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Term Paper

The Promises Of Capacity Mechanisms For Ensuring Supply Security And Their Potential Shortcomings

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Inhaltsverzeichnis

1 Introduction

As many developed countries around the world have been liberalizing their wholesale electricity markets during the last three decades[1], even if to different extents, their governments, regulators and customers had to make the experience that not all the hoped for benefits of these steps did materialize[2]. Economic theory had predicted that competitive markets should lead to cheaper electricity as prices would eventually converge towards marginal production costs. The market mechanism was thought to provide the necessary price signals to give generators enough incentive to invest in new capacity so supply and demand could be matched in the future[3].

Alas, market designers didn't pay enough attention to intrinsic imperfections of electricity markets resulting in insufficient investments in generation capacity. Inelasticities on the supply and demand side and the difficulty to store meaningful amounts of electricity for later use lead to high price volatility on the wholesale market[4]. Together with regulators' unwillingness to allow spot prices to climb too high for political reasons fearing that firms exercise market power new investments became unattractive to power companies thus leading to what became called the 'missing money problem'[5].

This issue particularly concerns so-called peak power plants[6] whose short-

[1] Chile and UK were the first countries to abolish generation monopolies and opening up their markets to private companies introducing supply-side competition. Several US states and EU countries followed in the 1990s and 2000s

[2] see IEA (2002, 2003)

[3] Finon & Pignon (2006), S.3

[4] ibid (2006), S.9

[5] The 'missing money problem' refers to the issue that so-called peak power plants which are in use only for a small part of the year (during peak demand periods) need high prices to cover their considerable fixed costs. If there are price caps in place, these prices will not come about which in turn results in under-investment in capacity.

[6] Böckers, Giesing, Haucap, Heimeshoff & Rösch (2012) S.4

term response times to sudden increases in demand make them indispensable for the system operator to ensure system reliability avoiding involuntary rationing by shedding load.

Aggravating the situation is the increasing share of intermittent renewable sources most markedly in the German electricity market. Spot prices experience a downward pressure as renewables have marginal production costs near zero and their bids on the wholesale market have to be taken according to German legislation[7]. This development makes it even more difficult for peak power plants to recoup investments costs. As a result from the year 2020 on, several authors predict a scarcity of peak capacity[8].

Capacity adequacy regarding electricity, defined as supply security in the long-run, can arguably be considered a public good, being nonrival but also nonexcludable[9]. Since a system failure caused by insufficient generation capacity imposes heavy losses on all market participants and supply security having characteristics of a public good meaning that free markets will not provide unless forced to, government intervention could be a solution to the problem of capacity shortages as explained above.

Serious market disruptions with recurring brown-outs and even black-out in the wake of California's electricity market reforms in the 1990s show that concern about how to guarantee future generation adequacy is not merely a theoretical thought experiment. This paper will at first present the causes of the problem of missing capacity as they have become manifest during and since the implementation of market liberalization[10].

[7] REFERENCE MISSING!!!!!

[8] Matthes (2006), S.

[9] Finon & Pignon (2006), S.3

[10] The term liberalization refers here to reforms to national electricity markets that abolished monopoly positions of incumbent utilities, vertical unbundling by which these firms had to separate different business acitivities along the value chain (generation, transmission, distribution to end-customers),divest whole segments of their business structure if necessary and introducing competition by private actors on the wholesale market. These stepshave been implemented to varying degrees, and this paper will take the developments on Germany's electricity market as an illustration)

2 Research Questions

This paper aims to look into the issue whether capacity instruments can solve the aforementioned 'missing money problem' in the long-term. This has to remain largely a theoretical discussion as the unintended effects of market liberalization have become fully visible only during the past decade in most markets[1] and capacity mechanisms are a fairly new approach to the problem. Empirical data are rather thin, and Germany which is to serve as an illustration for the questions at hand does not have any capacity market to date.

Germany's generation parc has not run through a complete investment cycle since market deregulation in the late 1990s and neither did other markets even if liberalization started earlier in some cases[2]. So empirically no final judgment can be made whether 'energy-only'–markets[3] provide sufficient incentives for new generation or not. Some authors even express doubts over the existence of a 'missing money problem'[4]. After a brief overview of some of the peculiar characteristics of electricity markets in general this paper will describe the 'missing-money problem' and why liberalized electricity markets may not guarantee sufficient investment in capacity to ensure adequate supply in the future.

In the third part I will deal with certain specificities of Germany's decision to phase-out nuclear energy until 2022 along with the goal to switch from fossil fuels to renewables for its electricity generation. Having outlined the nature of the 'missing-money problem' and its causes, a brief, in no way exhaustive overview of approaches to tackle investment shortfalls in 'energy-

[1] see IEA (2002)
[2] CITATION NEEDED!!!
[3] On an 'energy-only'–market solely electrical power is traded, generation and transmission capacity are not part of the transactions
[4] see Hogan (2005)

only'–markets shall follow. The aim of this paper is not to provide a comparison of the effectiveness of different capacity schemes, but rather highlight general shortcomings of this solution as well as flaws of specific dwhile scarcity of supply makes the available generation capacity very valuable due to high electricity prices, it renders it utterly valueless when the whole system collapses and no electricity can be sold anymore [5].

My paper will argue that capacity mechanisms will fail to address the deficiencies of 'energy-only'–markets if regulators inhibit the free functioning of market price mechanisms via upholding caps on spot prices. I will also attempt to show that the objectives of Germany's energy transformation (so-called 'Energiewende') towards renewables will make it more difficult to ensure supply adequacy while at the same time reaping the potential welfare gains of a deregulated market.

[5] Joskow & Tirole (2007), S.63

3 Characteristics Of Electricity Markets

3.1 Electricity As A Good Unlike Others

Electric power is unlike other goods or commodities in that it is expensive to store for later use. Given the current technology level only pump storage plants allow this on a large scale, geographic conditions permitting, which limits the feasibility of the approach to mountainous areas. Electricity markets thus require continuous and above all instantaneous balancing between supply and demand[1], as there is only a very limited amount of stored power available to make up for generation shortfalls.

Failure to balance supply and demand at any given time will put the system's stability at risk. This can result in disruptions for the entire electricity network due to involuntary load shedding as customers are forcibly cut off from power supplies by the system operator. As it is technically possible to suspend deliveries to specific end-consumers only in rare instances their willingness to pay higher prices to continue the service or else forego supply cannot be acknowledged by the market.

In addition most households have fixed-price contracts with utilities making them unresponsive to price spikes caused by supply scarcity[2]. This renders the demand side very inelastic in the short- as well as in the long-run. The 'traditional' function of market mechanisms to restore the equilibrium between demand and supply by price swings as classic economics would have it cannot be provided by the current market design.

[1] Creti & Fabra (2007), S. 259/260
[2] Hughes & Parece (2002), S.32

On the supply side we also find short-term inelasticities since lead-times for the construction of new power plants are considerable, ranging from between 2-3 years for gas-fired installations to 10 years or more for nuclear reactors[3]. The lump-sum nature of investments in generation capacity with hefty upfront costs for new infrastructure also leads to slow decision-making processes by power companies. By implication the system operator has to estimate future demand for specific time frames and then make sure that sufficient capacity will be available during that period.

While scarcity of supply makes the available generation capacity very valuable when wholesale prices are high, it renders it utterly valueless in case the whole system collapses and no electricity can be sold anymore[4]. The mere possibility of extreme cases where the system collapses under too much load or when the system operator resorts to involuntary load shedding to prevent this happening gives capacity adequacy the character of a public good. No customer can be excluded from the benefits of a functioning electricity system since it is nearly always impossible to cut off individual consumers. By implication providing the good 'supply security' is not a profitable business in itself and will thus not be made available by an 'energy-only'–market.

Joskow and Tirole deem regulatory action all the more warranted as a single power plant no supplying the contracted for amount of electricity could potential cause a system failure. This would impose a severe negative externality on all market participants[5] since they would all be immediately affected.

3.2 Specific Nature Of Electric Power Markets

To serve peak loads almost all the time there needs to be idle reserve capacity available, which does not earn any revenue when not supplying electricity to the system[6].

[3] CITATION NEEDED!!!
[4] Joskow & Tirole (2007), S.63
[5] ibid (2007), S.78
[6] Hughes & Parece (2002), S.33

4 Shortcomings Of Capacity Instruments

4.1 National Solutions In The Context Of European Market Integration

4.2 Regulatory Obstacles To Capacity Markets

5 Conclusion

Wie diese Arbeit zeigen wollte, sind in Lettland die Voraussetzungen vÃ¶llig andere als in den alten MitgliedslÃ?ndern der EuropÃ?ischen Union. Es kann daher kaum verwundern, dass die Politik auf die globale Finanzkrise anders reagierte. Ein Ende der Kopplung des Lats an den Euro stand und steht fÃ?r Lettland und seine baltischen Nachbarstaaten auÃŸer Frage[1]. Diese rigide WÃ?hrungsstrategie war der Grundpfeiler der Wirtschaftspolitik in den vergangenen 15 Jahren und sorgte bei auslÃ?ndischen Investoren fÃ?r Vertrauen. Eine Abkehr von festen Wechselkursen wÃ?rde nicht nur fÃ?r viele lettische Unternehmen, die Kredite in FremdwÃ?hrungen aufgenommen haben, den Bankrott bedeuten. Auch die Idee nationaler SouverÃ?nitÃ?t (symbolisiert durch eine stabile WÃ?hrung) trÃ?ge erheblichen Schaden davon. Der begrenzte Binnenmarkt bietet dem lettischen Staat nur wenig MÃ¶glichkeiten, fiskalische Impulse durch vermehrte Ausgaben zu setzen. Wie aufgezeigt, wÃ?ren solche MaÃŸnahmen aus Sicht der Wirtschaft Lettlands weitgehend ineffektiv, da sie nur beschrÃ?nkt von erhÃ¶hten Einkommen profitieren wÃ?rde, sofern sich diese Ã?berhaupt als gesteigerte Nachfrage materialisieren und nicht in Ersparnisse mÃ?nden. Die sogenannten Multiplikator-Effekte, auf welche der Keynesianische Ansatz vertraut, hÃ?tten somit kaum erzielt werden kÃ¶nnen.

Die unterschiedliche Art auf die Wirtschafts- & Finanzkrise zu reagieren, auf der einen Seite Keynesianische Konjunkturpolitik, und wie im Falle Lettlands pro-zyklische SparmaÃŸnahmen auf der anderen[2], bieten ein "natÃ?rliches Experiment" fÃ?r die GÃ?ltigkeit Ã¶konomischer Theorien zur BewÃ?ltigung einer Rezession. Ein fundiertes Urteil Ã?ber die Wirksamkeit der unterschiedlichen AnsÃ?tze wird erst in ein paar Jahren gefÃ?llt werden kÃ¶nnen mit

[1] The Economist, 28. Februar 2009
[2] Blanchard, Das & Faruq (2010), S.267

einer besseren Datenlage, die zum gegenwÃ?rtigen Zeitpunkt noch nicht vorhanden ist. Diese Arbeit hatte nicht die Ambition, diese Frage zu klÃ?ren, sondern will lediglich einen geeigneten Untersuchungsgegenstand vorstellen. Ebensowenig wird hier der Anspruch erhoben, eine Kausalkette zwischen den Ã¶konomischen Gegebenheiten und Handlungen der lettischen Regierung herzustellen. FÃ?r diesen Schritt wÃ?ren detailreichere Studien nÃ¶tig, um die Entscheidungswege nachzeichnen zu kÃ¶nnen. Offenkundig besteht weiterer Forschungsbedarf, sowohl hinsichtlich der empirischen Ãœberprüfung des keynesianischen Ansatzes und seiner Alternativen, als auch der nicht betrachteten, aber nicht weniger relevanten politischen Dimension. Von einer genaueren Untersuchung polit-Ã¶konomischer Faktoren der Antwort Lettlands auf die Krise sind weitere AufschlÃ?sse Ã?ber die Interaktion zwischen Ã–konomie und Politik zu erwarten.

6 Sources

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