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RENEWABLE ENERGY COSTS IN ITALY: A FOCUS ON SYSTEM INEFFICIENCIES' COSTS AND HOW MUCH THEIR EFFECT ON INVESTMENTS IN THE SECTOR

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Overview

Increasing the use of renewable energy entails costs as well as benefits. In most cases the industrial cost of renewable energy is higher than that of other energy sources, although extremely site specific. This cost has been one of the major impediment to an increased use of renewable electricity. The higher cost of many renewable energy sources, as compared to traditional fossil fuels, is partly due to their dispersed nature. However, renewable technologies, especially those for electricity generation, have undergone impressive technical improvements and are now commercially viable. Investment costs have come down considerably and, when the external costs are taken into account by the incentives for renewable generation, renewables can now be close to competitive with fossil fuels.

In Italy as well as in many European countries investing in renewables is rather new in the power sector. This implies costs related to the infancy of the technologies, that should be reduced as long as the technology becomes mature. Nevertheless, renewables are also burdened by costs not strictly related to the plant, but due to inefficiencies of the playing field that lead to indirect costs. For instance, one of the biggest barriers for some renewable energy plants is the permit procedure, which is still burdensome and time consuming, involving a very complicated bureaucratic licensing procedure. This has the consequence of a high "mortality" rate for the investments in the sector and leads to increased costs for those projects managing completion. The different regulatory environment is one of the main drivers for different renewable electricity costs in European countries.

Given these considerations, how should government policy change to promote greater use of renewables? The energy system has long been heavily regulated and publicly controlled. Although this is shifting, government still plays a major role in energy policy. Changes in energy systems, therefore, can come about from changes in government policy. This paper therefore focuses on the renewable electricity generation costs in Italy, with particular emphasis on "soft" costs related to the phase of acquiring permits for project development and to the operation along the whole life of the plant.

Methods

In liberalised energy markets, evaluating generation costs in view of the return of the investment is of primary importance. For renewable energy plant this means mainly looking at investments costs, while operational costs are in most cases negligible. The fact that these technologies are "capital intensive" leads investors to be very cautious towards new initiatives, because of the risks involved in the authorisation phase and in regulatory uncertainties. Given that electricity production cost is one of the critical issues for investments in renewable energy plants, this paper focuses on the main cost components of the most widespread renewable electricity generation technologies and evaluates their contribution to the cost of generating a unit of energy. The study carries out a detailed analysis of investment and operational costs of renewable energy sources for electricity generation as they apply to the Italian case. The focus is on photovoltaic, onshore wind energy, hydroelectric plants, biomass and biogas combustion. The methodology of the analysis is based on both own estimates, literature and data from operators. Country specific data are gathered through a survey amongst sector operators in Italy.

Results

After performing a detailed analysis of the investment and operational costs of renewable energy in Italy, the work evaluates the incidence of costs created by the ineffective regulatory and administrative environment, trying to evaluate the cost reduction achievable by better administrative procedures. The analysis highlights the cost factors that are not directly related to technology, namely permission costs, licensing costs, time delays and agreements with municipal authorities, giving an estimate of the present inefficiency of the administrative structure.

Finally, a sensitivity analysis of the impact of the main economic parameters on generation costs is carried out. The table below shows the cost of different renewable technologies as calculated for Italian investors.

Tab. 1: The cost of renewable electricity in Italy

Technology	Size (MWe)	Life (years)	WACC	Investment cost (€/kW)	CGM (€/kWh)	Fuel (€/kWh)	Investment (€/kWh)	Total cost (€/kWh)
Hydro small head (3 MW < P < 10 MW)	4,2	30	8,1%	4000	1,70		7,39	9,10
Hydro big head (P < 10 MW)	3,3	30	8,1%	2150	1,67		7,78	9,45
Wind HV (P > 10 MVA)	30,0	20	7,0%	1200	1,67		5,68	7,35
Photovoltaic (50 kW < P < 1000 kW)	0,3	20	4,0%	5800	5,61		32,95	38,55
Photovoltaic (1 kW < P < 3 kW)	0,0	20	5,5%	6500	9,33		42,01	51,34
Biomass direct combustion (15 MW < P < 20 MW)	17,0	15	9,3%	3000	4,00	9,46	5,05	18,51
Landfill biogas combustion	0,5	10	6,8%	1800	1,04	0,00	3,63	4,67
Biogas from anaerobic digestion	0,5	10	9,3%	3000	2,15	5,42	6,05	13,62

Conclusions

The young age of most renewable technologies entails higher costs than expected, not only for technical and economic reasons, but also for the inexperienced investors and administrators, which have not yet found a proper way to select and authorise new projects. Although renewable generation is expensive when evaluated in a short term perspective, it has long term positive impact at industrial and social level, particularly when considering the external costs of electricity generation from fossil fuels. Such positive impact can be gained earlier if inefficiencies are removed and a clear and simple regulatory environment is created, boosting the willingness and motivation of investors. The paper estimates the cost of inefficiencies, calculating each cost factor separately and evaluating the incidence on the cost of investments. Some indications are also given to policy makers for reducing the unnecessary costs for a faster growth of renewable energy generation.

References

- EC (2007), "Renewable Energy Road Map Renewable energies in the 21st century: building a more sustainable future", COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT, COM(2006) 848 final.
- ECN (2004), Potentials and Costs for Renewable Electricity Generation, M. de Noord, L.W.M. Beurskens, H.J. de Vries, February, ECN-C--03-006, available at www.ecn.nl.
- EREC (2004), Renewable Energy in Europe.
- ESHA (2000): BlueAge, Strategic study for the development of Small Hydro Power in the European Union. European Small Hydropower Association ESHA, 2000.
- EWEA, 2004, Wind Energy – The Facts, www.ewea.org.

Alex, Klein (2006) "Comparative Costs of Energy Coal, CCGT, Wind, Emerging Energy Research report for VESTAS.

Kooijman, H.J.T. (2002): Cost parameters and resource assessment of wind energy in Europe, Remarks and recommendations within the framework of the ECN project BETER, ECN-Wind-Memo-02-034, December 2002.

Arturo Lorenzoni, Epschtein Ohad, (2005), "Il costo di produzione di energia elettrica da fonti rinnovabili in Italia", report for Pirelli Ambiente.

Arturo Lorenzoni (2006), Promoting renewable energy and energy efficiency in liberalised markets, Newsletter 02, Venice International University Environmental Training Community, Sino-Italian Cooperation Program, April.

OECD/IEA (2003), Renewables for Power Generation - Status & Prospects. Available at www.oecd.org.

OECD/IEA (2003), Renewables Information 2003, (NET Ltd., Switzerland).

OECD/IEA (2004), Renewables Information.

Voogt, M., et al. (2001): Renewable energy burden sharing REBUS, Report for the European Commission, DG Research, ECN-C--01-030, May 2001