On the re-regulation of the liberalised power market in Europe:

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Abstract

In the coming decades, a significant quantity of new power plant capacity will be needed in Europe. The liberalised electricity market in its current form, however, only offers incentives for the construction of new power plants in exceptional cases. The cause is relatively high capital costs, which is becoming more difficult to cover with the profit margin generated in the market. This situation is exacerbated by the political uncertainty around long-term emissions reduction and renewable energy targets. The lack of clarity regarding emission targets leads to lack of clarity regarding the price of CO_2. An increased market penetration of renewable energies leads to a) lower wholesale power prices and b) an increasingly discontinuous electricity demand from conventional power plants.

It is therefore necessary to consider a re-regulation of the current market model in order to ensure a cost-efficient, continuous electricity supply given the boundary conditions of climate change policy. This will require an integrated energy and climate strategy that determines which capacities or outputs in a member state, or better yet the EU, should have in the future for the generation of electricity.

I. Introduction

For many decades already, energy policy faced different objectives that were partly contradicting one another (see Figure 1). In the course of time, the focus shifted: Economic efficiency become a central aspect for the liberalisation of the electricity market.

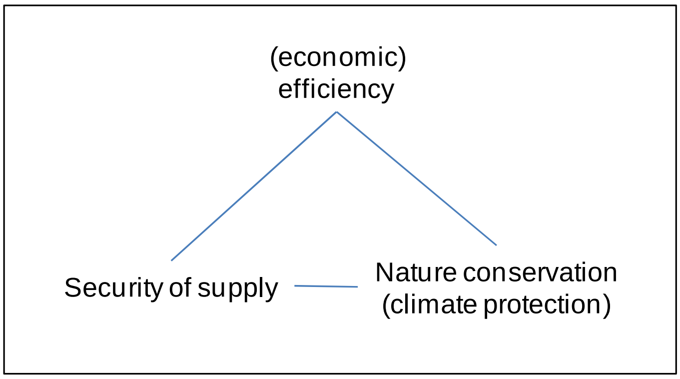

Figure 1: Objectives in energy policy

It was initiated at the end of the last century with the EU directive concerning the internal market in electricity.[1] There were many motivating factors; Paragraph 4 of the directive provides an overview:

> *"Whereas establishment of the internal market in electricity is particularly important in order to increase efficiency in the production, transmission and distribution of this product, while reinforcing security of supply and the competitiveness of the European economy and respecting environmental protection."*

As can be seen, various objectives were taken into account that contradict one another in part. At least with regard to efficiency, the Commission concludes that it has been successful

> *"By opening up these markets to international competition, consumers can now choose from a number of alternative service providers and products. Opening up these markets to competition has also allowed consumers to benefit from lower*

[1] Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, OJ 1996 L 027.

prices and new services which are usually more efficient and consumer-friendly than before. This helps to make our economy more competitive."[2]

The decrease in prices mentioned above can be explained by the fact that in the context of the liberalisation of the power markets the former regional monopolies were dismissed. As customers were now able to choose their supplier, the latter had to adopt their pricing strategy to the rules of competitive markets, i.e. most importantly to offer at marginal costs of production. This will be explained in more detail below.

In recent years climate change and the need for a massive reduction of greenhouse gas emissions has become a focal point of energy policy as can be seen by the adoption of the energy and climate package by the EU Council in April 2009.[3] If climate change is so important one may aks if there are consequences for the other two objectives. This is especially important as in the coming decades, new power plant capacity will need to be constructed Europe. This is necessary to:

- Replace old power plants that are nearing the end of their service lives
- Realise agreed upon targets for reduction of greenhouse gas emissions
- Replace the capacity lost in Germany due to the agreement to discontinue nuclear energy
- Cover, at least in parts of Europe, additional demand

In the liberalised electricity market, decisions about when, where and which power plants are built are left to individual investors that must refinance their investment through the revenues received on the power market.[4] In other words, there is no central player - like in the former regional monopolies - that was allowed to pass any costs (incl. a well defined profit margin) onto the consumer. The question is now, whether sufficient incentives exist in a liberalised electricity market for investments in new power plants. Investors in conventional power plants increasingly express their concern that the current boundary conditions do not make investment possible. On the other hand, the proponents of electricity from renewable sources

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[2] DG Com, "Competition policy and the consumer", 2004, available on the Internet at: <http://ec.europa.eu/competition/publications/consumer_en.pdf> (last accessed on 7 May 2009).

[3] Council of the European Union, "Council adopts climate – energy legislative package", Press release 8434/09 (Presse 77), 6 April 2009.

[4] It goes without saying the regulation (e.g. with regard to environmental impacts) is in place. This regulation may have an impact on the willing to invest as it determines the costs of prduction.

expect that these systems will be competitive in several years without further promotion measures.[5]

This paper therefore discusses whether investment in conventional power plants is economically sustainable and if so, under which conditions.

For this purpose, the mechanisms that influence investment decisions in the liberalised electricity market will be presented (Chapter 2). Which uncertainties result from the existing and possible future climate change policy will then be discussed (Chapter 3). Finally, the influence of the politically mandated expansion of renewable energies on the incentive for investment will be examined (Chapter 4). Based on the conclusion that in a liberalised electricity market there is little incentive for investment in new conventional power plants, recommendations will be developed for possible modifications in the boundary conditions that result in incentives for investment in a sustainable energy supply (Chapter 5).

II. Incentives for investment in the liberalised electricity market

Investment theory fills countless books these days. It is not possible to address the different approaches here. As the basic deliberation made here does not depend on the investment calculation[6], a relatively simple approach is selected: Investment in a power plant is profitable if the average total costs of the production of electricity (the so-called *electricity production costs*) are less than the average revenues that can be achieved for the electricity generated.

1. Electricity production costs

The electricity production costs of a power plant consist of a variable part, which is (typically) proportional to the quantity of electricity produced and a fixed part, which exists whether or not the power plant generates power. In order to simplify the analysis, it is assumed that there are only three cost factors for the production of electricity:

- capital costs

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[5] Bode and Groscurth, “Anreize für Investitionen”, infra, note 18, argue, on the other hand, that liberalised markets and a high market penetration of renewable energies are mutually exclusive. For more information, see Chapter IV.

[6] Different approaches can often be transferred one into another. For example, the net present value (NPV) of an investment uses a certain discount rate. The internal rate of return (IRR) actually looks for this “discount rate” under the assumption that the net present value of this investment is zero. Both approaches (NPV and IRR) are used frequently for investment calculations.

- fuel costs
- environmental costs in the form of CO_2 emission allowances.

Capital costs are typically fixed costs whereas the other two cost categories represent variable costs. According to experience, other expenses such as fixed and variable operating and maintenance costs are small compared to the three aforementioned factors and are thus not considered for the basic analysis here.

In order to add the variable and fixed costs of the electricity production costs in € per megawatt-hour (€/MWh), the fixed costs must be related to the amount of electricity generated. To do this, the total investment sum is distributed across the individual years of the target amortisation period using the *annuity method*. Dividing the thus calculated annual fixed costs of the investment by the electricity production, results in the specific capital costs of the power plant.

The specific fixed costs depend strongly on the amount of electricity that is produced. Fuel and CO_2 costs are, as opposed to the capital costs, variable and proportional to the amount of electricity that is produced. They depend on the fuel price, the efficiency of the power plant, the specific CO_2 emission of the fuel and the CO_2 price.

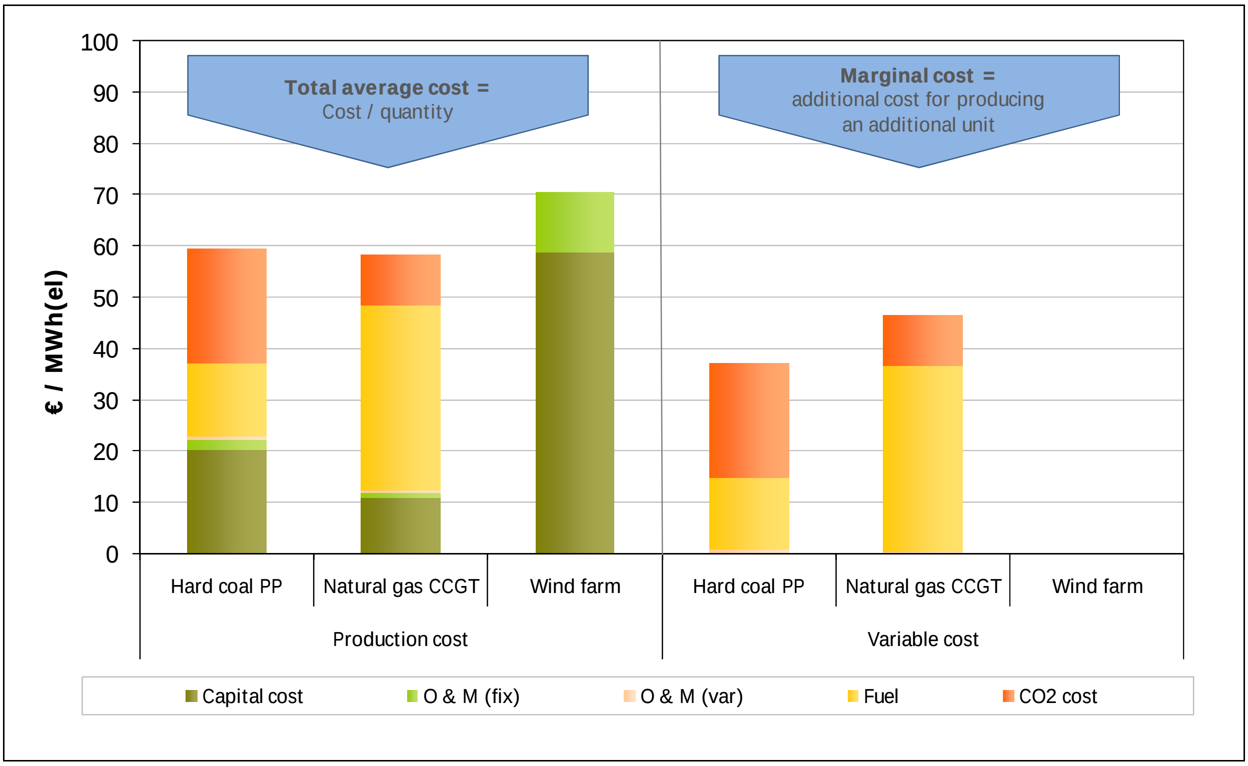

Figure 2: Electricity production costs of various power plants

2. Production quantity, electricity price and revenue of power plants

The revenue of a power plant is the product of the sold electricity quantity in one hour and the electricity price for this hour. The quantity sold is in turn important for the mentioned investment calculation. In the following, it is assumed that perfect competition prevails. This market form is also the objective of the European Commission in order "...to make sure that companies compete with each other and, in order to sell their products, innovate and offer good prices to consumers."[7] According to cost theory, in such a competitive market producers offer goods at the marginal costs of production, that is, the costs that are incurred with the production of an additional unit. Capital costs are no longer relevant in this case. The marginal costs result primarily from the sum of the specific fuel costs and specific CO_2 costs (see Figure 2).

In order to describe the pricing on the exchange, only the so-called spot market will be considered in the following.[8] This is the closest to the actual physical activity. The intersection of the cumulative supply curve with the demand curve for each hour of the day results in an equilibrium price, which also represents the revenue for the power plant operator (see Figure 3). From this the marginal costs and – in order to be economically viable in the long-term – the capital costs must be covered. Only after this occurs can profits be earned. The aggregated supply curve, which consists of the individual supply curves of the specific power plants, is also referred to as merit-order curve in energy economics.

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7 Jonathan Todd, Commission competition spokesperson; transcript from an interview on BBC World, September 2007, Source: http://ec.europa.eu/competition/consumers/index_en.html. More information on EU competition policy is also available on this site.

8 In addition to the spot market, there is also the futures market, at which standardised products are traded, i.e. electricity of a defined power along a fixed time period (year, quarter, month).

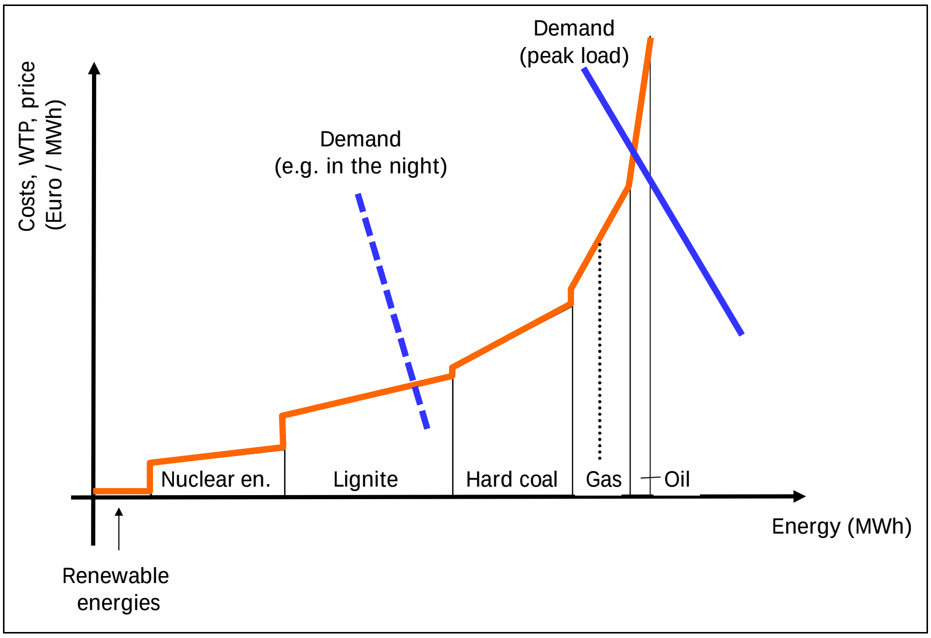

Figure 3: Pricing on the electricity exchange in one hour.

Typical progression of the merit order curve for 2006 with average availability of electricity from renewable energies (RE). The actual progression depends on the situation of the respective hour under consideration (own representation).

Up until now only an individual hour has been considered. Both the merit-order curve as well as the demand curve undergo constant change. For an investment calculation, revenues must be considered from the electricity sales over all hours of a year and over all years of the planned economic service life of the power plant. The time of the electricity production is important as electricity can only be stored on a small scale and in general must be utilised immediately.

The preceding information makes clear that it is difficult to create incentives for investment in new power plants in the liberalised electricity market due to relatively high capital costs. Attention was called to this problem several years ago.[9] Up until now, however, the problem has not entered the energy policy debate in a meaningful way.

As the previous analysis was purely static, the question arises whether there are possibly other, dynamic mechanisms that could provide the necessary incentives.

In the practice there is not only the spot market, which was considered here, but also the futures markets, at which longer-term supply contracts are traded. In case of scarcity in the electrical production capacities, individual electricity consumers who have previously bought ahead on the futures market can contemplate reducing their consumption and thus offer the freed electric capacity on the spot market. The prices resulting in such a situation are called

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9 Christoph Weber, “Das Investitionsparadox in wettbewerblichen Strommärkten“, 52 *Energiewirtschaftliche Tagesfragen* (2002), 756); The Boston Consulting Group, *Keeping the Lights On* (Boston: BCG, 2003).

scarcity prices.[10] Here prices above the marginal costs of the power plants can be demanded, creating incentives for investments.

If more power plants are shut down than are added, then the merit-order curve in Figure 2 is shifted to the left. As long as additional power plants are ready for operation, the electricity price increases along their marginal costs.[11] This results in an increase in the revenue of the existing power plants and, as their operating costs remain the same, also an increase in the profit margin. At the same time, the incentives for investment in new power plants increase. According to economic theory, these effects offer incentives to invest in new power plants.[12] Due to the particular characteristics of the electricity market, however, this incentive does not fully develop. For new power plants, the described mechanisms are only advantageous as long as less capacity is added than is removed from the network. Otherwise the old price structure is restored, or the prices might even decline. Additionally, capacity bottlenecks will only arise for a few hours, so that the new power plants can only profit from high electricity prices during these few hours. This only has a noticeable effect on the average revenues when the scarcity prices are very high.

It should be noted here, on the one hand, that electricity cannot be stored (or can only be stored on a very small scale). It must be produced when it is needed. It is not possible to store up reserves for times of scarcity that can then be used to supplement the market supply above the short-term production capacity. It should also be noted that, depending on the power plant type, several years pass between the decision to build a new plant and the actual start-up. Due to a lack of substitutes, consumers are reliant on electricity. A physical scarcity of electricity is thus associated with large economic damages that are not, however, reflected in the prices, so that no incentive for investment occurs.

As a result one can conclude that liberalised power markets do not provide sufficient incentives for new investments in the long-run – even in the absence of any additional effects

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[10] Paul L. Joskow, *Competitive Electricity Markets and Investment in New Generating Capacity* (Boston: MIT, 2006); Axel Ockenfels, Veronika Grimm and Gregor Zoettl, *Strommarktdesign – Preisbildungsmechanismus im Auktionsverfahren für Stromstundenkontrakte an der EEX* (Köln: Universität zu Köln, 2008).

[11] Up until now, a large number of old power plants from previous periods with high over capacity have been available, so that scarcity situations have hardly occurred. This will change, however, with the gradual shut-down of these plants.

[12] Compare e.g., Joskow, *Competitive Electricity Market*, supra, note10; Ockenfels, Grimm and Zoettl, *Strommarktdesign*, supra, note 10.

from climate policy. Against this background one can understand the need and call for subsidies for new efficient plants that have been agreed upon under the EU energy and climate package. Up to 15 % of total investment costs may be provided from public sources for the period 2013 to 2016.[13] Still, the subsidies seem to counteract the idea of a liberalised power market where decisions on new investments are made by individual players. It remains to be seen if these subsidies are the beginning of a continued public support policy for new plants.

III. Influence of climate change policy on investments in electricity production

It is a declared goal of the EU to reduce greenhouse gas emissions by up to 30% by 2020.[14] Germany has even declared its willingness to cut its emissions by 40% in the same time period.[15] Climate researchers assume that the global emissions must be reduced by 50% by 2050 in order to limit the increase in the global mean temperature to 2 degrees. In order to achieve this goal, the industrial nations will presumably need to reduce their emissions by 80% and possibly more.[16] Applying this reduction goal of 80% for 2050 to electricity production in Germany, the result is an emission budget of approximately 85 million tons of CO_2 per year.[17] It is currently unclear, however, when and how this emissions path will be politically fixed. It is also possible to shift between sectors, for instance, as a part of an increased used of electricity in the transportation sector. The emissions budget of the latter may consequently decrease. Considering the existing emissions trading system, the determination of the targets is particularly important for the CO_2 price and thus also for investment decisions. Emissions trading was introduced in the EU as an instrument for realising these targets. Since 2005 all large stationary emitters of carbon dioxide (CO_2), the

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13 Vermerk des Vorsitzenden für die Deligation, Energie und Klimawandel, Bestandteile des endgültigen Kompromisses, 17122/1/08, REV 1, 2008.

14 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region 20 20 by 2020 Europe's climate change oppportunity, COM(2008) 13, 16, 17, 18, and 19.

15 Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, *Das Integrierte Energie- und Klimaprogramm der Bundesregierung* (Berlin: BMU, 2007).

16 Intergovernmental Panel on Climate Change, *Climate Change 2007 – Synthesis Report* (Geneva: IPCC, 2007).

17 In the mid-term it will also no longer be possible to purchase substantial quantities of emission credits from climate protection projects in developing countries. Countries such as China or India will then also have to have emissions limits and will need their emission budgets for their own development.

most important greenhouse gas, are required to participate. The permissible total quantity of CO_2 emissions is specified and implemented in the form of emission allowances. Every plant must obtain a quantity of allowances corresponding to its emissions. Currently the majority of these emission permits are distributed at no cost. Starting in 2013 the permits, at least for a portion of allowances covering electricity production, will be auctioned off. The emission of CO_2 from electricity production will now incur a cost due to the implementation of the EU emission trading system. The costs for the CO_2 emission permits must be fully priced into the cost accounting for a power plant, either as explicit costs or as opportunity costs. If emission targets are only specified at short notice for short time periods compared to the technical service life of power plants, the uncertainty regarding the expected prices for emission permits causes an additional risk for the investment conditions for coal power plants.

Against this background, the question of whether coal power plants can be equipped with so-called CCS technology (Carbon Capture and Storage) gains significant importance. This option is currently being explored in a number of research and pilot projects. It cannot currently be evaluated, however, if this technology will ever be available and if so, at what costs and with what actual storage potential. With the following chapter in mind, it should be considered that CCS plants in general are best suited to base load operation.

IV. The influence of the promotion of renewable energies on investments in electricity production

The construction of plants that generate electricity from renewable energies with marginal costs of 0 €/MWh (for instance, wind power) shifts the merit-order curve in Figure 2 to the right. This lowers the electricity price.[18] As electricity production from wind power and photovoltaics is not constant but rather varies greatly, the degree of this shift and thus the effect on the electricity price also varies greatly. In order to obtain reliable information regarding averages, analyses with a greater temporal resolution, for instance one hour, must be performed.

Germany is planning to increase the proportion of renewable energies for electricity generation to 30% by 2020 and then to double the installed capacity again by 2050. With

[18] Sven Bode and Helmuth Groscurth, The Effect of the German Renewable Energy Act (EEG) on “the Electricity Price” (Hamburg: HWWA, 2006); Sven Bode and Helmuth Groscurth, “Anreize für Investitionen in Anlagen zur Stromerzeugung aus erneuerbaren Energien im liberalisierten Strommarkt 2020 und danach“, 7 *Energiewirtschaftliche Tagesfragen* (2008), 62.

almost 70 GW installed power, wind power plays the most significant roll.[19] To further illustrate just how dramatically this politically motivated expansion of renewable energies will change electricity production, Figure 4 displays how much electricity will still need to be produced from conventional plants. The curves display the minimum remaining load (consumption minus power from renewable energies) over the course of a day for various months of the year. The familiar structure of base-load, medium-load and peak-load power plants falls away almost completely.

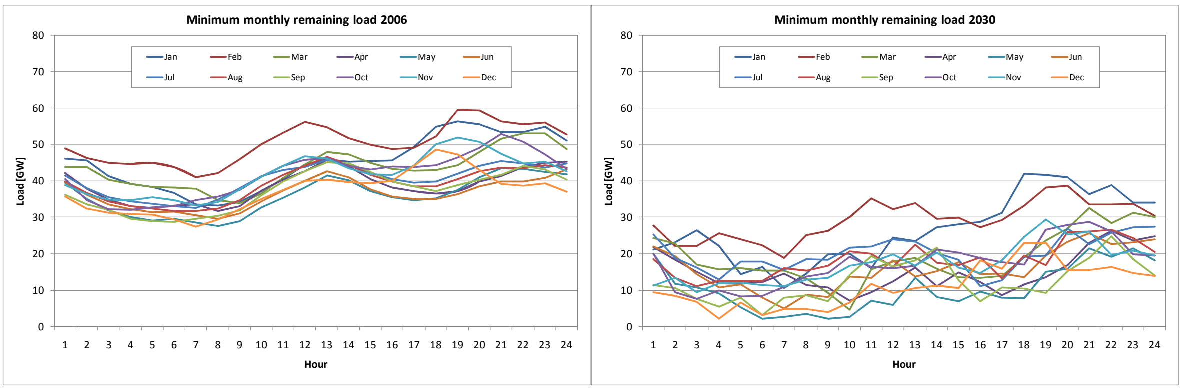

Figure 4: Progression over the day of the <u>minimum</u> monthly remaining load in Germany (= electricity demand minus power from fluctuating sources) today (left) and after an ambitious expansion of renewable energies in 2030 (right).

The increased feed-in has two consequences: On the one hand the wholesale electricity price is systematically lowered for all hours due to the shift in the merit-order curve. There are even hours in which no conventional power plants are required to meet the demand. In these hours the exchange price for electricity will fall to 0 €/MWh. Thus wind power plants earn little or no money precisely when the wind is the strongest (and the demand is the weakest). On the other hand, the utilisation hours of the conventional power plants are reduced. Their fixed costs must thus be spread over fewer operating hours and the electricity production costs rise. Added to this is the fact that changed demands are placed on conventional power plants due to the fluctuating supply, which could in turn be problematic for the planned CCS plants.

The analysis shows how difficult it is for an investor to estimate the earnings situation for a new power plant.

It should be noted here that renewable energies will face revenue problems without continuous support schemes. The power price decreases systematically when the "wind

[19] Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, *Leitstudie 2007 'Ausbaustrategie*

blows“ (see Figure 2). If the market share is to increase as discussed, permanent support schemes will be necessary even beyond 2020. Otherwise there will be no incentive to invest even if total average costs from renewable energies are smaller that those of conventional plants.[20]

V. Creating investment incentives for conventional power plants

The profitability of new power plants depends on a number of factors that the investor cannot influence and are in part difficult to predict:

- Development of fuel prices
- Development of CO_2 prices
- Development of the total available power plant capacity with respect to the demand
- Development of capacities of various power plant types

The resulting uncertainty causes investors to be reserved regarding large power plant projects. Those who do nonetheless invest in power plants will make their calculations with additional risk premiums.

Many years separate the beginning of the planning for a power plant and its actual start-up. A deficit in power plant capacity cannot therefore be solved quickly. In order to create the necessary investment security, part of the risk must be born outside of the current electricity market. In return, investors will have to forego a part of their chances of profit in case of an advantageous set of circumstances.

Various options are discussed in the following regarding how this could happen. Here not only economic criteria but also the interests of long-term climate protection will play a role. All approaches mentioned would have to be introduced by the respective regulator.

1. Increasing spot market prices

It is conceivable to raise the prices via regulation.[21] It is possible to specify an artificial market price that is high enough to provide an investment incentive whenever the reserve capacities, i.e. the difference between available and demanded output, fall below a defined threshold. This would, however, provide a significant temptation for large companies to

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Erneuerbare Energien' (Berlin: BMU, 2007).

[20] Bode and Groscurth, “Anreize für Investitionen”, supra, note 18.

trigger such a situation by holding back actually available power plant capacity. Alternatively, a sufficiently high price could be paid, for instance, for the 20 to 100 hours in the year with the highest load.

A significant disadvantage of this solution is that the higher spot market prices would apply for all power plants, thus leading to substantial windfall profits for old, fully depreciated assets, which are already highly profitable. This would cause the total burden of the consumer to increase massively.

2. Additional revenue for new power plants

As an alternative to the spot market price approach, additional revenues could be targeted at new power plants. This approach might be favoured by the consumers as it avoids the windfall profit for old, existing plants mentioned in the previous chapter.

a. Introduction of an obligation to expand by the regulator

It is possible to prescribe that final sellers of electricity conclude contracts for reserve capacities as a percentage of their maximum power output in the previous year. This would create a market for new capacities that would allow the operators a profitable operation. Presumably, however, only plants with low investment costs would profit from this, thus primarily gas turbines.

b. Invitation to tender for capacity premiums for power plant investments

A competition for capacity premiums could be initiated. To do this, a central system coordinator would regularly invite tenders for capacity allocations for new power plants. These can be differentiated according to technology and commissioning times. The projects requiring the smallest premium are awarded the contract. Once in operation, the power plants market their electricity on the exchange as usual. Countries such as Chile, Colombia or South Korea have already implemented such regulations for their electricity markets.[22]

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[21] Joskow, *Competitive Electricity Market*, supra, note 10.

[22] compare, e.g., Jung-Yeon Park et al., "Investment incentives in the Korean electricity market", 35 *Energy Policy* (2007), 5819.

This method does not, however, ensure that the power plant actually covers its total production costs. This depends on the corresponding tender. The offer during the invitation to tender is generated based on a current market analysis and can be either too high or too low, depending on how the market actually develops. The power plant could therefore be unprofitable despite the additional revenue or it could also be profitable without these payments, so that the additional revenue represents “windfall profits”. The payments merely reduce the economic risk of the investor at the expense of the consumer. To avoid windfall profits, Joskow[23] proposes to subtract from the premiums those contribution margins that a defined reference plant would have earned on the market.

Using targeted invitations to tender allocations, the system operator can influence the composition of the future mix of power plants. This presupposes, however, the formulation of a national energy strategy. The system operator can, in particular, work towards long-term goals such as climate protection, supply security and independence from imports. To do so the system operator could, for instance, make the capacity allocation for coal power plants dependent on CCS technology. The system operator could also invite to tender gas turbine allocations for reserve and balancing energy.

c. Feed-in tariff for new conventional power plants

Analogous to the German Renewable Energy Act (EEG), a fixed feed-in tariff could also be paid for conventional power plants that are absolutely needed. It is also possible to specify here a fixed allocation for tender. The project with the lowest tariff receives the contract for the supply over a fixed time period.

As opposed to electricity from wind power or photovoltaic under the Renewable Energy Act, however, it is not easy for the investor to calculate the required tariff, as this is not determined solely by the known investment costs, but is also subject to the uncertainty in the development of the fuel costs. A coupling of the tariff to the fuel price index should therefore be considered.

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[23] Joskow, *Competitive Electricity Market*, supra, note 10.

3. Feedback effects of the construction of new power plants

For the possible creation of additional investment incentives, the following must be considered. If the reduction of CO_2 emissions required for a meaningful climate change policy is implemented through a national cap, this will mean a continuously decreasing budget of emissions permits will be pitted against a demand that may decrease mildly due to efficiency improvements and may rise dramatically if new coal-fired power plants are built. As a consequence, the price of emissions will rise continuously. This makes it fairly certain that the coal-fired power plants are pushed out of the merit order and must thus be put out of service. It is certainly possible that the power plants will have earned back their investment by that time, as the current CO_2 price only reflects the present, quite moderate reduction target rather than the deep cuts necessary over the long term. Investors hope, however, to be able to continue to operate the power plants past this point. It must be clear to the investors, and to policy-makers as well, that the operation of the power plants may become unprofitable before the technical service life of the power plants has been reached. If investors and other stakeholders accept this fact, then there is no objection, in principle to such investments. Experience shows, however, that an early shut-down of a power plant will likely be the object of intense lobbying from various sides, both for each individual plant as well as with respect to the climate change targets as a whole. It is to be expected that either additional emission permits will be distributed or the emission budget increased. Both result in the climate change targets not being met. Figure 5 illustrates this process.

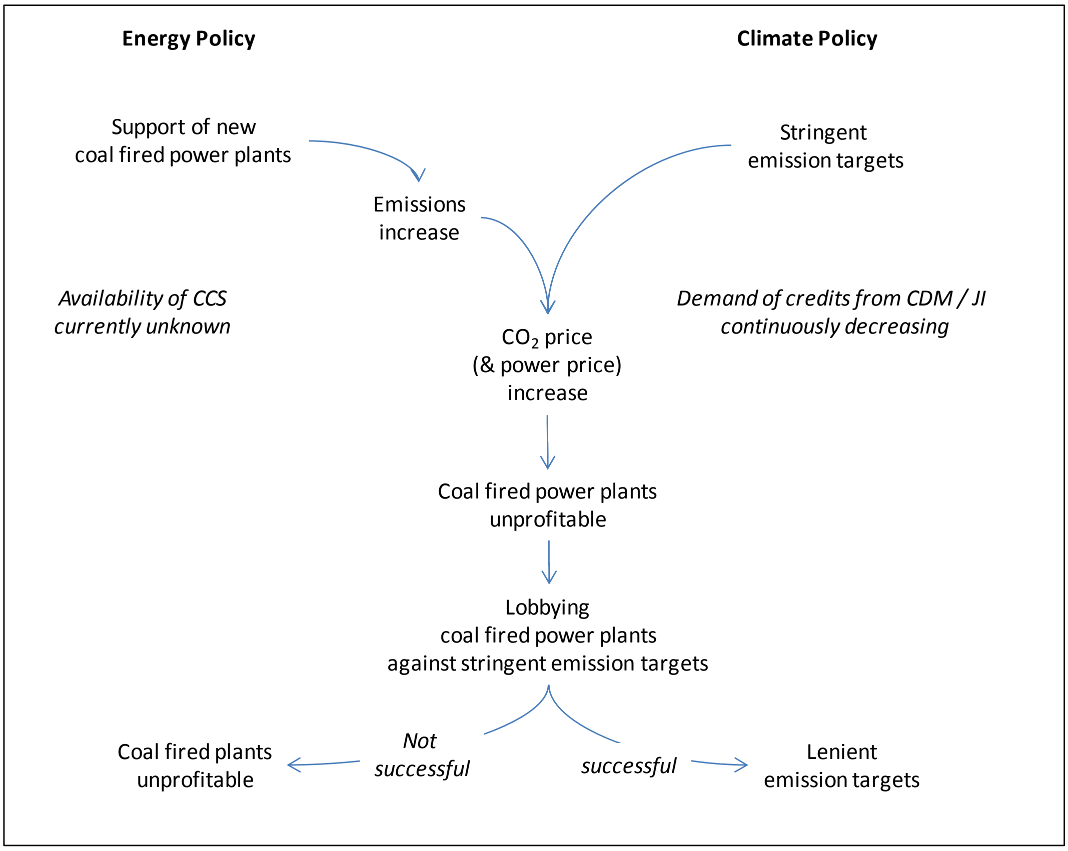

Figure 5: Possible interaction between construction of new coal power plants and climate policy

VI. Conclusions

In the coming decades, new power plant capacity will need to be constructed in Germany and Europe. The liberalised electricity market with functioning competition, however, only offers incentives for the construction of new power plants in exceptional cases. This is regarded today – at least in the USA – as a reliable finding.[24]

This difficult framework is exacerbated by the requirements of climate protection. In particular the uncertainty of the actual medium-term and long-term climate change targets make the decision for or against an investment in a conventional power plant difficult.

In addition to this, the expansion of renewable energies mandated as a result of climate change causes further problems from the point of view of operators of conventional plants. On the one hand, the electricity price and thus the revenue decrease due to the expansion of capacities with low marginal costs and on the other hand, the fluctuating production with

[24] Joskow, *Competitive Electricity Market*, supra, note 10; Ockenfels, Grimm and Zoettl, *Strommarktdesign*, supra, note 10.

simultaneous priority provision for renewable energies result in new demands on power plant utilisation, which cannot be fulfilled by all power plant types.

Due to the special characteristics of the electricity market with regard to storage capacity and realisation times of new construction projects as well as the importance of a secure electricity supply for the overall economy, it appears to be quite risky to hope that the invisible hand of the market will find the appropriate solution. An acceptable solution for the classic triangle of energy policy of supply security, environmental and climate protection and profitability is not to be expected with the current market design. This results in the necessity for an integrated energy and climate strategy that determines which capacities or outputs a member state, or better yet the EU, should have in the future for the generation of electricity. A possible option within the logic of a liberalised electricity market is the construction of capacity markets, which provide additional revenue for the new power plants. Capacity premiums are only then compatible with climate change targets when the CO emissions of the power plants are taken into account when tendering new capacities or if stringent, immutable emission budgets are defined for emissions trading. Together with the required support schemes for renewable energies a major share of power generation (capacity) will be defined by quantities or prices that are set by policy makers. This would represent a significant departure from the original idea of a European common energy market and toward integrated climate and energy policy.