

# Assignment 3

The regulation/organization of the energy system in the UK  
OEM140 course 'Energy, economy and society'  
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# The main features of the energy system

## **Introduction:**

This report gives insight into the regulation and organization of the energy system of the United Kingdom (UK).

## **Assignment a:**

### **The Central Electricity Generating Board (CEGB)**

Before 1990, in England and Wales, the Central Electricity Generating Board (CEGB) had a monopoly over the generation and transmission of electricity. Between 1948 and 1990 the public owned the electricity supply industry (ESI). With 12 area boards, the CEGB operated in the industry as a vertically integrated statutory monopoly. This structure had extensive capital costs. It depended too much on indigenous coal and nuclear power, which had very high costs. At the same time this system had a low rate of productivity growth, a very long payback time and there was a very inefficient balance between the coal miners, the industry itself, domestic voting consumers, large industrial consumers, the department of energy and the treasury. Due to these insights in inefficiency, the political awareness concerning the energy system grew in the UK.

### **Privatization of the energy system**

With the help of the politicians Parkinson, [1992], Lawson, [1992] and Henney [1994] the energy industry was restructured and privatized. With this privatized reform the idea was to create a spot market for bulk electricity that many generators were required to bid daily. In this new generation where you can choose your own privatized distribution network operators (DNO), the CEGB generation was separated from transmission to ensure that all generators have equally access to dispatch.

Around 1990, the main benefits came from generator efficiency gains, switching to nuclear power and lower emissions. The main costs came from high rate of French electricity, the cost of restructuring and premature investment in new gas-fired generating plant.

The CEGB was divided into four successor companies: "PowerGen", "National Power", "Nuclear Electric (Later "British Energy" and "EDF Energy")" and National Grid Company". On the 31th of March 1990, three of which were sold to the general public. In the first five years after restructuring the energy system changed from a central integrated and publicly owned energy system towards an unbundled more commercial system, the labor productivity in the successor companies more than doubled. Even though the energy system becomes privatized, the energy generation will still be centralized. After privatizing the energy system 92% of fossil fuel that was used for generating energy was coal, 7% oil and only 1% gas. In the next five years the coal prices and the use of coal increased significantly, which resulted that by August 1996, the electricity generation was for 23% fueled by gas. At the end of 1994, British Coal was privatized. This fuel switch and the increase of efficiency resulted in a fall of

the fuel costs. The fossil fuel cost per kWh fell by 45% while nuclear fuel cost per kWh fell by 60%. Currently the UK electricity prices and Coal are stationary (Frydenberg, Onochie, Westgaard, Mdtsund, & Ueland, 2014).

Unfortunately for the British citizens the fall in the unit costs of electricity was not translated directly into corresponding falls in prices, but into increased profits for private energy plant owners. In the five years after privatization, electricity share prices rose by over 250%, and outperformed the stock market by over 100% (Newbery & Pollitt, 1997).

### **The current situation**

Currently the Electricity Networks Association (ENA) represents transmission and distribution companies in the electricity and gas sectors. Great Britain had fourteen distribution networks that were initially privately owned by fourteen separate companies. Now these distribution networks have been traded in such a way that six companies operate them, who act as distribution network operators (DNOs). The DNO's are private companies including a shareholder system, but are very limited in the ways they can achieve revenues, due to governmental regulations.

The current traditional energy model is under stress due to the adoption of legal obligations concerning climate change by the UK. One of these legal obligations is a mandated policy goal of 80% reduction in national climate change emissions by 2050. There is also a legal obligation within the EU law to generate 15% of all energy consumption from renewable energy sources by 2020.

Overall the legal obligations will include the stimulation of large volumes of intermittent generation, more distributed generation and larger and more variable loads at grid extremities, potentially including large volumes of electric vehicles and heat pumps. The United Kingdom also considers other innovative smart technologies in order to make the energy regulation more efficient and controllable. One of the most important innovations is the adoption of the smart grid. The International Electro technical Commission states that "the Smart Grid is the concept of modernizing the electric grid, the main focus is on an increased observability and controllability of the power grid". In the UK the Department of Energy and Climate Change (DECC) is the government department responsible for UK smart grid policy. Right now the UK is still at an early stage of developing a smart grid, as in many other countries. The very liberalized and competitive electricity supply industry in the UK makes it very interesting to see how the move towards the smart energy grid will be discovered and uncovered (Connor, Baker, Xenias, Balta-Ozkan, Axon, & Cipcigan, 2014).

# The main features of the energy system

## Assignment b:

### Market failure

In the earlier years of the UK's energy model, the years before 1990, the model was based on a traditional cost-of-service regulation (COSR). The overall failure with these regulations for the electricity industry is the lack of incentives for making the system more efficient. Another failure is the lack of incentive for cutting generation costs for asset management. Once there is competition in the energy supply market in the scenario of a privatized supply model, the competition among suppliers will create lower electricity prices and at the same time create more jobs across the province. Privatized energy supply will ensure that investments in electricity generation and transmission are more focused on optimizing the energy generation and transmission process and it will ensure the management of the assets is done carefully and responsibly. Creating an energy market will lead to new technologies in the energy generation, transmission and supply, in order to make it more efficient. This results in more choices for customers, which can also result in more reliable energy due to the demand and in making environmental choices within energy demand.

All these advantages for a privatized energy supply model resulted in a change in the energy model in the UK in 1990. However in reality not everything went as expected. Starting from the opening of the market onwards mostly (ex) stated owned foreign utility companies took over, especially Eon and EDF play an important role in the UK. The main issue in the energy market from the UK is lagging effect in the transition from the publicly owned electricity company to the privatized market (Woo, Lloyd, & Tishler, 2003).

One of the problems is that the market is not competitive due to the limited transport capacity and the inability of customers to react on price peaks. This means for example that customers cannot benefit from a cheap generator in the south if they are living in the north where the prices are higher. This is mainly caused by strategic biddings of the dominant utility companies. Where capacity is withheld to artificially influence the electricity rates. In 1989, two firms controlled over 80% of the total energy generation capacity, and the number of players in the market is only decreasing. This is caused by the entry of independent power producers (IPPs) and increasing electricity imports from France and Scotland, which creates divestiture of a part of the generating capacity of the bigger generators in other parts of the UK. Through the market power the biggest two utilities (Eon and EDF) have, the electricity rates are not decreasing significantly (Woo, Lloyd, & Tishler, 2003).

### Investment problems

Due to uncertainty in future carbon prices, which is of course not only related to the UK electricity network, it is likely that investment in low carbon technology is delayed or deterred which leads to greater decarbonization costs in the future. This is a temporary

problem because prices for different fuels are changing a lot over time due to new investment in different kind of renewable energy sources. Because the entire world wants to reduce CO2 emissions it is likely that coal will not be used anymore over a certain period of years, which automatically solves this problem carbon prices.

Since the privatization of the UK's electricity supply industry in 1990, the approach towards network regulation has provided little incentive for innovation, whereby the primary focus was on general cost reduction. In recent years however, OFGEM has acknowledged the need for these innovations and opened up the grid for this by implementing a smart grid system (Connor, Baker, Xenias, Balta-Ozkan, Axon, & Cipcigan, 2014).

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