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Briefing Paper:
The Merit Order Effect

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Author: Stephen Crosher
Contact: stephen@fleetrenewables.com

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How renewable energy generation reduces the cost of electricity to consumers.

Introduction

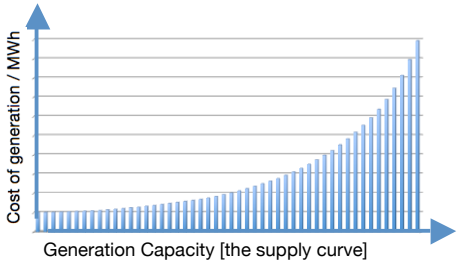
Merit Order definition: First used by the Central Electricity Generating Board, it is the ranking of available electrical energy supply in ascending order of cost of production. The ranking is used to ensure that those with the lowest marginal cost are utilised first and those with the highest cost are used last.

In 2007 The Fraunhofer Institute studied the impact of renewable energy generation on the Merit Order within Germany. The impact of renewable generation [primarily wind and solar] is now known as the Merit Order Effect. No one has published an in-depth study for the UK however information is available for Germany, Ireland and Australia.

This briefing sets out how the generation characteristics of renewable energy based systems impact on the merit order and the consequential reduction in the cost of energy to the consumer.

Background

Every energy generation power station produces energy at a different cost. In broad terms these costs are made up of capital repayments, fixed and variable operating costs, the cost of the fuel and decommissioning. Decommissioning is usually a deferred cost, paid after plant closure using revenues from other plant available at the time.



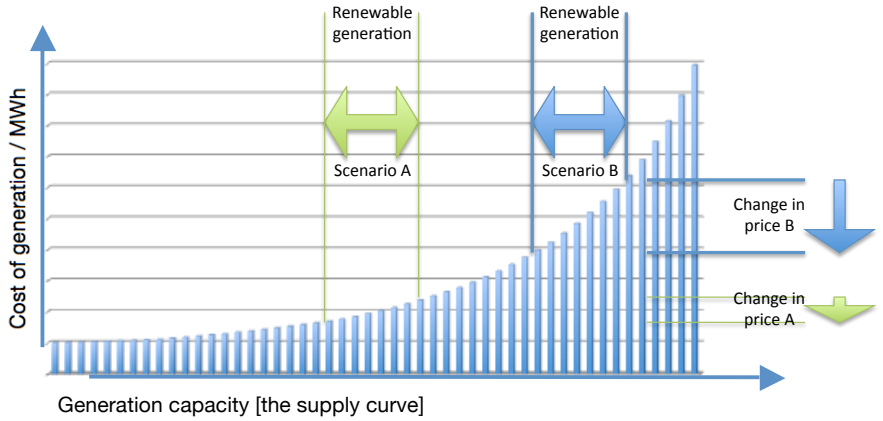
To generalise: Older power plants have largely repaid their capital, so that this element becomes an increasingly small factor in the cost of energy from that plant. However older plants also tend to have higher variable operating costs [increasing maintenance] and lower efficiencies - for each tonne of coal or cubic meter of gas input less electrical energy is generated.

New base-load power stations often produce energy at prices above the general market level due to their highly intensive capital requirements. Until this capital is repaid the cost of energy from these new plants will remain above the cost of energy from other sources. In addition to the high energy cost from the new base-load plants there will be the decommissioning and clean up costs of the retired base-load power stations also being added to energy bills, a double affect that will cause price rises.

Some power plants are designed to produce base load, operating nearly continuously - usually nuclear and large thermal – while other plants are switched on or off relative to demand and supply from other sources.

The Renewable Electricity Generation Opportunity

Renewable generation is variable by its nature with a very low marginal cost of production, as the energy resource is free. The effect of renewable generation when on-line is to shift the wholesale price of energy from one point on the supply curve to another, i.e. as renewable generation becomes available the grid operator can progressively switch off the more expensive forms of energy generation, thus reducing the overall cost of wholesale energy which in turn is passed on to the consumer.



Scenario A illustrates the effective drop in energy prices when overall demand is low relative to overall capacity, and scenario B shows the much larger effect on prices when demand is high, i.e. closer to the peak supply capacity. High demand results in the use of power plants with much higher marginal costs of production.

Case Study: In 2007 the Fraunhofer Institute modelled that the 2006 Merit Order Effect for the German energy market due to the impacts of renewable energy was an overall saving of €4.98 billion, based on 52.2TWh renewable generation. This equated to an average price reduction of €7.83 MWh across the whole energy market and a value of €95 for each MWh of renewable energy generation.

Rising costs of thermal fuels particularly gas will have dramatically increased the impact of the merit order effect still further in recent years. Since 2006 energy costs have risen by 40% across the EU27– at a time when EU economies have been sluggish. Deutsche Bank predict gas prices to rise by 24% and oil at over $125 a barrel by 2015.

NB: Graphs are illustrative only, source Fleet Renewables