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Human Capital Needs and Development for Green Economies

The case of Enel Green Power

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1. Abstract

Climate change has been a political priority on governments' agendas since many years now. Experts and politicians have been analyzing and studying possible consequences of the current green threats. Global economy is likely to come across deep transformations, not only due to environmental factors, but also as far as the impact on labour market is concerned. Restructuring processes are likely to change production methods, work organization and sectoral occupational potential. Similarly, climate change may consequently lead to job creation, job losses or simply to a change in occupational profiles. Some relevant scientific projections on future labour markets[1], assert a significant number of green jobs will be created, not only in eco-industries, but also in many different sectors, demonstrating the far-reaching impact of the current ecological challenge.

Coherently, many governments have taken on board this issue, in Europe as well as overseas. One for all, Obama's Presidency is investing considerable amount of resources and efforts in the call for green economies and a worldwide commitment for saving the planet. Likewise, some European countries – in different measures – are raising a massive debate around green jobs and future labour market scenarios in the related sectors. In order to support governments in finding coherence between the European and international call for more efforts in tackling climate change on the one hand, and the relative practical measures and investments on the other hand, widespread public awareness and debate are needed.

In order to get there, people need to be equipped with higher and better skills, grounding on individual responsibility as regards the urgency of climate change. Green economy growth, in other words, needs to be accompanied by human capital development, passing through highly and better skilled workforce and more aware population.

The present business case analyzes a power leading multinational in the field of renewable energy: Enel Green Power. The study shows that the company can rely upon highly skilled and motivated human capital, having identified which competences the labour force needs in order to create value, efficiency and gains for the company. This case witnesses that human capital development in terms of green skills, competences and motivations could gear up green economies. Starting from sector specific companies, like EGP, and then possibly involving other businesses and sectors, indirectly committed to save the planet.

[1] Not all studies agree on data about the positive impact of climate change on the labour market. For a focus on the issue see Adapt dossier n. 9, 16th July 2009.

2. Introduction

We assume a world based on green economies cannot come true without skilled and motivated human capital. Starting from a macroeconomic scenario, we observe that in the long run population growth and scarce resources will bring about serious problems in many parts of the world. Climate change effects, row materials scarcity, waste mismanagement are likely to bring about natural disasters and civil disequilibria. This is due to the fact that societies have always acted in view of a short-run sustainability perspective; that is to say, for their survival.

In order to escape from such risks, a comprehensive and all-accomplished concept of sustainability, for present and future generations, is needed. That is the basis of what we call a "green efficiency scenario" [2]. In this hypothesis, everybody is individually committed for the environment and firmly believes in green values. Not only individuals, but also institutions, education bodies and companies acquire green skills and behave greenly. In a green efficiency scenario the eco-industry reaches its potential and companies play in a competitive market, interacting with consumers willing to buy green products and services.

Yet, this scenario does not match with present conditions in many countries of the world. Political commitment is not always translated into practical measures and labour force often seems to be inadequately skilled and motivated. We are currently experiencing a "late consumerist phase", where green markets work significantly sustained by state aids and people are not completely aware of the risks the environment is running.

In order to shift to a green efficient society, a cultural and economic revolution is needed. And we hypothesize this revolution can be achieved only if the whole population is involved, committed to struggle for a cause, on the basis of strong green skills and beliefs.

In order to demonstrate such a wide hypothesis, we focused on a narrow – but relevant for contemporary world – aspect of this subject: power production from renewable energy sources. This is an example of how a productive sector today depending, for some technologies, on state aids may be much more productive: for the sake of saving the planet and for economic purposes. Today renewables experience a low offer of high-skilled labour force and the sector is tackling big challenges to increase competitiveness and new technological fronteers. Renewables, like many other sectors, will not be able to develop on a massive scale unless highly skilled and committed human capital is available. Furthermore, by sharing common values, through stronger and deeper green commitment, workers and companies can achieve sustainability on the long run.

[2] TNO Netherlands Organisation for Applied Scientific Research, SEOR Erasmus University Rotterdam, ZSI Centre for Social Innovation, May 2009, *Investing in the Future of Jobs and Skills Scenarios, implications and options in anticipation of future skills and knowledge needs Sector Report: Electricity, Gas, Water and Waste*, in Adapt Green Jobs Observatory, www.adapt.it .

The present business case analyzes Enel Green Power, a world leading player in the renewable energy sector. Our hypothesis is that deep awareness and commitment for ecological issues and environment protection are needed for human capital employed in a company working for environmental protection. Green awareness is the driver motivating human capital to acquire the necessary green skills (legislation, business management and economy, technology), which are the levers stimulating value creation along the value chain. Put it simply, if green skills stem from “green efficiency” as a social value they are likely to bring about gains for the company. As we already pointed out, the underpinning reason is that the shift to such a scenario requires something like a revolution. Having said that people and workers need to be extraordinarily committed, involved, as protagonists of the whole process, we assume that bringing green competences to the heart of lifelong learning is the stepping stone for easing the transition to the green efficiency scenario.

This business case also attempts to provide for an innovative definition of green skills. Conclusions also offer a number of insights to education and training institutions, to allow students grasp the career opportunities potential offered by renewable sector. Such an achievement may derive both from conceiving lifelong learning as an opportunity to spread ecological values or green culture among people, and from a more integrated relation between schools and industry leading to additional in-company educational and training opportunities.

3. PART I: Green skills for green jobs

3.1. Background[3]

The global shift to a low-carbon economy influences changing labour market needs, especially in some sectors such as transport and energy production. According to the Environmental Agency of the United Nations and the International Labour Organization[4], the impact of such a transition should double the global market for green services and ecological products.

This is a clear proof that the so called "job churn" effect is likely to be experienced, both across sectors and within the same industry. Firstly, new markets and job opportunities are stemming from the eco-crisis, in the sectors mentioned above as well as in many others. Secondly, existing jobs will change their content, in terms of required skills and working methods. Thirdly, other jobs will simply become obsolete and tend to disappear without any replacement. Scholars and experts should not disregard that such an effect is likely to have a considerable impact also on indirect jobs in supplier industries, which entail massive job's and human resources' volumes.

These scenarios share a common variable: the change in skills needs. On the one hand, this means new jobs are going to require new qualifications, at the forefront of technological development and innovation. On the other hand, existing job profiles are going to be redefined in their skills requirement, as asserted by the UNEP study: the workforce needs transversal green competences and apply them in day-to-day work, in terms of greened methodologies and behaviors. Therefore, green skills and qualifications are partially overlapping with those already existing, redefined according to technological change and ecological challenges[5]. It is also true that new skills and qualifications have to be developed in through entirely new training programs.

The importance of the right competences for green jobs grounds on a clear economic rationale: the lack of green skills could hamper the creation of green jobs, therefore hindering the shift to a green economy. The final consequence of green skills gaps is that investments and stimulus packages implemented to tackle the ecological challenge would eventually prove to be inefficient.

The preventive adoption of adequate training policies for human capital development is therefore a priority that cannot be disregarded by European member States, as recently observed by the European Commission[6]. Therefore, unless EU countries unlock their human capital potential, they will not be able to face green challenges and shift towards green markets. In other words, a sustainable, long-lasting answer to environmental challenges can stem only from the right skills and competences.

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[3] The present paragraphs are inspired by Rustico L., 2009, Green skills for green jobs in Adapt dossier n. 9, 16th July 2009, in www.adapt.it

[4] UNEP, ILO et al., 2008, *Green Jobs: Towards decent work in a sustainable, low-carbon world*, in Adapt Green Jobs Observatory, www.adapt.it

[5] OECD, 1999, *Seminar Social and Environment Interface Proceedings*,. The same opinion is hold by the Austrian Institut für Wirtschaft und Umwelt.

[6] European Commission, 2008, *New skills for new jobs*. *Anticipating and matching labour market and skills needs*, COM/2008/0868 final. In Adapt Newsletter n. 1, 14th January 2009, www.csmb.unimore.it

3.2. Defining "green skills"

Although politicians, experts and scientists assert human capital development, motivation, skills and competences are the key strategy to cope with green job markets and green economies, literature on the theme is scarce in Europe. Research has been mainly focusing on employment projections and on sectoral analysis, more than on green competences and the relative education and training paths.

Nevertheless, according to existing literature, the definition of "green skills" is not agreed among experts, and this is partly due to the lack of consensus on the definitions of "green jobs" and "green sectors". Actually, there are many other variables that impede to share a common definition. We assume this is because green markets are still living a transition phase and they have not achieved their own potential.

First of all, referring to Cedefop studies and projections[7], skills and competences will gain importance in guaranteeing the access to the labour market. This is translated into a widespread requirement for higher level qualifications to cover all jobs and occupations, also in green sectors. Consequently, a greenly trained workforce needs general upgrading and updating in their competences.

Going into detail, existing literature struggles against two definitions of "green skills". On the one hand, some experts state that such skills are simply traditional qualifications and competences applied to environmental issues (OECD)[8]. This holds true both for technical and general skills: until technology will not make tremendous innovation improvements, we will continue to rely upon existing technologies, redefined and adapted to the green footprint. Just like traditional jobs, green ones will need someone working for procurement, accountancy, ICT and administration. On the other hand, some scholars maintain that green industry requires new skills and curricula, still to be developed in order to fulfill content requirements of specific occupations. They would be «Knowledge of sustainable materials [...], "carbon foot printing" skills, environmental impact assessment skills (flora, fauna), good grasp of the 'sound' sciences». Green skills, by the way, are most of all transversal skills, such as: «Strategic/leadership skills, adaptability/transferability skills, systems analysis […], holistic approach, risk analysis, co-ordination skills, entrepreneurship»[9].

Common agreement is achieved as far as green skills bipolarization is concerned: specific/technical skills on the one hand and generic skills on the other hand. The first ones are specific knowledge and competences in environmental sciences, biology and engineering. The second ones are linguistic and electronic skills, the capacity of learning «*how* to learn, communicate, interact and adapt to changing environments in addition to a high quality education»[10]. As observed by Cedefop, such a bipolar pattern

[7] Cedefop, 2008, *Future skill needs in Europe, Medium-term forecast, Synthesis report,* in Adapt Newsletter n. 7, 25th February 2008

[8] OECD, 1999, *Seminar Social and Environment Interface Proceedings*

[9] Cedefop. 6-7 October 2008. Thessaloniki, Greece. *Future skill needs for the green economy*

[10] TNO Netherlands Organisation for Applied Scientific Research, SEOR Erasmus University Rotterdam, ZSI Centre for Social Innovation, May 2009(2), *Investing in the Future of Jobs and Skills Scenarios, implications and options in anticipation of future skills and knowledge needs. Executive Summary: Electricity, Gas, Water and Waste,* in Adapt Green Jobs Observatory, www.adapt.it

derives from the «holistic» nature of the new skills paradigm created by green economy. This approach comes from the endemic multidisciplinary approach of green jobs, pulling together professionals from different sectors: «engineers, planners and architects with ecologists and archeologists»[11]. In order to work in team with high degree of autonomy and responsibility, green workers should be able to easily adapt to change. Developing leadership and other social and personal skills turns out to be a strategic prerequisite for green job profiles.

Therefore, as a recent study for the European Commission reports, among the two sets of competences relevant for green jobs, «soft skills will become increasingly important, especially so for high skilled professional job functions»[12] across all occupations and functions. This is due to the changing nature of innovation processes: «predefined technical knowledge capabilities will become somewhat less important while skills to adapt and learn new competences and life-long learning will be put at a premium»[13].

Furthermore, "green skills" is not a homogeneous category since they are needed through a vast range of levels and sectors, still to be clearly defined by the literature[14].

As far as levels are concerned, evidence suggests that green skills are provided at high and low educational levels, although experts' opinions diverge. For example, some scholars fear the risk of green labour market sharpening jobs' polarization: while high educational attainment levels are required for skilled jobs (such as environmental consultants), a vast range of green occupations are manual, low- or non-skilled (e.g. waste collectors). Most European studies, supported also by the European social parts[15], agree in saying that green workers are going to be more qualified and therefore will required higher qualifications, while decreasing the demand for low-skilled workers. Although European experts claim that green skills are high level ones, experiences from overseas suggest that they may turn out to be middle skills. In fact, to fill this middle-skills' gap the USA have recently supported education and training programs in community colleges[16]. These institutions, at half way between VET and higher education, answer future skill needs' and local labour market requirements, also by developing solid networks with social partners[17]. If we assume that many green

[11] Peter Szovics, Manfred Tessaring, Clive Walmsley, John McGrath, Conclusions from the workshop on Future skill needs for the green economy,l *Identification of future skill needs for the green economy,* in Adapt Green Jobs Observatory, www.adapt.it

[12] TNO Netherlands Organisation for Applied Scientific Research, SEOR Erasmus University Rotterdam, ZSI Centre for Social Innovation, May 2009(2) *,* in Adapt Green Jobs Observatory, www.adapt.it

[13] *Ibidem.*

[14] For a complete dissertation on the definition of green jobs see references in Adapt dossier n. 9 16th July 2009

[15] ETUC (2007). *Climate Change and employment. Impact on employment in the European Union-25 of climate change and CO2 emission reduction measures by 2030* in Adapt Green Jobs Observatory, www.adapt.it

[16] The American Graduation Initiative recently launched by President Obama invests 12 billion dollars in community colleges, in order to have 5 more million USA graduates by 2020. See Barack Obama, *Remarks by the President on the American Graduation Initiative, at the* Macomb Community College Warren, Michigan (July 14 2009) in Adapt Education, Training and Labour Observatory, www.adapt.it

[17] OECD, Education Policy Analysis 2005, Chapter 1*, Alternatives to Universities Revisited,* http://www.oecd.org/dataoecd/0/22/35745467.pdf

jobs are middle-jobs, nowadays Europe lacks such level of qualifications. In any case, since training and retraining are necessary at different levels, green competences are likely to increase anyway labour force qualification level, together with their job quality and working conditions.

As far as sectors are concerned, variety is even greater, since it differs from one sub-sector to another. For example, while educational attainment levels in agriculture and fishery decreased throughout Europe since 2000, the agri-food subsectors (agriculture, fishery, food and beverage) have registered a substantial increase in the level of qualifications required from 2000 to 2006[18]. A recent study by ECORYS for the European Commission recalls some of the skills needed in a number of greening sectors. For example, many of the new positions in the wind power industry (renewables) require highly skilled workforce, equipped with qualifications based on entirely new training programs designed according to technological development. Or, in the building sector, higher-skilled and higher-paying employment will arise due to energy-efficient equipment. Moreover, previous experience in the sector is not going to be enough since jobs will be redefined in terms of new skills, training, and certification requirements. At the top level of qualifications, researchers and engineers will find room for applying diagnostic techniques, knowledge of renewable energy, installation, organizational skills (i.e. town planning).

As an example, a recent report on skill needs in Electricity, Gas, Water and Waste sectors[19] identifies the key competences that have to be developed in such productive branches.

[18] ECORYS for the European Commission. December 2008. *Environment and labour force skills. Overview of the links between the skills profile of the labour force and environmental factors*,
[19] See footnote 2.

Figure 1: Skills and knowledge needs in energy, waste, water sector

Overview of skills and knowledge needs identified for each job function and scenario
Knowledge ('hard skills')
• Legislative / regulatory knowledge (environmental / safety / labour / contracting); Language*; e-skills; Marketing skills; Technical knowledge; Product knowledge; Product development
Social Skills
• Team working skills; Social perceptiveness (listening / understanding); Communication; Networking; Language*; Intercultural
Problem-solving Skills
• Analytical skills; Interdisciplinary; Initiative, Multi-skilling; Creativity
Self-management Skills
• Planning; Stress and time management; Flexibility; Multi-tasking
Management skills
• Strategic & visionary; Coaching and team building; Change management; Project management; Process optimizing; Quality management; People skills crucial for collegial management style
Entrepreneurial skills
• Supplier and customer relationship / understanding; Business understanding / development; Trend setting / trend spotting

Source 1: TNO Netherlands Organisation for Applied Scientific Research et al. (2009)

Apart from content related aspects, we claim that green skills represent an opportunity to develop education and training paths hand in hand with the labour market. If green competences are "vocational", green skills curricula should be tailored and designed according to the job profiles required by the market, together with social parts and other stakeholders. This would allow a closer matching with local labour market needs. More generally, the world of education and training and the labour market should be better integrated bearing in mind the final aims, which are spreading a long term sustainability concept and people's personal growth and employability.

Hence, our research hypothesis concerning green skills is twofold: on the one hand we assume that they are lifelong learning competences and they have to be taught from primary school throughout the whole life span. On the other hand, according to us green skills will turn out to be completely new skills: a mix of traditional knowledge (until technology does not change) and traditional skills (such as transversal ones) but new and redefined according to social values and behaviors supporting the shift to a "green efficiency scenario".

3.3. Human capital for a "green efficiency" scenario

Green skills and the call for eco-sustainable development are not something new: they have been political concerns for many governments in the world from several years now. But an economic lever to turn ecological problems into economic opportunities for global change was missing. On the contrary, today climate change is an emergency calling for a prompt answer from society, also in terms of economic adaptation.

Decades ago – and still today in many countries – the ecological challenge consisted in saving land, seas and rivers equilibrium from polluting factors deteriorating natural ecosystems. Human capital needs to cope with such problems were limited to adequate legislative skills and solid chemistry notions.

In the most recent years the global situation has become more complex and human capital needs to be better endowed with necessary skills and competences to face the years to come. Today experts, governments, and media are very keen in denouncing the effects of CO_2 emissions and global warming (also named as climate change). Hence, greenhouse gases seem to be the only dangerous enemy to be fought. They are produced by means of transportation pollution, energy production and big plants fumes. The next step may be waste mismanagement, which, indeed, is already on many governments' agenda.

In other words, until climate change urgency did not come to the global scene, a social and economic reason to realize green efficiency on big scale markets and throughout global based rules was lacking. Nowadays climate change is the environmental driver pulling an environmental, economic and cultural revolution all over the world. The real novelty in this term is that, due to the structure of the topic, greenhouse gases and consequently climate change could only be addressed on a global basis and with global commitments and rules.

Today societies still live in a "late phase of consumerism", having not yet become aware of the risks and challenges posed by changing environmental circumstances and the relative economic development. In this transition phase risks are as big as the challenge itself: the potential of a green revolution, in terms of occupational impact, technological development and cultural change, is incremental. Today we only have a partial vision of green jobs and green markets, because their whole potential still has to be expressed. If we want to ride this wave and see where it leads to, we forcibly have to boost people by educating and training them to grasp all green opportunities. Hence, we are experiencing a transition that will necessarily bridge us to a new scenario: what we have called "green efficiency"[20].

In a macroeconomic hypothesis, given demographic projections depicting a growing world population, we are going to reach resources availability threshold soon. Once oil and row materials are limited, the world will experience "scarcity" and its economic and social consequences.

In order to prevent that situation, the concept of "sustainability" has to change. In the last decades human capital development has been narrowly linked to short term

[20] See footnote n. 2.

sustainability; that is to say to solve problems that showed off from time to time for their own survival. This cannot hold true anymore today. In order to cope with resource scarcity and climate change, and build up widespread responsibility towards present and future generations, the world has to develop a long term and global concept of sustainability, at the basis of green efficiency.

With such expression we indicate a hypothetical scenario where «Policy instruments are developed and implemented to decrease demand and to substitute old technologies for green technologies (biomass, wind, solar) and nuclear power plants. This makes the energy market less dependable on oil and gas prices and helps to reduce the effects of climate change»[21]. In the green efficiency scenario, environment is at the heart of EU regulation, which is perfectly integrated and accepted. Competition is consequently stimulated among countries and companies, building up the room of maneuver for businesses to create value and make profit from their production. In particular, companies operate in big scale competitive macroeconomic conditions and are allowed to make profits without any needs of incentives. Green markets work in respect of common competition and safety laws, established at the international and EU level.

To realize an eco-sustainable economy (from an environmental and an economic point of view), with companies producing green products and services on a big scale, the whole society (institutions, public education, civil society, enterprises) has to co-operate for building up and delivering a long term concept of sustainability in the next years and decades to come, when climate change urgency will have possibly led to a "green efficiency" scenario.

In order to come across such revolutionary solution, a global road map for environment, sustainability, in parallel with an ongoing social and economical development is needed. According to us, the road to green efficiency should start from education and training: how to teach sustainability to our kids, to make them responsible protagonists for tomorrow? How to teach them the concept of "efficiency", to be applied on the long run to resources use but also at work? How to make them learn environment is something to be respected for present and future generations? How to deliver beliefs and behaviors concerning flexibility and the capacity to adapt to changing situations? Our answer is: education and training. Politics and the media can influence public opinion; but beliefs, attitudes, behaviors are basically shaped in the first life stages, although they need to be confirmed and strengthened throughout the whole life. Of course, this is not a one-cut solution. Families, communities, media, institutions have to share the burden of responsibility.

This is not the case today. In its first development phase, eco-industry is addressing, in a way or another, new business challenges, tackling environment-related issues as a cost or a duty and explaining why incentives are needed. Yet, state aids may contrast with companies' basic economic concepts, like profit and value creation.

In general, capitalistic economy is profit based; it means that it is crucial to make profit from an investment mainly using two levers. One is price: given companies'

[21] *Ibidem.*

investments, the higher goods prices the higher the return. The other is volume: given the actual development stage of the industry and the need for incentive for certain technologies, goods volumes are limited to the amount of money a state may fund. This model can work today in some industries if companies take advantage of state incentives. Yet, once again, this cannot go on forever, because incentives are paid by the population and, in any case, they should stimulate and not curb competition or reduce efficiency. Thus, in order to be competitive, companies would need to produce without a limited threshold on a global scale. Such a scenario can be realized thanks to technological innovation, leading to massive scale production and therefore to costs reduction. This way companies can let profit grow without any predefined limitation by using both the lever of price and volume.

Different models and indicators could apply to measure the success of a company: Cash Value Addes (CVA), Cash Flow Return on Investment (CFROI), Economic Value Added (EVA), Return on Capital Employed (ROCE) are only some of them. All the models assess returns (gains, in terms of profit, organizational effectiveness, innovation, etc.) on the basis of how much capital is invested.

These economic models and relative constraints do hold true also for companies working in the eco-industry: albeit their ecological commitment, such companies experience high costs to produce eco-compatible goods and services. Not only due to immature technology and consequent direct production costs, but also due to small scale production and market restrictions. This goes hand in hand with consumers not being prone, sensitive and committed enough to the ecological challenge, so that their demand cannot drive eco-industries' supply. Furthermore, the market is monopolized by traditional companies selling competitive goods and services at a lower price, an optimum which is reached thanks to lower raw material costs and solid lobbying networks and abilities. Finally, in eco-industries, time horizons are short (for example, sites for power production from renewables are constructed in a shorter period), technological change is a constant, and business sectors are new and open to transformations. Therefore, companies need highly skilled and flexible human capital, prone to adapt to changing market and technological situations. In a broad sense, human capital with more and better skills prompts innovation processes and eases adaptation mechanisms to new technologies; indirectly, it also helps attracting investments and increasing competitive potential[22]. We should not forget that nowadays such benefits can be just narrowly perceived since skills gaps in the EU are transversal to many sectors and occupational levels[23].

We assume that economic development is not enough to trigger green economy mechanism. Challenges arising from "green efficiency" scenario, as we said, require

[22] Yet, as reported by the ILO, these effects are of greater importance for developing countries, where education and training, if available, are of poor quality and give access just to low-skilled, low productive and scarcely remunerated jobs.

[23] For example, the ECORYS Report (see footnote 18), states that UK greening businesses are experiencing skills shortages of technical specialists, designers, engineers, and electricians. The German renewables' industry, instead, lacks qualified workers. In many European countries, finally, the retail sector suffers skills gaps in sales staff and in project management, and competences and qualifications are often scarce in the renewable energy sector (i.e. consulting skills, communication skills).

green skills, deep commitment, beliefs and involvement. Human capital development for green economies should be conceived as a lifelong learning process and cannot be left apart from any learning experience.

Therefore, we cannot restrict the analysis of human capital development for green economy just to schools and VET providers. As such it should develop in different settings and age stages: from primary school, to apprenticeship contracts, to schools and universities but also in informal and non-formal learning, such as leisure activities and on-the-job. By stretching the idea of a "greening lifelong learning", competences for sustainable development are not only something narrowly limited to fulfill a job profile's requirements. Since climate change and eco-challenges call for everyone's commitment to a renovated "greened" life style, there is no educational or environmental reason for limiting the chances of acquiring green competences. Consequently, the target of this new greening education agenda broadens, since the latter turns out to be interesting for several bands of the population.

3.4. Hypothesis

Our hypothesis is that green human capital development is the answer to green markets development. This economic ground paves the way to what we have called the green efficiency scenario and therefore opens the door to environmental protection and long term sustainability for the planet. This is something that we do not experience today, albeit the widespread political call for ecological commitment.

In our hypothesis green awareness, translated into eco-sustainable behaviors as part of everybody education is the key social driver. As such it has the potential to pull a number of levers – namely: Education and training, economy, legislation, technology, industry – which in turn make green economies work. Parallel to these business drivers are the key competences and skills to be cultivated in order to bring about the green revolution.

As an example, even today, in the era of greenhouse gases, we can cluster green skills around three main core areas, although this simplification does not depict the complex skills requirement of green jobs.

1. Understanding which macroeconomic and legislative frameworks have to be set up at a global level to reduce CO_2 emissions. For instance, companies need workers that know, understand and can adequately apply laws and regulations but also push for the construction of an adequate economic and legislative framework for fully developing green economy.
2. Industrial and economic capacity to develop low environmental impact processes, that is to say greened energy productions and green procurement. It also deals with the ability to effectively communicate with political and institutional actors to spread green sensitivity.
3. Developing innovative technologies that help economic systems decrease their production costs, trying to reach the competitive price of traditional industries.

We hypothesize that in the years to come green skills will become something new: although technological and transversal skills are going to remain the same, workers' *Weltanschaung* needs to change. In other words, such competences have to be extraordinarily mastered by people, in order to allow them be the protagonists of the revolution. A deep involvement is granted when behaviors are part of one's education, because they ground on individual responsibility. This is why we assume that education, starting from primary schools, plays a key role in this awareness raising process. Schools, VET providers, Universities are working hard today to educate and train those young generations that will lead the world tomorrow. This means that, if "green efficiency" is to be realized, consuming green products and services will be a straightforward consequence of a new ecological awareness of the whole population. Consequently, by increasing the demand of green products, supply is likely to grow and goods' prices to stabilize. Therefore, individual green education will represent an economically viable proposition for companies in green economy.

If green efficiency has to be realized, green skills are critical not only because people can occupy greened professional profiles and accomplish companies' HR requirements

and consequently benefit from production efficiency and management effectiveness throughout the entire value chain. But green skilled people, be them students, workers, men or women, young or old people, will likely consume green products, or choose services with a low environmental impact. Aggregate demand stimulates competition among green industries, which become competitive and make profit in a dynamic big-scale market without state aids.

We now move on to our business case, analyzing Enel Green Power. First of all we describe the new sector of renewable energy and how companies in this sector work. Given the market, we will analyze the value chain of Enel Green Power, moving then to its productive processes. Finally, we study how skilled and motivated people can create value for the company in terms of efficiency and profit.

4. PART II: the case of Enel Green Power

4.1. Introduction

This business case tries to demonstrate the high potential of human capital development in promoting the shift to green economy. Yet, as announced in Part I, producing and consuming green products and services in a competitive green economy may be possible on the basis of a new and widespread ecological awareness.

Although the environment is a worldwide political and social priority and it touches upon several productive sectors, the most urgent and popular priority is climate change and the relative struggle to reduce CO_2 emissions. The world focuses today mainly upon two sources of such emissions: means of transportation and energy production. We are going to analyze the latter.

A number of socio-economic drivers have been pushing for substantial change in energy production sector in the last years. They include environmental change, technological innovation, demographic trends, as well as economic, social, cultural, and political factors. A study carried out for the European Commission concluded that the most important drivers for energy sector are «'trade and market liberalization', 'EU integration', 'environmental regulation', 'natural resources', the 'availability and price of oil and energy' and the 'availability and price of other natural resources'»[24].

Environmental regulation, implemented as a reaction to scarce energy and material supplies, has its consequences on sector production, market competition and employment. Among the very many communications, the Climate and Energy Package – issued by the EU Commission in January 2008 and adopted by the EU Parliament and Council in October 2008[25] – sets new binding standards aimed at tackling climate change. One of the ambitious objectives is to increase the use of renewables (wind, solar, biomass, etc) to 20% of the total energy production (currently it is around 8.5%). Among the benefits of these measures, Citizens' summary of the EU Climate and Energy Package highlights that about 1 million jobs will be created in the European Renewable Energy Industry by 2020. In December 2009 the Copenhagen summit on climate change will discuss energy management issues: more energy efficiency, use of an energy mix (more power from renewable sources, nuclear, etc.), and reduced consume of electric energy.

Renewable energies are, therefore, at the heart of European reforms as far as power production in concerned: they are part of what is called the "energy mix" necessary to cope with power resources scarcity. Besides the well known Renewable Energy Road Map[26] dating back to January 2007, the Directive of last April 2009 clearly stands that «Member States, with the participation of local and regional authorities, shall develop

[24] TNO Netherlands Organisation for Applied Scientific Research, SEOR Erasmus University Rotterdam, ZSI Centre for Social Innovation, May 2009, in Adapr Green Jobs Observatory, www.adapt.it

[25] The package comprises a set of directives, decisions and regulations. For the aims of this project, the focus will be on the promotion of the use of energy from renewable sources.

[26] Communication from the Commission to the Council and the European Parliament, Renewable Energy Road Map Renewable energies in the 21st century: building a more sustainable future http://ec.europa.eu/energy/energy_policy/doc/03_renewable_energy_roadmap_en.pdf

suitable information, awareness-raising, guidance or training programs in order to inform citizens of the benefits and practicalities of developing and using energy from renewable sources»[27].

In contrast with such a promising picture, today eco-industries are generally supported by incentives, while lacking a clear regulatory framework. A well defined and globally agreed road map for green efficiency would be needed, to eventually stimulate – and not curb – competitiveness. The road map to green efficiency should consider human capital as a crucial factor, since its development is a social lever to create value.

On the basis of such premise we turn to apply our hypothesis to a utility focused on the renewable energy sector: Enel Green Power.

Enel Green Power is a world leading player in RE, born back in 2008 aggregating all the renewable energy assets of the Enel Group, is the Italian largest power company and the second listed utility by installed capacity in Europe. Enel Green Power is an international company, with a balanced technology mix and a diversified geographical presence, factors that make Enel Green Power a very distinct player within the industry. Today EGP operates in thirteen countries, with an installed capacity of about 4,5 GW and an energy production of 17,2 TWh, managing more than 500 assets with around 2.600 employees. In particular, EGP operates in Italy, the home market, with about 2.600 MW of installed capacity, mostly geothermal and run-of-river hydro, in North America, with about 750 MW, mostly in wind and hydro and now geothermal, while in Latin America, EGP owns about 700 MW of capacity, mostly hydro. Finally in the rest of Europe, the company is present in Spain, France and Greece, and it's developing projects in Romania and Bulgaria. The company has identified specific key competences to be developed along the value chain, having analyzed most relevant business drivers and related processes.

Studying EGP we outline the linkages between human capital excellence and value creation, having in mind the industry's basics: value chain, main productive processes and relative business drivers. We will try to draw an integrated model to explain how to derive human capital needs and profiles from the structure of EGP business. In addition, the model could be useful to understand the direct impact of the main processes – considering managers and employees involved – on company profitability.

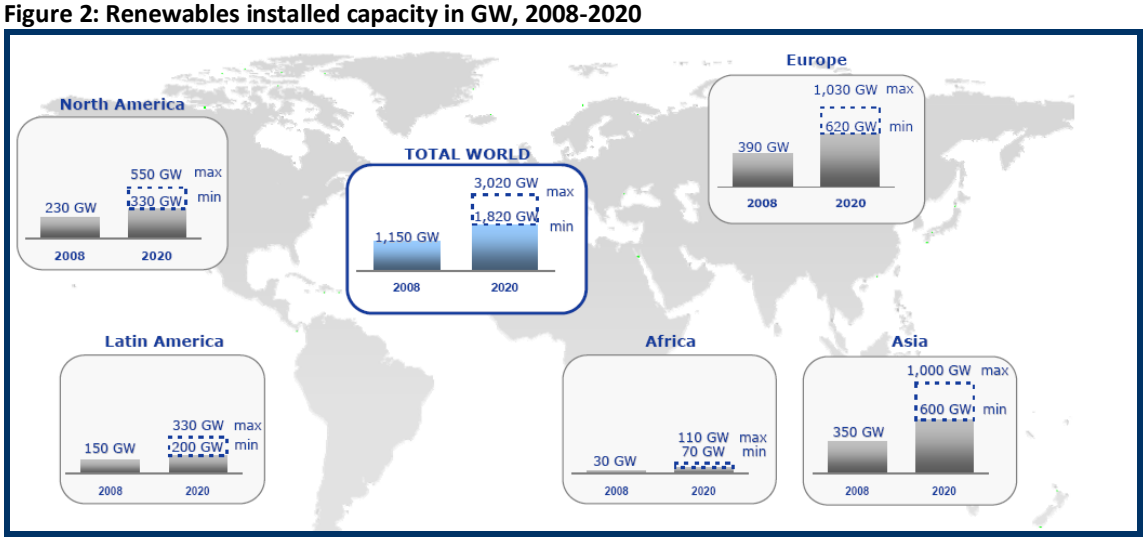
[27] Directive 2009/28/Ec of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

4.2. Renewables: the industry and key strategic drivers

Renewable energy has experienced sustained growth over recent years, fuelled by technological advances and political support in many countries. At the end of 2008, about 1.150 GW of renewable energy capacity was installed in the world, including large-hydro plants, mostly in Europe, Asia and North America.

Estimates of future growth widely vary across available sources. In the figures below, data provided by the International Energy Agency estimate a growth of 700 GW to 2020 (in the most conservative scenario). Substantial growth will take place in all geographies, with Europe and Asia leading the way. As far as North America is concerned, the new Renewable Energy Policy launched by Obama Administration will have a very strong impact on future growth, although this is not represented in these figures. In a more aggressive scenario, up to 1.900 GW of capacity could be added by 2020, doubling total renewable installed capacity in only 12 years. Even in the current economic crisis, fundamentals of renewables remain solid and growth will be robust.

Figure 2: Renewables installed capacity in GW, 2008-2020



From a technological perspective a growth pattern can be found in all key technologies: hydro, biomass, geothermal, wind on-shore and off-shore, solar photovoltaic and thermal. These technologies are in different maturity stages, ranging from very mature ones (like hydro) to more recent ones (like solar photovoltaic): the former exhibit a bigger installed base and a smaller growth rate. Nevertheless, irrespective of maturity stage, all technologies have major potential for capacity additions, typically of several hundreds GW.

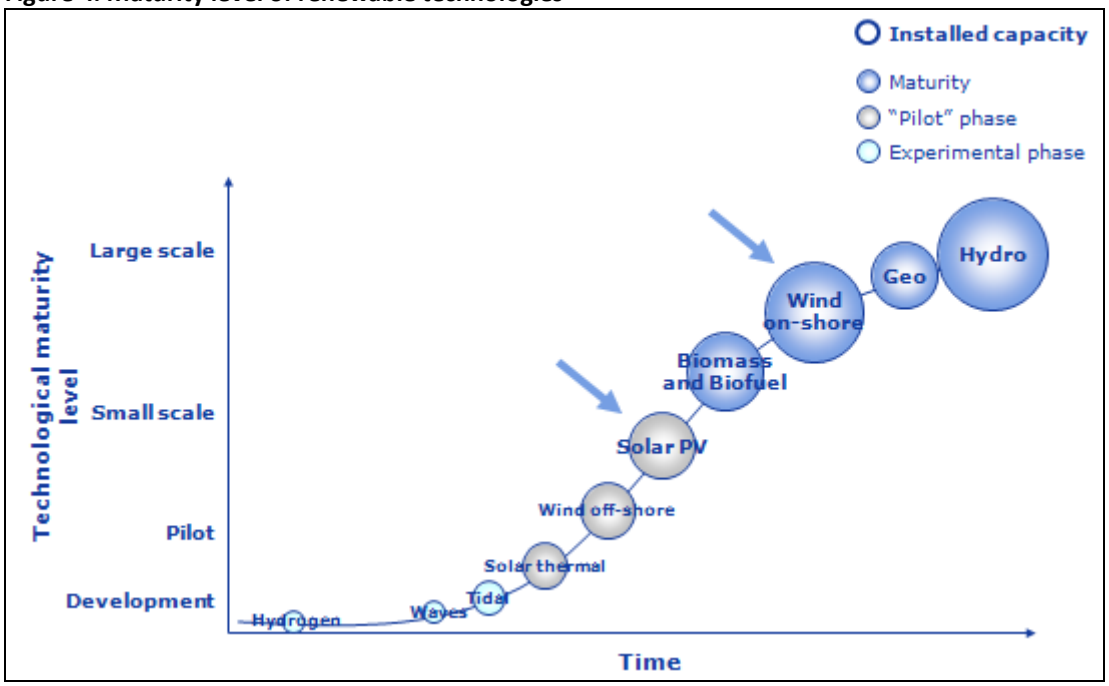
Figure 3: Renewables installed capacity by technology, 2008-2020

Technology	Global installed base 2008	Global installed base 2020	Δ capacity	CAGR	Technological maturity
Hydro	960 GW	1,280 GW	+320 GW	2%	Very high (large hydro)
				8%	Very high (small hydro)
Biomass	50 GW	470 GW	+420 GW	20%	Very high
Geothermal	10 GW	30 GW	+20 GW	10%	High
Wind	120 GW	800 GW	+680 GW	17%	High (on-shore) Low (off-shore)
Solar	10 GW	440 GW	+430 GW	37%	Medium (c-SI) Low (Thin Film) — Solar PV
					Low — Concentrated solar power
TOTAL	1,150 GW	3,020 GW	+1,870 GW	8%	

In the following figure are shown main differences in terms of technological maturity for different sources. The main drivers of competiveness are:

- CAPEX → the cost of the technology
- Load factor →resources availability, technological efficiency, productivity decay
- OPEX → the operational costs
- Useful life → the time period (years) in which a plant can produce electricity
- WACC → Weighted average cost of capital

Figure 4: Maturity level of renewable technologies



Some of renewable sources are not yet economically competitive. We can identify three main elements that can affect their technological development in slightly different ways:

- Incentives on energy price (e.g. Feed-in; Green certificates)
- Fiscal incentives (e.g. Production Tax Credit; Investment Tax Credit)
- Capex incentives (e.g. Grants; Equipment production subsidies)
- R&D incentives (e.g. Grants; Funds)

The ability of the industry and its managers and employees to maximize the incentive benefits and to consequently drive renewables to economical competitiveness is going to be crucial in green efficiency for developing these sources on a real massive scale.

4.3. Human capital needs and development in renewables

With a broader view on renewable companies' activities we would like to propose an approach to highlight the role of human capital in improving economic performances. Briefly summarizing, we will show how to concretely measure effectiveness of human capital in a renewable energy company, following the next steps:

- Analysis of the industry and definition of the main business drivers.
- Analysis of the value chain.
- Proposal of a measurement model (EVA).
- Overview of EBPM tools.

With reference to the sector's business drivers we will point out which operational levers could affect value creation with a direct link to the value chain. Having defined operational business drivers and the correlation with the Economic Value Added (EVA) model components we will analyze the possible green jobs profiles to improve the related performance.

In our view, excellence consists in maximizing company value creation (EVA) with respect to people and environment. In this sense the main aim of the following business case is to link the value chain to business drivers, EVA model and, consequently, to put forward green profiles with high impact on main processes in terms of value creation.

The obvious final goal of selecting and hiring workforce efficiently matching job vacancies is to trigger profitability ratios by leveraging on both operative and strategic decisions.

In order to understand how this shift can occur through human capital investment, we study the structure of the value chain in renewables, which is actually quite easy and similar to that of traditional energy sources. The main difference concerns plants dimensions with more distributed energy production for renewables against centralized generation for traditional sources. The value chain is summarized in the figure below, starting from manufacturing equipment to electricity sales.

Figure 5 Renewables value chain

The main actors of the industry are:

- Equipment producers (wind, solar, hydro, geothermal and biomass etc.).
- Developers.
- Engineering, Procurement and Construction contractors.
- Utilities or Independent Power Producers.
- Consumers (in these sector consumers could become producers).
- Regulators.

The activities directly managed by these actors are:

- Project development, to be realized on green field bases, thorough co-development agreements or by acquisition of developed projects.
- Procurement, normally managed by central dedicated functions; some operators are evaluating more vertical integrated approaches.
- Engineering and construction, managed by general contactors with project management tools to control quality, time and costs.
- Operational and maintenance, managed within the company with some exceptions in wind.
- Energy management.

In analysing the attractiveness of renewables, we have to consider its main growth stimulus, coming from the huge potential dimensions of the market. Currently the latter leaves enough space for every player leading to low levels of competition. The attention of the main social and environmental sustainability stakeholders, the early stage of the life cycle of the industry, the absence of real big players with the tendency of higher levels of businesses concentration, are likely to drive to enormous future demand and growth.

Considering the original structure of this industry, equipment and technological costs remain the main critical aspect to take into strong consideration. In this sense, it will be crucial the interaction with manufacturers, other suppliers and regulators in order to find the most efficient common path to decrease costs down to real economical sustainability. Human capital, in this process, is absolutely decisive.

Given this background, the value based performance using the EVA indicator (Economic Value Added) is a key instrument for measuring value creation. The model could be applied at a divisional, business unit and functional level. In general, the principles that drive this model perfectly fit with renewable energy sector:

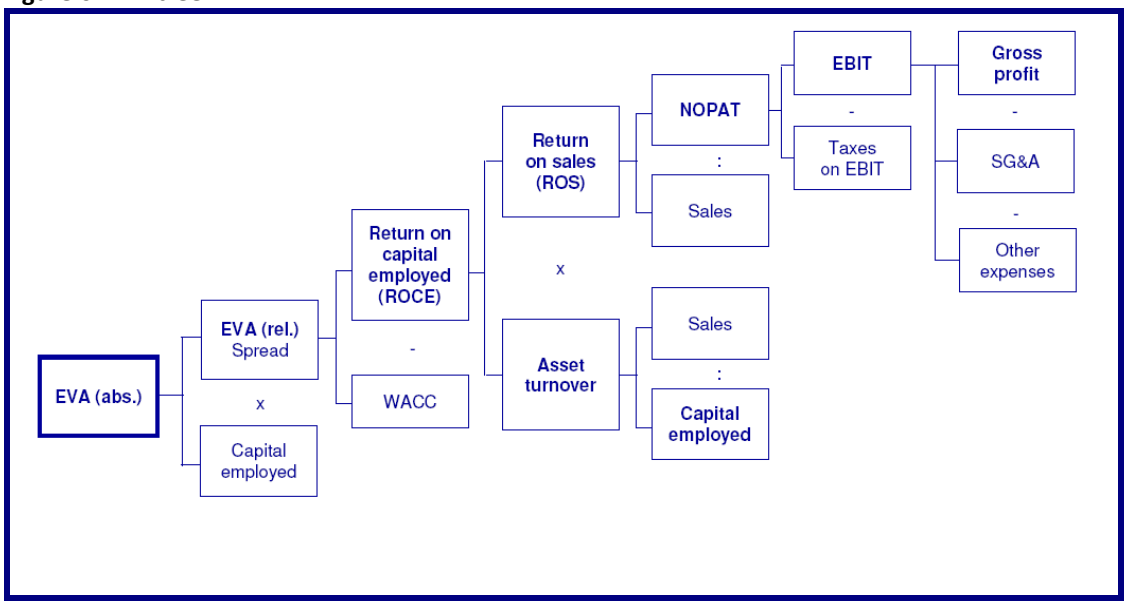
- Goal setting, evaluating strategies and investments.
- Making value creating decisions.
- Measuring and assessing performance.
- Compensate value creation.

Considering the main value drivers of EVA, these are:

1. Increase the return on capital employed (ROCE) for existing capital.
2. Invest in value creating projects.
3. Reallocate unprofitable invested capital.
4. Reduce the cost of capital.

To go deeper in the most important drivers of value creation in this industry, it is important to analyse how they are affecting the relevant components of the EVA tree.

Figure 6: EVA tree



Typical operational and strategic value drivers affecting EVA in this industry are directly connected with the value chain:

- Investment selection.
  - Geographical dimension.
  - Technological dimension.
- Development costs.
- Cost and time delivery of equipments.
- Cost, time and quality of engineering and construction.
- Electricity price and incentive.
- Operational costs.
- Useful life.
- Load factor.
- Efficiency (f.i. solar).
- Quality drivers.
  - Safety
  - Environment
  - Quality

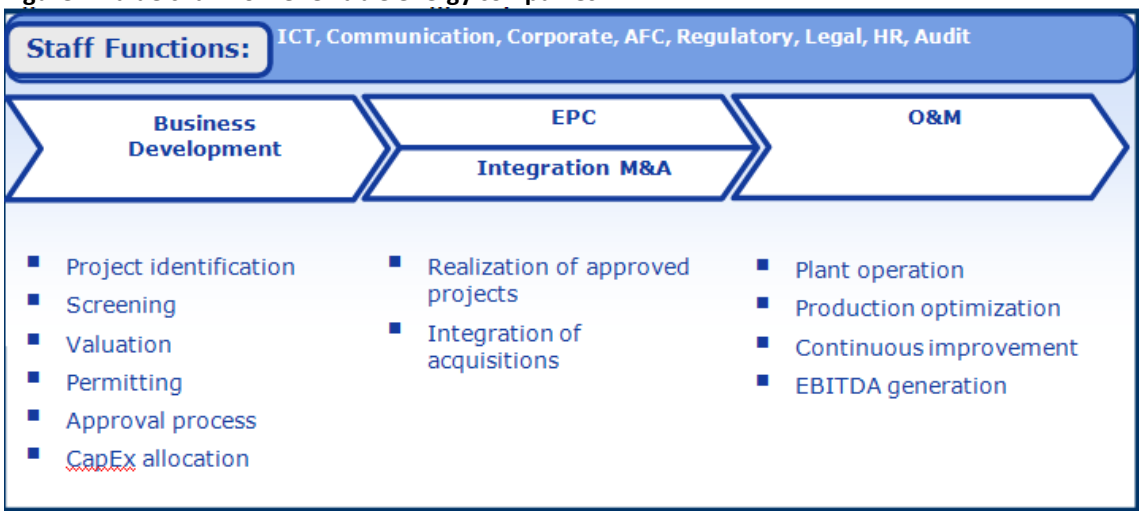
Turning to analyse the value chain of Enel Green Power, we aim at identifying which activities create competitive advantage within the organization. The value chain analysis is now the starting point to recognize the link between strategic value drivers and company levers that could produce key measurements.

In literature, the concept of value chain is developed by Michael Porter as the fundamental instrument for the identification of potential competitive advantages. According to Michael Porter, the value chain activities are divided into two groups:

support activities (including HR, Finance and Accounting, Investor Relations, Legal, etc.) and core business activities.

The value chain of a typical renewable energy company reflects Porter's Model. All the activities are divided in two main groups. The first is represented by all activities carried out by the staff function. They represent nine classes of processes that are strictly interrelated with the operational ones. For example, Human Resource processes are constantly involved throughout the entire value chain. We will primarily focus on operational levels even if staff processes are crucial in order to enable the business units to their main activities.

Figure 7 Value chain for renewable energy companies



The critical processes for value creation are those that have a direct effect on strategic Company Efficiency Indicators:

- Business Development
- EPC (Engineering, Procurement and Construction)
- O&M (Operation and Maintenance)

Studying the main macro-processes of each indicator, we firstly describe those which are typical of Business Development:

- Market and new opportunity analysis.
- Development planning.
- Greenfield and M&A project management.
- Strategic partnership development.

In turn, Business Development drives the following strategic drivers:

- Demand potential and country attractiveness.
- Resources availability, screening and identifying high potential projects.
- Electricity prices, selecting the most attractive market in term of prices and incentives.
- Development cost, optimizing fees, land rights, permitting, interconnection times and expenditures.

Secondly, in the Engineering, Procurement and Construction phase the allocated capital is exploited with the final goal to bring the plant in operation having respected the estimated:

- Quality requirement (number of Non-Compliance NC, useful life).
- Costs (construction and logistic costs).
- Timing (time to commissioning).

In particular, procurement processes have a big impact on value creation. Going back to the EVA model, procurement processes leverage equipments costs' optimization by defining best procurement strategy for each technology as well as efficiency ratios as account payable and inventory. Typical procurement processes are:

- Procurement planning.
- Suppliers selection.
- Tender management.
- Contracts management.

Thirdly and finally, Operations & Maintenance activities intend to operate the plant in a safe and environmental healthy way by improving the production output and reducing operational expenditure. Typical processes of the O&M phase are:

- Increasing useful life and load factor.
- Reducing operational cost (maintenance cost, Surveillance costs etc.).

With the given brief overview over the value chain, we have outlined useful methodologies and tools to define and implement an integrated approach that could drive to operational excellence: starting from the definition of a complete process map, we have come to the definition of the needed human resources.

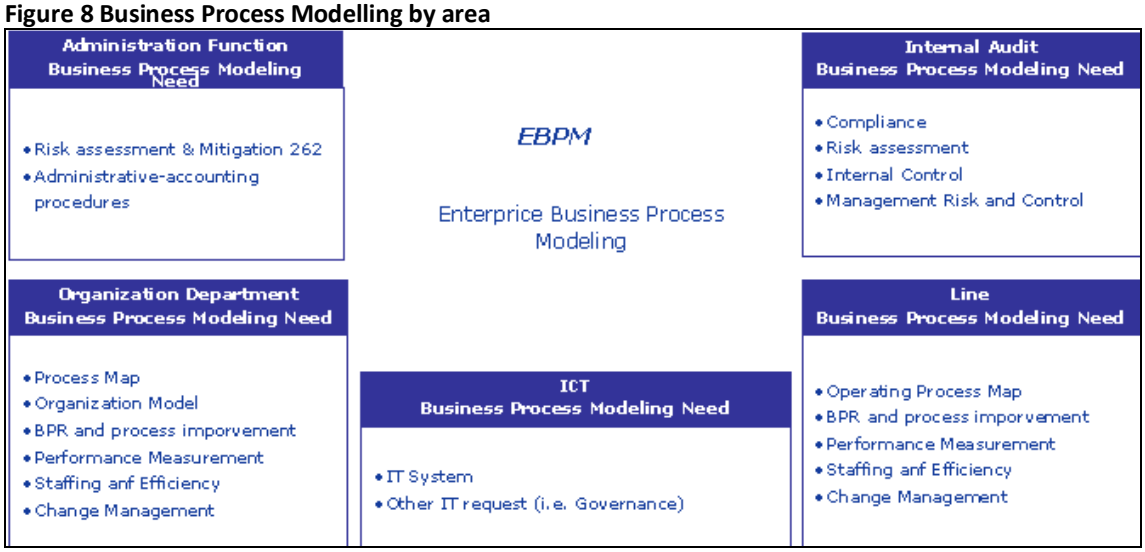
Methodologically speaking, to capture the operational efficiency potential we should follow four main pillars:

- Process map based on value chain analysis.
- Organizational model based on defined processes to assure governance.
- Continuous Improvement Programs.
- Key Performance Indicators to measure value creation.

From these pillars derives a need for a methodology and IT platform that could support an integrated approach to drive excellence: The Enterprise Business Process Modelling.

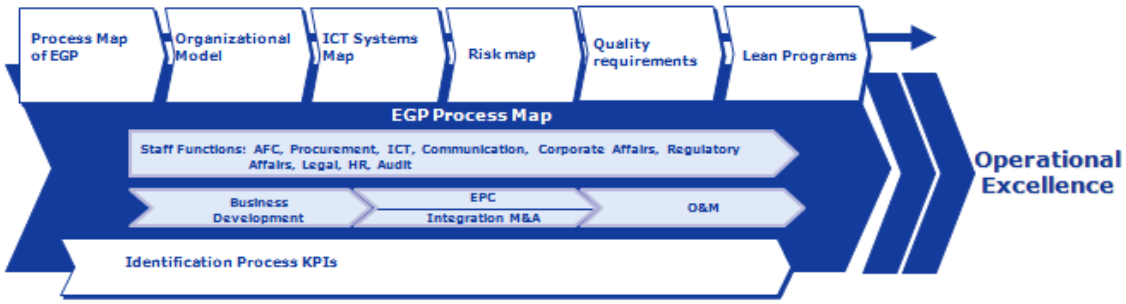
This model represents a recognized integrated business process model that permits to manage human capital activities in different company areas (Administration, Audit, HR Department, ICT, Line Functions). For example, different units need different information with different levels of details; thus it is important to find a way to support diverse requirements by maintaining a common approach and the same platform. The following figure exemplifies information needed by different organizational areas.

Figure 8 Business Process Modelling by area



The aim of an integrated approach to EBPM is to define, design and implement organizational models, IT-maps, risk maps, quality standard, starting from a common process platform. On this basis it is possible to implement human capital excellence in programs/projects, boost hard and soft human resource levers like organizational or company culture and measure the obtained results using defined value chain related measures.

Figure 9 An integrated approach to excellence



Hence, the first step to achieve an integrated model to excellence is creating an end-to-end company process map with the ambition to cover all the main value chain activities and to find common rules and interfaces. This means that all activities have to be designed with a common framework and methodology. This could be established through an available relational database for the definition, design, modelling and optimization of macro-process, process, sub-process, activities, operations and tasks.

Briefly summarizing what we have said up to now, in order to measure in a concrete way effectiveness of human capital in a renewable energy company like Enel Green Power steps are the following:

- Analysis of the industry and definition of the main business drivers.
- Analysis of the value chain.
- Proposal of a measurement model (EVA).
- Overview of EBPM tools.

The before mentioned business drivers are connected with the main processes identified within the three core areas of the value chain, designed and analyzed thanks to the EBPM methodology and instruments:

- Business Development.
- Engineering, Procurement and Construction.
- Operation & Maintenance.

Having outlined the effect on value creation of the different business drivers and the link with the value chain, they have given an overview on the main green human capital needs, skills and profiles that could be developed.

4.4. Green jobs profiles in a RE company

EGP is a company interested in hiring human resources able to create added value along the value chain, by developing specific skills that, once again, follow green efficiency levers (legislation, economy, industry, technology).

By analyzing the value chain business drivers we highlighted which competences lead to value creation and consequently to economic gain for Enel Green Power. Summarizing, those competences are at the heart of the following job profiles:

- Business Developer: in charge of identifying and developing projects having always in mind the optimization of the capital allocation.
- Project Manager: in charge of putting plants in operation having respected time, costs and quality requirements.
- Procurement Manager/Buyer: responsible for the provision of all the needed materials and equipments. As shown before, this profile is crucial in this industry due to the strong impact of fix costs.
- Plant Manager/Operation Manager/Maintenance Manager: in charge of managing plants in a healthy and profitable way by increasing production and reducing operational costs.

An adequate support to run business is furthermore needed by staff functions: ICT, Communication, Corporate, AFC, Regulatory, Legal, HR, Audit. Here skills are traditional ones, although adequate knowledge of the industry is needed in order to give line functions effective support.

In the current development phase of the industry, legislation and regulation are crucial not only to directly influence the short term profitability but, most importantly, to define the road map is globally needed to shift to a maturity phase: toward green efficiency. Thus, people responsible for regulation and organization should be able to:

- Develop adequate legislative corporate frameworks, suitable for green projects and abiding by international and national regulations
- Communicate effectively with local communities and develop economic-industrial capacities to sell green goods and services.

Other important skills are connected with innovation and R&D. In fact the industry is phasing a new era characterized by rapid and massive growth perspective, with some technologies typical of a mature stage (f.i. Hydro) while others are still developing (f.i. Wind or Solar) or are in a testing stage (f.i Tidal and Wave). Therefore, to really reach the potential volumes and diffusion of renewables sector, the effort in terms of skills and motivation needs to be substantial.

As regards the above mentioned profiles and skills, we derive that RES companies are interested in skills that turn out to be quite traditional skills. Real innovation lies in adapting such competences to the new and rapidly changing reality, as far as environmental, legislative, technological, economic aspects are concerned. This means that green skilled workers have to learn how to adapt to and cope with new actors, priorities, values. If the latter are shared and aligned by workers and companies, there is likely to be room for mutual efficiency gains.

Given this background, Enel Green Power has experienced the growing need for adaptation of existing professional profiles (managers, business and financial professionals, engineers, etc.[28]) in order to increase efficiency and move towards a new fast growing scenario. What is common to all this profiles in Enel Green Power, such as in the whole sector is that a job profile is never conclusively defined. Technological processes' fast pace and constant change require workers quick adaptation and flexibility to run after, or better to anticipate, business and to manage it. Consequently, personal skills like self-and stress management are essential.

Analyzing some existing job profiles, managers and entrepreneurs, as all the other profiles, have to «quickly pick up new trends, explore new markets and channels, invest in customer relations and optimize their processes and finance to reduce costs»[29]. Therefore, entrepreneurialism, creativity, innovation are an added value for people who cover these roles in companies. Equally, up to date legislation knowledge, especially with regard to environmental law, as well as communicative and intercultural skills are essential.

Business and finance professionals, instead, have to develop what we called industrial-economic skills. Hence, these practitioners need personal and social abilities useful to communicate with local communities to sensitize to certain products and services' purchase. Of course, they cannot lack legislative and green procurement[30] knowledge.

Engineers operating in power production from renewable energy sources sites have to master technical knowledge and abilities, with the aim of producing added value and efficiency along the value chain. Although technicians, not only engineers but also ITC professionals, have to hold the stage as far as specialized technical details, they also have to learn how to cope with legislation related issues or economical matters.

Every job profile, as we said, has to be dynamic, flexible and adaptable to different situations. What is more, if we keep in mind green efficiency as our goal, we cannot

[28] These categories and relative competences are drawn from the TNO report in footnote 1.
[29] *Ibi.*
[30] For green public procurement see http://ec.europa.eu/environment/gpp/index_en.htm

disregard regulatory or procurement competences as key knowledge areas to be mastered by all workers. The latter should be committed, aware and responsible of the challenge they fight for.

More broadly, taking into consideration the wide spectrum of other occupations requiring green skills, we could say they cover a broad array of competences including new ones and the redefinition of those already existing, in the basis of a widespread cultural awareness and sensitivity of the environmental risks across all jobs.

5. Conclusions

In the last chapter we have analyzed a practical case concerning a renewable energy company by outlining the linkages between excellence in human capital and value creation throughout a brief analysis of industry basics: value chain, main processes and business drivers. Our hypothesis seems to be confirmed: we can see there are some key competences that are crucial to create value along the value chain.

On the one hand these skills are both technical and transversal, but they are not something new. Technology is not that developed to require new engineering abilities and business management works more or less the same as in traditional companies. What changes most, as far as the content is concerned, are systemic skills, like the knowledge about sector competitors, energy sources, key values of the sector, etc.

On the other hand the industry is phasing substantial growth and technological development with incredible stimulus coming from all major stakeholders, mainly due to climate change as social and economic lever, as we said in our introduction.

The green efficiency scenario could be considered as the auspicate outcome of today and future social, economical and industrial policies. Considering this quasi revolutionary elements, our strongest assumption is that green skills are going to become something completely new when they are supported by the driver of green awareness and that this combination of traditional expertise and new awareness has to be considered the only possible way to drive the needed changes in the way of real sustainability.

As a cultural issue, all education and training providers, with public primary education commitment at the forefront, are involved. However, in the era of lifelong learning, no life stage and life context can be counted out: general education, vocational training, on-the-job and in-company training, adult education, are all potential learning venues for green skills. In general terms, training and retraining required by green jobs changing nature, have the potential to contribute to lifelong learning challenge and enhance working conditions. Having said that, we should bear in mind the European Commission's guidelines concerning education and training: we do not learn only at school, in universities, in formal contexts, but we learn in any situation of our life, be it non formal or informal, family, workplace or leisure. Primary education bears the responsibility to provide citizens with green awareness, and teach them to manage and apply concepts such as sustainability, efficiency, etc. In turn, companies strengthen theoretical knowledge, develop practical abilities and improve transversal skills day by day on the job training. Such assumptions lie on a strong belief about the educative value of working activities, and this holds true also for green occupations.

It is therefore clear that we do not support a supply led approach to education; on the contrary we believe in education and training tailored around individual needs and attitudes, and shaped in view of long term sustainability for future generations. Furthermore, many green competences are not available today because of a static idea of the relation between education and labour. Strengthening school-to-work transition paths and better integrating learning and working would develop new skills and teach young people to learn "how to learn" as far as work methodologies and contents are

concerned. To get there, green skills have to become part of workers value kit, as we said: they have to become acquired behaviors and beliefs, in order to be as deep as it is necessary to make citizens and workers highly motivated and committed.

In order to realize what we described as the best scenario, we add some practical insight to develop human capital for green economies.

Our first suggestion is to build up a strategic approach: if sustainability has to be conceived on the long run, and if the shift to green efficiency is so complex and far reaching, we cannot focus on single solutions.

Secondly, better integration between education and training and work, as mentioned above. If pupils are used to applying concepts such as sustainability, and efficiency, to their daily tasks, they will automatically behave and work according to those values, which meet those of eco-industries, when they become workers. Such links do not only consist in sharing pedagogical methodologies among the two worlds (for example, working experiences help raising individual responsibility; they may develop communicative and social skills and teach stress and self-management). We are also referring to the delicate school-to-work transition: the former should offer placement and counseling services to students, in order to inform and orient them in their transition to the labour market.

Although vocational training and work have their say in preparing workers for green jobs of tomorrow, the third suggestion is directed to traditional education paths: they should modernize vocational and general courses and their modularization so to increase learning paths flexibility. Courses should be planned also according to local labour market needs. Tailoring training offer to real needs and not to general standards is a great achievement, if we believe in an individualized and personalized idea of education and training. Methodologies should also change: for example, blended learning would allow more time flexibility, give room to self-management abilities and individual responsibility.

Fourth, the role of social partners and other stakeholders should be considerably strengthened. As we mentioned, they can play an active role in spreading values related to eco-sustainability, thanks to their links with labour market, education and training, and civil society. Moreover, they could build up a dialogue with education and training as far as green curricula definition is concerned, to plan training paths as close as possible to real human capital needs.

In order to learn which really those needs are the fifth insight is to strengthen social dialogue as the best driver for anticipating and forecasting skills gaps and consequently plan education and training supply. Anticipating and forecasting human capital needs, at different governance levels but also with a sectoral approach, is of crucial importance: it prevents skills shortages and it ensures a better matching between competences' demand and supply. Large companies already have overall longer-term business strategy reducing the skills mismatch, but this should be somehow true also for SMEs.

Sixth, society as a whole should take on board the European Commission invitation for an actual concept of lifelong learning. Ten years after the first time this concept arose, we still make distinction among different segments, often leaving apart the real aim of learning. One way to give LLL real implementation is recognizing the importance of non formal and informal learning, proven that the relative learning outcomes are genuine and useful for the student/worker.

Innovative work organization solutions, finally, may help companies to better allocate human capital in the productive process, also given the emerging job profiles and new technologies. In doing so, managers should always consider the complex nature of green skills, and that they are not narrowly limited to one task's accomplishment.

If all we have said is true, that is the shift to green efficiency for saving the planet needs everybody to be highly motivated and commitment, we all agree with the USA President Barack Obama stating that «at the end of the day, we can have the most dedicated teachers, the most supportive parents, and the best schools in the world – and none of it will matter unless all of you fulfill your responsibilities»[31].

[31] Barack Obama, *Back to School Event*, Arlington, Virginia, 8th September 2009, in Adapt newsletter, 2009, n. 25, *www.adapt.it*