SECTORAL FOCUS REPORT

L'efficienza termica in Italia: soluzioni tecnologiche ed opportunità di business nell'industria

Luglio 2015

POLITECNICO
MILANO 1863

MIP
POLITECNICO DI MILANO
GRADUATE SCHOOL
OF BUSINESS

energystrategy.it

Energy Efficiency Report 2014
Executive Summary

The fourth edition of the Energy Efficiency Report focuses on some of the most "hot topics" for the market operators in the energy efficiency sector: the risk management in energy efficiency projects, the financing of energy efficiency projects, the ICT-based technological solutions that allow to collect and analyze data on energy consumption of end users, the characteristics of the energy efficiency value chain in Italy for the different technological solutions. Finally, the Report focuses on the industrial thermal insulation, under-analyzed technological solution that however can significantly contribute to a reduction of the thermal energy consumption associated to the production processes.

Risk management is undoubtedly one of the most interesting and innovative contributions of the Report, which aims to understand which are the barriers to the diffusion of energy efficiency in our country. A wrong estimation, assessment and management of risk sources related to an energy efficiency intervention, in fact, can significantly affect the amount of the energy benefits and, consequently, the economic benefits that can be achieved by the end customer.

Considering the installation of a CHP plant (a 1 MW_e Internal Combustion Engine - ICE) – with a total investment of around € 1.2 million - it is possible to estimate an average Net Present Value (NPV) of about 2.8 million €. In the absence of measures to mitigate the risk sources that value might worsen up to 9%, while on the contrary, by implementing a risk management system the NPV might get an increase up to 14%.

The Report highlights that it is essential to identify the different risk sources that may occur throughout the energy efficiency project lifecycle: from the design phase to the O&M phase. Once identified, the risk sources have to be managed through the implementation of appropriate mitigation strategies, which are designed to reduce the risk sources' impact on the technical and economic feasibility of the project and their likelihood. A survey, which was conducted through the analysis of about 100 real case studies, led to the identification of 16 risk sources and 9 mitigation strategies. Within the Report, for each risk source a brief description and the most effective mitigation strategies to reduce impact and likelihood are identified, also highlighting the roles that the different actors involved during the energy efficiency project should take play within the risk management system. The report also explores the relationships between the different risk sources, suggesting a systemic approach to risk management, in order to: (i) identify potential risk sources; (ii) assess their potential magnitude and likelihood and, finally, (iii) identify, plan and manage the mitigation strategies, coordinating the various actors involved in the implementation of energy efficiency projects (e.g. technology providers, ESCo, end users, financial institutions, insurance institutions, etc.).

Despite the undeniable benefits that can be ascribed to risk management, the analysis of the Italian energy efficiency industry shows that such topic is little known by the different players within the industry. Besides, the adopted mitigation strategies are almost exclusively related to the risk sources within the design phase of an energy efficiency project, thus neglecting all the other project phases.

A second crucial barrier to the widespread diffusion of energy efficiency projects in Italy concerns the financing of such projects. From the Report, it emerges that the use of a proper financial instrument, consistently with the characteristics of the specific energy efficiency project, is a critical component for the project success. The currently available financing instruments at national level are both public and private.

Among public instruments, the European Energy Efficiency Fund (EEEF) has a € 265 million budget, aiming to finance energy efficiency projects in the Public Administration sector. A second public instrument is the European Local ENergy Assistance (ELENA), a technical and financial assistance to local and regional

authorities for the implementation of energy efficiency measures with a total budget of € 731 million. There are local financing mechanisms as well. The European Regional Development Fund (ERDF), through the JESSICA mechanism, uses European funds in order to support energy efficiency projects for production processes of SMEs. There are initiatives promoted by virtuous Regions, which through regional tenders try to promote the spread of energy efficiency measures especially among households.

Among private instruments, in addition to the "traditional" bank loan, there are other "alternative" instruments. Project bonds, i.e. bonds issued as part of project finance transactions, which are intended to remunerate the investor as a function of the cash flows generated by the energy savings attributable to the project. Mini-bonds, which are medium–long term debt securities that can be issued also by non-listed SMEs for raising capital in order to implement energy efficiency projects. Leasing, a sort of lease of the technology for energy efficiency with the possibility for the end user to purchase the asset at the expiry of the contract and at a predetermined price. It is also worth mentioning the crowdfunding, a form of financing that consists of a collection of funds, usually organized through the Internet, by involving people who don't belong to traditional financing institutions (such as banks or investments funds).

Finally, it is possible to find the necessary financial resources to finance the energy efficiency projects through special agreements among the different actors working in the field. First of all, through the so-called "White Certificates anticipation", i.e. an agreement between a subject entitled to obtain the White Certificates and the customer of the energy efficiency project, who gets part of the capital needed to realize the energy efficiency project from such player (typically around 25%), which will be returned through the White Certificates issued after the project implementation. Another alternative refers to an agreement between an energy utility (who provides energy to its customer) and the customer, which is affected by the energy efficiency project. The utility itself deals with the energy efficiency project funding (up to 100% of its value) and then is refunded through an agreed increase in the customer's energy bill.

Despite such a broad availability of tools, the use of "traditional" bank loan is still predominant. As mentioned before for risk management practices, the Italian market appears to be immature from this point of view. Between 2007 and 2013 public funding was used for less than € 50 million and leasing for around € 74 million, compared to the pretty much higher relevance of the "traditional" bank loans (about € 585 million). This is mainly due to the barriers to exploit the other financing sources. For example, the use of public instruments is hampered by the long required bureaucratic procedures (more than one year in certain cases), and the high project minimum dimension required (hundreds of thousands of euro typically), which penalizes small-medium size projects.

Although leasing is a well-established financing mechanism, its limited diffusion within the national energy efficiency sector is mainly due to the contract clauses typically requested, which are affected by the peculiarities of the energy efficiency technology that must be "removable" and "fungible". For the other private financial instruments, the main adoption barriers refer to organizational and management difficulties that usually characterized newly formed mechanisms.

An empirical investigation, that has involved 80 Energy Service Companies 35 financing institutions, highlights a significant willingness to reverse this trend in the next future, also thanks to the desired development of a guarantee fund. About this possible evolution, even the policy maker seems to be aligned with the industry. So much so that the Law Decree 102/2014 (the national transposition of the European Energy Efficiency Directive, 2012/27/EU) has set up the National Energy Efficiency Fund, which aims to support energy efficiency investments through the provision of guarantees and funding (either directly or through banks and financial intermediaries). The criteria, conditions and methods of operation and management of the Fund will be determined by one or more decrees, while the available budget for the years 2014 and 2015 is respectively equal to € 5 and € 25 million, which can be further integrated to a maximum of € 30 million per year for the period 2014-2020.

Taking into account: (i) the energy saving targets set by the National Energy Strategy and the already achieved results; (ii) the technological solutions for energy efficiency currently available and their cost-effectiveness in the different fields of application; (iii) the "leverage effect" of the past guarantee funds, it is estimated that the National Energy Efficiency Fund budget should be equal to € 51 million in order to reach the 30% of the energy saving target set by the National Energy Strategy for the residential, industrial and service sectors; such value should be respectively equal to € 136 and € 220 million to achieve the 40% or 50% of the same target.

A third main barrier for the diffusion of energy efficiency projects in Italy regards a lack of awareness of the energy consumptions and the possible areas of intervention. In other words, it refers to a proper implementation of the energy audits, i.e. preliminary investigations aimed at obtaining information about the energy needs of an energy user, through the involvement of experienced and qualified players and the use of reliable and effective technologies. As a proof, in recent years there has been a growing offer of ICT-based solutions to facilitate and automate the process of collecting and processing information about energy consumption and on the characteristics of the energy user. The real applications of such solutions reveal how their correct use allows a rationalization of the energy consumption, not only due to energy efficiency measures determined through the audit, but also thanks to a change in the energy user habits resulting from increased awareness of its energy consumption. These hardware-software solutions can be distinguished into three different configurations. The "monitoring systems" allow the collection of information about the energy consumption and a benchmark analysis in comparison with “ideal” situations of plant operations. Considering a housing unit (about 100 m^2) with annual an electricity consumption of 3,000 kWh and a thermal consumption of 13,000 kWh, the implementation of a monitoring system, which informs the households about the energy consumption of the heating/hot water production and lighting systems, may result in a reduction of the energy bill of around € 160 - € 220 per year, compared to an initial investment of around € 1,500 - € 2,000. The "control systems" allow energy users to monitor the energy consumption patterns, to compare the obtained information with predefined target values (set points) and then automatically implement corrective measures. Considering a building of large food retail company (around 2,500 m^2), the implementation of a control system, which automatically manages the operation of compressors of 30 refrigeration systems, could lead to a reduction of the electricity bill of around € 12,000 – 15,000 € per year, corresponding to about 85 MWh_e - 95 MWh_e, compared to a total investment of about € 30,000 - € 40,000. The "supervisory systems" include the features of the two other systems, allowing the monitoring of the energy consumption patterns, the comparison of information obtained with predefined target values, and the choice and automatic implementation of corrective actions based on the results of a technical-economic analysis. Considering an automotive assembly plant (with an annual production volume of 15,000 cars), the implementation of a supervisory system – which automatically manages the operation of the electrical engines, the variable speed drivers and the compressed air supply within the engine-chassis assembly plant and painting plants – could result in a reduction of the energy bill of around € 500,000 - € 550,000 per year, corresponding to around 4 GWh_e and 1.5 GWh_{th}, compared to a total investment of around € 250,000 - € 300,000.

It seems clear that a widespread diffusion of such systems could lead to a significant energy and economic benefits. For monitoring systems, the potential annual energy savings thanks to their adoption is estimated equal to about 10 TWh_{th}, with an average annual market volume of around € 480 million. For control systems, the estimated energy saving potential amounts to 24.8 TWh_{th}, with an average annual market volume of around € 810 million. Finally, for the supervision systems t the estimated energy saving potential amounts to 40.7 TWh, with an average annual market volume of around € 1.68 billion.

Then the value chain configurations of the main technological solutions for energy efficiency are identified and analyzed within the Report. The main goal is to identify not only the roles of the different players involved, but especially to understand which are the drivers influencing the investment or collaboration

choices. In particular, 9 different markets are analyzed, for a total of 14 technological solutions for energy efficiency and 25 different value chain configurations. The different value chain configurations are classified according to two dimensions: (i) the kind of intermediary between the energy efficiency solution provider and the end customer, who can be the provider itself (no real intermediation in this case) or can be of two types: (i.i) "generic", which identify those individuals who do not work exclusively in the energy efficiency sector; (i.ii) "specialized", which identify those players (mainly Energy Service Companies - ESCo) for which energy efficiency represents the core business; (ii) the size of the intervention, distinguishing between "small" and "large" scale project as a function of the specific technology. From the analysis it emerges that the most part of the whole turnover (about 4.43 billion € per year) is attributable to the value involving "generic" intermediaries.

Finally, the Report focuses on the analysis of the industrial thermal insulation, a poorly investigated technological solution that however represents a remarkable energy saving potential for the Italian industrial sector. It regards the installation of special materials in order to reduce thermal losses in "critical" areas of the production processes, through a hot thermal insulation, for the heat conservation at temperatures that can reach 500 - 550 ° C, or a cold thermal insulation, for the conservation of low temperatures that can reach -50 °C in non-cryogenic processes and the "absolute zero" for cryogenic processes.

The energy and economic benefits associated to the adoption of this technological solution are huge: for example, a production process characterized by the presence of flanges and valves with a surface of approximately 300 m^2 (heat temperature equals to 300 °C; annual operating hours equal to 5,000), the adoption of a thermal insulation (fibrous materials) – for a total investment equals to € 35,000 - € 40,000) - would generate annual energy savings of around 1,300 MWh and a reduction of the energy bill of about € 65.000 per year.

Taking into account the industrial sectors in which the highest benefits resulting from intervention on thermal insulation might be achieved, their cost effectiveness and the sentiment of the market operators, the expected energy saving associated to the adoption of this type of solutions in Italy between 2015 and 2020 amounts to about 6.8 TWh per year, with an annual average market volume of around € 80 million. The achievement of this potential would significantly contribute (9.8%) to the energy saving target set by the National Energy Strategy for the industrial sector.