

Opportunities and Challenges for the Renewable Energy Sector in Europe

The Opportunities

The issues of global warming resulting from the production of CO₂ have finally convinced most governments around the world that the problem is being generated by human activity, principally by the burning of fossil fuels for transport purposes and electricity generation.

Policy decisions of European, national, and regional governments will and are creating many opportunities for manufacturers, producers and investors who are interested in replacing the current fossil fuel generation fleet with totally renewable forms of electricity generation. The objective of replacing all thermal generation employing the combustion of fossil fuels is achievable within the foreseeable future. Also achievable is the substitution of all land-based forms of transportation using combustion engines with electric vehicles which can be powered by the new fleet of renewable energy generators during off-peak demand periods.

This has given rise to major opportunities for renewable energy generation from hydro, wind, solar, tidal, and wave technologies, some of which have been developed and proven, and others which have still to be developed. Besides the energy sector, the whole area of transportation, both private and public, needs to be taken into this carbon reduction plan.

Hydro-electric generation is the longest established and proven renewable technology, with many operating projects having operating lives of 80 years or more. However, large-scale hydro generation requires major rivers that have not been exploited. Large hydro projects also have major, and in most instances today, unacceptable environmental impacts. The opportunities are therefore extremely limited for large-scale hydro projects although there are thousands of mini-hydro projects that can be developed. There should also be opportunities for pumped storage hydro generation, because pump storage is a very effective way of storing energy produced by other renewable technologies when there is overcapacity. The more non-dispatchable renewable capacity connected, the more need there will be for energy storage, and pumped storage would allow the storage of relatively large volumes of energy.

Wind generation has in recent years been the most successful renewable technology with tens of thousands of megawatts connected throughout Europe. In some countries like Spain it could be argued that there is overcapacity, because at times there is more capacity than demand, resulting in the need to spill the wind and not generate. Most European countries have not yet installed the wind generating capacities found in Spain, and the potential of off-shore wind generation is enormous and not yet exploited. As the technology improves, it is possible that smaller machines could become affordable to small rural domestic consumers, who may wish to reduce their electricity costs and maybe even become generators. The potential for tens of thousands of domestic generators is therefore a real possibility. Expansion of a true European transportation grid would allow the export of excess capacity to other European markets preventing wind spilling and reducing thermal generation in other European markets. Additional

pumped storage capacity would, as previously indicated, prevent wind spillage. If the full off-shore potential on the Atlantic coast is to be harnessed then the European grid and additional pumped storage are needed soon.

Solar generation fits into two categories, Photovoltaic (PV), and Solar Thermal (ST). These technologies have been less successful than the wind technology, and capital costs are substantially higher resulting in the need for a much higher tariff. Nevertheless, the technology is improving and with improvements, capital costs and subsequent tariffs are likely to come down. With PV projects in particular, it is foreseeable that most private homes could be fitted with PV collectors in those parts of Europe with an adequate solar resource, such as the southern European peninsulas. This could turn millions of household consumers of electricity into generators. The metering and control systems are already available to facilitate distributed generation in such numbers. Solar generation has less of a dispatch problem than wind, as the solar resource is much more predictable, and less volatile than the wind resource; nevertheless, there is still a significant dispatch problem with solar generation which needs to be catered for.

Marine energy, in the form of tidal and wave energy, is still in its infancy and at least a decade away from reliable commercial operation. Nevertheless, a decade is nothing in the electricity sector, and rapid advances in the development of the technology are being made. There is likely to be some commercially successful projects of material size by 2020, although they will be limited in number.

The Challenges

The major obstacles and challenges for this new fleet of generators are technical, operational, environmental, political, regulatory, commercial, and financial.

Technical challenges are many depending on the technology, however the historic technical model of the electricity systems with concentrated generation connected to high voltage transportation to distribution in high density population centres does not facilitate connection of distributed renewable generators producing relatively low capacities. An entire new transportation and distribution model is needed to facilitate the tens of thousands, if not millions, of new domestic generators that will wish to sell, as well as buy, electricity.

System operators have already been meeting the operational and control problems of adding non-dispatchable renewable generators to the system. Significant progress has been made in connecting thousands of wind generating units to a system that used to control and dispatch only dozens of thermal units. What is evident is that advances in control and instrumentation technology, at all points in the supply chain, will allow us to meet the technical challenge of tens of millions of tiny generators. Besides improved control and instrumentation systems, another way of managing the dispatch problems of renewable projects is to consume more electricity in off-peak periods and less in peak periods. An ideal way of doing this is the electrification of transport, with more electric trains, trams and cars. The arrival of the electric car should allow us all to recharge our personal transport at home during off-peak night-time hours. This in turn would

drastically reduce CO₂ emissions from private transportation. Demand at peak periods can also be reduced with many domestic tasks being programmed to be performed during off-peak periods. The construction of more pumped storage plants would also allow us to store excess renewable generation for use during peak demand periods.

All technologies however, even renewables, have their environmental impact. It is very evident that large sections of the general public do not have faith in the current environment protection legislation, or in the authorities established to protect the environment. A major reason for this mistrust is that promoters very often do not do enough to inform all stakeholders, especially the public at large, of the impacts and benefits of their projects. All projects that necessitate an environmental impact study should have a comprehensive stakeholder communications plan. Such plans, in our experience, serve to substantially reduce public concerns about electricity infrastructure projects of all kinds.

Renewable generation with its diversity in technology and size lends itself to greater competition and liberalisation. The energy policies in Europe however, especially in the major central markets of France, Germany and Italy, are not open or conducive to real competition or the multi-generator model. In these markets the policy appears to be the consolidation of the national champions so that they can expand into the smaller energy markets of the EU by buying up small competitors. If the trend continues the EU could be dominated by 5, maybe 6, giant and very powerful utilities with the ability to dictate energy policy. How this will contribute to a more competitive and diverse energy market, I personally fail to see.

Electricity generation is a capital intensive business, involving many risks and challenges, with investors often having to wait for many years to recover their investment. The decision to invest is therefore a very difficult one involving much complex risk analysis and many mitigation strategies. Governments can reduce risk and make the investment decisions easier by introducing regulatory frameworks that will give investors confidence that their project will be allowed to compete in a fair market and receive a viable tariff for the economic life of their project. Reviewing and changing the regulatory framework on a regular basis, so as to influence the operation of the market in any way, will only generate investor doubt and delay, which could in turn prevent investment.

Obviously if generators are unable to secure a commercial tariff for new renewable capacity they will be reluctant to make the investment. The problem historically has been the calculation and agreement on a viable tariff for renewable generation. The setting of an incentive tariff resulting from calculation and industry sector agreement has resulted in many reviews post commercial operation, due to the subsequent perception by regulators and governments that the tariff has been set too high. The major problem with an incentive tariff is that in many instances it neuters the promoter's commercial skills by allowing manufacturers and constructors to predict how much margin there is in new projects, thereby reducing negotiation room, and sets the price for equipment and construction. It would be much more commercially effective for governments to establish a new build target for new renewable technologies, and then request proposals from promoters for a contracted tariff for a specified period. Such a process would allow the promoter to employ his commercial and negotiating skills to their maximum to secure a more competitive procurement and

construction price for the project. As the final price for consumers should be competitive but at the same time cost reflective, there is a challenge for suppliers and regulators to provide undifferentiated commodity pricing for electricity.

The current international banking crisis is not helping the promoters of capital intensive electricity generation projects. Nevertheless, if projects are being promoted by experienced companies like ESB International, employing proven technology and machines that are to be constructed by reputable and financially sound constructors, and the projects are to be operated in competitive and fair markets by experienced operators and will secure competitive tariffs guaranteed by a stable regulatory system, it is our experience that projects will obtain very favourable financing terms. However, all of the above are required. One final thought, it should be remembered that after payback of the investment capital, all renewable energy is free bar the operation and maintenance costs. It will be interesting to see if the operating life of wind and solar plants is significantly longer than the payback period, as has been the case for hydro projects.

Note: The views expressed are the personal views of Mr. Philip Clarke and are not meant to represent ESB policy on the issues discussed.