

Security of energy supply, disturbance in electricity supply in 2006 and the link to the EU energy package

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Abstract: The European Commission published a package of documents in January 2007 to pave the way for an overall energy policy at the community level. Energy Policy for Europe is the main document, specifying the goals, the means and some elements of its strategy to achieve those goals. The paper discusses the content of this document as well as some others, mainly relevant for the security of supply. It discusses also the large disturbance of electricity supply in Germany on 4 November 2006 from the security of supply point of view. Some implications to the energy market and for the market regulation are also discussed in the paper.

Key words: Electricity Market, Regulatory Authority, Security of Electricity Supply, Supply Disturbance

1 Introduction

The European Commission published a package of documents, named Energy for a Changing World, on the 10th of January 2007. It consists of the main document, Energy Policy for Europe, which contains the most important goals and elements of the common EU energy policy and the main strategic steps to achieve them, [1]. The package encompasses 19 additional documents which cover the main fields, relevant for the energy policy and strategy issues at a national and community level. The documents cover the areas of Energy Efficiency, Renewable Energy, Progress in Biofuels, Internal Market for Gas and Electricity, Gas and Electricity infrastructure, Nuclear Energy, Sustainable Power Generation from Fossil Fuels and a Strategic Energy Technology Plan [2].

The main issues for security of supply, from the perspective of a regulatory authority (i.e. the regulator), relate to the diversity of energy and production sources, undisturbed network operation and appropriate market conditions. These are,

together with other crucial issues, addressed in the policy document [1].

The EU energy market was gradually introduced over the past years. A strong asymmetry in the market opening occurred among the member states which put the stakeholders in a different position in different member states. This strongly influenced their behaviour, particularly in their investment policy. Throughout the EU, except for RES, low intensity in new investment was observed over the past decade, which affects also the security and quality of supply.

2 Energy Policy for Europe

The whole package is a result of a long preparation in several parallel fields, among them a discussion and evaluation of a sector inquiry [3] which found serious internal market malfunctions. Some of the policy and strategy elements were already discussed in the Green Paper on a European

strategy for sustainable, competitive and secure energy [4]. The public debate among the stakeholders was very intensive. Some of them even questioned the environment policy, particularly its emission targets and trade, whether they are coherent with the sustainability and affordable prices for the industry. For example, manufacturing industry underpinned that the existing emission trade schemes excessively impact electricity prices [5].

The European Commission's answer can be seen as a measure to address the most important questions of both, sustainable security of supply and affordable prices. The energy price affects the competitiveness of the member states economies and may easily endanger the goals of the Lisbon strategy. The Energy policy for Europe for the first time addresses both questions in a coherent way.

2.1 The main goals

The main goals are reflected in the three pillars of the energy policy, which are sustainability, security of supply and competitiveness. For sustainability reasons, there is a strong environmental target representing a certain limitation to the market. While energy accounts for 80% of all greenhouse gas (GHG) emissions in the EU, it contributes significantly to the climate change and air pollution. The aim of the community energy policy is reducing the greenhouse gas emissions at a global level to a level that would limit the global temperature increase to 2°C compared to pre-industrial levels [1]. This involves strong environmental measures including energy and transport policy measures at the national and community level.

For security of supply, limiting the EU's already large and still growing exposure to an increasing volatility of prices for oil and gas. This is also a part of competitiveness aspect, where the goal is a well functioning, more competitive EU energy market, stimulating innovation technology and jobs, with the least limitations, particularly in physical terms, resulting from the scarce capacities of the bottlenecks in the networks.

2.2 The concept of energy policy

The main concept is obviously to pursue the way that energy production and supply shall be market activities in a highly transparent business

environment, in which the barriers and market distortions shall be removed to the maximal extent. The networks shall be operated independently from the market participants, throughout the EU as one single network. Regulators shall be coordinated and have the powers to regulate the cross border issues as well. And finally, the energy sources from third countries shall be a part of the external policy at the EU level.

In such a market oriented business environment other policy goals are also expected to be supported by market based mechanisms. The energy policy enables that, for example in additional supporting RES [6].

Table1: Some goals and implications of the common energy policy

Goal	Sustainability	Security of supply	Competitiveness
<i>Target measure</i>	Limit of 2°C to the global temperature increase	Diversity of fuel mix, RES, energy efficiency, single European network, sufficient gas import	Well functioning energy markets, reasonable energy prices
<i>Some implications</i>	Emission limits and measures at a state level, possible redirection of support mechanisms for RES and energy efficiency	State energy policies, regulator's measures to TSOs, operational security rules, external relations, other	Further unbundling requirements, more market monitoring, competition protection measures, cross-border regulation, other

There are, however, some challenges to the external relations to ensure the appropriate gas sources. Most of the imported gas originates from non-EU countries. This requires also some tolerance and exemptions for the gas transport infrastructure, particularly for new one. Scarce capacity of the gas pipelines and low diversity of sources are among the main risks for short and long term security of supply. Moreover, the electricity sector undergoes a period of low investment activity as well, since there is a motivation for particularly vertically integrated incumbents not to invest into new cross border capacities in order to keep the cross border trade and influence limited.

Low investment intensity is also a serious concern for the long-term electricity generation adequacy.

The renewable energy sources for electricity generation may, intensively supported, significantly increase to the level of 20% until 2020 ([7]) or above, but the rest of at least $\frac{3}{4}$ of electricity will originate from conventional fossil and nuclear sources. Therefore environmental and safety requirements together with correspondent technology development is foreseen [8], [9].

3 Some expected implications

The main implications to the electricity generation at the level of a member state, is a swing towards:

- a more diverse fuel mix,
- additional support to RES,
- sufficient support for investments, particularly for adequacy reasons.

The latter will be a particular challenge, since the investment cycle takes some years or around a year, depending on the type, whereas the main market signals are much shorter, within the time frame of hours to some months.

Main implications to infrastructure are stronger unbundling requirements together with their enforcement, a more intensive regulatory control and increasing pressure for efficiency together with new regulation. Main implication to regulation is a new concept, added to the concept of regulation at national level. The new one is supranational regulation of cross-border issues, which will be encompass both, operation security and coordination, and capacity allocation oversight.

4 A large disruption in electricity supply in November 2006

The incident was actuated by a planned opening of a double 380 kV transmission line Conneforde-Diele. The TSO E.ON Netz informed the neighbouring TSOs, RWE Transportnetz Strom and TenneT in advance, and opened the line at 21:28 h, the 4th of November 2006, without calculating the N-1 contingency of the network after shut down. Power flow was redirected, but overloaded another line, south from it. The TSO performed a topology change, however the line tripped due to automatic overload protection around 22:10 h. This resulted in splitting the whole UCTE network into 3 main areas: West, North East and South East. In the Western area a power

deficiency of 9.000 MW caused a frequency drop to 49Hz, whereas the imbalance in the South Eastern area lead to a frequency drop to 49,7 Hz. This led to a series of blackouts in different states, which could have been prevented by a communication and coordination among the TSOs in question. There were no counter trading measures taken at the German-Dutch border which could have helped. Moreover, the hazard was even larger due to lack of coordination in the process of distribution systems restoration. Most of the renewable generators are connected to the distribution systems, however the TSOs do not have control nor coordinate their reconnections. The sequence of events is explained more in detail in [10], the circumstances summarized and evaluated from the regulator's view in [11]. In the view of continuously increasing generation from renewable energy sources, their contribution and influence on the networks is significantly increasing. Therefore their steady-state operation as well as their behaviour under adverse conditions have to be regulated by new, amended operational security rules.

5 Contribution of institutions to prevent disruptions of supply

What can a regulator do to prevent such supply disruptions? Usually the regulators are not involved into planning issues in a way which can ensure the generation adequacy. This is in general the responsibility of the government or shared with the TSO. A regulator may and ought to draw attention of the responsible authorities to require appropriate planning, it may comment plans and initiate reviews. One of its most important tasks is reporting on the state of the energy sector as a whole. These overall reports over some years enable a clear and complete analysis of the key parameters for the security of supply.

What can a government do? It has usually the ultimate authority in the planning process and both, the generator's and the system operator's investment decisions cannot, directly or indirectly, bypass it. Therefore a clear understanding of the importance of the system adequacy, operational security and its rules is of utmost importance. The government can enforce, implement or require improved operational security rules that significantly diminish the probability of such disturbances. Apart from that, a government can

secure imported energy sources, particularly hydrocarbons, through its external policy.

6 Conclusions

From the work, described above, we conclude:

- the importance of security of supply has developed to one of the three pillars of the EU energy policy, the main document of the energy package. Security of supply is coherent with the other two pillars, namely environmental one, based upon the GHG emissions limits, and competitiveness, based upon an improved market functioning,
- the support to other measures and fuels, particularly to the renewables, will intensify, and may be re-directed at the level of member states, especially since the GHG limitations have become binding,
- some new measures are needed for TSOs operation, particularly in relation to the network security rules, regarding more coordination and communication to prevent disruptions. The measures ought to take into consideration also the behaviour of renewable generators, especially those connected to the distribution networks. An option may be to develop new guidelines for secure operation, since the type of error occurred may be repeated. A single European network may be the answer at supranational level, but not within any member state;
- a supranational regulatory authority with decision making power can significantly contribute to prevent irregularities in the fields of cross-border capacity determination and allocation, security rules and others. However, this relates only to the competence for cross-border issues. It can only be efficient and accepted, if it is composed in a way to include the existing state energy regulatory authorities.

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