk regarding the possible

change of the incentive system in photovoltaic sector, could be considered for the two multi-utilities as really significant, since both dimensions, probability of occurrence and impact are quite high in comparison with other sources and other companies. The frequency of a change in photovoltaic incentive could be measured considering last 5 years: every year a new Conto Energia was given off by the Government with a progressive reduction of feed-in tariffs. As far as the impact of the possible change on the revenues is concerned, in 2011 the incentives weight on total revenues from renewable business respectively 54,08% and 52,64% for Company C and F. The resting percentage is guaranteed chiefly by the partial adoption of the unconventional business model. As a result, the frequency and the impact render the risk of change in incentives and feed-in tariffs really relevant.

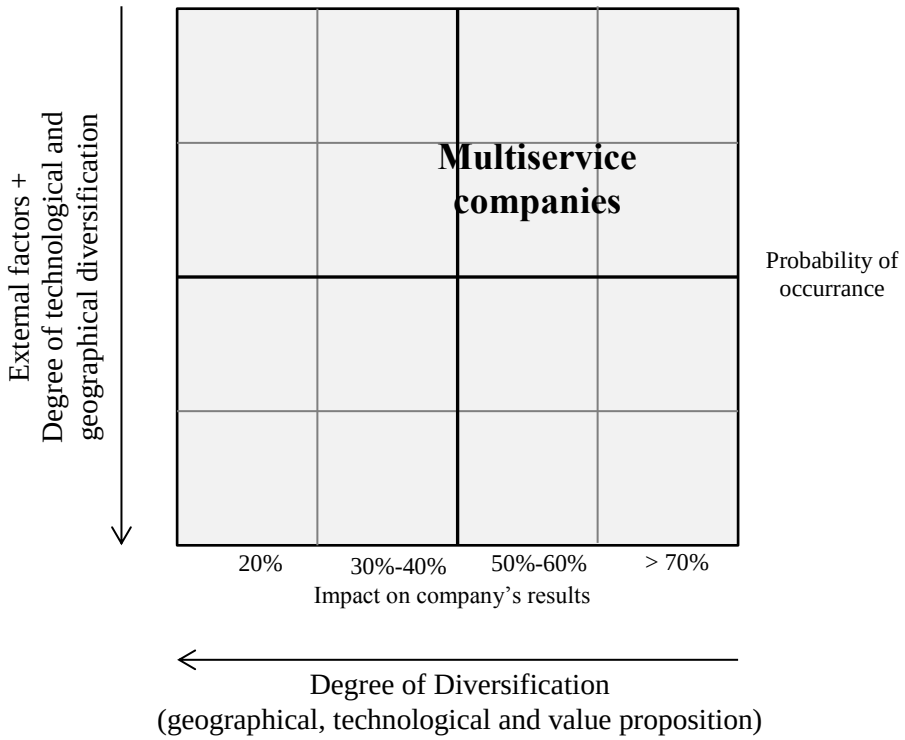

Figure 6.8 – Classification of the risk regarding the possible change in feed-in tariffs for Multiservice Cluster

2. Outsourcing of operative stages of the value chain

Regarding the degree of covering of the value chain, leaving in outsourcing a more or less considerable part of the value chain allows Companies C and F to manage the risk correlated with external context. Firstly, both firms leave to external EPC partners the construction of the plant, which doesn't clearly entail a cost advantage, but it represents a system to reduce the risk of immobilize capital in internal resources, in particular employees. *"Three years ago, in 2009, when we had to take the decision regarding internal organization, we decided not to hire workers for the construction of the plants, not because we didn't have in house competences to manage these activities and a greatest number of employees, but because of the uncertain evolution of photovoltaic sector" (Company C). "Leaving in outsourcing these stages may be a limit, as the construction is one of the most onerous phases, but it is a way to externalize the risk. […] a*

posteriori, with "Quarto Conto Energia", the company would have had at least 30% of unallocated workforce" (Company F). Immobilizing equity in internal resources increases always company's risk, in particular if the firm doesn't have at its disposals great financial possibilities. The outsourcing is used by the sole Company C also in the upstream part of the value chain with the same aim: *"Outsourcing the authorization stage let the company not to take on the risk of managing an activity or a project that may not concretize."*

6.4.2 Internal Organization

Costs

1. Organizational Structure: non-autonomous Subsidiary in a multiservice holding

Both firms exploit the costs advantages generated by the typical internal structure of a great holding group. In the different subsidiaries are in fact concentrated all operative activities, i.e. project management during the construction, operation and maintenance, etc., while the staff procedures, i.e. legal aspects, administration, etc., are supplied by other functions within the holding through a mechanism of service agreements. *"As a result, the company obtains evident advantages due to the scale of staff activities through two mechanisms: (i) it can simply spread the fixed costs on different business areas, and (ii) it gains contractual power with external entities, like suppliers and local institutions." (Company F).*

2. Human Resources reallocation

Additionally, the human resources allocated on renewables business weren't researched (or just partially, in Company C's instant) outside the two organizations, as both companies have developed complementary competencies during their years of activity in energy generation, environment sustainability, waste treatment, etc.; *"eventual knowledge gaps have been overcome through training courses realized inside the organization" (Company F).* This had two impacts on the costs: (i) dislocating an internal resource implies lower additional costs, since *"the reallocated resources were assigned to a deadlock business […] The spostamento of HR within the organization doesn't entail, in this case, great differential costs."* (Company C). Furthermore, the researched competences are particular and rare: *"Company C looks for "hybrid competences" including both technical and managerial skills"*; this is the typical profile of a person who has developed experience during the years of work in other companies and thus demands an adequate payoff for his/her capabilities, as for a recent graduate; thanks to internal reallocation of employees, Company C succeed avoiding the hiring of experts, reducing external engagement to ten new people: *"the new employees are all newly graduated young people, responsible for the site and project evaluation and client relationship management. Middle managers all come from inside the company"*; (ii) the additional cost is represented by the training courses, that should be in any case contingent, and not structural as the hiring of new employees.

Development Time

1. Organizational Structure: non-autonomous Subsidiary in a multiservice holding

The internal structure, based on vary hierarchical levels and society boxes, may under some points of view speed up the procedures. A complex internal organization diversified in many businesses requires, in fact, a certain degree of formalization, like for internal validation of investments. The existence of two gates for the approval of the investments, represents a way to accelerate the evaluation of many projects coming from different areas. In fact, if all business plans were evaluated at a corporate level, it would be overloaded of work, the investment committee would analyze an amount of projects coming from both traditional and the process would last months instead of the 2/3 weeks usually necessary.

The formalization regarding this procedure leads to two creaming off: the first may be defined "absolute" creaming off, as it occurs within the renewable units and concretizes in the obligation for renewable units to propose only those projects that already respects some standardized economic valued (in terms of IRR, WACC); while the second is "relative" and it is conducted by the first-level subsidiary: it compares the business plans coming from all the owned spin-offs and evaluates the possibility of simultaneously realizing them.

In this way, the proposals that arrive at the upper hierarchical level have a low probability of being screened out: the formalization is thus a tool to guarantee a more equal and corrected distribution of loads, horizontally among first-level subsidiaries responsible for different business areas, and vertically among corporate, first-level and second-level subsidiaries.

"Our internal structure guarantees a speeding up of corporate approval compared to a unique structure: company's time to market is lower if likened to an organization that takes all decisions inside and at the same hierarchical level: if for instance all investment choices had been taken at a corporate level, for Company F it would have necessary meant a delay" (Company F).

Nonetheless, being a non-autonomous subsidiary really causes resource allocation problems highlighted in literature. This is evident in mono-period operating analysis: though the rapid and significant increase in renewable installed capacity in the last two years, the efforts compared with traditional business are still low, because of the lack of autonomy given to renewable structures. In this case, some scholars' contributions are thus confirmed: the most recent trend suggests in fact that innovation activities are better executed in small and separated units, than in larger ones (Lee and Chen 2009; Lejarraga and Martinez-Ros 2008), with an adequate degree of autonomy, because top managers are accused of having an emotional commitment to the established strategy and status quo and often are unable to see things from a different perspective (Burgelmann, 1994; Miller, 1990; Hill and Rothaermel, 2003). In particular, many authors support the thesis that an incumbent firm, in order to develop radical innovations, should create a completely separate organization from the existing one, i.e. a spin-off or a subsidiary, since "isolation may protect the project from the counterproductive forces within the mainstream" (Christensen, 2002; Rice, Leifer, and Colarelli O'Connor, 2002; McDermott and Colarelli O'Connor, 2002). Furthermore, some scholars underline the necessity of creating separate and different processes particularly regarding resource allocation (Chao and

Kavadias 2007; Hogan 2005), especially by the management through mini-projects, since each project is seen as unique and requires different resources (Yu and Hang, 2010). The empirical analysis provides evidence: Company C, which keeps renewable activities within mainstream spin-off, records lower mono-period economic performance than Company F, which on the contrary creates a second level dedicated subsidiary, and in any case, both companies record particularly negative mono-period performance in comparison with the rest of the sample.

Company C's spin-off responsible for solar can just in some cases overcome some stages of internal procedures, enjoying a greater autonomy: *"in some specific instances, the projects don't even arrive at a corporate level, since the first level subsidiary "Company C Reti" has an elevate autonomy degree; this usually happens for innovative projects concerning specific technologies, whose competences are focused only within the spin-off: they don't require a feasibility analysis at a corporate level, but just a formal authorization" (Company C).*

Figure 6.9 summarizes the impacts of internal organizational approach on the three sub-goals, i.e. risk, development time and costs reduction; the plus shows a positive impact on sub-objectives, while minus implies an increase respectively of risk, time and costs.

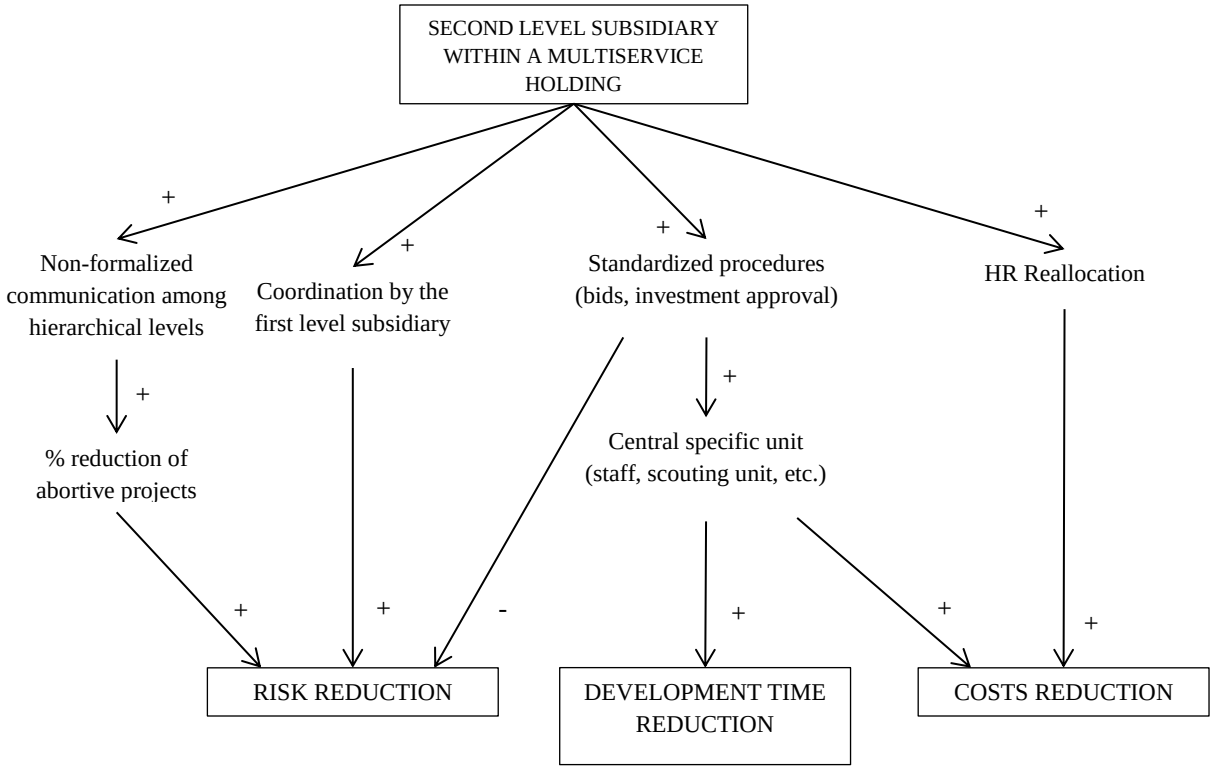

Figure 6.9 - Impacts of internal organizational approach on the three sub-goals: risk, development time and costs reduction

Another internal process which affects development time is R&D. Because of the lack of competences and resources, the multi-utilities realize R&D activities completely outside the organization. The unique roles created within the company usually have a coordinating and directing tasks. Company C created in fact a "Scouting Unit" with the aim of monitoring technological innovations coming from existing partners and

identifying new hypothetical partners by studying the evolution of the technology state of the art; Company F, on the contrary, doesn't create a specific internal structure responsible for managing external network, but assign this role to human resources already committed in other activities, in order to have always the same interface with external partners, i.e. universities, research centers, and R&D committee of feder-utility. The impact of the lack of internal systematic organization that conducts a parallel research within the company is chiefly a lengthening of all R&D activities: *"since 2006 we have developed just one pilot projects concerning photovoltaic for primary cabins, but we haven't developed any patent" (Company C); "the unique three pilot projects realized in the last few years regards photovoltaic and biogas, but we haven't succeed obtaining patents regarding renewables; anyway we obtained one patent in close fields, like wastewater treatment, where the research is active also within the company." (Company F).*

"Leaving the research completely in outsourcing is absolutely ineffective, so as doing only scouting or only testing, because professors or researchers tend following different direction in respect with an industrial company." (Company H): the main problem is, in fact, the non-marketability of developed solutions that causes a lengthening of the process and a delay of R&D performances.

6.4.3 External Organization

Costs and Revenues

The two multi-utilities developed a widespread network of external partnerships, mainly for research and development activities. Anyway the commitment and the aim of the relationships is different for Companies C and F, as the first creates just outsourcing partnerships and collaboration with universities, while the second applies a kind of open innovation approach. Consequently also the impact on costs is different, depending on the approach adopted.

At a first glance, the partial Open Innovation approach adopted by Company F should guarantee better economic performance, also according to literature; some scholars, in fact, highlight that both outbound and inbound paradigms bring to higher revenues and sales: Lichtenthaler focuses on the effects on ROS, Inauen (2011) and Von Hippel (2007, 2009) on the share of new products sales. Nonetheless, there is a wide academic gap concerning two aspects, which are even more interesting in this specific case: first, no recent quantitative works explicit the impact of these approaches on firm's expenses, and secondly there are no contributions about the effects of a partial adoption of the model and about the evolution of firm's economic results from open innovation implementation to its maturity. A complete open innovation model, in fact, entails the creation of ad hoc figures, roles, processes for the management of external entities, knowledge transfer, adaptation of the developed solutions to internal business needs, etc. An example could be the integration of internal processes with external customers/suppliers/competitors via web Gassmann, Henkel, and Chesbrough (2010), or intellectual property's procedures and mechanisms (Kim and Mauborgne, 2004; Chesbrough, 2006, 2007). Since Company F's approach is still new and immature, it causes higher costs and

worse results than it theoretically should; this could be one of the reasons which may explain Company F's negative economic performance.

In practice, in fact, the differential costs of open innovation approach are due to the management of several relationships with external partners: *"maintaining an external network is generally more onerous, as the company has to coordinate and direct all research activities; furthermore, some support activities are necessary, such as the research of possible partners, the creation of agreements, the periodical recovery of data and information, etc. The Company is trying to implement such processes, and results are stil unquantifiable." (Company F).* The activities of coordination are even more difficult, as Company F took the decision of avoiding an internal R&D department, which could have initially made up for the lack of dedicated resources and processes.

In any case, Company F's partial Open Innovation model can also bring relatively significant economic advantages; this approach of outside-in open innovation entails, in fact, a more flexible cost structure: the lack of internal researches implies lower fixed costs for expert researchers and technologies, and thus no amortizations; the agreements represent the unique form of outgoing cash flows and anyway they can't be considered completely variable, at least in an open innovation approach: *"the company established several framework agreements with research institutes and universities, that usually last four years; in other cases, the partnerships are received in heritage from other parts of the holding and they have existed for a decade" (Company F).* As a result, the choice of a partner results comparable to an investment, as the agreement in an open innovation context reaches a duration of several years and can't be disposed immediately. The choice of the adoption of framework agreements makes up for the lack of custom in new relationships, due to the recent entrance of these companies in renewable business in comparison with companies of Utilities and Industrial Group Clusters. These kinds of contractual forms facilitate the communication between subjects that don't know each other and guarantee shorter procedures as they are based on standardized rules.

On the contrary, the approach adopted by Company C regarding external organization may be considered more systematic. The multi-utility usually creates long-term agreements with external supplier and installer or with research institutions and universities, but rarely realized a bidirectional exchange of information and knowledge. The consequence of this easier approach is a leaner research and management of the network; for instance, as the research of partners and supplier is through this methodical and standardized approach, it can be executed by a specific Scouting Unit, responsible just for this activity with consequent lower costs and time because of the specialization of the employees in this task.

Development Time and Risk Management

The development time of the multi-utilities might be influenced by two external relationships: (i) the relationship with credit institutions and (ii) the agreements with EPC companies.

The lack of internal financing resources might cause a longer development process, as it must include also the stage concerning external credit research and management. As far as credit institutions and banks are concerned, both companies enjoy the good relationships with local banks because of the importance of their

brands in the local areas where they operate; this could speed up the whole development process. For instance, in order to accelerate the opening of the building site, Company F strikes up pre-agreement with banks by presenting them the business plan before its formal authorization. As a result, after the validation of the internal committee, the company can immediately start with all operative stages, without waiting for the fulfillment of other bureaucratic procedures: *"the execution of all agreements with credit institutions is parallel to the internal authorization process; in any case, the brand of the company in our municipalities facilitates the supply of financial resources by banks." (Company F).*

Concerning the agreements with EPC companies, it might have two apparently opposite impacts on risk management. On one hand, leaving in outsourcing increases the risk of managing external subjects, instead of maintaining the control of the whole chain. On the other hand, externalizing an activity means transferring the risk to a third part; theoretically, if the construction were a prerogative of the supplier, the consequences of a possible delay in this stage would fall on the external subject in term of costs. Nonetheless, this second impact is just theoretical, as empirical experiences in this business area shows its inconsistence: a delay in the construction, even if compensated by the EPC company, deprives the energy firm of the possibility of owning a specific technological plant in a specific span of time and thus of enjoying the economic advantages (incentives) considered during the investment evaluation; this cause (i) a strong reduction of the IRR of the project and thus a longer time necessary for compensate the investment; (ii) the deferment of waited economic results. An example could be the delay in Company F's recent investment: *"Company F invested 200 million € for a WTE plant in Parma; the construction of this installation should have closed on June 2012. Because of some external problems (mainly building site problems), it will be set in use at the beginning of 2013"* (Company F)

Table 6.19 – Synthesis of the impacts of Company-Specific and Cluster-Specific elements on Performance Indicators, for Multiservice Cluster

	Operating performance		Economic performance		Comments	
	Multi-period	***Mono-period***	***Multi-period***	***Mono-period***	**Company-Specific Elements**	**Cluster-Specific Elements**
C	High	Very High	Medium	Very High	• **Business Model** ○ Acquisition of authorized projects reduces development time (*multi-period Oper.*), but has a negative impact on *economic performance* + *Multi and mono-period eco*: Disposal of some industrial-scale plants increases marginality because of lack of internal competences in managing renewables.	• **Business Model** + *Multi-period eco and oper.*: reduction of external authorization time thanks to good relationships with local authorities (frequent an easier communication, etc.) - *Multi-period eco*: geographical and technological non-diversification increase the risk caused by change in incentive. • **Internal Organization** + *Eco*: Reallocation of internal resources working on deadlock businesses - *Mono-period Eco and Oper.*: resource allocation problems because of lack of autonomy + *Multi-period Oper.*: small, specialized units ease flexibility and unformalized communication, which reduce risk and development time ○ *Mono-period Eco and Oper.*: lack of internal R&D unit, ad hoc for renewable technologies reduces operating returns but also costs
F	High	Medium	High	High/ Medium	• **Business Model** - *Multi and mono-period Eco*: no economies of scale in unconventional business model which cause disadvantages justified by image goals. • **External Organization** - *Eco*: immature and partial open innovation approach causes negative economic performance, because of the lack of specific internal figures, processes, tools, for managing outside-in knowledge.	

			1. Cost Reduction														2. Increase Revenues			3. Risk Management								4. Development Time				
			A. Reduction of Structural Costs							B	C	D. Reduction NVA activities					E	F	G	H. Risk conc. Revenues				I. Risk conc. Costs				J.	K.	L.	M.	N.
			A 1	A 2	A 3	A 4	A 5	A 6	A7	B 1	C 1	D 1	D 2	D 3	D 4	D 5	E 1	F 1	G 1	H 1	H 2	H3	H 4	I 1	I 2	I 3	I 4	J 1	K 1	L 1	M 1	N1
5. Business Model	O	O1									- -																					
		O2[10]				- -		-	-																							
		O3[11]				++			+																							
		O4															-			-		- -	+									
		O5															-					- -										
	P	P 1								- -													+					++			
		P 2[12]						+			+																					
6. Internal Organization	Q	Q1	+	++				++																+				++				
	R	R 1													-	-																
	S	S 1																														
		S 2																														
7. External Organization	T	T 1																						-								
		T 2																								-	-					+[12]
		T 3									+																		+			
	U	U1[11]									+		-		- -	- -							+									

Table 6.20 - Synthesis of qualitative impacts of Organizational Elements on Hierarchical Performance-Tree, for Multiservice Cluster. For Elements Codification see Attachments 1 and 3

- ++: strong positive impact of the Organizational Element on Performance Element,
- +: positive (not always quantifiable) impact of the Organizational Element on Performance Element,
- -: negative (not always quantifiable) impact of the Organizational Element on Performance Element,
- - -: strong negative impact of the Organizational Element on Performance Element

Common result for the whole cluster

[10] Specific just for Company F

[11] Specific just for Company C

[12] In comparison with those competitors which can't finance RES projects through equity (Private Non-Listed Company)

6.5 Private Non-Listed Company

6.5.1 Business Model

The chosen business model is chiefly characterized by:

1. a partial diversification on all three dimensions: (i) technology, (ii) geographic area and (iii) value proposition; this diversification is largely more limited in comparison with ex-monopolist cluster, and thus just partially entails the effects already analyzed for the first four companies;
2. the outsourcing of construction, installation, operation and maintenance, due to evident lack of internal scale and competences.

Cost Reduction

Among the most significant expenses (about 30% of totality) identified by the CFO, there are all costs concerning the plants and assets management, i.e. O&M, insurance costs, taxes, property rights to privates, other uses, etc., particularly high for wind plants. The choice of the business model has two main impacts on the degree of these costs.

1. The company is, in fact, chiefly focused on both photovoltaic and wind technologies with equal efforts and results (the revenues for 2011 are equal for the two business and equivalent to about 38.000 k€, while people employed are 35 for solar and about 40 for wind). Nonetheless, in the wind business, the company applied a strategy of delocalization, by operating not only in Italian territory, but also in France and Romania, with a percentage of installed capacity, respectively of about 32%, 46% and 22%. The above mentioned costs are country-specific, since they depends on the specificities regarding taxes, rules about insurances, etc.. Delocalizing thus the business which results more expensive (wind), in those countries, like Romania, where generally the costs are more reduced, is a strategy to maintain the required technological diversification, and contemporaneously reducing costs. By applying this geographical diversification, the gross operating profit of an industrial-scale wind plants arises up to more than 65%: *"if we consider the old tariff (150 €/MWh), a wind plant that produces 2.000 MWh/year guarantees 250,000/200,000 € of gross operating profit on 300,000 € of revenues."* Furthermore, by delocalizing the same technology in more countries, the company can exploit economies of scale: *"development, engineering and management of a wind plant are the same for Italy and France; for this reasons Company G created a transversal structure that could exploit the resulting synergies",* which explains its high mono-period economic performance.
2. The choice of leaving in outsourcing the O&M to the supplier, adopted in particular for wind plants, may stem a percentage of the above descripted costs. Company G is in fact still young if compared with main competitors and hasn't an installed capacity or a previous history in renewable business so significant to generate learning economies. As a result it is still convenient for the company to leave O&M processes outside. Also concerning unconventional value proposition of small plants,

Company G isn't active in the downstream part of the value chain, i.e. the installation and sale to final users (except for some units at a corporate level, responsible for front-office activities, i.e. sale of contracts, customer relationship management, etc. which cover a percentage of installation procedures through sale-agents), but rather sees as customers the installers dislocated on the whole national territory. With these societies the company has long-term agreements for the supply of photovoltaic plants for retail users. By adopting this strategy, Company G might exploit the widespread diffusion of external entities, without immobilizing internal resources: this has a strong impact on the extent of the reached target, as local installers already represent an external sale force that should be exploited. The utility, in fact, could have invested in internal dislocated structures responsible for customer relationship and installation, but because of its recent entrance in renewable business and its limited financial resources, it would have covered just a limited geographical area, with consequent lower market share. The effects on revenues of the creation of this external network depend thus firstly on the market share it can reach. However, another direct consequence of this approach is the reduction of the possible margin the company could obtain if it would have internalized the installation activities, as *"the lengthiness of the value chain necessary cause the reduction of company's marginality, because each subject along the chain must obtain a profit and the final price is, in this sector, dictated by competitors that have a better image and a longer history in the business."*

Increase Revenues

Company G applies a diversified business model, as it offers both (i) traditional value proposition and unconventional business model, which in turn includes two different value propositions: (ii) the sale of industrial-scale and small-scale solar plants respectively to investment funds and retail customers; (iii) the sale of a combined product with the electricity contract; in this third case, Company G maintains the ownership of the plant, receives the incentives and leaves the consumption of the electricity to the customer.

This approach entails mainly two effects on the revenues: the first is purely economic, while the second has a financial nature.

Regarding the economic impact, the value proposition diversification causes a general higher marginality. In fact, the internal management of industrial-scale photovoltaic plants, i.e. traditional business model guarantees intermediate profits in comparison with the two forms of unconventional business model, i.e. between 10 and 12%, mainly because of the incidence of the costs of O&M outsourcing (O&M is often left in outsourcing to panels and turbines suppliers and the contractual costs are considered as the third hugest cost, after structural costs, i.e. personal, assets, etc. and assets/plants management, i.e. internal O&M). The unconventional business model guarantees in fact different profitability depending on the size of the disposed plants and thus on the target for the disposal: *"the target for great renewables parks is represented by investors or funds; in any case, they are really competent and includes some experts in renewable business: in these cases the contribution margin is lower, i.e. about 10% on the single plant; on the contrary,*

the company can gain up to 20% of margin on the revenues of small-scale plants (this margin is calculated considering all costs, like the costs for external purchase of panels and components)".

		Value Proposition	
		Traditional Value Proposition	*Unconventional Value Proposition*
Scale	*Industrial-scale*	10-12%	10%
	Small-scale	-	20%

Table 6.21 – Marginality coming from Industrial-Scale and Small-Scale photovoltaic plants, for both internal management and external disposal in 2011 (Private Non-listed Company)

It is important to underline that the factor that causes the difference among the marginality is not internal, but rather depends mainly on the kind of the target for the plant disposal. In fact, there are no differences in internal management of the two businesses (photovoltaic industrial and small-scale plants), since all activities are managed within the solar subsidiary located under the renewable spin-off. The different marginality is thus caused by a different value proposition, with different market targets, customer interfaces and customer purchasing habits.

On the other hand, the financial impact regards the deferment of cash inflows. In fact, even if the traditional business model has a greater marginality than unconventional concerning big plants, it causes a delayed cash inflow, and thus repay the investment in the long-term horizon, causing deferred effects on economic performances. This phenomenon and its huge effect on economic performances is evident by considering the evolution of results (revenues, gross operating profit and EBIT) from 2010 to 2011. During 2011, in fact, the application of unconventional business model for industrial-scale plants increased: in only one year, the company disposed the 50% of its French wind plants, i.e. 50% of 153MW, and 95 MW of authorized projects to KKR investment fund, 12 photovoltaic parks for a total amount of 19MW to RTR Capital and 8 MW of hydroelectric (owned by the renewable spin-off and thus affecting its performances). As a consequence of this strategy, the revenues decreased of 17,6% (multi-period economic index), but gross operating margin increased in a single year of 65,9% and EBIT up to 194,5%, because of the capital gains generated by the disposals. It is evident that the unconventional business model applied to both wind and photovoltaic industrial-scale plants guarantees instantaneous cash flows, even if with lower margins. Company G is probably more focused on a short-term strategy that aims at covering the losses generated in the other niches, i.e. photovoltaic small-scale, because of the effects of contextual turbulence. Company G's report of 2011 explains, in fact, the tentative of stemming the negative results of retail market, by both shifting towards great plants disposal and towards sale of panels and components: *"the marginality concerning retail activities in photovoltaic is still positive, but decreasing compared with 2010; this is caused by the uncertainty of the normative context. As a consequence, the activities of this sector, initially oriented towards realization and sale of "turnkey" plants, are actually focusing on the sale of photovoltaic*

modules and other components with low marginality. But because of the above mentioned reasons (disposal of great plants) *the company may boast a better operative results if compared with previous year."* This approach is also a consequence of some contextual variables, regarding the limited financing resources of the company partially due to its young age. It brings another consequence, i.e. the difficulty in finding the capital necessary for new investments: the disposal clearly facilitates this process, even if the greatest part of whole financial resources are still researched outside, slowing down the entire development.

Risk Management

At a first glance, Company G's diversification on the three different levels can be categorized as a way to disperse the risk.

Regarding the value proposition diversification, the unconventional value proposition of small-plants includes two different models, as already stated above: the sale of solar plants to retail customers, and the sale of a product combined with the electricity contract, in which the company maintains plant ownership, receives the incentives and leaves the consumption of the electricity to the customer. In the first case, the revenue model guarantees a margin of 20%, because of the lack of competences of the target, while in the second case, it comprises two components: (i) the tariff of electricity which is a prerogative of Company G's trading function and is not differential with respect to traditional energy generation, and (ii) the incentives obtained by the government for the production of green energy. Even if the application of the second value proposition completely exposes the company to the continuous change of feed-in tariffs, since the revenues not only depends on but are fully represented by the incentives, Company G succeeds in creating a mixed model, which guarantees both incentive-free and incentive-based revenues. In this way the company could exploit the possible growth of photovoltaic incentives, but without taking on the risk of a complete dependence on them; as a consequence, Company G's dependence on incentives, measured as the ratio between perceived feed-in tariffs and total revenues, was generally low but quite variable in the analysed period (2009, 2010 and 2010) and in comparison with the rest of the cluster: this mirrors the adopted value proposition diversification, i.e. the focus on traditional business model in case of negative contingent variables (2010) and increase of small-scale solar plants in case of advantageous factors (2009) (see Table 6.20); this may partially explain Company G's positive economic performance.

	2009	**2010**	**2011**
Incentive-based Revenues/Renewable Revenues	33,88%	24,59%	26,93%

Table 6.22 – Share of incentives over Renewable revenues in 2009, 2010 and 2010 for Private Non-listed Company

Regarding the geographical diversification, the country-specificity of some specific costs and revenues limit the risks. Nonetheless, Company G delocalizes its activities only in three countries, it being understood that the majority of the business is still located in Italy. As a result, it actually can't exploit a complete and real risk diversification, even if it is improving year by year.

Finally, concerning technological diversification, as it is limited to wind and photovoltaic parks, it can't be really considered a risk dispersion.

6.5.2 Internal Organization

Cost Reduction

The most significant cost regards the stream of structural costs, in particular personnel and bases management (about 60% of total operative costs). However, personnel costs are relatively limited in comparison to main competitors operating in the same business areas, for the new business, in fact, the majority of top and middle managers wasn't researched outside, but simply reallocated in a new organogram: *"it can't be considered a real extra-cost, in comparison with the situation before the introduction of renewables, as those people were already operating in the organization; on the contrary, for the same level of human resources, their productivity and effectiveness increased, because they are focused in a dedicated structure and thus more committed with its activities."* Just some operative figures were researched outside. In any case, the total number of employees of the renewable subsidiary is about 100, and the new employed is under 10%, with a resulting negligible amount of differential costs. Furthermore, the people hired within the solar spin-off are young newly graduated, whose cost is usually limited, if compared with their productivity.

Even if the administrative and staff costs aren't included in the list of the most significant expenses identified by the CFO, they have to be analyzed, because of two reasons: (i) even if they don't have a great impact on actual economic performances, they are differential costs, if compared with the previous situation, i.e. before the creation of the ad hoc spin-off or even more before the introduction of the innovative business; (ii) they may be caused by non-value added activities, if the internal organization is deeply examined. All staff activities, in fact, i.e. administration, legal procedures, purchase, management of human resources, etc. are conducted within the corporate organization and then supplied to each subsidiary through a service agreements, like all other holding structures. Nonetheless, the renewable subsidiary includes, in addition to operative units, also: (i) "Administration and Services", responsible for economic and financial management of the society; (ii) "Logistics" for material transfer, warehouse management and purchasing of non-core material. As a consequence, the renewable spin-off needs employees who partially perform the same tasks already realized within the holding. Secondly, the administration of the subsidiary should be in any case under the control of the corporate level, in order to guarantee the strategic and financial integrity of the whole organization, and to avoid that the social responsibility and image of the company would be damaged by a wrong management within each single subsidiary. This implies many activities: (i) a stronger control conducted by the "Management Control Systems" within the corporate organization; (ii) more frequent

coordination and communication mechanisms between the different hierarchical levels of administration functions.

Another differential expense regards legal costs necessary to maintain a separated company, i.e. corporate laws. These amount to about 10.000€/year, and even if should be quoted among the costs caused by the organization approach, they are considered by the CFO as *"relatively low, in comparison to the indirect benefits coming from the realization of an ad hoc structure".*

Increase Revenues and Risk Management

The internal structure, based on the existence of one company and many small vehicle subsidiaries, has important effects on the activities of management control system. The reason why Company G adopted such a structure is to have easier access to financing markets: *"if the company asks for a loan for an investment in a wind park, the credit institution want the handover of the plant within a small vehicle structure where all cash flows, plant profitability and other financial/economic indicators are clearer and more identifiable"*. This clearly facilitates and accelerates also the activity of the internal Controller, responsible for supporting decisional processes within the company, i.e. evaluating the strategy, understanding if the goals are consistent with available resources, measuring if people's behaviors and actions within the company are functional to the achievement of the target, etc.

One of the main consequences of the Controller's more adequate work is a definition of effective key performance indicators, for the single person or for a specific unit. As a consequence, human resources' motivation and productivity increases, if the system is able to correctly measure each organizational unit's results and to catch the specific responsibilities. Each unit or person is thus judged and rewarded for each own work and contribution to value creation, and this is possible if the historical data concerning their performances are precise, clear and not influenced by uncontrollable factors. Furthermore, the creation of small organizations helps avoiding opportunistic behaviors, as the association of each organizational structure with just those performances that it can directly influence and determine.

Moreover, these systems respond to an important problem that Company G identified as overriding for a society that doesn't enjoy the history and brand power of main competitors: keeping human resources working for the company, even after the training programs. The controlling and rewarding mechanisms are really effective, as the overall turnover, concerning both employees' new entrance and going out, is +19,5% in the last year, and even if their really effects on revenues increase or decrease are indirect and difficult to estimate, Company G's CFO states that their *"effectiveness is increasing, since the people are concentrated in a dedicated structure".*

Figure 6.10 contains the positive effects coming from the creation of small vehicle companies on employees' behaviors: the most specific and significant impact is the reduction of the turnover (highlighted in the graphic) as it represents one of Company G's main risks in comparison with all other clusters, because of firm-level contingent elements.

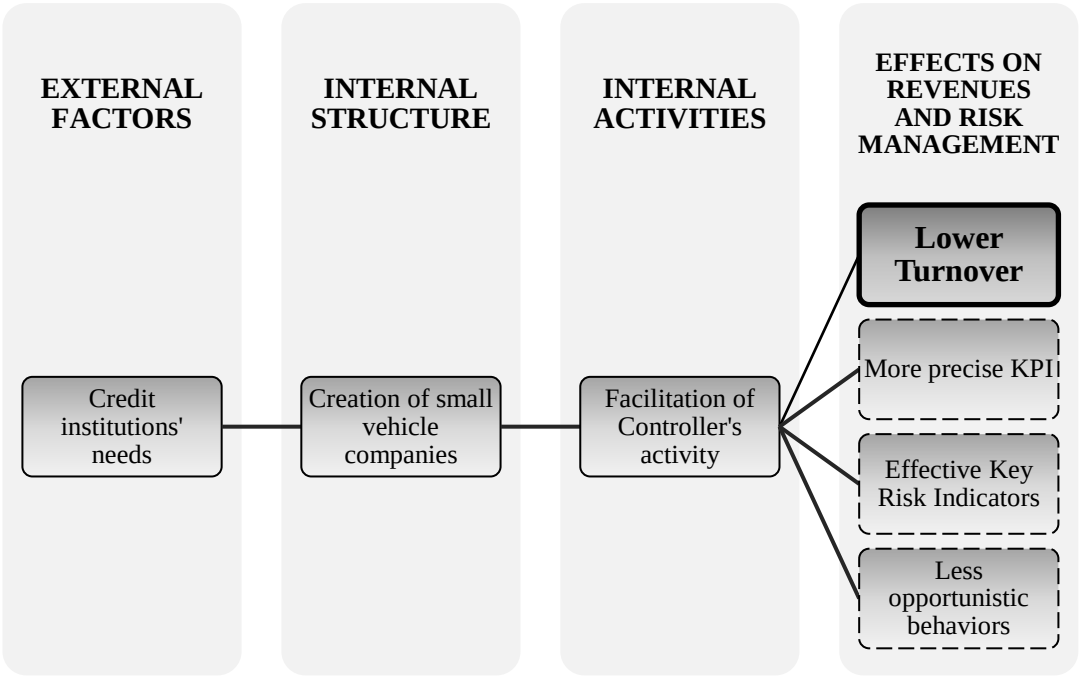

Figure 6.10 - Positive effects coming from the creation of small vehicle companies on employees' behaviors for Company G

6.5.3 External Organization

A peculiarity regarding Company G's external approach is the creation of Corporate Ventures for R&D activities, mainly with investment funds (with KKR in 2011, with J&P Avax in 2010, etc.), but also with start-ups. This model affects the cost structure and risk management.

Cost Reduction and Risk Management

First of all, in general the externalization of R&D activities permits a lower immobilization of internal capital in risky activities: Company G's CFO highlights the impossibility for the society of creating an internal research center because of costs problems and due to the uncertainty of the context. Nonetheless, the other side of the coin is a complete lack of control on development processes and thus longer times, generation of unmarketable solutions, the necessity of adapting the innovations to technical needs, etc. This problem is even more significant if R&D is left in outsourcing to many different subjects, i.e. start-ups, industrial partners, etc., while is less important in the case of creation of a JV with an investment funds, in which the competences are clearly defined. Within a wide network it is, in fact, difficult to individuate the real output of the activity, so that even the CFO is unable to define the returns of the last years concerning research and development. For this reason, after having developed a new radical technology, Company G often requires the consulting of universities and research centers, even if this process causes a further delay of revenues. An example is the realization of a new biomass installation: Company G started the development of a new technology, which exploits dietary waste for energy generation; it is a pilot project that may be set in going on June 2013, after a delay of about 1 year, whose development lasted many years. As far as research

activities are concerned, It is thus evident the negative impact of this approach on multi-period economic and operative performance: in comparison with the great efforts of last years (K€ 150,000), the revenues are still inexistent, so as generated electricity.

Negative Company G's JV performance could be also analyzed in light of recent scholars' contributions. A wide stream of literature focuses in fact on factors influencing joint venture performance. A recent trend traces back JV success to a list of elements, i.e. bargaining power, commitment, control, trust, conflict, co-operation, cultural distance, justice, goal compatibility and conflict resolution mechanisms (Reus and Rottig 2009; Ren et al., 2009; Christoffersen, 2012). In particular, when commitment and trust exist, it is argued that partners become more determined to work to make the alliance work (Geyskens et al. 1996; Voss et al. 2006), while bargaining power and control of one of the partners, reduce JV effectiveness. What is even more interesting in this specific case, is that several articles address the performance implications of co-operation (Argyle 1991; Christoffersen, 2012); co-operation may be pursued though the application of several mechanisms, such as (i) adoption of information exchange tools, figures, and processes, (ii)creation of shared problem-solving procedures and (iii) flexibility and restraint in the use of power (Heide and Miner, 1992): co-operating mechanisms are argued to reduce hazards of opportunism and agency problems via more open information sharing, which reduces information asymmetry (Luo and Park 2004). Nonetheless, a gap exists in the quantitative single effects of these factors: substantially, there is a lack of contributions regarding the weight of each factor on JV performance.

In this case, empirical analysis generally confirms literature, and furthermore it gives another contribution. Company G, in fact, doesn't create specific figures and processes for "information exchange", "creation of shared problem-solving procedures" and "obtaining flexibility"; this could be considered one explanation for its low performance. Nonetheless, the JV doesn't present internal control and power imbalance and is characterized goal compatibility and absence of cultural distance. As a result, co-operation factors have a stronger and more significant impact on final performance, than all other aspects identified in literature: the lack of internal specific procedures is a sufficient condition for JV negative performance.

Table 6.23 - Synthesis of the impacts of Company-Specific and Cluster-Specific elements on Performance Indicators, for Private Non-listed Company

	Operating performance		Economic performance		Comments
	Multi-period	***Mono-period***	***Multi-period***	***Mono-period***	**Company-Specific Elements**
G	Low	Medium	High	Very high	• **Business Model** + *Multi and Mono-period Eco*: Delocalization in emerging countries of those technologies (wind) which cause higher costs + *Multi and Mono-period Eco*: synergies and economies of scale thanks to geographical diversification in Italy and France + *Multi and Mono-period Eco*: Low immobilization of resources in downstream activities (O&M, installation, etc.) + *Multi-period Eco*: exploitation of market dynamics thanks to speed shift from one value proposition to another + *Multi and Mono-period Eco*: value proposition diversification in small-scale plants sale causes better returns thanks to cash flows in short-term, which compensate losses in traditional business model - *Multi and Mono-period Eco*: Lower incentives in emerging countries - *Multi and Mono-period Oper.*: disposal of plants reduces installed capacity • **Internal Organization** + *Multi and Mono-period Eco*: Lower turnover, thanks to better and more specific KPIs and reward mechanisms + *Multi and Mono-period Eco*: higher HR productivity, thanks to better and more specific KPIs and reward mechanisms - *Multi and Mono-period Eco*: duplication of staff figures and costs • **External Organization** - *Multi-period Oper.*: lack of adequate process, figures, tools to direct and manage R&D activities increases development time and slows down increase in installed capacity/energy generation

			1. Cost Reduction														2. Increase Revenues			3. Risk Management								4. Development Time				
			A. Reduction of Structural Costs							B	C	D. Reduction NVA activities					E	F	G	H. Risk conc. Revenues				I. Risk conc. Costs				J.	K.	L.	M.	N.
			A 1	A 2	A 3	A 4	A 5	A 6	A 7	B 1	C 1	D 1	D 2	D 3	D 4	D 5	E 1	F 1	G 1	H 1	H 2	H 3	H 4	I 1	I 2	I 3	I 4	J 1	K 1	L 1	M 1	N 1
5. Business Model	O.	O 1															+	+ [13]				+										
		O 2			+																											
		O 3			+	++		++																								
	P.	P 1						+			+												+								
		P 2						+			+								+				+								
6. Internal Organization	Q.	Q 1		-				- [14]						- [14]																		
		Q 2						+ [15]			+ [15]	+ [15]																				+
	R.	R 1						++					++																			
		R 2						-																								
7. External Organization	S.	S 1													-								+		-						
	T.	T 1								+					- -								+		- -					- -	

Table 6.24 - Synthesis of qualitative impacts of Organizational Elements on Hierarchical Performance-Tree, for Private Non-Listed Company. For Elements Codification see Attachments 1 and 4

- ++: strong positive impact of the Organizational Element on Performance Element,
- +: positive (not always quantifiable) impact of the Organizational Element on Performance Element,
- -: negative (not always quantifiable) impact of the Organizational Element on Performance Element,
- - -: strong negative impact of the Organizational Element on Performance Element

[13] Performance Improvement just in Short-Term

[14] Staff Resources and Activities

[15] Reduction of HR Turnover reduces:

- Needed HR, since no additional cautionary employees have to be included in the Sizing of the Spin-off
- Non-Value Added activities, such as training, integration and coordination of new hired, research of external figures, etc.

6.6 Industrial Groups Cluster

6.6.1 Business Model

Cost Reduction

Companies B and I have a common cost structure, characterized by a general low impact of operating costs on total revenues, concerning renewable business; Company B, in fact, boasts a ratio between EBITDA and revenues in the renewable business area higher than both the one in other businesses of its own portfolio and the rest of the sample: in 2011 it reaches in fact more than 72%, and its average on the three years is about 70%. The impact of operating costs on the revenues reaches 80-90% if we take into account the corporate level or the whole energy business; on the other hand, an horizontal analysis among competitors shows that this cluster's performance is over the rest of the sample (see Table 6.25): even the companies of Utilities Cluster show a ratio between 55 and 65%. Some of the reasons that bring to such performances may be researched in the adopted business model.

	A	B	C	D	E	F	G	I	J
EBITDA/ Revenues (Renewables)	62,64%	**72,17%**	46,68%	41,45%	55,78%	31,21%	84,44%[16]	71,18%	76,22%[17]

Table 6.25 – Ratio between EBIT and Revenues for the whole Sample in 2011; Company B presents a particularly high value

The model applied by the cluster can be considered an "hybrid approach" that mixes the economic advantages of "make" and "buy" strategies. About the 30% of Company B's installed capacity comes from acquired projects: 26 MW out of 450 from the merge with a small company and 100 MW from externally authorized projects. While Company I has recently acquired another medium-size utility which has a large portfolio of renewable energy assets, especially in onshore wind energy and biomass. As a result, if compared with vertically integrated companies, for the same output (e.g. installed capacity) Company B and I employ less human resources and internal assets and thus enjoy lower operating costs. However, EBITDA doesn't track also the costs of acquisition of a project or a company; thus, a more precise studies of performances may be conducted if the relation between EBIT and revenues is taken into account; in this case, the cluster's performance presents a worst trend, with a ratio equivalent to about 30% (the first cluster's average value is about 35%), confirming long-term negative impacts on economic performance of a "buy" strategy..

[16] Company G's outperformance in 2011 is contingent, rather than structural: it is due to the sale off of photovoltaic components, panels and modules during the year which generated immediate cash flows. The values in previous years are: 42% in 2010 and 22% in 2009.

[17] This result doesn't mirror real Company I's performance: in previous years EBITDA/Revenues (RES) always remains between 50% and 57%, consistently with the rest of Utilities Cluster.

Increase Revenues and Risk Management

The cluster's revenue model depends on the focalized value proposition offered by the two companies. Both firms, in fact, present a share of revenues deriving from incentives really high, equal to about 70%, as they focus their offer only on traditional business model. Regarding Company B, in particular, it doesn't have a great margin of arbitrariness for increasing its revenues, since it has a value proposition concentrated on those businesses/technologies that guarantee the highest feed-in tariff: *"the 90% of our efforts is from now on allocated on wind, since it assures the highest margin"*. Company B doesn't offer both unconventional business model and those additional or complementary services that generate a revenue free from the uncertainty of incentives, such as ESCO activities, offer of small and medium systems with an immediate return of cash, post-sale services, etc. The Company I's partial better performance may depends exactly on its diversification in some of these supplementary services: *"Company I supports households, not only by providing comprehensive energy saving consulting services, but also in acquiring energy-saving household appliances and low-emission vehicles powered by natural gas. It also provides grants for the acquisition of electric cars when customers sign an eco-power contract"*, particularly by providing packages of services: *"the Group's ability to combine electricity, natural gas and telecommunications into a single package gives it an advantage over the competition" (Company I).* Anyway, also Company I remain mainly concentrated on traditional value proposition, like Company B, since these activities represent a small share of total revenues. As a consequence, even if the cost structure allows the cluster to exploit an higher efficiency, low mono and multi-period performance are caused by the limited revenues, because of business model non-diversification.

Operative Performance

The value proposition focalization and the refusal of the unconventional business model in the renewable business has also an impact on operative performance, as it can partially explain the improvement in installed capacity and energy generation from renewables of last years.

In order to obtaining cash for financing internal projects of both traditional and renewable business, both companies periodically dispose a share of owned plants; as the business model adopted by the firms doesn't consider the sale of renewable plants, in order to obtain the required equity the unique solution is the disposal of traditional installation, i.e. thermoelectric and hydroelectric. In the last year, 2011, Company B sold out about 1,080 MW of thermoelectric plants and a small share of hydroelectric installations. As a result the improvement in its operative performances of 2011 is just apparent, as it is expressed through a relative index: the ratio between renewable installed capacity and total installed capacity is more affected by a reduction of the denominator of about 1,080 MW, than by an increase of the numerator of 60 MW. This explains the improvement in performances of +1.38% for installed capacity and +0.67% for energy generation.

Development Time

For what concerns the development time, Companies B and I suffer for the lack of geographical diversification of their business, even if different contextual variables affect in different ways their performances. Company B, even knowing the bureaucratic problems of its country, decided to focus all its activities in Italy; by analyzing the business plan for the five-year period 2008-2013, it is evident that some goals haven't been reached, as the forecasted installed capacity of wind was 570 MW (against the real 470 MW in 2011). *"Regarding wind, the worse performances have been caused by the adopted approach: we decided starting from the authorization stage, even if we knew that this choice would have exposed us to external risk. […] In Sicily, Calabria and Puglia the local institutions haven't done services conferences for many months and our projects remained in a limbo waiting for the authorization"* (Company B). The operative performances, in term of development time, are thus more affected by the risk if the company can't couple the most adequate business model with the geographical area where it decides to operate; the organic development, that covers the external authorization, isn't suitable for the Italian region where the bureaucracy may cause delays of months, if the priority of the company is increasing the installed capacity. The partial adoption of a downstream-focused business model limited this problem, as in 2010, Company B acquired the control of a 26 MW wind park project in the town of Melissa, in the province of Crotone (Calabria), but as for the forecasted operative performances it still represents a 8% of total additional installed capacity concerning wind business.

As a result, (i) the focalization in a specific geographical area, and (ii) the adoption of an organic development model, exactly in those regions where the slowing down of all bureaucratic procedures is critic, are the main reasons why Company B's operative performances are limited in comparison with both the rest of the sample and Company I. On the other hand, Company I non-diversification doesn't cause such negative effects, mainly because of the differences between Germany and Italy in the execution of the normative procedures of authorization.

6.6.2 Internal Organization

Costs Reduction

The low impact of operating costs on the cost structure may be also caused by the internal structure adopted by the cluster, defined "ambidexterity" by the literature. In fact, it lets the companies exploit different synergies, in particular with the traditional energy business of generation from fossil-fuel sources. In particular, in addition to all centralized staff functions, Companies B and I present a centralization of the stage "Project Development". Company B, in fact, has a central "Engineering" function, common for both renewable and traditional business, while Company I adopts a less formalized structure: depending on the technology and size of the projects, some experts of other departments are included in the development team (e.g. grid management employees for onshore wind). The effects of this approach on operating costs is clear: no external resources are researched, hired and managed for filling the competence gap, but rather internal experts are exploited by more than one business area. At a first glance, it may appear as just a costs saving, but this solution can cause some indirect and induced expenses: (i) the structure adopted by Company B can

be compared with a "matrix organization", where each resource belonging to the "Engineering" function has many different managers as the number of technologies is; consequently, a frequenter communication among the directors of each unit is required, in order to equally and adequately allocate the resources on the projects; (ii) it may remain a partial know-how gap or at least a low specialization of the resources; this may cause costs in term of non-value added activities, such as a slowing down of the projects, higher rate of failing projects, more revisions, more recourse to external consulting services, etc.: *"among the most significant costs of the renewable business unit, there are the costs concerning service agreements with the holding, and then all the costs concerning the development and the operative management of plants. The development costs have always been heavy in the last years (about 35%), mainly because of the external consulting that the business unit research outside the company. […] The development can be considered a critical process, as it is necessary and consistent with our strategy of increasing the installed capacity within 2016, but if conducted in house it causes high expenses" (Company B)*

Risk Management

The application of traditional procedures to the management of renewables increases the inborn risk of this business area. Traditional fossil-fuel based energy generation is in fact really programmable and easy to forecast; the procedures for internal engineering are standardized and characterized by the inertia developed in decades of work. Adapting those processes to renewable business means amplifying its risk because of their rigidity; an example regards the purchase of components and structures: in traditional energy production there is no variability in the price of each component, as the market reached its maturity 20/30 years ago: the improvement regarding thermoelectric turbines is negligible. As a consequence, after the approval of a new thermoelectric project, the purchase of required material follow standardized calculation and procedures, by contacting the few suppliers of upstream sector. Different is the situation for photovoltaic purchase procedure: the price of panels changes month by month and the profitability of the investment is affected by this variability. The decision-taking process is more articulated and requires in advance information concerning the purchase data. The procedures adopted in the renewable business should be more flexible and less standardized. The same could be stated for other internal procedures, actually formalized and shared with traditional business: investment evaluation, project development, etc. The reason why the companies still maintain common processes for traditional and renewable business is the need to keep low costs and to cause the minimal changes to actual organization, because of the low renewable business strategic importance. But in this case, empirical evidence confirms literature regarding organizational inertia's negative impacts on performance (Hannah and Freeman, 1984; Pfeffer, 1992; Chandy and Tellis, 2000; Wüstenhagen and Boehnke, 2008). For instance, a consequence of the adoption of same processes for traditional and innovative business within Company B's business unit is the almost complete exclusion of photovoltaic technology from the renewable portfolio: *"the solar business is fragmented and dynamic; it is the typical business for start-ups or small entrepreneurs, that has a more irrational decisional process. We saw too much uncertainty in the photovoltaic technology and we focused the business on wind, though we*

deprive the company of the revenues coming from a technological diversification. […] Regarding the purchase and the engineering the wind business was more similar to traditional technology and thus more adequate for existing procedures." (Company B).

Development Time

Though at a first glance and according to the literature, the ambidexterity might cause the slowing down of some procedures, in particular regarding the decisional procedure, the empirical analysis shows that no stall or delay are brought about.

Firstly, in fact, even if the companies formally maintained all activities within the original organization, one or more legal societies responsible for renewables exist within the energy business unit. As a result, some procedures may be lightened through the existence of delegation to lower hierarchical levels: *"The director of the development function within the business unit can legally sign some authorizations for small projects and can accomplish some other bureaucratic duties; the advantage is that Company B owns many "corporate vehicles" with operative delegation, even if the great strategic decisions remain centralized."* The resulting procedure isn't thus weighted down by the different vertical passages from the operative to the managerial levels: the internal validation process is for both companies formally equal to the rest of the sample, even if the organizational approach is different, unlike what it may be apparently stated.

Secondly, another frequent theme in literature is the possible inadequate resource allocation within an ambidextrous structure between traditional and innovative businesses, because of the organizational inertia, the psychological and emotive commitment with mainstream business area, the apparent unprofitability of the new field, etc. (Bower, 1970; Christensen, 1997). In Companies B and I's empirical case, scholars' considerations are fully confirmed; renewable business newness and risky bring the top and middle management to a more precise forecast of possible performances, that are revised and adjusted every year or semester; the lack of commitment towards the new business is thus clear in the cautionary targets defined every period: *"the business unit received every year the resources necessary to develop and realize from 30 to 50 MW of installed capacity" (Company B)*. Nonetheless, even if the business unit hasn't experienced a direct and evident resource under-allocation, organizational inertia leads to cautionary forecasts and limited targets: an increase of 30-50 MW per year for Company B represents a percentage growth in installed capacity comprises between 6 and 13%. As a result, negative multi and mono-period operating values are fully on the line to these targets, as shown in Table 6.22: the targets are actually reached, but not because of Cluster's great efforts in new business, but rather because the goals were upstream largely underestimated.

	2009	**2010**	**2011**
Absolute Operating Target (Industrial Plan	+ 40 MW Wind + 20 MW PV and Biomass	+ 50 MW Wind + 15 MW PV and Biomass	+ 60 MW Wind + 10 MW PV and Biomass

2008-2013)			
Absolute Operating Targets (Interview)	+ 30/50 MW	+ 30/50 MW	+ 30/50 MW
Relative Operating Targets (Interview)	+ 7,6/12,7%	+ 7,1/12%	+ 6,3/10,5%
Multi-Period Performance	+ 7,2%	+6,4%	+ 13,97%
Mono-Period Performance	2,69%	1,74%	1,34%

Table 6.26 – Comparison between Operating Results of 2009, 2010 and 2011 and Target values declared by Company B in 2008-2013 Industrial Plan

6.6.3 External Organization

Costs Reduction

Regarding the external organization and its impact on the cost structure, different consideration may be done according to the different type of external organization and aim of the relationship.

As far as the suppliers are concerned, both firms may have adopted a winning strategy, at least for what regard photovoltaic panels providers. *"Company B isn't vertically integrated towards downstream activities (retail sale of photovoltaic systems) and hasn't a great development in solar parks; as a result, it has never considered the possibility of internally produce panels. Furthermore, for these reasons we haven't either had the necessity of creating long-term framework agreements with suppliers: this has been a winning choice as the price of panels decreased: Company B followed month by month the market, obtaining important economic advantages, except for the period between the end of 2010 and the beginning of 2011, in which a bottleneck of some months occurred." (Company B).* In addition, Company B created a specific team within the renewable business unit, responsible for scouting the market and identifying most advantageous supply opportunities. Even if this entails the exploitation of economically better expediencies, the team composed by 10 employees still represents an operating cost (personnel expenses), differential in comparison with the rest of the sample and which negatively affects relative economic performance.

As far as research partnerships are concerned, the dissimilarities in the approaches adopted by the two companies lead to different considerations. Regarding Company B, the lack of an internal R&D unit causes the decrease of internal operating costs: the society only has a testing function with 23 technicians; for the real research activity, in term of basic and explorative research, it exploits Company D's resources, about 2,000 experts and researchers: the outsourced R&D doesn't impact on operative costs. On the other hand,

Company I, is largely committed with both basic and applied research, conducted through both an owned Research Centre for Energy Technology and the relationship with other manufacturing companies.

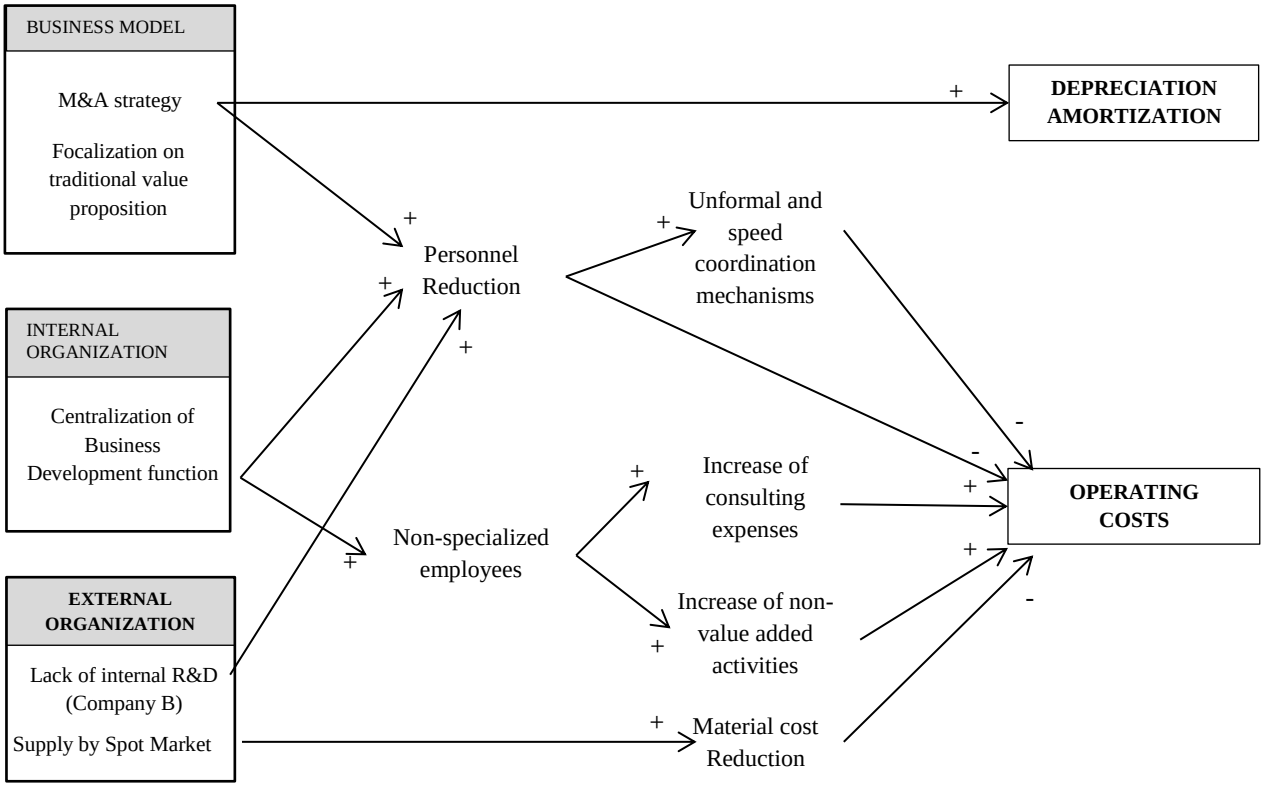

Figure 6.11 - Impacts of organizational dimensions on cost structure

Table 6.27– Synthesis of the impacts of Company-Specific and Cluster-Specific elements on Performance Indicators, for Industrial Groups Cluster

	Operating performance		Economic performance		Comments
	Multi-period	***Mono-period***	***Multi-period***	***Mono-period***	**Cluster-Specific Elements**
B	Medium	Medium	Low	Medium	• **Business Model** +*Multi and mono-period eco*: exploitation of opportunities through a mixed approach between M&A and internal development. - *Multi and mono-period eco*: non-diversification causes a greater exposure to incentive change and revenues reduction. +*Mono-period Oper*.: focus on traditional value proposition and disposal of fossil-fuel based plants increase relative indicators. - *Multi-period Oper*.: lack of geographical diversification limits the access to different technologies and resources.
I	Medium	Medium	Low	Medium	• **Internal Organization** +*Multi and mono-period Eco*: synergies with traditional organization reduce operating costs. - Multi and mono-period Oper.: organizational inertia and low managerial commitment cases cautionary and underestimated renewable targets. • **External Organization** - Multi and mono-period Eco: internal team for scouting market and identifying opportunities entails unjustified greater HR costs.

			1. Cost Reduction															2. Increase Revenues			3. Risk Management								4. Development Time				
			A. Reduction of Structural Costs							B	C	D. Reduction NVA activities						E	F	G	H. Risk conc. Revenues				I. Risk conc. Costs				J.	K.	L.	M.	N.
			A 1	A 2	A 3	A 4	A 5	A 6	A 7	B 1	C 1	D 1	D 2	D 3	D 4	D 5	E 1	F 1	G 1	H 1	H 2	H 3	H 4	I 1	I 2	I 3	I 4	J 1	K 1	L 1	M 1	N 1
5. Business Model	O.	O 1			-	-	-											- -				- -										-
		O 2			-	-	-																					- -				
	P.	P 1						++		- -																		++		++		
		P 2						++		- -																		++				
6. Internal Organization	Q.	Q 1	++	+	+		+	+	+		-			- -															-			
	R.	R 1	++	+	+		+	+	-		-	-		- -															-			
		R 2															-[18]	-[18]	-[18]													
		R3[19]								+	-												+								-	
	S.	S 1	+		+								-																			
7. External Organization	T.	T 1						+								+																
	U.	U 1									+				-								+								-	

Table 6.28- Synthesis of qualitative impacts of Organizational Elements on Hierarchical Performance-Tree, for Industrial Group Cluster. For Elements Codification see Attachments 1 and 5

- ++: strong positive impact of the Organizational Element on Performance Element,
- +: positive (not always quantifiable) impact of the Organizational Element on Performance Element,
- -: negative (not always quantifiable) impact of the Organizational Element on Performance Element,
- - -: strong negative impact of the Organizational Element on Performance Element

Common result for the whole cluster

[18] Shared evaluation procedures lead Top and Middle Management to boost traditional business and to reduce both operative and economic RES targets

[19] Specific just for Company B

6.7 R&D Based Company

6.7.1 Business Model

Cost

The Business Model adopted by Company H has consequences mainly on internal costs level within the division "Energy". If it's clear that between renewable and the core business (oil & gas) may not exist synergies due to external factors, the lack of complementarities also within the "Energy" division is just a consequence of the specific business model adopted, and precisely of the value proposition offered. In some cases in fact, it could be possible to exploit similarities between traditional plants and industrial-scale renewable plants, as Company B states and does, since some stages (purchase, project management, engineering, etc.) are replied in both businesses. On the contrary no resemblances exists with the realization and installation of small-scale plants and traditional plants, as the both technical and managerial elements belong to different worlds. Company H's choice of undertaking only the unconventional business model, doesn't allow the exploitation of any synergy; as a result, technical employees, management tools, managerial roles have to be replicated for traditional and renewable activities, entailing significant acquisition costs.

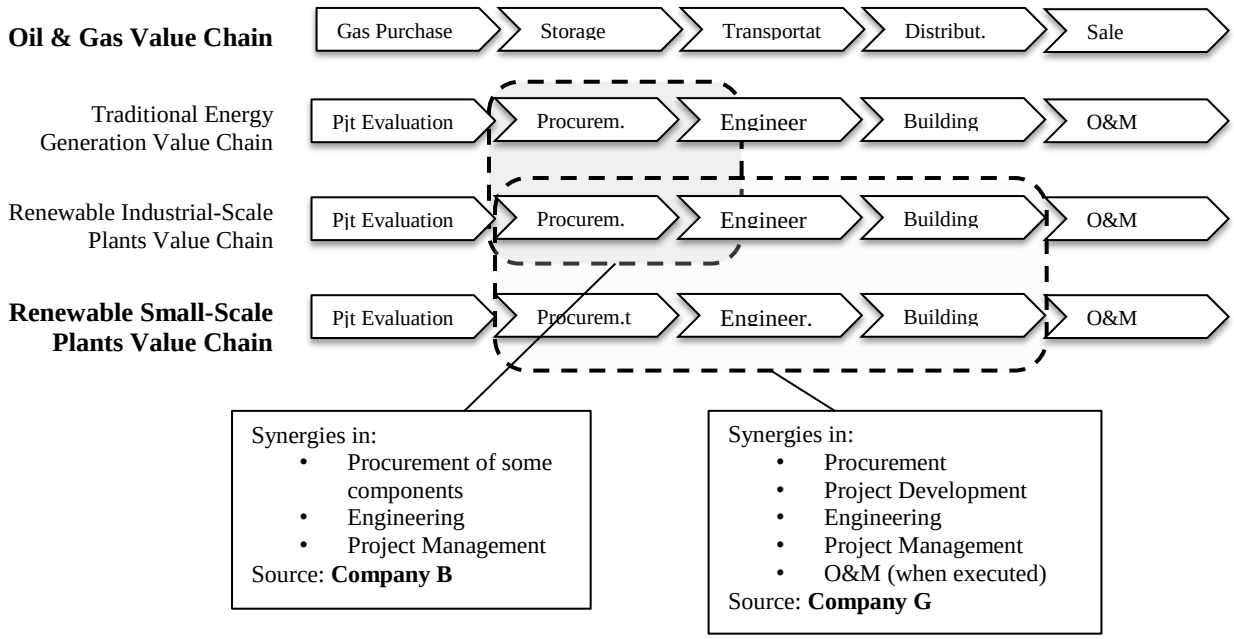

Figure 6.12 – Synergies existing among Traditional and Renewable Energy Generation businesses; no synergy exists with Oil&Gas Value Chain

As far as the vertical integration is concerned, this strategic choice entails important effects on economic performance. Theoretically (Transactional Costs Theory, Williamson, 1987), producing in house photovoltaic panels should guarantee an higher profit, as the supply chain is completely covered by the company and the margin that is usually gained by the supplier along the chain is internally kept. In reality the

diversification in this upstream activity actually represents a loss for the company, as the manufacturing costs aren't competitive in respect with Asiatic producers; this is confirmed also by the other oil incumbents that adopted this kind of business model: for instance, British Petroleum, that established *"the world's largest vertically integrated solar PV firm in 1999 […] recently decided to subcontract solar panel manufacturing to China and India, dismantling the vertically integrated solar firm, and only retain those activities where value can be created"* (Pinkse and Van den Buuse, 2012), and by other European firms specialized just in this stage of the value chain: *"in 2008, for example, sales of European leader Q-cells amounted to 570 MW, although this firm is now challenged by new entrants from China"* (Jäger-Waldau, 2009). Furthermore, in this kind of business the cost competitiveness can be achieved through a large-scale production; the capacity of Company H's manufacturing firm is just 30 MW, and it's not even comparable with the one of European specialized solar cell producers, i.e. Q-Cells, First Solar, Suntech and Sharp (REN21, 2009), and even less with Chinese and Indian manufacturing firms. This confirms the unprofitability of all upstream activities concerning cells and modules, insomuch as Company H itself *"progressively shifted its activities in last years from cells and modules manufacturing to panels and photovoltaic system commercialization, due to the low margins they guaranteed".*

Anyway, the strategic choice of maintaining a vertical integration is more due to brand and image reasons, rather than economic convenience. Company H is, in fact, one of the first Italian cells and panels manufacturer, active since 2006. Keeping this activity in house means for the company to maintain the image of "environmentally sustainable" society which it tried to build up in this decade. Furthermore, in comparison with its whole business, the losses caused by renewable vertical integration still remains acceptable.

6.7.2 Internal and External Organization

Cost and Development Time

The level of costs is mainly influenced by the internal organization adopted by the company. Company H, for the contingent and strategic reasons already expressed above, decided not to split out the business in an ad hoc organization, but rather to manage it within an internal business unit, separated from core activities but shared with traditional energy generation. This is the solution adopted by similar incumbents of the oil & gas business that try approaching the renewables, such as British Petroleum and Shell (Pinkse and Van den Buuse, 2012): the two incumbents share with Company H *"the view that solar technology is disruptive and lacks intra-firm complementarities to gas and oil activities. Therefore, these firms built their renewable divisions outside core business activities (Bower andChristensen,1995), […] through separate business divisions detached from the fossil-fuel supply chain (Shell Renewables and BP Alternative Energy)".* This approach implies different effects on the costs structure of the company. First of all, no duplication of administrative and staff roles is necessary within this kind of structure: this is one of the main strong points of a structure containing more business units, compared with an holding with many separated subsidiaries, since there is no multiplication of CEO, CFO, COO, administration board, etc.

As far as competences and HR are concerned, also external organization has to be analyzed. The lack of internal competences, in fact, regarding renewables required the creation of an external network of relationships in an Open Innovation approach. Nonetheless, this kind solutions causes some practical problems that required the creation of internal roles responsible for controlling and directing the research activities. The greatest difficulty in leaving in outsourcing the R&D is connected to the impossibility of finding a unique interlocutor within the partner, i.e. university or research center. In particular, each professor or technical expert is skilled for his/her specific field and can't consider the element of the technological problem if they lie outside from this area of study. It is thus necessary for Company H to have an internal figure responsible for splitting the problem in under-problems, for identifying within each partner the competences for a specific under-problem and then for assigning them. By adopting this disaggregate approach, it is necessary a person that maintains an holistic vision of the entire technological matter. This has two impacts on economic performance: (i) the creation of internal specific resources entails new costs, essential for an effective R&D process, whether these people are researched outside the company, or they are reallocated from other traditional jobs, which represents Company H's most frequent approach; in this second case, in fact the resulting reallocation expenses are higher in comparison with the rest of the sample: the displaced figures were in fact active in completely different sectors and owned capabilities which could not be adapted to renewable business. As a result, the company experiences high costs due to training, coaching, non-value added activities caused by the adaptation of the new roles, etc.

In addition to HR aspect, in order to successfully exploit the know-how matured outside company's boundaries concerning a completely different business, H had to develop new internal processes and competences, necessary for knowledge management: even if the company had already adopted an open approach before renewables introduction, now it has to adapt the competences and the processes necessary for managing existing relationships with universities in a new sector. This adaptation implies long implementation time and consequent returns delay: for instance, the relationship with MIT hasn't entailed any economic revenue yet, as the developed technologies couldn't be immediately commercialized by the company; in particular, since Company H wasn't able to internally manage the knowledge developed by the American University converting it in a feasible solution, it required the consulting of another institute, Politecnico of Milano; this solution causes both economic and operating negative effects: (i) by involving third parties for further activities, the company lengthen the time-to-market and defers possible revenues, (ii) the company has to incur the consulting costs of additional studies; as a result, against an investment of about 800.000 € for the development of mirror technology, Company H hasn't generated any revenue yet.

Risk

The delay in commercializing the developed technologies could be a strategic decision, besides an inability. In this way, in fact, Company H can maintain a low risk degree: for instance, the choice of a non-commercialization of developed CSP technology could be motivated by the need of avoiding the risk concerning the installation of a radical new technology. Furthermore, this choice is consistent with Company

H's general renewable strategy: renewables have always been considered a "Support business" to core business, which allows to maintain an image of "green company" and would not justify a great and risk investment.

Furthermore, the approach adopted by Company H is largely influenced by some firm-level contingent factors, which strongly reduce research risk. First of all, in fact, thanks to its image in many countries, leadership and financial resources, Company H could create a worldwide network of strong partnerships with center of excellence and solid universities (e.g. MIT, Politecnico of Milano, etc.). Secondly, agreements are characterized by a strong involvement and consolidated relationships, thanks to the history of the company: the relationship with Politecnico has lasted for instance since more than ten years ago; this contributes to reduce the volatility of the relationships and to increase the commitment and thus the probability of rapid returns. Furthermore, the company can save time and costs concerning partnership research, frequent coordination, consolidation of the relationship, etc.

Another element regarding external organization affects risk management: the type of partners. *"Company H never acquire start-ups or participate to Venture Capital, even if it considered and evaluated the two possibilities. […] Even if the small start-up may develop innovative technologies, it is too risky for the company to acquire it, also because, the small start-up usually propose itself to great incumbents when it want to pass to a large-scale production (otherwise it would address just to investment funds) and this is not the company's strategy."* Company H prefers creating joint ventures with incumbents of other industries in order to share the risk, like the one created in 2011 for the production of Butadiene from renewable sources with Novamont, leader in bio-plastic production. This strategy is applied by other oil and gas firms: Shell entered two joint ventures with incumbent firms in 2006, Shell–Saint-Gobain joint venture, and in 2002 with Company E and Siemens; Total created different joint ventures with incumbent firms from electic utilities, such as GDF Suez in Photovoltech and Company D in Tenesol. As a result, *"this cross-industry collaboration between an oil and gas firm and electric utilities illustrates that incumbents from both industries not only perceive their investments in solar ventures as mutually beneficial, but are also uncertain about the prospects of the solar business and therefore prefer a form of risk sharing*." (Pinkse and Van den Buuse, 2012).

Revenues

The internal structure adopted by Company H has an influence, not directly on the revenues level, but rather on its perception by top management. Isolating renewables activities from core business, but keeping them within the mainstream organization, *"might have planted the seed of eventual failure and/or divestiture"* (Pinkse and Van den Buuse, 2012) in Company H, so as in other oil and gas incumbents such as Shell and British Petroleum. Adopting a structural ambidextrous organization, in fact, implies that all staff activities and tools remains the same for both innovative and core business units. One of the most important support areas is Finance and Control, since from this function derives the data necessary for the economic evaluation of the business unit. The tools adopted by the CFO to evaluate business performances didn't changed within

Company H after the introduction of renewables in the business portfolio, exactly because it decided not to create a separate spin-off; as a result the innovative business experiences precisely those problems of underestimation and wrong evaluation identified by the literature regarding ambidexterity. The same happens for the other oil & gas incumbents: *"As a separate business unit, it seems difficult for solar to survive in an oil and gas firm when subdued to the same performance targets as highly profitable fossil fuel-oriented business units, operating in a mature market. This problem has become larger overtime, because a solar business involves investing in a relatively R&D intensive emerging technology, while performance targets in the oil industry have increasingly emphasized short-term shareholder returns"* (Grant, 2003; Pinkse and Van den Buuse, 2012). As a result, the new business is seen as low-profitable by top management, partially because it is analyzed with the same reference points of traditional business.

Table 6.29– Synthesis of the impacts of Company-Specific and Cluster-Specific elements on Performance Indicators, for R&D based Cluster

	Operating performance		Economic performance		Comments
	Multi-period	***Mono-period***	***Multi-period***	***Mono-period***	**Company-Specific Elements**
H	Very Low	Very Low	Very Low	Very Low	• **Business Model** - *Multi and Mono-period Eco*: focus on small-scale photovoltaic plants causes no synergies and no economies of scale. - *Multi and Mono-period Eco:* vertical integration results disadvantageous for the company and responds just to image goals. - *Multi and Mono-period Eco and Oper.:* the culture of renewables as just a "support business" reduces commitment, financial and human resources, competences and consequent economic and operative performance. • **Internal Organization** - *Multi and Mono-period Eco*: adoption of common (between renewable and traditional business) KPIs for business evaluation results inadequate and ineffective. - *Multi and Mono-period Eco*: need of creating new internal processes for managing external knowledge - *Multi and Mono-period Oper.*: skill and competence gap due to the allocation of people employed in traditional business on renewables. - *Multi and Mono-period Eco and Oper.:* additional consulting activities (to external R&D left in outsourcing to research centers and universities) for obtaining marketable solution because of the lack of internal processes, tools and competences. - *Multi and Mono-period Eco:* the low commitment leads to the will of keeping a low risk and thus to the non-commercialization of potentially advantageous innovative technologies. • **External Organization** + *Multi and Mono-period Eco and Oper.*: worldwide consolidated network of partnerships thanks to company's brand, history and image.

			1. Cost Reduction														2. Increase Revenues			3. Risk Management								4. Development Time				
			A. Reduction of Structural Costs							B	C	D. Reduction NVA activities					E	F	G	H. Risk conc. Revenues				I. Risk conc. Costs				J.	K.	L.	M.	N.
			A 1	A 2	A 3	A 4	A 5	A 6	A 7	B 1	C 1	D 1	D 2	D 3	D 4	D 5	E 1	F 1	G 1	H 1	H 2	H 3	H 4	I 1	I 2	I 3	I 4	J 1	K 1	L 1	M 1	N 1
5. Business Model	O.	O 1	-		- -	- -	- -	- -																							
	P.	P 1							- -		- -					+																
6. Internal Organization	Q.	Q 1		++																											
	R.	R 1													- -																- -
		R 2															-[20]	-[19]	-[19]													
7. External Organization	S.	S 1																					+		++						
	T.	T 1						-[21]															+								- -	

Table 6.30 - Synthesis of qualitative impacts of Organizational Elements on Hierarchical Performance-Tree, for R&D Based Company. For Elements Codification see Attachments 1 and 6

- ++: strong positive impact of the Organizational Element on Performance Element,
- +: positive (not always quantifiable) impact of the Organizational Element on Performance Element,
- -: negative (not always quantifiable) impact of the Organizational Element on Performance Element,
- - -: strong negative impact of the Organizational Element on Performance Element

[20] Results are evaluated with the same tools and indicators of traditional business by CFO; RES is thus perceived to be disadvantageous

[21] Company H created new internal roles for controlling and directing external research

7. Conclusion

At the end of this study, it could be useful and interesting to analyze in a general picture both the contributions brought by the applied framework to (i) up-to-date current literature and to (ii) energy incumbents which in praxis introduce renewable sources in their energy portfolio, and their possible limits which open the doors to further future analysis.

7.1 Theoretical Contribution to Literature State of the Art

This thesis was born on the basis of some gaps in scholarly literature concerning the Incumbent's Curse and its application in the energy sector.

By firstly considering generic multi-industry literature on the Incumbent's Curse, few scholars have in fact provided an holistic analysis on the phenomenon, by jointly considering contextual variables causing the curse, the incumbent's peculiar problems, possible problem-solving approaches and their impacts on corporate performance. On the contrary, just one or at the most two out of these three aspects are explored in more depth in wider studies, by isolating it and without considering its possible interaction outside the adopted framework: Christensen (1997) explains the Incumbent's Curse by linking resource dependence theory to a firm's internal resource allocation process, Chandy and Tellis (1998, 2000) identify causes, a possible antithetic thesis for confuting the phenomenon and resulting successful organizational approaches, while Hill and Rothaermel (2003) focus on the organizational factors which moderate the incumbent's decline following the arrival of a radical innovation in technology. Those authors who indeed provide a comprehensive analysis (Chiang Jin-ying Liu, 2009), limit it to a theoretical review of previous works, without including further empirical results. On the other hand, this thesis starts from ten empirical case studies and highlights the following: at the beginning, contextual variables have been collected and then their linkage with actual structures has been evaluated; finally, starting from multi-period and mono-period performance, we defined organizational and strategic levers which mainly affect four key sub-goals: revenues increase, costs reduction, development time decrease and risk management.

Furthermore, by widening the perspective specifically to energy industry, this study may bring two other contributions to current literature.

Firstly, general energy literature and particularly papers about renewables don't provide any holistic contribution to the Incumbent's Curse; the phenomenon itself is in fact not widely considered by authors of energy field[22].Furthermore, even those scholars who deepen the theme offer a limited work if compared with our aim, since they (i) don't consider in a sole analysis the influencing contextual variables, the solving business model, the adopted organizational approach and impacts on performance, (ii) don't provide an empirical overview on the renewable sector.

[22] Shilling and Esmundo (2009) indirectly provide contributions concerning Incumbent's Curse, Wüstenhagen and Menichetti (2012) analyze energy incumbents' incentive/disincentive in investing in renewables, Richter (2012) provides an overview on business models adopted by great utilities while facing RES technologies.

Secondly, there is a general lack of organizational studies concerning specifically energy and the renewable sector. This study, by considering different strategic and structural approaches adopted in the renewable field and their impact on performance, offers an empirical widening to organizational theory. In particular, interesting outcomes are provided concerning two key themes:

- **Open Innovation**: this thesis contributes in the analysis of the impact of the just partial adoption of the Open Innovation paradigm. In literature, a few papers aim at estimating economic performance coming from the general adoption of the Open Innovation model (Lichtenthaler, 2009; Inauen, 2011; Von Hippel, 2007, 2009), and scant contributions concern the changing process from Close to Open Innovation (Chiaroni et al., 2010). Nonetheless, there is a wide scholastic gap concerning two aspects, which are even more interesting in this specific case: first, no recent quantitative works make explicit the impact of these approaches on a firm's expenses, and secondly there are no contributions about the effects of a partial adoption of the model and about the evolution of a firm's economic results from open innovation implementation to its maturity. This work herein provides evidence about the negative results coming from an incomplete Open Innovation paradigm in the renewables field, which involves just inter-organizational networks, but doesn't touch internal organizational structures, evaluation processes and knowledge management .systems[23].
- **Joint Venture**: a wide stream of literature focuses in fact on factors influencing joint venture performance. A recent trend traces back JV success to a list of elements, i.e. bargaining power, commitment, control, trust, conflict, co-operation, cultural distance, justice, goal compatibility and conflict resolution mechanisms (Reus and Rottig 2009; Ren et al., 2009; Christoffersen, 2012). Nonetheless, no contributions concerning the relative importance and weights of these factors have been provided, in particular in energy industry. By analyzing Company G's JV failure, co-operation factors have a stronger and more significant impact on final performance, and it emerges that co-operation factors have a stronger and more significant impact on final performance than all other aspects identified in literature.

7.2 Practical Contribution

This study may provide two main practical contributions, concerning on the one hand the form of adopted framework, and on the other hand empirical contents.

First of all, in measuring the effectiveness of renewable energy approaches, this thesis starts from a framework which provides a useful basis for company evaluation. Among various alternatives, the adopted model[24], both based on scholar contributions and on empirical suggestions, has demonstrated values by capturing and representing the most significant key factors and relationships. An implemented framework may thus be useful as it identifies the pivotal elements involved in renewable management belonging to the

[23] See Chapter 6 "Discussions", concerning Company F's External Organization. (Pag. 195)
[24] See Chapter 3 "Framework"

three categories: (i) contingent and organizational factors which may affect future approaches, (ii) strategic and organizational models adopted to manage renewables, and (iii) key performance variables for measuring both economic and operating effectiveness in managing renewables. On the other hand, the framework focuses on three key relationships, which may explain the effectiveness and the success of managing RES, without deflecting attention on non-pivotal mechanisms.

As far as the core contents of the thesis are concerned, from a practical point of view the most useful empirical results concern the relationship between approaches and performance (R4). In particular, this work offers a relatively wide basis of organizational approaches adopted by energy utilities to manage renewables, and their respective impact on performance variables. Key results may be summarized following context-approach clustering:

- **Ex-monopolists** enjoy a wider basis of complementary assets, mainly due to a longer corporate history and which are concretized in greater financial and human resources, know-how, competences, stronger brand and image, etc., incomparable with the rest of the sample. The resulting approach is clearly influenced by firm-level starting conditions: ex-monopolists may face renewables worldwide and by creating ad hoc autonomous subsidiaries. Key differences within the cluster concern the ways in which the companies are led to the same current approach:
    - Company A gathered all renewable resources and assets spread in those countries where it was present and then listed the new company on Borsa Italiana; as a result, it actually enjoys a wide-ranging know-how and a complete autonomy.
    - Company D's current renewable spin-offs derive from M&A strategies, chiefly driven during the last decade; current structure is thus completely fragmented in several subsidiaries, one for each renewable value proposition (i.e. industrial-scale plants, retail small-scale installations, energy efficiency services), which don't speak to each other without exploiting significant synergies.
    - Companies E and J separated an internal business area, following the canonic way to the spin-off; thus they are still suffering the rigidity of traditional organization, especially Company E regarding decisional stages, projects approval and financing.
- **Italian multi-utilities** generally enjoy their strong relationship with referential territory; in particular, this is an Italian peculiarity which allows Companies C and F to have a powerful brand and image both with local customers and with authorities, the owners of important renewable processes. Companies' strategic choices are always consistent with their territorial vocation, insomuch as in some cases "social and environmental responsibility" becomes a goal or even a constraint rather than a corporate value; for instance, Company F accesses the retail market ~~just~~ only for ethical reasons causing highly negative economic results.

  Another important peculiarity concerning this cluster is the strong portfolio diversification which furthermore allowed companies survival during the whole century: if C and F hadn't had the local leadership in waste treatment, water and environment services, they would never have coped

successfully with energy colossuses. This portfolio diversification affects the strategic and organizational approach to face renewables: photovoltaic and biomass areas are always considered the natural complement to existing value propositions and never enjoy adequate autonomy; this is apparent in particular in (1) evident limitations concerning decisional processes and in (2) a forced focalization of renewable business: C and F have a low technological and geographical diversification and are always concentrated on a specific market niche. From an economical point of view, this is translated in (1) a higher risk, (2) lower exploitation of economies of scale and learning. On the other hand, from an operative point of view, the ethical relationship with local territory becomes an opportunity; for instance, it speeds up development processes since shareholders and stakeholders often coincide in a unique entity, overcoming those problems known as "Shareholder Theory".

- **Diversified companies** approach renewables by adapting existing structures and procedures to the new business. The commitment of Companies B and I in RES technologies is in fact quite low and this concretizes in the adoption of the so called "ambidextrous model": the same organization contemporarily pursue opposite goals, concerning in this case both fuel-based and alternative sources-based businesses. In particular, the two areas are managed within the same legal entity, but in two different business units. Many procedures, human resources and competences are shared between traditional and new business, both concerning support and primary processes. Regarding support activities, it is quite usual within the sample to share procurement, finance, legal activities, etc.; nonetheless Companies B and I also share some other staff procedures, i.e. performance evaluation, risk monitoring, etc. which are usually considered business-specific. Another important difference compared to the rest of the sample concerns primary processes: Companies B and I are the unique companies which share primary processes between fuel-based and RES technologies, for instance in particular Plant Engineering. Furthermore, the lack of managerial commitment in alternative sources concretizes in a strong focalization: no diversification concerning technology, country or value proposition has been evaluated; companies B and I are both focused on wind and photovoltaic industrial-scale plants for internal management, respectively in Italy and Germany.
  By analyzing the impacts of this approach, it can be stated that ambidexterity positively affects costs, since the two societies enjoy a share of operating costs below the average (less than 30% compared to revenues), but negatively impacts economic and operating effectiveness: both revenues and installation increase are quite limited in the last two years (respectively less than 3% and 13%).
- **Company G** represents an isolated case, mainly because it was recently created and it is private and non-listed. Its brief history has two main impacts on actual structure and performance: (1) it has a strong commitment in renewables, since the top and middle management don't represent an obstacle to innovation, as happens for many other incumbents; (2) the company doesn't enjoy any complementary assets, in term of networks, relationships with authority, brand, know-how, etc. As a result, in order to survive within the market, it is actually focused on short-term performance.

- **Company H** starts from a completely different business portfolio and history. It has been included in the sample to provide a more wide basis for considerations, but it deserves a separate analysis because: (1) renewable business is considered just a support area, and managerial levers have a particular low commitment in this technology; as a result the company allocates renewables in a business unit included in the Energy spin-off: this causes all resource allocation problems typical of the incumbent's curse; (2) it is exclusively focused on R&D activities, by exploiting relationships and partnerships created for the traditional business; nonetheless, the lack of competences requires further external consulting and consequently longer development time and higher costs, as the company itself is not able to commercialize the new solutions.

7.3 Future Research

Empirical analysis highlights how organizational theory for the renewable sector, its contextual causes and corporate implications are highly significant and well worth studying, but at the same time underlines a number of avenues for future further research. In particular, even if the adopted approach extends and integrates previous knowledge on the theme, there are limitations to the method taken here, which could become areas for further work.

First, qualitative analysis always provides a partial view of reality, and rather should be completed with a quantitative study. Nonetheless, the second kind of analysis necessarily needs a wide sample of significant organizations, which is actually unavailable in the renewable energy industry for two main contextual factors:

1. The energy market was liberalized less than 15 years ago in the three considered countries (i.e. Italy, Germany and France), after a monopoly that had lasted about half a century; as a result, the number of possible incumbents which could be included in the sample is limited to municipalized multi-utilities, which resisted the nationalization process, and to the scant number of companies which accessed the market in the relatively brief span of time between liberalization and today.
2. From both industrial and technological points of view, renewables are still immature and just a few companies have already invested a significant amount of effort in them. RES low development is partially a consequence of point (1): during the nationalization stage, monopolists weren't incentivized to introduce radical innovation which at the beginning may have higher costs and provide negative profits, since no "new entrants" could have threatened their positions.

Nonetheless, according to many experts (Wüstenhagen, 2012; IPCC, 2011a; IEA, 2009b), renewables represent an emerging and quickly developing industry; it is expected that "global investments in renewable power generation technologies will range from USD 1,360 to 5,100 billion in this decade, and from USD 1,490 to 7,180 billion in the decade 2021–2030, with the higher values being consistent with a stabilization of CO2 concentration at 450ppm" (Wüstenhagen, 2012).

Consequently an even greater number of EU companies is actually investing in these technologies and could represent a basis for future research samples. In a way then, further studies may benefit from improved data availability due to the higher maturity of the renewable energy industry, and thus provide a mathematical basis for present results.

Moreover, RES are actually getting a foothold in many emerging countries, like South America, Africa and Eastern Europe, mainly because of "outside-in intrusion" by American and EU energy colossuses. Future research should pay more attention to localization and delocalization issues by considering plants location an important contextual variable.

For the same reasons, in a few years it could be possible to evaluate companies' long-term performances: this present work considers in fact long-term economic impacts of current strategies and structures just on a theoretical point of view, because of an evident lack of available data already illustrated in more depth above. A long-term evaluation could be particularly useful to understand holistically the impacts of those strategies which apparently seem to be focused on short-term horizons: for instance, it could be interesting to carry out an in-depth analysis of the effects of Company G's strategy on economic and operating performance in a few years.

Finally, on a methodological point of view, this thesis provides a general framework aimed at investigating three kinds of relationships[25] concerning the overcome of the incumbent's curse in front of a new technology in the energy industry.

This framework could be thus adopted for future research in similar fields where the incumbent's inflexibility actually represents a significant and real obstacle to innovation; some possible future applications may concern the development of electrical autos by automotive incumbents, which try to face a completely new and disruptive technology, after a century of fuel-based engines.

[25] See Chapter 3 "Framework"

Attachments

Attachment 1: Performance-Tree Codification

Code	Element
1.	***Costs Reduction***
A.	**Reduction of Operating Costs**
A1	Exploitation of synergies with mainstream organization
A2	Exploitation of synergies in staff activities
A3	Exploitation of synergies in operative activities
A4	Exploitation of economies of scale
A5	Exploitation of learning economies
A6	Reduction of Resources
A7	Reduction of purchasing costs
B.	**Reduction of Contingent Costs**
C.	**Reduction of Capital Costs**
D.	**Reduction of "Non-Value Added" activities**
D1	Red. Training and Coaching
D2	Red. Integration of new subjects
D3	Red. Coordination of internal units
D4	Red. Coordination of external entities
D5	Red. Transaction costs
2.	***Increase Revenues***
E.	**Increase Incentive component**
F.	**Increase Incentive-free component**
G.	**Increase Market Share**
3.	***Risk Management***
H.	**Risk concerning revenues**
H1	Risk concerning availability of natural resources
H2	Risk of change in energy prices
H3	Risk of change in incentives
H4	Increase of Operating Lever
I.	**Risk concerning costs**
I1	Risk of bureaucratic procedures
I2	Risk of managing external subject
I3	Risk of change in interest rate
I4	Risk of finding financing resources
4.	***Development Time***
J.	**Reduction of Time necessary for internal procedures**
K.	**Reduction of Time necessary for external authorization**
L.	**Reduction of Time necessary for operative activities**

M.	**Reduction of R&D Time**
N.	**Reduction of Time for finding financial resources**

Attachment 2: Codification of Strategic and Organizational Approach Adopted by Utilities Cluster

Code	Element
5.	***Business Model***
O.	**Value Proposition**
O1	Value Proposition diversification in traditional and unconventional
O2	Technology diversification
O3	Multi-country diversification through centralization
O4	Multi-country diversification through centralization of engineering&construction
P.	**Management of the value chain**
P1	Organic internal development
P2	Co-development with acquisition of opportunities
P3	Acquisition of Authorizations
P4	Acquisition of plants
P5	M&A
6.	***Internal Organization***
Q.	**Structure**
Q1	Renewable Spin-off with complete autonomy
Q2	Renewable Subsidiary
Q3	Traditional V.P. Subsidiary + Unconventional V.P. Subsidiary + ESCO Subsidiary
R.	**Hierarchy and Processes**
R1	Complete autonomy in investment decision
R2	Flexibility until a defined threshold
R3	Formalized procedures for investment decision
S.	**Human Resources**
S1	Reallocation of internal figures
S2	External Acquisition
7.	***External Organization***
T.	**Industrial External Partners**
T1	Shopping Around Model
T2	Long-term agreements
T3	Vertical integration through JV
U.	**Collaboration with local companies**

Attachment 3: Codification of Strategic and Organizational Approach Adopted by Multiservice Cluster

Code	Element
5.	***Business Model***
O.	**Value Proposition**
O1	Focus on Traditional Value Proposition
O2	Unconventional Value Proposition just in Retail Market (Company F)
O3	Unconventional Value Proposition with PV Industrial-Scale Plants disposal (Company C)
O4	Geographical Non-Diversification
O5	Technological Low Diversification
P.	**Management of the value chain**
P1	Acquisition of Authorizations
P2	Outsourcing of operative activities
6.	***Internal Organization***
Q.	**Structure**
Q1	Subsidiary within a Multiservice Holding
R.	**Hierarchy and Processes**
R1	Lack of Internal R&D
S.	**Human Resources**
S1	Reallocation of internal figures
S2	External Acquisition
7.	***External Organization***
T.	**Industrial External Partners**
T1	Agreements with EPC Companies
T2	Relationships with Credit Institutions
T3	Consolidated Relationships with Local Authorities
U.	**R&D External Partnerships**
U1	Partial Open Innovation Approach

Attachment 4: Codification of Strategic and Organizational Approach Adopted by Private Non-Listed Company

Code	Element
5.	***Business Model***
O.	**Value Proposition**
O1	Value Proposition Diversification
O2	Geographical Diversification
O3	Technological Diversification
P.	**Management of the value chain**
P1	Outsourcing of operative activities
P2	Outsourcing of installation activities for Retail Market
6.	***Internal Organization***
Q.	**Structure**
Q1	Autonomous Spin-off
Q2	Many small vehicle subsidiaries
R.	**Human Resources**
R1	Reallocation of internal figures
R2	External Acquisition
7.	***External Organization***
S.	**Industrial External Partners**
S1	Agreements with EPC Companies
T.	**R&D External Partnerships**
T1	Partial Open Innovation Approach

Attachment 5: Codification of Strategic and Organizational Approach Adopted by Industrial Group Cluster

Code	Element
5.	***Business Model***
O.	**Value Proposition**
O1	Focus on Traditional Value Proposition
O2	Geographical Non-Diversification
P.	**Management of the value chain**
P1	Acquisition of plants/M&A
P2	Acquisition of Authorizations
6.	***Internal Organization***
Q.	**Structure**
Q1	Business Unit within existing Structure
R.	**Hierarchy and Processes**
R1	Shared operative processes (e.g. Engineering) with traditional Organization
R2	Shared evaluation/resource allocation procedures with traditional Organization
R3	Lack of Internal R&D processes and structures
S.	**Human Resources**
S1	Reallocation of internal figures
7.	***External Organization***
T.	**Industrial External Partners**
T1	"Short-Term" Agreements with suppliers
U.	**R&D External Partnerships**
U1	External R&D Network with Universities/Research Centers

Attachment 6: Codification of Strategic and Organizational Approach Adopted by

5.	***Business Model***
O.	**Value Proposition**
O1	Focus on Unconventional Value Proposition
P.	**Management of the value chain**
P1	Vertical Integration (manufacturing of PV panels)
6.	***Internal Organization***
Q.	**Structure**
Q1	Business Unit within existing Structure
R.	**Hierarchy and Processes**
R1	R&D Additional Processes (Further External Consulting)
R2	Shared evaluation/resource allocation procedures with traditional Organization
7.	***External Organization***
S.	**Industrial External Partners**
S1	Joint Ventures with other Incumbents
T.	**R&D External Partnerships**
T1	Partial Open Innovation

R&D Based Company

Attachment 7: Semi-structured questionnaire submitted to the interviewed figures of the ten companies of the sample

1. Traditional Business Model

- Which was the traditional core business?
- With which business model was it managed?

2. Introduction of Renewables

- When did the Company the first investments/activities in the business of renewables?

- Business Model:

With which Business Model did E.On enter this market?

Value proposition:

Are the wind, solar and biomass plants authorized, developed, constructed and managed by the Company or does the company leave any phase in outsourcing?

Does the Company always manage the plants or let them to third parts? Why?

Which phases of the value chain permit the Company to obtain more value and why (Scale, specific know-how, complementary assets, etc.)?

Which pro and cons (costs and benefits) may have this business model?

Does the Company sell small photovoltaic plants for rooftops? With which structure (specific spin-off, centralized/ decentralized business unit, franchising installers, etc.)?

Does the Company operate also as Energy Service Company (ESCO)? With which structure?

Which are the pro and cons of being active in this specific business area?

Revenue Model:

Which impact have incentives on Company s total revenues (for the different type and dimension of the plants)?

- Organizational Structure:

Structure

With which organizational structure did the Company introduce renewables?

Which costs are really important in the Company's organizational structure? Could you provide evidence?

Which are the main pro and cons of this structure (synergies, costs, development time, etc.)?

Is it possible to exploit specific synergies (in upstream and downstream activities) within the structure? Could you provide evidence?

Which are the most critic processes? How did the Company solve these problems?

Human Resources

- Main roles: project manager, technicians etc.
- Necessary competences
- Research and selection methods: new personel, reallocation of existing roles, etc.
- Reward mechanisms: new mechanisms for the eveluation (short or long time, ex-ante or ex-post, etc.)

What kind of impact have the new roles created for the management of renewable activities on the cost structure and on the effectiveness of the processes?

- External Networks

Industrial Partners

- Number and type of the partners
- Aim of the relationship: exploration, development, etc.
- Level of commitment: strategic partnership, M&A, Joint Venture etc.

Universities and Research Centers

- Number and type of the partners
- Aim of the relationship: exploration, development, etc.
- Level of commitment

What pro and contra may have these solutions, in term of:

- Costs (management of the relationship, etc.)
- Development time
- Ability of implementing and commercializing the new solutions

How many pilot projects and patents obtained the company in the last years?

3. Performance variables

Economic and Financial Performance:

		2011	2010	2009
Energy	**Revenues**			
	EBITDA			
	EBIT			

Renewables (without hydroelectric)	**Revenues**			
	Share of revenues from incentives			
	EBITDA			
	EBIT			

Operating Performance:

		2011	2010	2009
Installed Capacity	**Thermo**			
	Hydro			
	Renewables			
Generation	**Thermo**			
	Hydro			
	Renewables			

4. Contextual Variables

Variables:

Which contextual variables (firm level, market level and technology level) may influence Company's organizational approach and economic performance?

- Firm level: company's age, dimension, history, location, etc.
- Market level: incentives, problem in the authorization process, etc.
- Technology level: development of distributed generation, etc.

Is the company adopting a structure, in order to protect itself from these specific risks?

References

Adler, P., Goldoftas, B., and Levine, D. (1999). Flexibility versus efficiency? A case study of model changeovers in the Toyota production system. *Organization Science*, 10, 43–68.

Aghion P. (2009) The effects of entry on incumbent innovation and Productivity. *The Review of Economics and Statistics*. 91(1): 20–32

Aiken M. and J. Hage, (1971) The Organic Organization and Innovation, *Sociology*, 5, 63-82.

Avlonitis, G.J., Kouremenos, A. and Tzokas, N. (1994), "Assessing the innovativeness of organizations and its antecedents: Project Innovstrat", *European Journal of Marketing*, Vol. 28 No. 11, pp. 5-28.

Bauer, R.A. (1960). Consumer Behavior as Risk Taking, in Dynamic Marketing for a Changing World, R.S. Hancock, ed.Chicago: *American Marketing Association*, 389-98.

Blind K. (2012) The influence of regulations on innovation: A quantitative assessment for OECD Countries *Research Policy,* 41, 391– 400

Bolinao E. N. (2008) A framework for Analysis of Ambidexterity and Performance in Small-to-Medium-Sized Firms, *DLSU Business & Economic Review*, 17, 99-110.

Bower, J. (1979). Managing the resource allocation process. Boston: Harvard Business School Press.

Brown S. L. and Eisenhardt K. M., (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations, *Administrative Science Quarterly* , vol. 42, pp. 1–34.

Burgelman R. A. (1994). Fading memories: A process theory of business exit in dynamic environments. *Administrative Science Quarterly*. 39, 24-44.

Burgelman, R.A. and Grove, A. S. (1996). Strategic dissonance. *California Management Review*, 32, 8-28.

Calantone, R.J. and Stanko, M.A. (2007) Drivers ofoutsourced innovation: an exploratory study. *Journal of Product Innovation Management*, 24, 230–241.

Cameron, K.S and Quinn, R.E. (1999), Diagnosing and Changing Organizational Culture. Based on the Competing Values Framework, Addison-Wesley, Reading, MA.

Harabi, N. (1995) Appropriability of technical innovations: an empirical analysis. *Research Policy*, 24, 981–992.

Chandy, R.K. and Tellis, G.J. (1998) 'Organizing for radical product innovation: the overlooked role of willingness to cannibalize', *Journal of Marketing Research*, 35 (4), 474–487.

Chandy, R. K., & Tellis, G. J. (2000). The incumbent's curse? Incumbency, size, and radical product innovation. *Journal of Marketing*, 64(3), 1–17.

Chao, R.O. and Kavadias, S. (2007). A theoretical framework for managing the NPD portfolio: when and how to use strategic buckets. *Management Science*, 54(5), pp. 907–921.

Chesbrough, H., 2003. In: Open Innovation: The New Imperative for Creating and Profiting from Technology. *Harvard Business School Press*, Boston.

Chesbrough, H. and Crowther, A.K. (2006) Beyond high-tech: early adopters of open innovation in other industries. *R&D Management*, 36, 3, 229–236.

Chesbrough, H., Lim, K., Ruan, Y., 2007. Open Innovation and Patterns of R&D Competition. Working Paper.

Chiaroni, Frattini, Chiesa, Turba (2010) Exploring the relationship between incumbency and radical innovation: the case of business to consumer e-commerce applications, *Int J. Enterpreunership and Innovation Management*, Vol 11, No 4.

Chiaroni D., Chiesa V., Frattini F., (2011) .The Open Innovation Journey: How firms dynamically implement the emerging innovation management paradigm. *Technovation*. 31, 34–43

Christensen, C.M. (1993) 'The rigid disk drive industry: a history of commercial and technological turbulence', *The Business History Review*, 67(4), 531–588.

Christensen, C.M. (1997) The Innovator's Dilemma: When New Technologies Cause Great Girms to Fail, *Harvard Business School Press*, Boston.

Christensen, C.M. and Bower, J. (1995). Disruptive technology: catching the wave. *Harvard Business Review*.

Christensen, C.M. and Raynor, M.E. (2003). The Innovator's Solution: Creating and Sustaining Successful Growth. Boston, MA: *Harvard Business School Press*.

Cohen, W.M. and Klepper, S. (1996). Firm size and the nature of innovation within industries: the case of process and product R&D. *Review of Economics and Statistics*, 78, pp. 232–243.

Cohen W.M. and Levinthal D.A. (1990). Absorptive Capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*. 35, 128-152.

Daft R.L. (1992) Organization Theory and Design, West, St. Paul, MN.

Damananpour F., (1991) Organizational Innovation: A Meta-analysis of Effects of De-terminants and Moderators. *Academy of Management J.*, 34, 555-590.

Damanpour, F. (1996). Organizational complexity and Innovation: developing and testing multiple contingency models. *Management Science*, 42, 693-721.

Danneels, E. (2004). Disruptive Technology Reconsidered: A Critique and Research Agenda. *Journal of Product Innovation Management*, 21(4), 246-258.

Deshpandk, Rohit and Frederick E. Webster Jr. (1989), Organizational Culture and Marketing: Defining the Research Agenda. *Journal of Marketing*, 53 (January), 3-5.

DeTienne D. R. Koberg C.S. (2002) The Impact of Environmental and Organizational Factors on Discontinuous Innovation Within High-Technology Industries. *IEEE transactions on engineering management*, vol. 49, no. 4

Dew N., Sarasvathy S.D., Read S., Wiltbank R. (2008). Immortal firms in mortal markets? An entrepreneurial perspective on the "innovator's dilemma". *European Journal of Innovation Management*. 11, 313-329.

Dodgson, M., Gann, D., Salter, A., 2006. The role of technology in the shift towards open innovation: the case of Procter & Gamble. *R&D Management* 36 (3), 333–346.

Duncan, R. B. (1976). The ambidextrous organization: Designing dual structures for innovation. In R. H. Kilmann, L. R. Pondy, & D. Slevin (Eds.), The management of organization design: *Strategies and implementation* (pp. 167–188). New York: North Holland.

Fagerberg, J. (2006), "Innovation – a guide to the literature", in Fagerberg, J., Mowery, D.C. and Nelson, R.R. (Eds), The Oxford Handbook of Innovation, *Oxford University Press*, Oxford, pp. 1-26.

Folkes, V. (1988), The Availability Heuristic and Perceived Risk, *Journal of Consumer Research*, 15 (June), 13-23.

Gambardella, A., Giuri, P. and Luzzi, A. (2007) The market for patents in Europe. *Research Policy*, 36, 1163–1183.

Gassmann, O. and Enkel, E. (2004) Towards a Theory of Open Innovation: Three Core Process Archetypes. Proceedings of the R&D Management Conference, Lisbon, Portugal, July 6-9.

Gassmann O., Widenmayer B, Zeschky M,(2012) Implementing radical innovation in the business: the role of transition modes in large firms. *R&D Management* 42, 2

Gassmann, O., von Zedtwitz, M., 2003. Trends and determinants of managing virtual R&D teams. *R&D Management* 33 (3), 243–262.

Gemunden, H.G., Salomo, S. and Holzle, K. (2007) Role models for radical innovations in times of open innovation. *Creativity and Innovation Management*, 16, 4, 408–421.

Ghoshal and Bartlett T (1994). Linking organizational context and managerial action: the dimension of quality in management. *Strategic Management Journal*, 15, 91-112

Gibson, C. B., Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Acad. Management Journal* 47, 209–226.

Gilbert R. J., Newbery D. M. G., Reiganum J. F. (1984). Uncertain innovation and the persistence of monopoly. *American Economic Review*. 74, 238-246

Graham, S.J.H., Mowery, D.C., 2006. The use of intellectual property in software: implications for open innovation. In: Chesbrough, H., Vanhaverbeke, W., West, J. (Eds.), Open Innovation: Researching a New Paradigm. *Oxford University Press*, Oxford, pp. 184–201.

Gregan-Paxton. Jennifer and Deborah Roedder John (1997). Consumer Learning by Analogy: A Model of Internal Knowledge Transfer. *Consroner Research*. 24 (3). 266-84.

Hannan, M. T., and Freeman, J. H. (1984). Structural inertia and organizational change. *American Sociological Review*, 49, 149–164.

Harabi, N. (1995) Appropriability of technical innovations: an empirical analysis. *Research Policy*, 24, 981–992.

Henderson, R.M. and Clark, K.B. (1990) Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms, *Administrative Science Quarterly*, 35(1), 9–30.

Henderson, R. (1993). Underinvestment and incompetence as responses to radical innovation: evidence from the photolithographic alignment equipment industry. *The RAND Journal of Economics*, 24(2), 248–270.

Henderson, R.M. (2006). The innovator's dilemma as a problem of organizational competence. *Journal of Product Innovation Management*, 23, pp. 5–11.

Hill, C.W.L. and Rothaermel, F.T. (2003) 'The performance of incumbents firms in the face of radical technological innovation', *Academy of Management Review*, 28(2), 257–274.

Hogan, J. (2005). Being successfully disruptive. *Medical Device Technology*, 16(5), pp. 21–23.

Huizingh H. R. E. Open innovation: State of the art and future perspectives *Technovation* 31 (2011) 2–9

Iansiti, M., McFarlan, F.W and Westerman, G. (2003) Leveraging the Incumbent's Advantage. *MIT Sloan Management Review*, 44(4), 58-64.

Inauen M. Schenker-Wicki A (2011). The impact of outside-in open innovation on innovation performance *European Journal of Innovation Management* Vol. 14 No. 4, 496-520

Jacobsson S. and Johnson A. (2000). The diffusion of renewable energy technology: an analytical framework and key issues for research, *Energy policy*, 28(9), 625-640.

Keil, T., 2002. External Corporate Venturing: Strategic Renewal in Rapidly Changing Industries. *Quorum Books*, CT, West Port.

King A. A., Tucci C.L. (2002) Incumbent Entry into New Market Niches: The Role of Experience and Managerial Choice in the Creation of Dynamic Capabilities

Kirshbaum R (2005). Open innovation in practice. Resource Technology management, 48(4), 24-28.

Klepper, S and Kenneth L.S. (2000a). The Making of an Oligopoly: Firm Survival and Technological Change in the Evolution of the U.S. Tire Industry. *Journal of Political Economy*. 108, 728 – 60.

Klepper, S and Kenneth L. (2000b). Dominance by Birthright: Entry of Prior Radio Producers and Competitive RamiŽ cations in the U.S. Television Receiver Industry. *Strategic Management Journal*. 21, 997–1016.

Kolk, A., Pinkse, J., (2008). A perspective on multinational enterprises and climate change: learning from 'an inconvenient truth'? *Journal of International Business Studies.* 39 1359–1378.

Kolodny, M. Liu, B. Stymne, and H. Denis. (1996) New technology and the emerging organizational paradigm, *Human Relations*, vol. 49, no. 12, pp. 1457–1487.

Kotler, P., (1986) Principles of Marketing, Prentice Hall, Englewood Cliffs, NJ, 1986.

Leonard-Barton D. (1992). Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Journal*. 13 (Special Issue): 111-126.

Lichtenthaler, E., 2004. Organising the external technology exploitation process: current practices and future challenges. *International Journal of Technology Management.* 27 (2/3), 254–271.

Lichtentaler U. (2009) External commercialization of knowledge: Review and research agenda International *Journal of Management Reviews.* Volume 7 Issue 4 pp. 231–255

MacCormack, A. and Iansiti, M. (2009). Intellectual Property, Architecture, and the Management of Technological Transitions: Evidence from Microsoft Corporation. *Journal of Product Innovation Management*, 26(3), 248-263

Mansfield, E (1986), The R&D tax credit and other technology policy issues. *The American Economic Review*, 1986.

March, J.G. and Simon, H.A. (1958). Organizations. *New York: Wiley*.

McDermott, C and O'Connor, G.C. (2002). Managing radical innovation: an overview of emergent strategy issues. *Journal of Product Innovation Management*, 19, 424-438.

Methe', D., Swaminathan, A., Mitchell, W., Toyama, R. (1997). The underemphasized role of diversifying entrants and industry incumbents as the sources of major innovation. *Strategic discovery: Competing in new areas*. 99-116. New York: Wiley.

Murase, E.M. (2003). Keitai Boomu: the case of NTT DOCOMO and innovation in the wireless internet in Japan. Unpublished doctoral dissertation, Department of Communication, Stanford University.

Naranjo-Valencia J., Jimenez-Jimenez D., Sanz-Valle R. (2011) Innovation or imitation? The role of organizational culture. *Management Decision* Vol. 49 No. 1, pp. 55-72

Nelson R. R., Winter S. (1982) An Evolutionary Theory of economic change. Cambridge, MA: Harvard University Press.

Paap, J. and Katz, R. (2004). Anticipating disruptive innovation. *ResearchTechnology Management*, 47(5), pp. 13–22.

Pfeffer J. (1992). Managing with power. Boston: Harvard Business School Press.

Piller, F.T., Walcher, D., 2006. Toolkits for idea competitions: a novel method to integrate users in new product development. *R&D Management* 36 (3), 307–318.

Pinkse J. Van den Buuse D.(2012) The development and commercialization of solar PV technology in the oil industry. *Energy Policy.* 40 11–20.

Pisano, T. and Verganti, R (2008). Which Kind of Collaboration Is Right for You ?. *Harvard Business Review*.

Porter M. E. (1985). Competitive advantage: Creating and sustaining superior performance. *New York: Free Press.*

Reiganum J. F. (1983). Uncertain innovation and persistence of monopoly: reply. *American Economic Review*. 73, 741-748

Richter M. (2012) Utilities' business models for renewable energy: A review Renewable and Sustainable *Energy Reviews.* 16 2483– 2493

Rosenbloom R. S., Christensen C. M. (1998) Technological discontinuities, organizational capabilities, and strategic commitments. Technology, organization, and competitiveness: Perspective on industrial and corporate change: 215-245. New York: Oxford University

Rothaermel, F. (2001) Incumbent's advantage through ex-politing complementary assets via interfirm cooperation. *Strategic Management Journal*. 22, 687-699.

Sakkab, N., (2002). Connect & develop complements research & develop at P&G. *Research-Technology Management*, 45 (2), 38–45.

Schumpeter JA (1942/87). Capitalism, Socialism and Democracy. *Unwin: London.*

Shilling M, and Esmundo M. (2009). Technology S-curves in renewable energy alternatives: Analysis and implications for industry and government. *Energy policy*. 37(5), 1767-1781.

Simon H.A. (1955). A behavioral model of rational choice. *Quarterly Journal of Economics*. 69, 99-118.

Stanko M.A. Calantone R. J. (2011). Controversy in innovation outsourcing research: review, synthesis and future directions. *R&D Management*, 41, 1

Tapscott, D., (1996). In: The Digital Economy: Promise and Perils of the Age of Networked Intelligence. *McGraw-Hill*, New York.

Tellis, G.J. (2006). Disruptive technology or visionary leadership? *Journal of Product Innovation Management*, 23, pp. 34–38.

Tornatzky, L. G. and Klein K. J. Innovation Characteristics and In-novation Adoption-implementation: A Meta-analysis of Find-ings, *IEEE Trans. Engineering Management*, 29 (1982), 28-45.

Tsai, K.H. and Wang, J.C. (2005). Does R&D performance decline with firm size? – A re-examination in terms of elasticity. *Research Policy*, 34(6), pp. 966–976.

Tushman, M.L. and Anderson, P. (1986) Technological discontinuities and organizational environments, *Administrative Science Quarterly*, 31(3), 439–465.

Tushman, M.L. and O'Reilly, C.A. III (1996) Ambidextrous organizations: managing evolutionary and revolutionary change, *California Management Review*, 38(4), 8–30.

Tushman, M.L. and O'Reilly, C.A. III (2002). Winning through Innovation: A Practical Guide to Leading Organizational Change and Renewal. Boston, MA: *Harvard Business School Press.*

Tushman, M. L., O'Reilly C. A. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behaviour*, 28, 185-206.

Unruh, G.C., (2000). Understanding carbon lock-in. *Energy Policy*, 28, 817–830.

Utterback, J.M. (1994) *Mastering the Dynamics of Innovation*, Harvard Business School Press, Boston.

Venkatraman, N., Lee, C. -H., & Iyer, B. (2006, August). Strategic ambidexterity and sales growth: A longitudinal test in the software sector. In Paper presented at the Annual Meetings of the Academy of Management. Honolulu, Hawaii.

Volberda (1998). Building the flexible firm. *Oxford University Press*.

Von Hippel, E. (1988). The Sources of Innovation. *Oxford University Press: New York.*

Walker, G. and Weber, D. (1984) A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly*, 29, 3, 373–391.

Wu J. (2012) Technological collaboration in product innovation: The role of market competition and sectoral technological intensity. *Research Policy*, 41, 489– 496

Wustenhagen R., Menichetti E. (2012) Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research. *Energy Policy*, 40, 1–10

Yu C., Hang C.C. (2010) A Reflective Review of Disruptive Innovation Theory. *International Journal of Management Reviews*, Vol. 12, 435–452

Company A (2010) "Bilancio Consolidato 2010

Company A (2011) "Bilancio Consolidato 2011

Company B (2007) "Business Plan 2008-2013"

Company B (2010) "Relazione Finanziaria 2010, Relazione sulla Gestione"

Company B (2011) "Relazione Finanziaria 2011, Relazione sulla Gestione"

Company C (2007) “Business Plan 2008-2012”

Company C (2010) “Bilancio Consolidato del Gruppo 2010”

Company C (2011) “Bilancio Consolidato del Gruppo 2011”

Company D (2010) “Company D, Corporate Profile”

Company D (2010) “Financial Report 2010”

Company D (2011) “Financial Report 2011”

Company E (2010) “2010 Annual Report”

Company E (2011) “2011 Annual Report”

Company E (2011) “Company E Offshore wind energy factbook”

Company F (2008) “2008-2012 Business Plan”

Company F (2010) “Annual Report at 31 December 2010”

Company F (2011) “Annual Report at 31 December 2011”

Company G (2008) “Business Plan 2008-2012”

Company G (2010) “Annual Report 2010”

Company G (2011) “Annual Report 2011”

Company H (2010) “Relazione Finanziaria Annuale 2010”

Company H (2011) “Relazione Finanziaria Annuale 2011”

Company I (2010) “Annual Report 2010”

Company I (2011) “Annual Report 2011”

Company J (2010) “Annual Report 2010”

Company J (2011) “Annual Report 2011”

Energy & Strategy Group (2009) “Solar Energy Report 2009”

OECD (2010) “Energy Technology Perspectives”

NATO (2011), “NATO Review 2011”

Terna (2011). “Dati di Produzione”

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Nessuno di noi aspira ad essere l'uomo medio."
[Prof. P. Secchi]

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