EU Renewable Energy Policy:
Successes, Challenges, and market reforms

By

Yuliya Yurchenko & Steve Thomas

Y.Yurchenko@gre.ac.uk & Stephen.Thomas@gre.ac.uk

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The Public Services International Research Unit (PSIRU) investigates the impact of privatisation and liberalisation on public services, with a specific focus on water, energy, waste management, health and social care sectors. Other research topics include the function and structure of public services, the strategies of multinational companies and influence of international finance institutions on public services. PSIRU is based in the Business Faculty, University of Greenwich, London, UK. Researchers: Prof. Steve Thomas, Jane Lethbridge (Director), Emanuele Lobina, Prof. David Hall, Dr. Jeff Powell, Sandra Van Niekerk, and Dr. Yuliya Yurchenko.

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1. Introduction: EU Renewable Energy Policy, Current State and Schemes

1.1 Support for renewables in the European Union

Low carbon sources – primarily renewables and perhaps nuclear power - are almost invariably acknowledged to give more expensive power than power from fossil fuel sources – coal and gas. In a competitive electricity market, as is being attempted in the European Union, low carbon sources will not be chosen by power plant developers unless they are either insulated from the market or provided with some form of subsidy to make them competitive.

Policy effort in the EU (e.g. the renewable energy Directive (2009/28/EC)) is aimed at supporting technologies and new capacity installations and production of renewable energy in three areas: (1) electricity or RES-E i.e. photovoltaics, wind, etc., (2) transport or RES-T i.e. biofuels, and (3) heating and cooling or RES-H&C i.e. biomass, solar-/geo-thermal, etc. (Winkel et al 2011). Amongst the three, EU renewable electricity sector has seen most state support and effective growth in terms of production and installed capacity in 1997-2012. It will thus be the main focus of this report. European Union competition law makes 'state aids' that distort markets illegal so for low-carbon sources to be promoted, there needs to be market mechanisms that do not distort markets or exemptions from this legislation. In this report, we look at mechanisms that have been used in the European Union to promote low-carbon sources, review the guidelines for state aid in the energy sector, and the challenges they pose to the EU renewable energy 2020 targets.

1.2 Evolution of EU RES Support in electricity market

In September 2001 EU adopted the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. The Directive provides national indicative targets to guide the member states' governments with the objective of facilitating increased generation and use of electricity produced from renewable energy sources (RES-E). It must be noted that prior to the EU Directive Germany and Denmark had already had significant success in stimulating renewable investments through use of Feed-In Tariffs (FiTs). The EU approach to support schemes for renewable power between 1996 and 2007 can be divided into three phases (Mez 2007: 2). They were:

1. 1996-1999

DG Energy and DG Competition had adopted a neoliberal approach of using competitive market 'instruments for organising the future harmonisation of the sector'. The approach led to pressure on member states to give up feed-in tariff schemes and instead introduce neoliberal instruments. This approach was met with opposition from other EU institutions and from the post-1998 German government. The so-called Red-Green coalition had taken new steps to support generation from renewable sources.

2. 1999-2001

DG Competition tried to expand the provisions of state aid legislation to make FiTs illegal and introduce specific provisions on RES-E into community guidelines on state aid for environmental protection with clear preference of market instruments (EC (2001) in Lauber 2007: 18). That attempt was not successful due to the European Court decision in the case of *PreussenElektra vs. Schleswag.* The case concerned the 'compatibility of the German Feed-In Law with the Treaty' and the element and role of state aid (Lauber 2007: 18). Aid to operating costs in the Community is outlawed apart from specific circumstances and a limited time (see Lauber 2007: 18-9 for details on aid and additional details of the case). In 1999 EC joined in PreussenElektra case but failed in Court as FiTs do not involve any state resources (Luber 2007: 20). This ruling has a significant effect on the future of incentives for RES-E in the Community.

3. 2002 – 2007/8

DG Competition allowed state aid in several countries in 2002 but the scheme showed slow growth. By contrast, REFITS (Renewable Energy Feed-in Tariff Schemes) in countries such as Germany were very successful in stimulating new renewable investment. It also became clear that the EU's 2010 RE-E target of getting 12% of gross domestic energy consumption to come from renewable sources would not be met. A new energy commissioner appointed in 2004 with 'a more pragmatic approach' (Ibid.) and a rethink of the existing policies followed.

In March 2007 the Climate and Energy Package targets were set by EU leaders (EC 2014). In 2008, EC Directive 2009/28/EC introduced 'mandatory national targets consistent with a 20% share of energy from renewable sources including a 10% share of energy from renewable sources in transport in Community energy consumption by 2020' (Ibid.). By 2009, when the targets set in the Climate and Energy Package based on the Directive were enacted, 60% of newly installed capacity in Europe in 2009, and nearly 20 of annual power production came from renewable sources (REN21 2010: 10) however, as the REN21 report shows, much more needed to be done on the levels of policy support and investment alike for the new targets to be met.

1.3 Mechanisms for supporting low-carbon power sources

There have been five separate mechanisms for supporting renewables used in European Union countries: Feed-in Tariffs (FiTs), emissions trading, capacity auctions, renewable obligations and a Carbon floor price.

Feed-in Tariffs

Feed-in tariffs are the mechanism most widely and most successfully used, in terms of capacity installed, in the EU. The roots for FiTs go back 35 years to the USA and the Public Utilities Regulatory Policies Act of 1978 (PURPA). The intention of PURPA was to be a relatively limited piece of legislation aimed at the perceived problem that monopoly utilities were not paying a market rate to buy surplus power from co-generators which generate their power for their own use and from small independent generators, choking off a potentially useful source of power. PURPA required that utilities pay the 'avoided' cost of generation to co-generators. In other words, they had to pay what it would have cost them to generate the power themselves. In states with surplus power, this would have been the marginal generation cost but in states where new capacity was needed, the regulators interpreted this as the full cost of generation of a new plant, which, at that time, utilities were arguing should be nuclear power. In influential states like California and New York, the price of power from new nuclear power plants was then very high and regulators set the price to buy power from independent generators correspondingly high.

This led to a flood of new capacity in California, some of it wind-power and some of it cogeneration from oil and gas producers. The fixed price meant that developers of new capacity did not have to worry about the risk that utilities would reduce the buy-in rates. Whilst it is clear the price set was too high, PURPA did show that traditional utilities were not the only companies that could generate power competitively and if barriers to entry were lowered, the market was often able to provide more capacity and at lower prices than expected. It was also the first major demonstration of renewables.

Feed-in tariffs were first taken up in Europe by Germany and then Denmark from 1990 onwards and again led to a significant level of investment in wind power. The original scheme in Germany paid renewable generators a percentage (65-90%) of the prevailing retail price (including network charges). In 2000, a new law in Germany meant that the renewables in Germany received a long-term contract, typically 20 years, and the price was fixed for that period. Instead of a flat rate paid to all renewables, different tariffs were payable for different

technologies and, for example, power generated using solar photovoltaic received 10 times as much a wind farms.

The main advantage of FiTs is low barriers to entry for new generators. A new generator faces no market risk with FiTs. They know they can sell all the power they can produce at a predictable price. The challenge for governments implementing FiT schemes is the price must be set very sensitively so that it is a realistic but challenging target. If the price is too high that would lead to a flood of new capacity and unnecessarily high costs for consumers. If the price is too low little new generation would be produced and any industry supplying the technology would struggle to survive. It is advisable that existing schemes continue to get the price that prevailed when the project was implemented but prices should be on a downward curve for new schemes, reflecting technical progress and learning for what are often 'infant industries'. To give continuity to the equipment and installation industries for these technologies, changes in the tariff should be in relatively small steps so the demand does not go from 'feast to famine'.

Capacity Auctions

These also have their root in the 1980s in the USA in 'least cost planning' (LCP) or 'integrated resource planning' (IRP). This built on the experience of PURPA that utilities were not the only potential power plant owners and based on the assumption that consumers do not want a kWh from a particular type of power plant, they want an energy service at the lowest available cost subject to environmental and other constraints. Under LCP or IRP, the volume of capacity needed was set by the regulatory authorities and bids solicited for that capacity with contracts, Power Purchase Agreements (PPAs), being awarded to the lowest bids needed to meet the required capacity. The contest could be for specific technologies or could be for all sources, including energy efficiency measures.

Capacity auctions were taken up in Europe in 1990 in the UK. Here, the attempt to privatise the nuclear power plants failed partly because the marginal cost of generation was about double the expected wholesale market cost. To allow the nuclear power plants to continue to operate, a consumer subsidy raising about £1bn per year was introduced – about 10 per cent of all bills was hypothecated to pay for the losses of the nuclear sector. The subsidy, the Fossil Fuel Levy (FFL), was complemented by the Non-Fossil Fuel Obligation (NFFO), which required electricity retailers to buy all the output from the plants. The subsidy was in place from 1990-96 and a small proportion of it was spent on four capacity auctions for renewables, the first in 1991 and the last 1998.

Capacity auctions are, in principle, more competitive than FiTs because the price paid is set by the market rather than by a central authority. In UK, the impact of this competitive pressure was impressive with the last auction producing winning bids for on-shore wind of about a third of that in the first auction and at a price not much higher than gas-fired generation. However, the problem was that less than about 20 per cent of the winning bids were actually built because of planning permission problems and because the relatively short contracts made finance difficult.

Capacity auctions have not been used in UK since then and not on any significant scale in other countries in Europe, but it is expected that the new arrangements in UK, being implemented in 2015, will involve capacity auctions.

Renewable Obligations

Renewable Obligations (ROs) replaced the NFFO auctions in the UK in 2002 but will be phased out in 2017. Under ROs electricity retailers are required to source a given and annually increasing percentage of their power needs from renewable sources. It is for them to decide how to do this and the incentive on them should be to meet the obligation at the lowest cost to ensure their competitiveness. The required percentage in 2009/10 was about 10 per cent, which was largely achieved, but in 2014/15, it was about 24 per cent which will not be met. The failure of the RO has been acknowledged for some time and its replacement expected since the

Electricity Market Reform process was started in 2012. The problems were mainly that it was often seen as cheaper to pay the fines than to meet the target and because the fines were recycled from the companies that did not meet the targets to those that did, failure to meet the target resulted in no serious penalty. The six large UK energy companies that dominate electricity retail were able to control which generation companies entered the market and had an incentive to build their own facilities potentially freezing out efficient new entrants. No other European country is expecting to implement ROs, so this option is not considered further.

Emissions trading

This option also originates in the USA in the 1980s when it was used with some success to reduce emissions of acid gases, especially sulphur and nitrogen oxides ('SOX' and 'NOX'). This could be achieved by either fitting to new plants or retrofitting to existing plants proven abatement technologies, such as flue gas desulphurisation for SOX and selective catalytic reduction for NOX, or by choosing technologies that do not emit these gases, such as nuclear or some renewables, although abatement technologies dominated.

A major difference for trading in CO2 permits is that there are no proven abatement technologies. The one option, Carbon Capture & Storage (CCS), has not been demonstrated on a commercial scale and given the lack of progress and increasing lack of interest by utilities in the past decade, there must be doubts whether it will be a technically or economically feasible option on the time-scale needed to combat climate change.

The European Union Emissions Trading Scheme (EUETS) is a so-called 'cap and trade' mechanism and was introduced in 2005. Under the EUETS, there was a limited and diminishing stock of emissions permits, which effectively set a reducing 'cap' on the amount of CO2 that could be emitted. Companies that wanted to burn fossil fuels had to acquire ('trade') emissions permit for the quantity of CO2 they would produce. The size of the permit stock would reduce over time to ensure more stringent emissions targets were met. In theory, the price of permits should have moved towards a level that would represent the additional cost of not emitting the CO2, in other words, the difference in price between, say, renewables or energy efficiency measures and burning fossil fuels.

In practice, there appear to have been serious design flaws, for example, the existing utilities were simply given permits and the utilities appear to have used these permits to make windfall profits rather than achieve the aim of reducing greenhouse gas emissions. In 2005, the permit price was about €15 per tonne of CO2 but the price has tended to fall since then to about €4/tonne in 2014. To put these figures in perspective, the UK government estimated that if the construction cost of a nuclear power plant (of the French 1600MW EPR design) was about €2.4bn, it would be competitive with gas generation with a Carbon price of €36/tonne. In 2013, the UK government announced agreement with EDF to build two EPRs at a cost of €9.6bn each i.e. 4 times higher than the estimate figure. If nuclear is one of the cheapest low-carbon generation options, it is clear that the carbon price is more than an order of magnitude too low to be effective.

The European Commission has plans to improve the market design so that the EUETS will become an effective means of reducing emissions, but outside the Commission, there is little expectation that these plans will be successful.

A Carbon Floor Price

In the EU, only the UK has seriously considered introducing a 'floor' price for carbon. In 2010, the British government announced that it would be imposing a floor on the Carbon price starting in 2013 with this floor increasing by 2020 to the equivalent in 2010 prices of about €36/tonne. The rationale was that those investing in low-carbon generation sources would have certainty about the extra costs fossil fuel generators would have to pay to purchase their emission permits.

In the March 2011 Budget, the government announced the floor price would be introduced in 2013 at £16/tonne and would reach £30/tonne in 2020, equivalent to about €36/tonne. The policy was expected to raise about £1.4bn in its third year. However, the pressure resulting from the announcement by the Big 6 of a round of price increases of about 10 per cent led to a review of a number of 'green' measures including the carbon price floor and the carbon price will be capped at £18/tonne, around the level set for 2015/16. It remains to be seen whether the EUETS will remain below the floor price and if it does, whether it will be effective in stimulating low-carbon generation than in countries without a floor price.

State aid legislation

The basic prohibition on the grant of State aid is contained in Article 107(1) Treaty on the Functioning of the European Union (TFEU). That article also defines the concept of State aid. It provides:

'Save as otherwise provided in the Treaties, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market.'

The European Courts have not yet provided a consistent and comprehensive interpretation of the conditions for State aid under Article 107(1) TFEU (ex Article 87(1) EC Treaty). While the Court's definition of aid is often based on the actual wording of the provision, in practice the Court has not adhered rigidly to that formulation. In particular, it is by now well established that the criterion of 'granted by a Member State or through State resources' are not alternative; it is necessary to show both that the measure is a 'State measure' and that it has been granted through State resources. The cumulative result of the Court's interpretation of Article 107 TFEU, therefore, is that in order to fall within that provision a measure must satisfy the following four criteria:

- There must be aid in the sense of a benefit or advantage
- Which is granted by the State and through State resources
- Which favours certain undertakings or the production of certain goods (selectivity), and
- Which is liable to distort competition and affect trade between Member States

State aid meeting these four criteria is unlawful and prohibited unless one of the derogations contained in Article 107(2) and (3) TFEU applies. Unlawful State aid cannot be granted or, if the respective Member State has already granted the aid, must be recovered. Certain State aid measures can be justified, and may get clearance from the European Commission in the sense that it issues a positive opinion and declares the measure compatible with the internal market. Normally all State aid measures have to be notified to the European Commission which must decide whether this aid is allowable. National courts may find that there is State aid, and even order recovery but the ultimate decision rests with the European Commission. In the field of renewable energy two instruments exist that usually allow for support for renewables to get clearance by the European Commission: the General Block Exemption Regulation, exempting certain types of investment aid even from the notification obligation, and the Guidelines for Environmental Aid.

The guidelines for State aid have been subject to review since 2012 and new guidelines came into force on July 1 2014. These require that the phase-out of feed-in tariffs begin in January 2016. Small projects, defined as having capacity of up to 3MW, or three generation units for wind, and up to 500kW for other renewable sources such as solar or biomass, can continue to benefit from any sort of aid including feed-in tariffs until 2020. Existing approved renewables support schemes are not covered by the new guidelines. New renewable projects must now be supported by market-based mechanisms, such as premia to the market price. The new guidelines also require national governments to start switching to a competitive bidding

process for granting renewables aid in 2015 and 2016, and to set up tenders for all new support grants from 2017. How realistic it is for low-carbon sources to be built under these conditions is impossible to tell. However, if the rules do choke off investment in low-carbon sources, this will lead to the European Union failing to meet its emissions targets and given that meeting these is likely to be a higher priority than enforcing state aid rules, it is likely they rules will have to be modified to be more favourable to low carbon generation.

Table 1 Summary: RES Target, Production and Potential

		Electricity	Transport	Heating	Total
Denmark	Share of total sector consumption in total final energy consumption, %	20	33	47	100
	Share of RES in corresponding sectoral gross final energy demand 2009, %	27	0	29	19
	Share of RES in corresponding sectoral gross final energy demand 2012, %	38.7	5.8	33.3	26
	Share of RES in corresponding sectoral gross final energy demand, ktoe				
	- Actual (2009)	864	10	2,173	3,047
	- Realisable potential (2020)	2,775	1,128	4,410	8,312
	- Realisable potential (2030)	5,881	1,393	5,826	13,101
Germany	Share of total sector consumption in total final energy consumption, %	22	28	49	100
	Share of RES in corresponding sectoral gross final energy demand 2009, %	16	6	8	9
	Share of RES in corresponding sectoral gross final energy demand 2012, %	23.6	11.1	6.9	12.4
	Share of RES in corresponding sectoral gross final energy demand, ktoe				
	- Actual (2009)	7,869	3,040	8,731	19,640
	- Realisable potential (2020)	21,942	4,313	28,757	55,011
	- Realisable potential (2030)	26,141	4,858	47,832	78,831
Spain	Share of total sector consumption in total final energy consumption, %	27	41	32	100
	Share of RES in corresponding sectoral gross final energy demand 2009, %	26	3	13	12
	Share of RES in corresponding sectoral gross final energy demand 2012, %	33.5	0.4	14	14.3
	Share of RES in corresponding sectoral gross final energy demand, ktoe				
	- Actual (2009)	6,325	1,073	3,775	11,173
	- Realisable potential (2020)	20,162	4,089	12,686	36,937
	- Realisable potential (2030)	33,418	5,640	16,832	55,890
UK	Share of total sector consumption in total final energy consumption 2009, %	23	36	41	100
	Share of RES in corresponding sectoral gross final energy demand 2009, %	7	2	2	3
	Share of RES in corresponding sectoral gross final energy demand 2012, %	10.8	2.3	3.7	4.2
	Share of RES in corresponding sectoral gross final energy demand, ktoe				
	- Actual (2009)	2,168	968	933	4,069
	- Realisable potential (2020)	18,579	2,226	12,992	33,797
	- Realisable potential (2030)	36,247	2,889	20,726	59,861
	Average growth 2009-2020 needed to reach target	-	-	-	15%

Source: compiled by the authors from EU Tracking Roadmap 2014[1] and Winkel et al (2011).

1.4 RES-E, RES-T, and RES-H&C

The targets set in the Directive are known as '20-20-20' targets. They identify the three main objectives for 2020:

1. 'A 20% reduction in EU greenhouse gas emissions from 1990 level
2. Raising the share of EU energy consumption produced from renewable resources (RES) to 20%
3. A 20% improvement in the EU's energy efficiency' (EC 2007/9)

The 20% RES energy target is composed of electricity (RES-E), transport (RES-T), and heating and cooling (RES-H&C). In each EU member state the proportion of each in the RES 20% is different as are both actual and realisable potential growth of RES share in the corresponding sectoral gross final energy demand. In Table 1 below we present a summary of production and consumption of RES energy in each of the three sectors, and their actual and realisable potential growth in the four countries of our focus: Denmark, Germany, Spain, and the UK.

As is shown in Table 1, in all four cases the majority share in total final energy consumption is with transport and heating while the share of RES in the corresponding gross final energy consumption in transport and heating is significantly, although to various degree, lower than the share of electricity. This means that if the 2020, 2030, and 2050 targets are to be met, significant changes in the corresponding sectors are necessary. Existing support schemes and their potential for realising the targets are addressed in corresponding sections i.e. RES-E, RES-H&C, and RES-T, of country chapters.

Below we present analyses of four EU member states: Denmark, Germany, Spain, and the UK. Denmark, Germany and Spain have been relatively successful at meeting their targets, albeit with rather different approaches, whilst the UK, which has tended to use more market-based mechanisms, is likely to fall far short. It must be stressed that even though significant progress has been made on RES-E targets in all four countries, achievements on RES-T and RES-H&C components of the targets are meagre.

2. Denmark

Denmark is a country with high taxes, low inequality, and extensive welfare state 'both in terms of service provisions and the social safety net'. Until the global financial crisis of 2007/8, 'Denmark was often mentioned in international debates as a model example of a well - functioning economy, with low unemployment and surpluses in both the public balance and the current account balance' (Laursen et al 2014: 2). It too was and still is a flagship of RES-E technologies and their integration into the electricity supply, although most recently those mainly involve wind. Denmark's history of renewables can be traced back to the oil crisis of 1973. Denmark's energy import dependence led to it putting extra effort into securing energy independence via supporting growth in production and consumption of energy from renewable, domestic sources; primarily wind energy. Nuclear power was formally rejected as an energy source option in 1985. However, Denmark has become a significant producer of oil and gas from its North Sea fields and expects to remain a net exporter of oil and natural gas well into the future. The country's renewables policy is still informed by the need to meet its greenhouse gas emission targets. The evolution of the Danish electricity sector since 1973 can be divided into two main phases: before and after liberalisation. The latter was introduced by the liberal-conservative coalition government that has been in charge in various combinations since 2001.

2.1 Electricity before liberalisation

Denmark's leading position in the field of wind power began with the pioneering work of Poul la Cour as early as the 1890s. La Cour's work 'provided a basis for wind electrification in Denmark during the first two decades of the 20th century' (Meyer 2007: 251). Between 1959 and 1967 the

Gedser Mill was producing 200 kW units and in the 1970s became the mother of modern wind turbines after introducing their blades on a horizontal axis in an upwind position (Ibid.). In the 1970s the electricity sector was 'characterised by a large number of small utilities and a few larger ones' all of which were publicly owned. The system was divided into two parts: the West (Jutland and Fynen and some smaller islands) and the East (Zealand, Lolland-Falster, and smaller islands) which had no direct grid connection until Sept 2010 when the Great Power Belt Link was completed (see later sections).[2] Great Power Belt Link (Storebælt) High Voltage Direct Current (HVDC) interconnection is a 600MW Line Commutated Converter (LCC) HVDC at a highest voltage level of 400 kV (Energienet.dk 2014). The East (Zealand) is synchronised via an alternating current (AC) with the Nordic Grid through Sweden, while the West is synchronised with the Western European grid (UCTE) through Germany. This meant that the East traded routinely with the Nordic countries whilst the West traded with countries like Germany. Some of the power stations were the usual 'condensing' plants in which the waste heat was discharged into the sea and co-generation plants where this heat was used for space-heating through local heat grids. Fossil fuel was used in more than 90% of the units until the oil crisis (Meyer 2007: 252). Since 1973/4 oil has been replaced with coal but the rest of the system's operations remained the same. In the 1980s Danish energy policy changed as a shift towards a 'sustainable energy development' and 'reduction for greenhouse gas emissions in an effort towards the mitigation of climate change' (p. 253). Two official plans followed in 1990 and 1996 to solidify the intentions. The main aims of the plans were to 'increase the share of wind and biomass in electricity production'. The RES target set in the plans was '12-14% of primary energy by year 2005 and 35% coverage by 2030' (Ibid). Wind power was given prime importance in those long-sighted visionary plans with 'targets for installed capacity of around 1,500 MW in 2005 and 5,500 MW (4,000 MW offshore) in 2030, covering 10% and up to 50% of Danish electricity consumption respectively dependent on future development of electricity demand' (Ibid.).

The overall Danish government strategy for wind power promotion between mid-1970s and mid-1990s was a combination of:

1. 'Long-term government support for research, development and demonstration
2. National tests and certification of wind turbines
3. Government sponsored wind energy resource survey (wind atlases)
4. Subsidies, FiTs and regulations
5. Local ownership of wind turbines and careful selection of sites' (Meyer 2007: 254)

2.2 Electricity after liberalisation

In June 1999 the Danish Parliament approved a new Energy Act following the EU Directive on liberalisation of energy markets adopted in 1996 (see discussion above). The act, in accordance with the Public Service Obligation possibilities of the EU Directive, gave priority to RES-E in the supply system (Meyer 2007: 261). In 2001 Denmark saw a change of government from a social-democratic to a more market-oriented liberal-conservative coalition. This led to a drastic change in renewable energy policy. Most of the public funding for support and development of RES was reduced including funding for many advisory committees, local information offices and, in the 2002 budget all 'R&D programmes, financial support, and agencies for renewable energy, except for wind' were discarded (Photovoltaic Bulletin 2002). After lengthy negotiations with the EU and ensuing adjustments, the RES-E priority was removed in the autumn of 2003. The 1999 Act changed the non-profit principle traditional for Denmark's energy sector and made power plants operate as commercial enterprises (OECD 1999). Such changes presented challenges for technologies and systems which were still in the development phase – solar collectors, biogas, wave energy, and proto-voltaics (Meyer 2007: 266). Wind power on the other hand was in a better position due to (1) being competitive at the current market conditions and (2) due to its technological systems development being taken over by the Danish Wind Industry that was also gaining access to winder markets (see the next section of this report). An

independent Regulatory Committee was established the same year to regulate the profits of grid companies. Transmission system operators (TSO) had to be completely independent of companies operating in the competitive parts of the electricity sector, generation and retail. The Act also introduced a quota on annual CO_2 emissions for utilities starting with 22 million tonnes in 2001 and decreasing to 20 million tonnes by 2003 (Meyer 2007: 261). The emissions quota was introduced in Denmark to support its commitment to the Kyoto Protocol.[3] The quota amounted to 655 million tons of CO_2 equivalent by 2008-12 equating to a 21% reduction in comparison with the 1990 level (Ibid.). In addition, the Energy Act introduced a shift from the FiTs system to a green market for trade in green certificates (RES-E labels) combined with a consumer quota for green electricity certified by government. Under the liberal-conservative coalition government in 2005, the increase in wind power capacity was slow (Meyer 2007: 254).

For the RES systems and technologies that in early 2000s were at their development stage e.g. solar collectors, biogas, wave energy, and photo-voltaics, the cuts in state support were catastrophic. They were simply not competitive in the energy market especially if 'externalities from fossil fuels are not fully internalised' (p. 266). So, in 2009, production of photovoltaics, geothermal electricity, solar thermal electricity, and wave and tidal power all equalled zero (Winkel 2011: 71). Biogas production only grew from 17 ktoe in 1999 to 26 ktoe in 2007 and 27 ktoe in 2009. The realisable potential by 2020 is estimated to be 162 ktoe, which will be unattainable unless the current annual production growth rate of 3% is increased (Ibid.).

In 2000, just before the 2001 change of government, Denmark became part of the wholesale electricity market, NordPool that covers the Nordic region, including Norway, Sweden and Finland although the East is still synchronised to UCTE. NordPool's history dates back to 1991 when it was created as a result of Norway's decision to deregulate its electricity market. It was subsequently expanded to include Sweden, Finland and finally Denmark. In 1998 Nord Pool ASA opened its first office in Denmark. By 2002 the firm became the Nord Pool Spot - a company that was, by 2014 'also the world's largest market of its kind, and provides the leading market for buying and selling power in the Nordic and Baltic regions, as well as Germany and Great Britain'.[4] Within the Nord Pool, Elbas, Nord Pool Spot's intraday trading system for the physical electricity market, was launched in 1999 which was joined by the Eastern Denmark in 2004 and Western in 2007. In August 2005 a Danish national power grid operator merger was completed which brought together the electricity networks of Eltra, Elkraft System and Elkraft Transmission and the natural gas transmission system operator Gastra into one state-owned company, Energinet.dk (Enegienet.dk 2013). The company 'owns the natural gas transmission system and the 400 kV, 150 kV and 132 kV electricity transmission system and is the co-owner of the electrical interconnections to Norway, Sweden and Germany' (Ibid.). It is 'an independent public enterprise owned by the Danish state as represented by the Ministry of Climate, Energy and Building' and its revenue comes from tariffs approved by the Danish Energy Regulatory Authority (Ibid.). The latest element of grid integration was the construction and bringing into operation of the Great Belt Power Link (Storebælt HVDC) in September 2010 that for the first time sent wind-power generated electricity from Western Denmark to Eastern Denmark (Energienet.dk 2010). Since the liberalisation of the energy market there has been greater grid and supply integration and stress on wind power as a RES, onshore and offshore alike. The grid integration allows bring the wind power generated offshore into the main grid that previously was compartmentalised.

2.3 RES-E

The main support principle for RES-E in Denmark is promotion via a price regulation i.e. producers receive 'a variable premium on top of the market price'. In some cases 'plant operators are granted a guaranteed bonus and are thus not subject to a statutory maximum'. In addition, a small subsidy is paid by transmission grid operator Energinet.dk to small systems for the generation of electricity. The subsidy is an incentive introduced by the Danish government

and the Danish Commission on Climate Change strategy to decrease reliance on imported gas and increase production of renewable electricity[5]

2.4 RES-H&C

The support mechanism for generation of RES-H is tax exemptions. So, 'biomass, being CO2 neutral, is exempt from the CO2 tax' and 'solar heating plants are exempt from both energy and CO2 taxes' (Winkel 2011: 73).

2.5 RES-T

In January 2010 Danish government obliged oil companies 'to ensure that in 2012 at least 5.75 percent of annual sales of fuel for land transport consist of biofuels'. Since January 2005 a CO2 tax exemption on biofuels has been in place and is still the main supporting measure for biofuels. There are also proposals for 'the restructuring of vehicle taxation so that it is transferred from ownership of a vehicle to its use'. The proposal will make it more attractive to buy an energy-efficient vehicle, irrespective of technology. If such a restructuring is approved, it could probably be implemented after 2017.

Denmark's expansion of renewable energy 'is financed by feed-in-tariffs paid by consumers of electricity, but the rising efficiency of renewable energy [according to the government] means, that the cost to consumers of 33% renewable energy in 2020 will be lower than the 11 % provided in 2002'.[6] What is peculiar in Danish case is that according to the government 'the transition is relatively cheap, and business competitiveness not harmed' – something that is often an issue in other EU countries. The government estimated that it will cost approximately €10 per household a month at the highest (2020) and that that price will only slowly increase to this level. The government consider this 'a reasonable insurance policy against unexpected increases in fossil fuel costs and a solid investment in Denmark's future energy security'.[7]

In February 2014 a cross-party agreement was reached in Parliament for the adoption of the Green targets as Law. Denmark's new climate minister Rasmus Helveg Petersen announced that 'the broad agreement on the 40% reduction of greenhouse gasses, to ensure meeting the ambitious targets that the government has set, will continue, even after an election' (in King 2014). Prime Minister Helle Thorning-Schmidt too has backed the new law (Ibid). For the first time in the country's history, a uniform decision across all political spectrum was achieved - the Social Democrats, the lead member of the ruling coalition, together with the Conservative People's Party, Socialist People's Party and the Red-Green Alliance, all backed the Law. Moreover, even Lykke Friis who is a front-bench spokeswoman for the opposition Liberal Party, right-of-centre and fiercely pro-business, declared that 'the decision to ditch fossil fuels is a matter of sound financial planning'.[8] The Danish Energy Agency (2012) has calculated that in 2012 renewable electricity production accounted for 43.1% of domestic electricity supply (of which 29.8% was wind power). To put it differently, 'renewables accounted for 25.8% of energy consumption in 2012, against 23.1% in 2011' (King 2014). The Law also established a Climate Council that is modelled on the UK's Committee on Climate Change (CCC) and 'will advise the government on the most cost effective ways of reducing the country's reliance on fossil fuels' (King 2014).

There is strong promise of fossil fuel dependency decrease in Denmark considering that between 1980 and 2010, 'the share of renewable energy rose from 3 % to 19 %'. If the growth remains on the same level,' the rise will continue to 33 % by 2020' making a third of Danish energy 'produced by green energy primarily [from] wind and biomass'. The Danish government's vision is that by 'tying electrical grid into a regional framework and by having a spare capacity backed by biomass, Denmark will continue to have a stable energy system'. [9] Whether this optimistic forecast will materialise remains to be seen. The government announced that 'by the end of this decade, [Denmark] will produce a third of its energy from renewable sources - wind power, in particular, but also solar power and the burning of "biomass."[10] In 2014, 23.40% of energy consumption was renewable, which is the eighth highest

indicator among OECD countries. Presently 'the government has rather ambitious renewable energy goals which state that Danish energy production should be fossil free by 2050' (Laursen et al 2014:23). The goals are achievable provided green energy production growth rate does not decrease.

3. Germany

In 2014, Germany was Europe's largest national power market and one of the three historically biggest producers of environmental technology in the world, alongside US, Japan, and now China. It is also a leader in terms of energy produced from renewable sources among large industrialised countries. Overall, there is a strong 'consensus … that the country's long-term economic competitiveness must be linked to the restructuring of the economy in a resource and energy efficient and climate-friendly direction' (Schreurs 2012: 6-7). That consensus is a social foundation of Germany's energy transition also known as 'Energiewende'. The term first appeared in 'a 1980 study by Germany's Institute for Applied Ecology' and literally means 'energy transition'.[11] In 1982 a book by the Institute entitled *Energiewende*: *Growth and Prosperity Without Oil and Uranium*[12] was published which laid out the main principles of the energy transition to the system without nuclear power or fossil fuels. In 2004, according to the analysis of Seiwert et al. (2007), Germany surpassed the US as the world's largest exporter of environmental technologies (in Schreurs 2012: 7). In terms of the RES support schemes, Germany pioneered the use of the FiTs system. The directed public policy of the red-green coalition (in office 1998-2005) led to a remarkable expansion in the sector and by 2007 the country had the highest installed capacity for wind energy and second after Italy for photovoltaics in the EU (Lauber and Mez in Mez 2007: 177).[13] In 2007 the policy was aimed at achieving more than 50% of electricity generated from RES by 2050. This policy was popular with the public but not the established interests in the energy sector (Ibid.). By 2010, greenhouse gas emissions were about 23% below 1990 levels (Schreurs 2012: 7).[14] At the same time the government established ambitious greenhouse gas emissions targets and established standards to guide industry and society as well as created some 370,000 new jobs through renewable energy industries. The amended Energy Act that came into force on 1 August 2014 set even more ambitious targets so that 'the share of the energy generated from renewable energy sources increases from 40 to 45 percent until 2025, from 55 to 60 percent until 2035, and to 80 percent until 2050'.[15]

Total energy demand has seen some drop in the early 1990s but electricity generation has steadily increased. In 2008 as a result of the economic crisis a sharp drop in consumption occurred. In 2014 'total power generation [had] not come back to pre-crisis levels, despite a boom of the German economy and increasing power exports ' which is likely to be an indicator of 'efficiency gains in the economy' (Jungjohann and Morris 2014: 6). In 2013, Germany was still the leader for wind power in the EU – and 3rd in the world after China and US respectively - with 34,250 MW installed capacity.[16] In terms of photovoltaics, in 2012 Germany became the world leader too 'with 7.6 GW of newly connected systems; followed by China with an estimated 5 GW; Italy with 3.4 GW; the USA with 3.3 GW; and Japan with an estimated 2 GW'.[17]

3.1 Energiewende

Nuclear phase out started long before the disaster of Fukushima and is at the core of Germany's Energiewende. The first policy step was taken in the year 2000 with adoption of the Renewable Energy Act (EEG) by the German government that announced a nuclear phase-out. Until 2009, subsequent governing coalitions stuck to this decision and then 'the Conservatives (CDU) and Liberal Democrats (FDP) came into power, gave in to nuclear lobby pressure, and delayed 'the retention period of nuclear power plants'. When, in 2010, the government presented its goals for renewable energies and for the reduction of CO_2 emissions, the goal was for Germany to become one of the first industrialised countries to base its electricity production, mobility,

industries and private households on sustainable and renewable energy. The engine for this ambitious programme was the Renewable Energy Act (EEG) (Greenpeace 2014).[18]

In 2010, the German government formulated guidelines for an environmentally sound, reliable and affordable energy supply in a long term energy strategy that reached to 2050. The strategy identified 9 spheres of action to be taken in order to achieve the targets of 80% RES energy in the general supply by 2050:

- Renewable energies as a cornerstone of future energy supply
- Energy efficiency as the key factor
- Phase-out of nuclear power and fossil-fuel power plants
- An efficient grid infrastructure for electricity and integration of renewables
- Energy upgrades for existing buildings and energy-efficient new buildings
- The mobility challenge
- Energy research towards innovation and new technologies
- Energy supply in the European and international context
- Acceptance and transparency.[19]

A large part of Energiewende implementation is the monitoring process that helped to develop the framework as it is being implemented by '[identifying] suitable indicators and [stating] the necessary data on which to base' the policy (Löchel et al. 2014: 3). In 2014 the second Monitoring Process report by the Expert Commission on the "Energy of the Future" (data of 2012 and partly 2013) suggested the government moves onto a 'more problem-orientated approach' (p.3). Thus a change from the previous report was the decision to 'monitor to identify suitable indicators approach' and 'aim more to analyse and evaluate the developments observed' in regards to the issues such as:

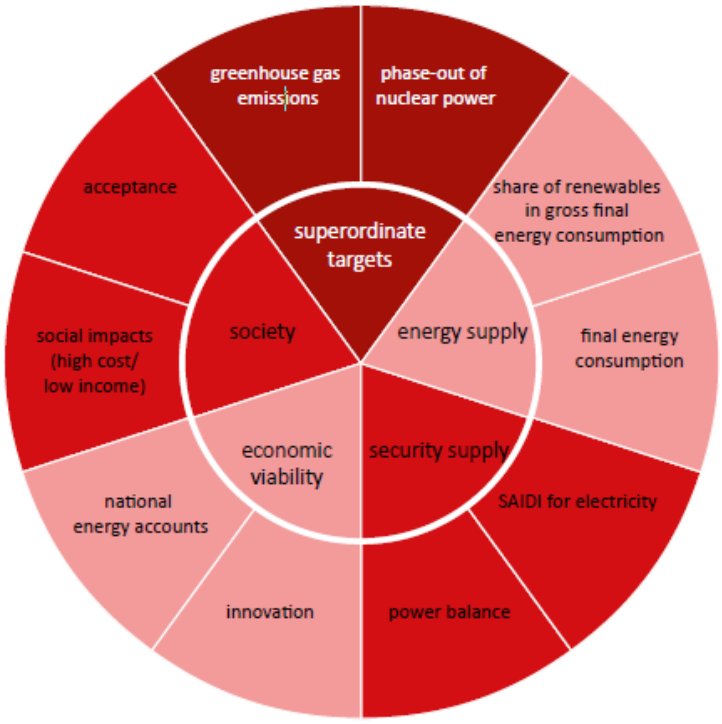
1. The monitoring process as an element of the Energiewende
2. The phase-out of nuclear energy and development of greenhouse gas emissions
3. Initiatives in the field of energy efficiency
4. Development of supply security in the light of potential unreliability of certain energy sources e.g. wind
5. Economic viability of the energy supply
6. Innovation impetus provided by the Energiewende (Löchel et al. 2014)

Energiewende is defined by 'two superordinate targets: lowering greenhouse gas emissions by at least 80% by 2050 and phasing out the use of nuclear power by the end of 2022' (Löchel et al. 2014: 4). The two in turn are complemented by a number of sub-targets which are implemented via political enforcement but are inflexible and need to be made more adjustable without compromising the attainment of superordinate targets (Ibid.). Until 2013 German government has been only using quantitative target in the Energy Concept as lead indicators which is a shortcoming. It needs to be overcome by taking into account 'non-quantitative aims of security of supply, economic viability and environmental soundness – beyond greenhouse gas emissions – of the energy supply as well as acceptance and societal impact of the Energiewende' (Ibid., p. 4) for a more long-term policy approach, sustainable economically, socially, and environmentally. The new proposed framework for the 'Energy of the Future' monitoring process is based on ten lead indicators for five dimensions of Energiewende. The framework includes: greenhouse gas emissions, the phase-out of nuclear power, the share of renewables in gross final energy consumption, final energy consumption, System Average Interruption Duration Index (SAIDI) for electricity, the power balance, innovation, National Energy Accounts, social impacts on the basis of the "high cost/low income" approach and acceptance' (Ibid., pp. 4-5). Figure 1 below is a visual representation of the lead indicators and dimensions.

Other state stakeholders also take part in these in the discussion on Energiewende with their own systems of indicators. Their main suggestion is the use 'of an aggregate perspective

through lead or aggregate indictors based largely on the energy policy triangle of "security of supply, economic viability, and environmental soundness"' with inclusion of dimensions beyond the triangle as well (p.5). One positive development is that the presence of many complementary initiatives expends the information base.

Figure 1. Lead indicators for the 'Energy of the Future' monitoring process.



Source: Löchel et al. (2014: 5).

In June 2011, a new amendment of the Renewable Energy Sources Act (EEG) was passed by the Bundesrat. It came into force on 1 January 2012 and aimed to make RES more competitive. It keeps the existing FiTs in place but adds a market premium 'that allow producers to sell RES-electricity on the electricity markets' (Winkel et al. 2011: 109). The EEG amendment also changes the tariff structure of other RES and included biomass, geothermal, and offshore wind power. In the case of photovoltaics, a dynamic 'degression' of tariffs based on capacity increase had been in place since 2010/11 already (Ibid.). In May 2011 the Act on the Promotion of Renewable Energies in the Heat Sector (EEWärmeG) too was amended to implement the objectives of the Directive on the Promotion of the Use of Energy from Renewable Sources (2009/28/EC). It introduced strict 'norms for heating and cooling in existing public building that undergo major renovations' while allowing private buildings' standards to be less restrictive. In the transport sector, the mandated E5 fuel blend was increased to E10 (10 % ethanol) in January 2011 and additional quality criteria for biofuels were introduced by the Biofuels Sustainability Ordinance. They allowed biofuels to benefit from tax reductions and to be an eligible source to fulfil the blending target (Ibid.).

3.2 RES Support schemes

RES-E

FiTs have been the major support instrument for RES-E in Germany backed by EEG and supported by additional fiscal measures that support RES-E installations. Responsibilities for monitoring and implementation are divided between the Federal Ministry of Environment (BMU) and the Federal Grid Agency. All qualifying technologies apart from those that involve

co-firing in conventional power plants are eligible for FiTs which can be combined with the fiscal support (Ibid, p. 109). FiTs are distinguished by 'technology and size of installation, and are subject to annual degression for new installations'. The scheme is financed by final consumers and there is no overall cap on the cost. In case of compliance with distinct quality of service provision criteria additional bonuses are paid to suppliers.

'Feed-in Tariffs have resulted in a more than 25% share of renewable electricity, technological innovation, thousands of tonnes of CO_2 savings, 370,000 jobs as well as high revenues for communities and regions**.** About 20 million Germans today live in so-called 100% RE regions (in total about 140 country-wide) that aim to supply 100% of their electricity and often also heat demand with renewables. These regions create local value by saving high costs for energy imports, creating local jobs and generating tax income. The FiT law leveraged private investment: About 888 energy cooperatives as well as private investors, farmers, banks and enterprises own about 95% of total installed RE capacity. The "big four" power providers own the other 5%'.[20]

RES-H&C

The primary support for RES-H&C is the RES-H Act (EEWärmeG) that 'introduces the obligation to use RES-H in new buildings larger than 50m² and includes the Market Incentive Programme (MAP)'. The latter provides 'investment subsidies and grants as well as long-term, low-interest loans with a fixed interest rate and redemption-free grace years for RES-H&C installations' with an annual budget of €350 million in 2010 (Winkel 2011: 110).

RES-T

The main source of RES-T is biofuels which are supported by a quota obligation (overall set at 6.25% annually until 2014) as well as by a tax exemption. Second generation fuels (advanced biofuels generated from various types of biomass) and ethanol are tax exempt until 2015 but exemptions for all other biofuels were phased by 2014. Instead of expected raise of quota obligation in 2015, the requirement was replaced with another one: 'the mineral oil sellers must now reduce the greenhouse gas emissions of their products by 3.5% (4% in 2017 and 6% in 2020)'.[21]

In September 2013 the BDI industry federation[22] - this represents about 100,000 companies including Siemens AG (SIE) and Volkswagen AG (VOW) – announced they wanted to get rid of feed-in tariffs that 'guarantee owners of new clean-energy plants above-market payments for 20 years under the EEG renewable law'.[23] In a 19-page long reform proposal BDI urged for the renewable energies to be integrated into the market. They stipulated in the proposal that 'the EEG with its guaranteed feed-in tariffs and priority access for renewables can't support the needs of a power generation market with supply and demand structures' (Ibid.). Indeed, Germany is Europe's biggest clean-energy market with some of the highest power prices. There were multiple pressures on Chancellor Merkel from the VCI chemical lobby, Germany's biggest utility industry groups VKU and BDEW as well as the Free Democratic Party, Merkel's junior coalition partner to phase out or halt feed-in tariffs.

Future prospects

Renewable Energy Act Reform

In early April 2014, the German cabinet approved the Renewable Energy Act Reform that some referred to as the Feed-in Tariff 2.0 (FiT 2.0).[24] The bill was met with criticism as it was seen as failing to address issues that it was aimed to address, such as grid development, market integration and financial instruments. Instead, the bill favoured the corporations and energy utilities that have failed to integrate renewables into their business model' (Ibid.). Leidreiter (2014) calls the **reform 'a collection of compromises that shields fossil autocracy and large energy utilities** at the expense of energy consumers, citizen cooperatives and the renewable energy sector with its 370,000 employees'.[25]

The new policy is controversial on the following grounds:

1) Cap for wind and photovoltaic RES
   An attempt to centralise and control the Energiewende - by capping the amount of renewable electricity that qualifies for the FITs. It will differ depending on type of technology: on-shore wind 2.5 GW per year, photovoltaic 2.5 GW per year, biomass about 1 GW per year and offshore wind 6.5 GW to 2020. This does leave a lot of room for manoeuvre for renewables however introduces a degree of rigidity into a previously flexible, decentralised and community-driven approach.
2) Exemptions for energy intensive industry
   The main reasons behind the increasing electricity prices in Germany are the exemptions for energy intensive industries from the renewable energy surcharge which cost average consumers 6.3 euro cents per kWh.
3) Taxing self-consumption of solar PV
   The reform introduces a FiT surcharge on self-produced electricity consumed by owners of solar photovoltaic systems larger than 10 kW (except existing installations). This jeopardises existence of specific business models for energy cooperatives and regional energy suppliers that emerged as a result of Energiewende by making them less economically viable in two ways. Firstly, it increases their costs of production and consumption. And secondly, the reform facilitates tougher competition from the energy intensive industries that will only pay 15% of the same surcharge regardless of the way the energy is generated. Because fossil fuel energy is cheaper, this will create a general pull away from the use of RES.
4) Direct marketization
   The reform makes marketization i.e. removal of state support/protection and exposure to market competition from all other eligible energy suppliers, of RES production mandatory. Previously, under the Renewable Energy Act a fixed FiT was ensured for 20 years. That will now change.
   'The reform foresees the mandatory direct marketing first for renewable energy plants with a capacity over 500 kW (from August 2014 onwards). From 2016 onward, this will also apply to installations over 250 kW and from 2017 installations over 100kW' (Leidreiter 2014).
5) Quota system instead of Feed-in Tariffs
   Successful FiTs will be replaced with a tender or quota system by 2017 thus removing the purchase obligation for RES that is embedded in FiT. This will make RES producers easy to be outcompeted due to their limited economic capacity and lack of bureaucratic experience/capacity of/in the tendering process. The auction reform to enter into force in 2017 was 'sharply criticised' by the Bundesrat[26] because it will 'discriminate against smaller players that have led the country's renewable energy revolution' (Knight 2014: 1). The obligatory auction procedure means that 'onshore wind project developers would have to bid before having all permits and preliminary contracts, and would have to price in the risk of not winning' (Ibid.). The objections were dismissed by the government because it was decided that they contradict EU State Aid Guidelines.

Return to coal

Over the last two years there has been much speculation in the media as to the changing role of coal in Germany and elsewhere. Some even spoke about a possible "glowing future" for coal power and a "coal comeback" in Germany (Schultz 2012, McCown 2013). Moreover, some argued that domestically produced lignite can become a replacement for nuclear power that is being phased out at the moment (Birnbaum 2013). The German government appears to be paradoxically committed to both Energiewende and construction of coal plant at the same time. However, a recent report by Jungjohann and Morris (2014) dispels those speculations. They claim that the concerns are 'based largely on a temporary uptick in coal power in 2012/13 (due to a cold winter and greater power exports) and on a round of new coal plants currently going online' (p.4). More importantly, coal is not making a comeback and 'projects started in 2005-2007 as part of an overall trend in Europe caused by low carbon prices and upcoming stricter

pollution standards for coal plants' (Ibid). Thus, the coal plant construction is unrelated to the post-Fukushima nuclear phase-out that began in 2011. Jungjohann and Morris conclude that by initiating a reform of the emissions trading system (EU-ETS) Germany could phase out coal by mid-2020s. It is also advised that the country considers 'taxing carbon and implementing a Climate Protection Act, focus more on efficiency, and strengthen natural gas as a bridge fuel' (p.4). However, in the light of the Renewable Energy Act reform discussed above the likelihood of coal remaining strong is high.

Remunicipalisation

In the light of growing energy prices in Germany there has been growing public discontent of energy privatisation and growing support for (re-)municipalisation (EPSU 2011).[27] So, between 2007 and 2011 '44 new local public utilities (Stadtwerke) have been set up and more than 100 private concession contracts for energy distribution networks and service delivery have returned to public hands'. In the City of Hamburg, for example, in January 2014 Vattenfall agreed to sell its 74.9% share in electricity grid to the city following a referendum on remunicipalisation of the distribution grids for electricity, gas, and district heating held in September 2013 (Lethbridge and Yurchenko 2014: 17). Vattenfall co-owns the district heating network with the city, 74.9% and 25.1% respectively and is offering to sell its shares to the city (Lang 2014). There have been cases of energy companies selling entire networks back to the government. 'Almost all existing contracts in the energy sector are up for renewal in the period up to 2016' and 2/3 of communes plan to buy back their energy networks (Ibid.). Whether this will materialise or not is not currently known however a full scale remunicipalisation of energy networks is unlikely and can be undesirable for the communes due to the potential high costs of operating the grids. Presently, 'high penetrations of renewables with legal priority over fossil fuels are driving down wholesale market prices - sometimes causing them to go negative' and decreases the value of coal and natural gas plants (Lacey 2014). Utilities' profits are further jeopardised because their 'commercial and industrial customers are increasingly trying to separate themselves from the grid to avoid government fees levied to pay for renewable energy expansion'. In 2014 16% of German companies were 'energy self-sufficient -- a 50 percent increase from just a year ago' and some 23% percent of businesses claim to plan to 'become energy self-sufficient in the near future' (Hromadko 2014). Lacey explains the dynamic:

'Grid maintenance costs go up and the capital cost of renewable energy moves down, more customers will be encouraged to leave the grid. In turn, that pushes grid costs even higher for the remainder of customers, who then have even more incentive to become self-sufficient. Meanwhile, utilities are stuck with a growing pile of stranded assets' (2014).

Thus Vattenfall saw $2.3 billion in losses in 2013 due to this same "fundamental structural change" (Lacey 2014) in the electricity market and sold its grid (see the Hamburg case above) precisely because it was too expensive to run. Remunicipalisation in such a case can become burdensome for the communes unless regulated and financially supported by the government.

4. Spain

Spain has been committed to RES promotion, particularly on-shore wind and photovoltaics, since the oil price crisis of 1973. The intention was solidified in numerous legislative acts since the mid-1990s. In 2004 Spain ranked first in EU in terms of installed wind energy capacity and with photovoltaic market on the rise. The two positive RES-E market developments were facilitated by favourable climatic conditions but mainly were due to 'a stable, comprehensive and strategic policy framework for the promotion of renewable energy sources' (Bechberger in Mez 2007: 201). Spain had seen the highest increase of primary energy consumption of renewables of EU-15 countries in the decade up to 2007. The main contributors to that increase were the feed-in tariffs and premia that facilitated the sectoral growth.

Spain was one of those hit hardest in the 2007/8 credit crunch and the ensuing financial crisis. At the end of 2008 the government began to cut subsidies across all sectors, including renewables. Despite this, in the same year still Spain accounted for half the world's new solar-power installations in terms of wattage. A series of legislative measures followed aimed at marketising the sector and cutting state support.

On 30 April 2009 the Royal Decree 6/2009 was adopted that aimed at limiting the tariff deficit i.e. difference between costs to consumers and electricity supply costs of delivering the service. The tariff deficit is the cost incurred by all energy producers. One of the measures aimed at reducing the tariff deficit and 'facilitate grid integration' of small RES-E producers was an introduction of a Registry for new RES installations (apart from solar photovoltaics).[28] The Registry introduced 'yearly caps on the amount of new wind and CSP installations'. A year later RD 6/2009 was replaced with harsher legislation RD 14/2010 that suspended incentives for new RES-E projects. At this point already it was not certain whether the RES targets for 2010 would be met. For example, the Spanish government expectation that RES-E would contribute 42% of total electricity demand (MITyC & IDAE in Batlle et al 2011: 1) with decreasing support for the sector was unrealistic. In 2011 the state of the renewable energy market in Spain was uncertain (Winkel et al 2011: 276). The Law on Sustainable Economy was adopted in March 2011 that stipulated general conditions to implement sustainability in accordance with EU targets.[29]

4.1 RES-E

The key policy instrument in the Law on Sustainable Economy was a special remuneration scheme with a choice of a feed-in tariff or a feed-in premium. This scheme 'covers all major renewable technologies (and high efficiency production as cogeneration) and provides support for different time periods depending on the technology. Tariffs are differentiated by type of technology and size of the project, and indexed to inflation. In addition, the remuneration scheme was subject to modification if capacity targets were exceeded (as happened with solar PV and wind power). Offshore wind projects are covered by a specific tendering procedure' (Winkel et al 2011: 277).

4.2 RES-H&C

Since 2006, the 'main support instrument for the promotion of renewable energies for heating and cooling purposes is based on the implementation of the Technical Building Code'. According to the Code 'any new or renovated building is obliged to integrate a solar thermal energy installation' where requirements depend on:

1. The climatic zone
2. The surface area, and
3. Type and use of the building

There are many cogeneration units in Spain (particularly CHP-plants fuelled by either biomass or biogas) in which cases 'the heating and cooling facilities are also promoted indirectly via the above-mentioned feed-in-scheme'.

4.3 RES-T

There are two main tools developed for renewable fuels in Spain: (1) tax exemption mechanisms and (2) mandatory targets for biofuels utilization enforced by quota obligation for retailers to blend their fuel with a minimum share of biofuels.

4.4 Royal Decree-law 1/2012 (RDL 1/2012)

In early 2012 the Spanish cumulative energy deficit stood at €24 billion.[30] Special regime installations i.e. RES-E generators, are not funded by the State Budget. Instead their cost is included in electricity rates for consumers. Government regulation meant that retailers including Endesa SA (ELE) and Iberdrola SA (IBE) had 'to pay above-market prices to renewable

power producers' without allowing the incurred costs to add to customer bills that, according to retailers, caused a deficit.[31] In fact the government simply no longer had the money to support the renewables i.e. reduce the "deficit". On the 27 January 2012 the Spanish government 'suspended financial incentives for new renewable energy projects' in an attempt to tackle the growing tariff deficit.[32] The latter meant temporarily suspending 'procedures to pre-allocate payment … and financial incentives for new electricity production plants based on cogeneration, renewable energy and waste'. The freeze did not affect 'facilities which are already operational or already pre-registered' (Ibid.). The RDL 1/2012 guaranteed the existing 'economic basis for installed wind power and pre-registered farms' while it froze 'the incentives to facilities that are not registered in the Pre-allocation Register' (Williamson 2012). Moreover, the Registry itself is now suspended and although the RDL 1/2012 states that all suspensions are temporary, it is not specified for how long the suspension will last. This added uncertainty into the already destabilised sector and a year later the deficit too 'expanded 46 from the 3.85 billion euros registered a year earlier' according to the National Energy Commission Report of 18 April 2013.

The photovoltaic market has been affected by retroactive cuts to particular financial incentives aimed at encouraging the construction of small-scale solar photovoltaic (PV) projects. The Spanish Photovoltaic Union (UNEF) – the industry association for the solar sector - has voiced concerns about the government reforms claiming that they will damage the PV sector. The revision of subsidies was provoked, among other reasons because renewable technologies had 'prove[d] more popular and cheaper to install than originally envisaged' (Out-law 2012). The government also announced that in 2011 33% of its electricity demand came from renewable sources. On the other hand, during the same year wind power 'experienced the slowest growth ever recorded in percentage terms with a 5.1% increase in accumulated power to just under 21.7 GW'. The renewable energy industry stated that in 2011 'less than 10% of the wind turbine production carried out in Spain' was utilised domestically; and '1050 MW installed in Spain in 2011 are from orders for wind turbines made in previous years' (Williamson 2012). 2012 was the final year of the Pre-allocation Register according to which 'a total of 1903 MW of wind power is registered and pending commissioning' (Ibid).

The result of cuts can be seen in drop of compensation for solar photovoltaic (PV) generation that reached €1.96 billion (amounting to an average 0.388 €/kWh) in the first seven months of 2013.[33] That is a reduction of 5.43% (0.3995 €/kWh) in comparison with the same period in the previous year (Ibid).

The Royal Decree-Law 9/2013, (**"RDL 9/2013"**), ratified by the Spanish Parliament on 17 July 2013, approved a package of extraordinary and urgent regulatory measures aimed at fixing the tariff deficit problem, which is threatening the financial stability of the Spanish electricity system (Ashurst Madrid 2013: 1). The directive cancels renewable generators' right for a premium plus the market price or a fixed regulated tariff. According to RDL 9/2013 a 'renewable generator could be entitled to receive a "*specific remuneration*" on top of the pool price in order to compensate for the investment cost and operational costs that cannot be funded out of its participation in the electricity market' (Ashurst Madrid 2013: 1). The 'specific remuneration' will be based on: (i) the installed capacity of the generation unit; and (ii) the operation of the renewable facility. This means: (1) marketization of the RES sector, and (2) cancellation of the feed-in tariff option which most PV plants previously enjoyed. The amount of the remuneration will be calculated basing on (a) 'the income generated by such renewable assets in the electricity market; (b) operational costs and (c) initial investment of such renewable assets'. It also 'shall not exceed the minimum level to finance costs' while permit for 'reasonable returns'[34] to be made by RES producers. It sets new parameters for the new economic regime of renewable generators and also states that the regime can be reviewed every 6 years.

4.5 Electricity Industry Law 24/2013

Public discontent over the government's withdrawal from renewable energy support is growing and can be seen in the growing number of customers choosing to change conventional suppliers for small green energy cooperatives[35] like Som Energia, Catalonia.[36] On 27 Dec 2013 Electricity Industry Law 24/2013 (LSE 24/2013) was adopted as a 'response to the structural reform of the electricity industry included in the Council Recommendation on the National Reform Program 2013 of Spain, approved by the Council of the European Union on July 9, 2013' (Garrigues 2013: 1). It replaced the Law 54/1997 and was based on four main principles:

1. 'Recognition of free enterprise when it comes to the conduct of the activities aimed at supplying electricity that are regulated in the law: generation, transmission, distribution, energy recharging services, retailing and intra-community and international exchanges, as well as the technical and economic management of the system.
2. Consideration of the supply of electricity as a service of general economic interest, previously considered as an 'essential service'
3. The access of system participants to grids as one of the cornerstones of the operations of the electricity system, essential to guaranteeing supply and effective competition in the market; and
4. The configuration, as a new feature, of the economic and financial sustainability of the electricity system as a guiding principle for the actions of the public authorities and the other system participants within the scope of application of the law' (Garrigues 2013: 1).

The reform was rather vague and in essence meant a green light to marketisation of the RES-E sector and liberalisation of the electricity market. Now RES electricity producers have to compete under relaxed rules with all other energy suppliers, including fossil fuel energy suppliers. What such changes also mean is a shift in approach to electricity as a commodity 'essential' for all to have, a truly public good that if need be should be subsidized, to now being a 'service of general economic interest' or SGEI[37]. SGEI are strictly regulated by EC in terms of when and how they qualify for State Aid and apply to both private and public suppliers of SGEI. For the general public it means having less control over access to green energy and less potential for affecting prices on RES or any other energy. The decision whether to marketise specific SGEIs de *jure* lies with the EU member state government. However, governments are restricted in their decision power by combination of marketization pressure with austerity policies i.e. general crack down on subsidies and move towards increased liberalisation of the market. In Spain the electricity market is already liberalised which means that Principle 3 can be seen as a direct attack on individual suppliers and solar industry alike.[38] Together with RDL-1/2012, the industry reform can be interpreted as a retroactive tax on solar energy producers of every size.[39] Worker cooperative electricity suppliers which despite the economic crisis and being few are growing in numbers are too under threat.[40] Their existence – and renewable energy production too – are jeopardised by allowing cheaper conventional energy suppliers to have unrestricted access to the grids. These changes in combination with subsidy cuts make renewable energy suppliers less if not altogether uncompetitive. The first three principles that advocate non-discriminatory liberalised market will inevitably lead to increase in consumer electricity costs. Thus it is unclear how the forth principle of 'economic and financial sustainability' of the electricity system can be achieved when even improved unemployment is still at 23.7%,[41][42] real wages are falling in general and wages of many are subject to a freeze.[43] It is explained in the Preamble of LSE 24/2013 that sustainability means 'the ability of the electricity system to satisfy all of the system's costs'. At the same time the system's revenues must meet all its costs and must be kept in balance through necessary adjustments, increase/decrease in other cost items or revenues (Garrigues 201: 2). The system's costs are funded out of the amounts paid by consumers with some exceptional cases funded from the General State Budget. Article 14.7 of LSE stipulates that the 'new regime will apply to new installations and, only as an exception included in the Eleventh Additional Disposition, to any other installations already put in place at any date before the entry into force of the Law of the electric sector'.[44] The reform replaced the system of FiTs and feed-in premiums with a system of

retribution. This meant cancellation of the previously regulated price per MWh and replacement with a price calculated on the basis of initial installation investment. In a discriminatory fashion all 'existing Spanish RES installations will be grouped and assigned to a "standard installation" based on the criteria listed above regardless of the real costs in which producers have incurred' (Cortesi 2014). The reform will introduce a:

> 'new cutback for renewable energy producers which, for photovoltaic energy, will ratify the 30% average cut on support schemes put in place by RDL 14/2010 and that will be in force until the 14th of July of 2013 (which means until the reform itself enters into force) and thus will have very negative in impact on the Spanish RES sector' (Cortesi 2014).

In addition, the reform introduces new rules to the 'regulatory lifespan of the installations' which means that it will have a retroactive effect on RES installations that date back to 2004.

The threat to renewable energy posed by this law was brought to the attention of the European Parliament in Questions on 18 Feb 2014. It was considered as that which through 'change in the tax regime applied to renewables may lead to the closure of existing facilities, and the lack of incentives of any type, new taxation (Law 15/2012) and charges (the so-called 'backup charges') are all serious obstacles to the development of new installations'.[45] European Parliament decided that because Spain's 'renewable energy share was 14.3% in 2012, above the interim target for 2011-2012 of 11%', no action would be taken against them unless they breach their 2020 target of 20%.[46] Considering the increasing cuts to support schemes for renewables and marketization/liberalisation of the sector, in 2020 it may be too late to reverse the damaging effect of the currently implemented energy reforms in Spain.

On 16 June 2014 The Cabinet approved Royal Decree 413/2014 (RD 413/2014) 'on electricity generation by means of renewable, cogeneration, and waste facilities'. The law cuts 'renewable energy subsidies as part of a drive to reduce a 30 billion euro ($41 billion) power tariff deficit, built up during years of keeping prices below regulated costs' (Reuters 2014). According to RD 413/2014 a 'renewable generator could be entitled to receive the "specific remuneration" on top of the pool price in order to compensate it for the capital and operational costs that cannot be funded through its participation in the electricity market' (Ashurst 2014: 1) Both the 'remuneration' and the 'operation costs' are calculated in the same arbitrary and abstract manner as the LSE factor are. It also 'set the rate of return for existing renewable energy facilities at 7.4 percent and at 7.5 percent for future operations' (Reuters 2014).

This was soon met with criticism from, among other, Holtrop S.L.P. (volunteer lawyers for the Platform for a New Energy Model, which represents some 1500 RES producers in Spain) who wrote a complaint to European Commission prompting infringement procedures against Spanish government

> 'considering that Royal Decree-Law 9/2013, Law 24/2013 and Royal Decree 413/2014 clash with the Renewables Directive, the Emissions Directive, free movement of capitals and the principle of the protection of legitimate expectations' (Holtrop 2014).

The estimated damages to the renewable energy sector could be catastrophic. According to the Spanish National Regulator's report on the Ministerial Order published on 7 April 2014, the overall reduction is estimated at €1.7bn (Ashurst 2014). So, 'the remuneration adjustment is split between wind power (€600m), PV power (€400m) and others such as cogeneration and waste (€150–200m for each renewable technology)'. Specifically, 'hydraulic/mini-hydro are heavily impacted, while cogeneration and waste suffer a reduction of between 79 to 90 per cent in the remuneration for investment (those assets are almost deemed to be amortised in the regulator's eyes)' (Ibid.).

5. UK

Until 2010, the UK electricity regulator (Ofgem) and the British government had expressed no doubts that the 'British Model' of a competitive electricity market was the best way to provide an affordable, reliable but sustainable electricity supply to consumers. However, in February 2010, the Energy Minister (Ed Miliband) and Ofgem both stated that the market solution was not sustainable.

Ofgem recommended[47]: 'far reaching energy market reforms to consumers, industry and government.' It stated: 'The unprecedented combination of the global financial crisis, tough environmental targets, increasing gas import dependency and the closure of ageing power stations has combined to cast reasonable doubt over whether the current energy arrangements will deliver secure and sustainable energy supplies.' And 'there is an increasing consensus that leaving the present system of market arrangements and other incentives unchanged is not an option.'

On the same day, the energy minister, Ed Miliband released a press statement that said:[48] 'However, for the longer term, Britain will need a more interventionist energy policy. The scale and upfront nature of the low carbon investment needed is likely to require significant reform of our market arrangements to deliver security of supply in the most affordable way.' He had told the Times two days earlier that: 'one alternative would be a return to "capacity payments" - in which power station operators would be paid for the electricity they generate and also for capacity made available.'[49]

These statements led to the instigation of the Electricity Market Reform programme[50] in the Energy Ministry that culminated in the Energy Act 2013[51], passed in December 2013. Like the nuclear programme, Electricity Market Reform has not been a party political issue and the coalition government that came to power in May 2010 fully bought into the statements of Ofgem and the Labour government Energy Minister

The significance of this was that the UK, the first European country to restructure its electricity system on competitive lines, became the first to state explicitly that the market system would not allow climate change objectives to be met. In this paper, we review the proposals and identify what their long-term impact, if fully implemented would be.

5.1 Previous UK policy on low-carbon

In other countries, measures to promote 'low-carbon' were marginal and were intended not to change the overall structure. The primary tool adopted has been Feed in Tariffs (FiTs). Of course, in the long term, as low-carbon sources take up an increasing proportion of the market, unless low-carbon sources are competitive with fossil fuel sources, the market will wither away. The European Commission, in its new guidelines on state aid for energy imposed from July 1 is requiring that FiTs be phased out from 2016 and be replaced by 'market-related' terms and beyond 2020, renewable sources should be 'grid competitive'. However, none of the member states had responded to this requirement by July 2014.

Other EU countries have consistently followed a single policy, usually FiTs, to promote low-carbon sources. However, by 2010, the UK had used three entirely separate schemes to promote renewables. These are discussed in more detail elsewhere. From 1990-98, there had been capacity auctions funded by the Fossil Fuel Levy (FFL), under which the government would open a call for tenders for a specified amount of capacity and accept the lowest bids. This scheme was successful at reducing prices but a high proportion of the successful bids were not built because of problems of planning consent and finance. This was replaced in 2002 by a Renewable Obligation (RO) under which electricity retailers were required to source an increasing percentage, specified by the government, of their supplies from renewables. This will

be phased out by 2017. It was not successful, mainly because the penalties for not meeting the targets were not sufficient to force the retailers to comply.

FiTs were introduced in the UK in 2010, but unlike countries like Germany where they have been the main instrument to introduce renewables, in UK, they were just targeted at small sources, less than 50kW. The uptake of solar panels was rapid and in 2011, the government halved the 'export' tariff for power sold back to the grid because the budget had been spent. Whilst this did not affect those whose installation had already been approved, it did dramatically reduce the uptake and the industry that had been built up to supply and fit solar panels was badly affected.[52] It is not clear what the long-term future for FiTs is given the changes to State Aid guidelines.

5.2 Provisions of the Energy Act of 2013

There were six main provisions under the Energy Act:[53]

1. Introduction of long-term contracts (Feed-in Tariff with Contracts for Difference) to provide stable financial incentives to invest in all forms of low-carbon electricity generation
2. A capacity market
3. A Carbon Price Floor (announced in the 2011 Budget) to reduce investor uncertainty, putting a fair price on carbon and providing a stronger incentive to invest in low carbon generation now
4. Liquidity measures to enable the Government to take action to improve the liquidity of the electricity market
5. Emissions Performance Standard (EPS): to limit carbon dioxide emissions from new fossil fuel power stations. This effectively prevents new coal-fired plant being built unless it has Carbon Capture and Storage fitted
6. A limit on the number of energy tariffs offered to domestic consumers; a requirement for companies to automatically move customers from poor value closed tariffs to cheaper deals; a require to provide information by suppliers to consumers on the best alternative deals available to them

Under the first point, in effect, this new law will produce a Single Buyer (SB) body, in July 2014 yet to be named (referred to as the counterparty body) or established, which will be government owned and will contract for power from new low-carbon generation sources. The budget for the counterparty body would come from a levy on consumers and would increase to £7.6bn on so-called contracts for differences (CfDs)[54] by 2020 meaning that it would have about £1-1.5bn per year to spend on new projects.[55] The CfDs would be long-term contracts to provide stable and predictable incentives for companies to invest in low-carbon generation. Under these, generators would receive the market price from the market for all kWh generated: if the market price is below the contract price, the buyer makes up the difference and vice versa.

While the counterparty body has been overtly set up for low carbon plants, the higher the proportion of plants covered by these contracts, which are entirely outside the market, the more risky it will be to build a plant to survive in the market. In a windy, sunny year, the amount of solar and wind power produced will be high and given that all the output of such plants has to be bought, the utilisation and hence the profitability of gas-fired plants, which will be needed for some time to provide flexible capacity, will be low. Logically, this means all plants will eventually be covered by long-term contracts written by the government. This will mean that the wholesale market will inevitably wither away and given that the wholesale price will be set by these government contracts and will be the same for all retailers, there will be nothing for the retail companies to compete over.

Provision for capacity payments was also included in the Energy Act. There have been increasing concerns that when Britain's remaining coal-fired capacity was forced to close in

2015/16 under the European Union's Large Combustion Plant Directive, there would be a shortage of generating capacity. Given that in UK in 2013, there was 5GW of modern gas-fired plant moth-balled and about 10GW of plant under construction, the issue does not appear a lack of investment. The problem appears to be the lack of incentive for generators to retain plant as available if it is not profitable even if it is necessary for security of supply.

In March 2014, the government announced details of the first capacity auction, which took place in December 2014. These will provide payments for 15 years agreed four years before the payments would start for new capacity and for up to 4 years for existing capacity.[56] Payments would be capped at £75/kW per year so that a 1000MW plant could get income of up to £75m per year. In return, capacity would have to be available to generate when needed or face penalties.

Under the EU Emissions Trading Scheme (EUETS), Carbon trade started in 2005 with the market price settling at about €15/tonne. By 2014, the Carbon price had fallen to about €4/tonne. However, permits were given to existing generators and gave large profits to them. By 2011, the UK government had lost confidence in the EUETS to set a realistic price for Carbon – if the market was working well, the Carbon price would be high enough to bridge the gap between the cost of fossil-fuel generation and that of low-carbon sources.

In 2011, the UK government announced Carbon Floor Price (CFP) would come into effect on April 1 2013 at about £16/tonne (€19) and would rise in real terms to about £36 (€43) by 2020 and about £70 (€84) by 2030. Under this scheme, low carbon generators would sell permits and if the price was lower than the floor price, the difference will be made up by the 'Climate Change Levy', which is paid by fossil fuel generators and ultimately consumers. However, pressure on the government to act on electricity prices led to the abandonment of the increase in Carbon price in 2014 and it will be capped at £18/tonne, around the level set for 2015/16

Under the liquidity measures, there will be a requirement to force companies to buy a given proportion of power through wholesale market under the 'Secure & promote' programme introduced on April 1 2014. This will require the six major electricity companies (the Big 6) to post bid and offer prices for range of contracts up to 2 years ahead during 2 1-hour trading windows each day.

The UK public has become increasingly dissatisfied with the dominance of the Big 6 companies, which dominate both generation and retail, are perceived as acting in an exploitative way and a public opinion poll found the Big 6 were less trusted than British banks. In July 2014, Ofgem referred the electricity market to the Competition and Markets Authority (CMA), the UK anti-trust body, for a full-scale investigation. This will be a major inquiry which will not report before December 2015 and will have scope to recommend far-reaching changes, for example, the break-up of the Big 6 and a requirement for the retail and generation sectors to be separate at a corporate level.[57] Because of this uncertainty, the companies are unlikely to want to make significant commitments when the result of the CMA inquiry could be a significant reduction in the UK business.

5.3 Motivations for EMR

Given the history since 1990 of governments designing measures to support the nuclear industry, e.g., the FFL and the rescue of British Energy from bankruptcy, the question must be asked, how far are the EMR proposals designed to facilitate nuclear construction with any promotion of renewables a secondary objective?

In 2006, when the British Prime Minister, Tony Blair, announced his intention to re-start nuclear ordering in the UK, a key element that made the policy more publicly acceptable was a promise that no public subsidies would be given for new nuclear power plants implying that any new nuclear power plants would have to compete with fossil fuel plants on an equal basis,

perhaps with some support from a positive Carbon price. It is highly unlikely this promise could ever have been fulfilled, but, equally, it is clear that the British government was not prepared to abandon its nuclear ambitions at almost any cost. The 2008 White Paper[58] foresaw construction costs of about £2bn per reactor. By 2010, the expected price tag had more than doubled and in 2013, when the terms of a deal were provisionally agreed, the price had risen to £8bn[59]. So, by 2010, it was clear that the ideal of economic nuclear power plants could not be achieved. However, with a CfD that guaranteed the price would not be subject to market risk, the project might be financeable. In fact, the terms that had to be agreed were remarkably generous to nuclear. The power purchase contract was for 35 years at a price of £92.5/MWh more than double market prices in 2013 and sovereign loan guarantees covering about 70 per cent of the expected cost were offered. These were far more favourable terms than were being offered for renewable projects. The contract would be signed on the public side by the new counterparty body. A particular concern is that if, as the government hopes, nuclear plants start to come on line at a rate of at least one per year from 2023 onwards, the budget of the counterparty body will be spent on the nuclear plants leaving little to finance new renewable plants.

5.4 Abandonment of green programmes

The political pressure resulting from a succession of above inflation electricity price increases led to the government abandoning a number of green initiatives from autumn 2013 onwards. The freezing of the Carbon price floor at a level far below that needed to bridge the gap between low-carbon sources and fossil-fuel sources was noted above. The Energy Companies Obligation (ECO) under which the electricity companies were allowed to collect revenue from customers to pay for energy efficiency improvements was cut, saving consumers on average £30-35 per household.[60] In 2014, the British Prime Minister proposed to not allow construction of new on-shore wind-farms other than those already permitted.[61] The government also announced that solar farms would not be allowed.[62]

5.5 Conclusion

Successive attempts to promote renewables in the UK have been significantly less successful than planned, in contrast to most other countries where FiTs have frequently led to much greater levels of new capacity than expected. In some respects, EMR appears to reflect a pragmatic judgement that markets alone will not deliver the low-carbon generation needed to allow UK to meet its emissions targets.

A particular concern is the number of untested mechanisms being introduced at the same time. These include: the Single Buyer and CfD system, the capacity payments scheme and the Carbon Floor Price compounded by the uncertainty introduced by the CMA Investigation.

6. Conclusion

It can be concluded from the evidence presented in this report that EU targets when combined with strong, consistent, and comprehensive national renewable energy policies, yield successful and promising results. For example, in 2014 in Denmark wind accounted for 28% of the gross electricity production[63], in Germany in 2014 non-hydro (hydro stands at 4%) RES-E's contribution to gross energy supply was 27% (wind 10%, solar 7%, and biomass 10%)[64], and in 2013 Spain generated 21.1% of its electricity from wind.[65]There are disagreements as to the best subsidy methods for development of RES-E. In 2011 in the EU there were two main options: (1) Indirect methods, i.e. implicit payments or discounts as well as institutional support tools, and (2) direct methods, i.e. investment supports, such as capital grants, tax exemptions or reductions on the purchase of goods and operating support mechanisms.

Since the mandatory national targets were introduced, most countries in the EU including those with strongest RES support and implementation record, have introduced policies of austerity to battle the effects of the 2007/8 Credit Crunch and the ensuing recession. That meant cuts to

public expenditure including RES support. So, we can be talking about a 4th phase of RES policy approach in the EU. This phase is based on marketization of RES-E sector and liberalisation of energy prices where they earlier were regulated. Such changes in national RES policies will make it hard to achieve the 2020 targets even for the champions of the sector in the EU.

Support mechanisms for RES are colliding with existing economic and industrial policies much more frequently; this clash often reflects political sensitivity to voters' perceptions and stakeholders' interests. More tangible concerns include the potential for RES to displace older and more polluting technologies, the impact costlier RES can have on energy prices, and the effects that the variable availability of renewable sources has on the delivery of electricity (Batlle et al 2011 p. 1)

In Spain, for example, the lack of policy certainty destabilises functioning and investment in the wind industry that is already visible in the lack of orders for wind turbines. This leads to changes in the sector and may lead to the relocation of manufacturers to other countries as the AEE already has warned (Williamson 2012). By now, with LSE, Royal Decree-Law 9/2013, Law 24/2013 and Royal Decree 413/2014 'the regime will result in many renewable generators being unable to fulfil their payment obligations to funders, suppliers, service providers and tax authorities, with the end result that some generators may have to file for insolvency, in most cases culminating in the liquidation of such companies due to their lack of economic viability' (Ashurst 2014).

Garman and Thernstrom (2013) identify two main challenges that governments face when moving towards renewable energy supply. The first is the high costs of both installation and the final consumer cost e.g. Germans and Danes pay 300% of equivalent US consumers. And the second is the 'growing dependence on renewable energy is far more serious: the potential loss of reliable electrical supply'. This comes from the ongoing issue of inability to store excess energy produced and inability to predict/plan production precisely in advance. Currently grid operators 'rely on coal and nuclear plants to meet base-load demand while modifying gas and hydroelectric power output to meet shifting demand' and compensate for fluctuations in RES electricity supply. Such problems can be solved by 'upgrades to electricity transmission and distribution and expansions of "dispatchable" generation capabilities, coupled with "demand-response" and other efficiency measures' (Ibid). The International Energy Agency estimated that for Germany alone, for example, between €47.5 billion ($62.9 billion) and €72.5 billion ($96 billion) in transmission and distribution over the next 10 years will be needed. There is also a problem of distribution (Moss 2012). Erik Kristofferson, from Energinet, Denmark's grid system operator, in 2012 stressed the need for 'huge investments' as 'a wide network of cables will have to be built, to bring [offshore wind] power to land, and on to the places where consumers use it' (in Moss 2012).

The ongoing disputes on gas prices and supply between Russia and Ukraine fuelled by the separatist campaign in the east of the latter and the challenges it presents for gas supply and price for the EU, force many European politicians to take a stronger stance on renewables as part of energy independence strategy. For Denmark, increasing energy independence is historically a priority. On 27 June 2014 the EU heads of state and government signed a strategic agenda that backs efforts 'to speed the creation of a common energy market, develop infrastructure and diversify supply'. Such added pressure to move toward 'an energy union with forward-looking climate policy' was provoked by 'a pricing dispute led to the cut-off of Russian natural gas supplies to Ukraine, the transit country for around 15 percent of the EU demand for the fuel' (Kolokowska 2014).

Batlle at al. (2011) stress that 'comparatively higher cost of RES-E technologies has made it virtually impossible for them to grow without regulatory intervention' (p. 1). There is a lack of consensus as to the best type(s) of intervention that would allow RES targets to be met and sustained. The cases we present in this report all point to the continuous need for regulatory

intervention as well as state and needed EU support for RES. Recent changes towards marketization of the sector and deregulation of prices are the opposite of that. There is intervention but it is assuming market forms which will make RES-E targets more difficult to achieve. It can thus be concluded that for EU to stay committed to its targets and to support its member states on the path to meet the set targets, the liberalised market approach must be reviewed and state support for RES energy is essential.

References

Ashurst Madrid (July 2013) *Insights on the Spanish electricity reform* [Online]. Available at: http://www.ashurst.com/doc.aspx?id_Content=9580. Last accessed 10 July 2014.

Ashurst Madrid (June 2014) *New regulation overhaul of Spanish renewables.* [Online]. Available at: www.ashurst.com/doc.aspx?id_Content=10685. Last accessed 13 July 2014.

Batlle, C., Pérez-Arriaga, I. J. and P. Zambrano-Barragán (2011) 'Regulatory Design for RES-E Support Mechanisms: Learning Curves, Market Structures, and Burden-Sharing'. CEEPR WP 2011-011. Available: http://web.mit.edu/ceepr/www/publications/workingpapers/2011-011.pdf. Last accessed: 5 July 2014.

Cortesi, F. (30 Jan 2014) *The new Law of the electricity sector once again affects renewable energy investments.* [Online]. HOLTROP S.L.P. Transaction & Business Law. Available at: http://www.holtropblog.com/en/index.php/blog-uk/renewables/306-the-new-law-of-the-electricity-sector-once-again-affects-renewable-energy-investments. Last accessed 11 July 2014.

Danish Energy Agency (14 Nov 2013). *Large drop in energy consumption and greenhouse-gas emissions in 2012* [Online] Press Release. Available at: http://www.ens.dk/en/info/news-danish-energy-agency/large-drop-energy-consumption-greenhouse-gas-emiss5rions-2012. Last accessed on 22 July 2014.

Danish Energy Agency (March 2011). *Energy Strategy 2050 – from coal, oil and gas to green energy* [Online]. Available at: http://www.ens.dk/en/info/publications/energy-strategy-2050-coal-oil-gas-green-energy. Last accessed 20 July 2014.

EC (2009) *Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources*. Brussels. Available: http://www.ecolex.org/ecolex/ledge/view/RecordDetails;jsessionid=81486EE7CA5E560409D392398C9539A0?id=LEX-FAOC088009&index=documents. Last accessed 6 July 2014.

EC (2009) *Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources*. Brussels. Available: http://www.ecolex.org/ecolex/ledge/view/RecordDetails;jsessionid=81486EE7CA5E560409D392398C9539A0?id=LEX-FAOC088009&index=documents. Last accessed 6 July 2014.

Energienet.dk (15 Sept 2010) *The Queen plugged in the Great Belt Power Link,* [Online]. Available at: http://www.energinet.dk/EN/ANLAEG-OG-PROJEKTER/Nyheder/Sider/Dronningen-satte-stikket-i-Den-elektriske-Storeb%C3%A6ltsforbindelse.aspx. [Accessed: 25 July 2014].

Energienet.dk (1 May 2013) *The Company,* [Online]. Denmark. Available at: http://www.energinet.dk/EN/OM-OS/Om-virksomheden/Sider/default.aspx. [Accessed: 23 July 2014].

Energienet.dk (1 Jan 2014) *Electricity facilities*. [Online]. Denmark. Available at: https://www.energinet.dk/EN/ANLAEG-OG-PROJEKTER/Generelt-om-elanlaeg/Sider/default.aspx. [Accessed: 8 Dec 2014].

European Photovoltaic Industry Association (EPIA). (2013). *Global Market Outlook for Photovoltaics. 2013-2017.* [Online]. Available at: http://www.epia.org/fileadmin/user_upload/Publications/GMO_2013_-_Final_PDF.pdf. [Accessed: 23 July 2014].

EC (2014) The 2020 climate and energy package. Available at: http://ec.europa.eu/clima/policies/package/index_en.htm

Garman, D. and S. Thernstrom (29 July 2013) 'Europe's Renewable Romance Fades' in *The Wall Street Journal* [Online]. Available at: http://online.wsj.com/news/articles/SB10001424127887323309404578613792021690244. [Accessed: 22 July 2014].

Garrigues (2013 *Updates: Energy.* [Online]. Available at: http://www.garrigues.com/en/Publicaciones/Novedades/Documents/Energy-Updates-1-2014.pdf. [Accessed: 12 July 2014].

Holtrop, P. (25 Jun 2014) *Our complaint was filed with the European Commission against Royal Decree 413/2014 on Renewables only ten days after its approval.* [Online] HOLTROP S.L.P. Transaction & Business Law. Available at: http://www.holtropblog.com/en/index.php/blog-uk/renewables/322-a-complaint-has-been-filed-with-the-european-commission-against-royal-decree-413-2014-on-renewables-only-ten-days-after-its-approval-2. [Accessed: 14 July 2014].

Hromadko, I. (2014) 'German Companies Take Back the Power' in WSJ March 2.

International Energy Agency projects that global energy demand will increase 34 percent by 2035. (in Østervang 2011)

Jungjohann, Anne and Craig Morris (2014) *The German Coal Conundrum: The status of coal power in Germany's energy transition*. Washington, DC: Heinrich Böll Stiftung.

King, E. (13 Feb 2014) 'Danish parties back 40% carbon reduction target' in *Responding to Climate Change* [Online]. Available at: http://www.rtcc.org/2014/02/13/danish-parties-back-40-carbon-reduction-target/

Knight, S. (2014) 'Bundesrat challenges auctions' in *Power in Europe* 678 June 9, pp.1-3.

Krukowska, E. (27 Jun 2014) 'EU Pledges Focus on Cheaper Energy With Secure Supply ' at *Bloomberg*. [Online]. Available at: http://www.bloomberg.com/news/2014-06-27/eu-leaders-to-pledge-focus-on-cheaper-energy-with-secure-supply.html. [Accessed: 22 July 2014].

Lacey, (2014) 'This Is What the Utility Death Spiral Looks Like' in *The Energy Collective* [Online]. Available at: http://theenergycollective.com/stephenlacey/349671/what-utility-death-spiral-looks. [Accessed: 14 July 2014].

Laursen, F., Andersen T. M., and D. Jahn (2014) *2014 Denmark Report.* Sustainable Governance Indicators. Bertelsmann Stiftung.

Leidreiter, Anna (2014) *German Renewable Energy Act Reform is not "Feed-in Tariff 2.0 (FiT 2.0).* Available: http://power-to-the-people.net/2014/04/german-renewable-energy-act-reform-is-not-a-feed-in-tariff-2-0/. [Accessed: 12 July 2014].

Löchel, A., Erdmann, G., Staiß, F. and H-J. Ziesing (2014) 'Statement on the Second Monitoring Report by the German Government for 2012'. Expert Commission on the "Energy of the Future" - Monitoring process report. Germany: Federal Ministry for Economic Affairs and Energy.

Lucky and Ray (2013) 'Growth of Global Solar and Wind Energy Continues to Outpace Other Technologies'. W*orldWatch Institute.* At: http://blogs.worldwatch.org/revolt/growth-of-global-solar-and-wind-energy-continues-to-outpace-other-technologies/.

Mez, Lutz, Ed. (2007) *Green Power Markets: Support Schemes, Case Studies and Perspectives.* United Kingdom: Multi-Science Publishing.

Moss, P. (8 Apr 2012) 'Are Denmark's renewable energy goals wishful thinking?' in *BBC. The World Tonight* [Online]. Available at: http://www.bbc.co.uk/news/science-environment-17628146. [Accessed: 21 July 2014].

OECD (1999) *Background Report on Regulatory Reform in the Electricity Industry* [Online]. Available at: http://www.oecd.org/regreform/sectors/2497351.pdf. Last accessed 25 July 2014.

Østervang, A. (13 May 2011) *Denmark's Road to a Low-Carbon, Energy-Efficient Economy.* Revolt: WorldWatch Institute [Online]. Available at: http://blogs.worldwatch.org/revolt/denmark%E2%80%99s-road-to-a-low-carbon-energy-efficient-economy/. [Accessed: 21 July 2014].

Out-Law.com (1 Feb 2012) *Spanish Government suspends renewable energy incentives 'temporarily' to tackle funding deficit.* [Online]. Pinsent Masons. Available at: http://www.out-law.com/articles/2012/february/spanish-government-suspends-renewable-energy-incentives-temporarily-to-tackle-funding-deficit/. [Accessed: 1 July 2014].

Parkinson, G. (4 Dec 2013) 'Germany Expands Renewables Targets, Considers 'Virtual Baseload' in Greentechmedia: [Online]. Available at: http://www.greentechmedia.com/articles/read/germany-expands-renewables-targets-considers-virtual-baseload. [Accessed: 21 July 2014].

Photovoltaics Bulletin (March 2002) *Denmark will dump renewable energy*. Volume 2002, Issue 3: 1.

REN21 (2010) Renewables 2010 Global status report. September 2010. Available at: http://www.ren21.net/Portals/0/documents/activities/gsr/REN21_GSR_2010_full_revised%20Sept2010.pdf. [Accessed; 20 July 2014].

Reuters (29 May 2014) *Spain close to approving new renewable energy rules: minister.* [Online]. Available at: http://www.reuters.com/article/2014/05/29/us-spain-energy-idUSKBN0E91JA20140529. Last accessed 14 July.

Schreurs, M. A. (2012) 'Breaking the Impasse in the International climate Negotiations: the Potential of Green technologies' in *Energy Policy* 48, 5-12.

Spain (2011) *Law No. 2/2011 of March 4, 2011 on Sustainable Economy (as last amended by Law No. 2/2012 of June 29, 2012)*. Madrid. Available: http://www.wipo.int/wipolex/en/details.jsp?id=11977. Accessed on 5 July 2014.

Spain. Ministry of Industry, Energy, and Tourism (27 Jan 2012) *The Government will temporarily suspend premiums for new special regime facilities***.** Available at: http://www.minetur.gob.es/en-US/GabinetePrensa/NotasPrensa/2012/Paginas/npregimenespecial270112.aspx. Last accessed 2 July 2014.

Spross, J. (14 Feb 2014) 'Denmark Is About To Set Even More Ambitious Climate Goals Than All Of Europe' in *ClimateProgress* [Online]. Available at: http://thinkprogress.org/climate/2014/02/14/3296351/denmark-climate-goals/. Last accessed 21 July 2014.

The Green Supply Chain (31 July 2013) 'Green Supply Chain News: Lessons from Europe's Experience with Renewable Energy Sources' [Online]. Available at: http://www.thegreensupplychain.com/news/13-07-31-1.php?cid=7268. Last accessed 21 July 2014.

Williamson, K. (10 Feb 2012) *Slowdown in Spanish wind.* ReFocus Network. [Online]. Available at: http://www.renewableenergyfocus.com/view/23813/slowdown-in-spanish-wind/. Accessed 30 June 2014.

Winkel, T., Ragwit, M., Resch, G., and I. Konstantinaviviute (2011) 'Renewable Energy Policy: Country Profiles'. RE-Shaping: Intelligent Energy Europe project.

www.ren21.net. Last accessed 4 July 2014.

Endnotes

[1] http://keepontrack.eu/contents/publicationseutrackingroadmap/kot_eutrackingroadmap2014.pdf
[2] http://www.energinet.dk/EN/ANLAEG-OG-PROJEKTER/Nyheder/Sider/Dronningen-satte-stikket-i-Den-elektriske-Storeb%C3%A6ltsforbindelse.aspx
[3] The Kyoto Protocol is an 'international agreement linked to the United Nations Framework Convention on Climate Change'. It was the first international attempt to accept the anthropogenic nature of climate change and commit its Parties to reduction of greenhouse gas emissions by establishing 'internationally binding emission reduction targets' (UNFCC 2014).
[4] http://www.nordpoolspot.com/About-us/History/
[5] Pobłocka-Dirakis, A. (2014) 'Electricity Promotion in Denmark'. EC. Available at: http://www.res-legal.eu/search-by-country/denmark/tools-list/c/denmark/s/res-e/t/promotion/sum/95/lpid/96/page.pdf?out=pdf.
[6] http://denmark.dk/en/green-living/strategies-and-policies/independent-from-fossil-funnels-by-2050/
[7] http://denmark.dk/en/green-living/strategies-and-policies/independent-from-fossil-fuels-by-2050/
[8] http://www.bbc.co.uk/news/science-environment-17628146
[9] http://denmark.dk/en/green-living/strategies-and-policies/independent-from-fossil-fuels-by-2050/
[10] http://www.bbc.co.uk/news/science-environment-17628146
[11] http://energytransition.de/
[12] http://www.energiewende.de/index.php?id=14
[13] In 2012 Germany was already the world leader with 32.4 GW installed PV capacity, some double of Italy with 16.4 GW (Lucky and Ray 2013)
[14] http://www.greentechmedia.com/articles/read/germany-expands-renewables-targets-considers-virtual-baseload
[15] http://www.lexology.com/library/detail.aspx?g=7ddfbd81-9a1e-4080-bff7-3963093c32a7
[16] http://www.gwec.net/wp-content/uploads/2014/02/GWEC-PRstats-2013_EN.pdf
[17] http://www.epia.org/fileadmin/user_upload/Publications/GMO_2013_-_Final_PDF.pdf
[18] http://www.greenpeace.org/international/Global/international/briefings/climate/2014/IPCC-WGIII-Energiewende.pdf
[19] http://www.osce.org/eea/101047
[20] http://power-to-the-people.net/2014/04/german-renewable-energy-act-reform-is-not-a-feed-in-tariff-2-0/
[21] http://www.energypost.eu/new-german-legislation-will-shake-eu-biofuels-market/
[22] The Federation of German industries – conventional energy suppliers in the case of renewables – that 'is the umbrella organisation of German industry and industry-related service providers. It speaks on behalf of 37 sector associations and represents over 100,000 large, medium-sized and small enterprises with more than eight million employees' (BDI 2014).
[23] http://www.bloomberg.com/news/2013-09-19/german-industry-wants-end-of-feed-in-tariff-on-rising-power-cost.html
[24] http://power-to-the-people.net/2014/04/german-renewable-energy-act-reform-is-not-a-feed-in-tariff-2-0/
[25] http://power-to-the-people.net/2014/04/german-renewable-energy-act-reform-is-not-a-feed-in-tariff-2-0/
[26] Bundesrat is the Upper House of the Germany's legislative branch of power i.e. Bundestag is the Lower House, directly represents federal lands in the law-making of the country.
[27] 'Germany: Trend toward re-municipalisation of energy sector'. EPSU. 2011. Available at: http://www.epsu.org/a/8107
[28] http://www.iea.org/publications/mtmr/countries/spain/
[29] http://www.wipo.int/wipolex/en/details.jsp?id=11977

[30] http://www.out-law.com/articles/2012/february/spanish-government-suspends-renewable-energy-incentives-temporarily-to-tackle-funding-deficit/
[31] http://www.bloomberg.com/news/2013-04-25/spain-power-deficit-widens-by-46-as-steps-to-close-gap-founder.html
[32] http://www.minetur.gob.es/en-US/GabinetePrensa/NotasPrensa/2012/Paginas/npregimenespecial270112.aspx
[33] http://www.aforenergy.com/newsshow.php?cid=16&id=38
[34] 'Reasonable return' is defined as 'return of investment, before taxes, which is the same as the average yield of 10-year Spanish bonds plus an adequate margin' (Ashurst Madrid 2013:2).
[35] http://www.wsj.com/articles/SB10001424052702304549504579320092481304568
[36] http://www.theguardian.com/social-enterprise-network/2012/jun/19/spanish-energy-co-operative-financial-crisis
[37] Services of general economic interest or SGEI 'economic activities that public authorities identify as being of particular importance to citizens and that would not be supplied (or would be supplied under different conditions) if there were no public intervention. Examples are transport networks, postal services and social services' (EC 2006)
[38] http://www.thelocal.es/20140321/sun-tax-talk
[39] http://www.wsj.com/articles/SB10001424052702304549504579320092481304568
[40] *WSJ* (2014) 'Spanish Cooperatives Challenge Electric Utilities'. Available at: http://www.wsj.com/articles/SB10001424052702304549504579320092481304568
[41] http://www.telegraph.co.uk/finance/economics/11325030/Spain-records-sharpest-fall-in-unemployment-since-adopting-the-euro.html
[42] http://www.tradingeconomics.com/spain/unemployment-rate
[43] http://www.economist.com/news/finance-and-economics/21615589-throughout-rich-world-wages-are-stuck-big-freeze
[44] http://www.holtropblog.com/en/index.php/blog-uk/renewables/306-the-new-law-of-the-electricity-sector-once-again-affects-renewable-energy-investments
[45] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+WQ+E-2014-001871+0+DOC+XML+V0//EN
[46] http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=E-2014-001871&language=EN
[47] https://www.ofgem.gov.uk/ofgem-publications/76371/ofgem-discovery-phase-ii-draft-v15.pdf
[48] Guardian 'Ofgem energy report: Reaction' February 3, 2010.
[49] The Times (2010) 'Labour prepares to tear up 12 years of energy policy' February 1, 2010.
[50] https://www.gov.uk/government/policies/maintaining-uk-energy-security--2/supporting-pages/electricity-market-reform
[51] http://services.parliament.uk/bills/2013-14/energy.html
[52] Financial Times 'Subsidy cut puts heat on solar panel installers' November 28, 2011
[53] http://www.legislation.gov.uk/ukpga/2013/32/contents/enacted/data.htm
[54] Under a CfD, the power is sold to the market and receives the market price with the difference between the market and the contract price settled bilaterally between the generator and the Single Buyer. If the contract price is higher than the market price, the Single Buyer pays the generator the difference and vice versa.
[55] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/68771/7072-government-response-to-the-house-of-commons-energy.pdf. The budget would be used to pay the difference between the market price and the contract price for electricity so only the increase in budget per year would be available for new projects.
[56] https://www.gov.uk/government/news/electricity-market-reform-capacity-market-design and http://www.out-law.com/en/articles/2014/march/first-uk-energy-supply-capacity-market-auction-to-take-place-in-december-says-decc-as-details-confirmed/
[57] https://www.ofgem.gov.uk/gas/retail-market/market-review-and-reform/state-competition-energy-market-assessment
[58] Department of Business, Enterprise and Regulatory Reform 'Meeting the energy challenge: A White Paper on nuclear power' BERR, HMSO, London.
http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43006.pdf
[59] See https://www.gov.uk/government/news/initial-agreement-reached-on-new-nuclear-power-station-at-hinkley and http://edfenergy.presscentre.com/News-Releases/Agreement-reached-on-commercial-terms-for-the-planned-Hinkley-Point-C-nuclear-power-station-82.aspx
[60] https://www.gov.uk/government/speeches/government-action-on-energy-bills

[61] http://www.theguardian.com/environment/2014/apr/24/tories-scrap-wind-farm-subsidies
[62] Guardian 'Solar farms to lose UK government financial support' May 13, 2014
[63] http://denmark.dk/en/green-living/wind-energy/
[64] http://www.renewablesinternational.net/german-power-sector-27-percent-non-hydro-renewable-in-2014/150/537/80072/
[65] http://www.theguardian.com/environment/2014/jan/06/wind-power-spain-electricity-2013