Background Paper:

Designing Electricity Markets for a Successful Energy Transition

European Engine Power Plants Association

EPGINE

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Designing Electricity Markets For a Successful Energy Transition

Our Key Messages

To achieve a succesful European energy transition at minimum cost, EUGINE recommends solutions which are European-wide, based on market forces and empowering market players:

1. Turning the Energy Union communication into European solutions

1.1. Addressing the power system adequacy issue at EU level to make unilateral interventions (capacity markets, strategic reserves) unnecessary

1.2. Accelerating the Integration of the Internal Electricity Market (market coupling, network codes, policy harmonisation)

1.3. Strengthening investment signals (2030, ETS reform)

2. Utilising market forces to develop flexibility at minimum cost

2.1. Investments should be driven by price signals (without caps), not by distorting interventions locking-in non-flexible and polluting technologies

2.2. Technology neutrality is needed to guarantee a level-playing field and a competition leading to reduced costs for society

2.3. Value for flexibility should be created to provide clear signals for investments in cost-efficient flexibility solutions

3. Empowering market players to foster self-balancing and ensure security of supply

3.1. Sharing responsibility: All market participants should have the same balancing responsibilities

3.2. Cost-reflectivity: the imbalance charge paid by the participants creating imbalances should reflect the full costs (availability & utilisation fees)

3.3. Marginal pricing: “pay-as-cleared” pricing methodology for balancing energy would incentivise self-balancing and thus flexibility solutions

3.4. Shorter time frames are needed for a more dynamic, competitive and liquid procurement of reserves by TSOs and market participants

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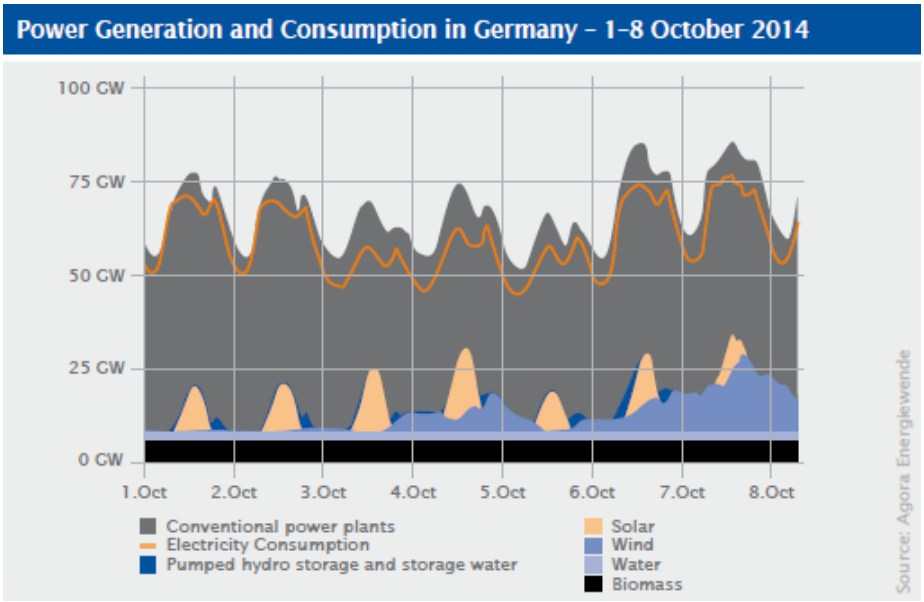
1. The EU Energy Transition

The EU has over the past years formulated a European energy policy addressing climate change, affordability of energy and security of supply, as well as creating the Internal Energy Market. As a consequence of this policy, an energy transition is taking place in the European Union from conventional generation towards increasing shares of electricity produced from renewable energy sources.



As shown by this graph describing power generation and consumption in Germany from 1 to 8 October 2014, the current energy transition means that thermal power plants must become much more flexible to offset variations of the power produced by more and more intermittent renewables.
(Source of the graph: Agora Energiewende)

As the share of renewable generation continues to grow, highly-flexible power plants will play an increasingly important role to provide the system with flexibility to balance demand and fluctuating wind and solar profiles.

However, investments into flexible power plants may no longer be profitable because increased amounts of renewable generation reduce both the running hours of thermal power plants as well as the average electricity price in the market. Many electricity markets are considering or already making changes in anticipation of these challenges becoming more prominent in the future.

2. Market reform options

Any market reform should focus on supporting the goals of the European energy policy: achieving a power system that is secure, affordable, sustainable and increasingly more relying on renewable energy sources. Two different market reform options are considered: further improvement of the Energy Only Market (EOM), or establishing an additional Capacity Market (CM) next to the EOM. There is a fundamental difference between how an EOM signals for new investment, and how a CM signals for new investment. Below we discuss both options.

In a CM, the primary investment signal for new plants is the level and availability of the capacity payment on offer (either through a central procurement mechanism or through a decentralised capacity market). Capacity developers are incentivised to deliver generation technologies that are likely to be awarded a capacity contract, which may not have the same flexibility characteristics as the capacity that would be delivered in an energy-only market.

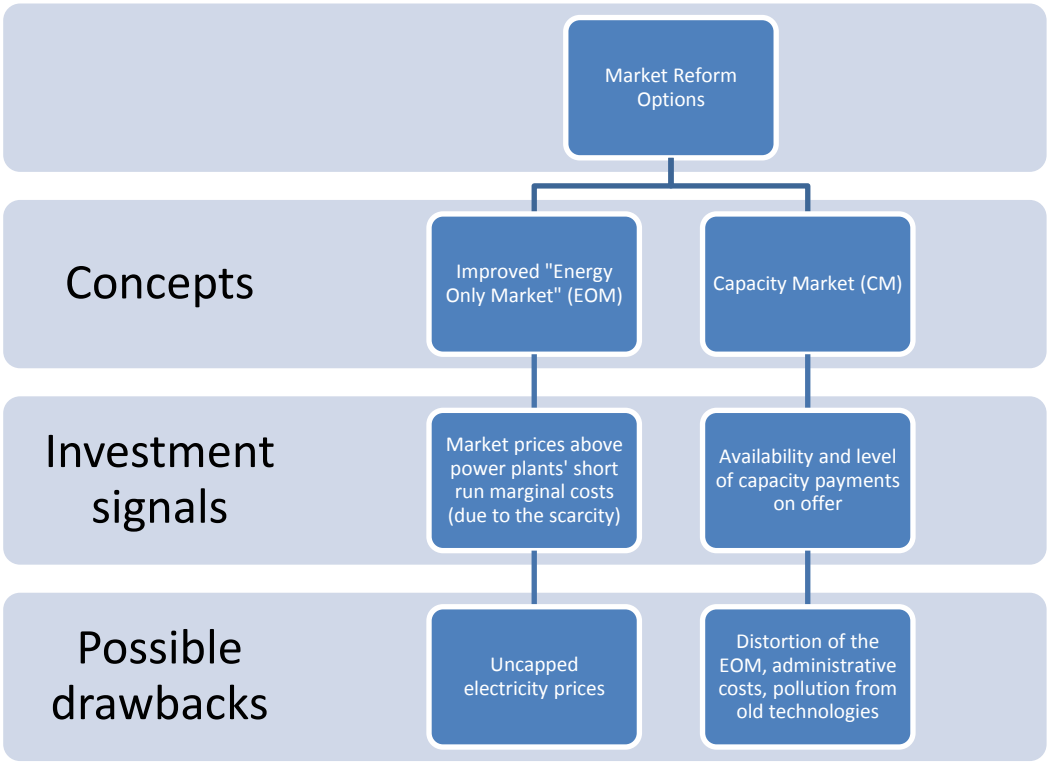
CM (in a centralised or de-centralised set-up) have been in use in some electricity markets, and also recently the British Government decided to introduce a CM in 2014. The British experience is similar to the experience seen in other capacity markets, particularly American models based on central procurement of capacity through auctions, which are highly administrative, and offer long term contracts for new investment, and low penalties – but also implement effective price caps on energy prices. Similar experiences are also seen in forms of CM that rely on decentralised procurement of capacity. One such example is the market in Western Australia, where there is still a requirement for a significant market monitoring role to ensure that capacity products traded can deliver the level of security of supply targeted by market policy makers in addition to annual reviews of price caps in the energy market.

In an EOM the marginal plant is able to receive a contribution for recovery of its fixed and capital costs when supplies are scarce. Supplies can be scarce across different timeframes, including in the spot markets, which means that providers of energy in these markets should be able to offer prices above their short run marginal costs if there are few flexible providers of energy left in these timeframes. This acts as a signal for the new entry of flexible plant.

In an EOM, expectations of average energy prices (affected by spikes in short term prices) would be to rise as capacity exits the market as part of the normal investment cycle. Of course, higher prices send an economic signal to the market to develop new capacity, and so the cycle starts again. However, with a CM in place, a pre-determined capacity “margin” is procured on a regular

basis, and therefore investment cycles will be absent from reading changes in the energy market price. Therefore a CM undermines the functioning of an EOM.

Additionally, the principle of fixed cost recovery in an external mechanism (the CM) coupled with price spikes in the energy-market (EOM) risk being seen as untenable by policymakers. To mitigate the potential for double payment, price caps or bidding controls can be introduced (as seen in the American capacity markets PJM and New England, or in the Irish Single Energy Market (SEM)).The EOM may not create the intended incentives to encourage efficient forms of flexibility to the market. Assuming that flexibility will be required in future, there may therefore be a need for further intervention from authorities.



The third energy package of the EU achieved a very successful liberalisation of the European energy market. We believe an improved EOM is a further market based reform of the electricity arrangements, required to prepare the market for the future generation portfolio, leading to a competitive and functioning energy market where any distorting effects are eliminated.

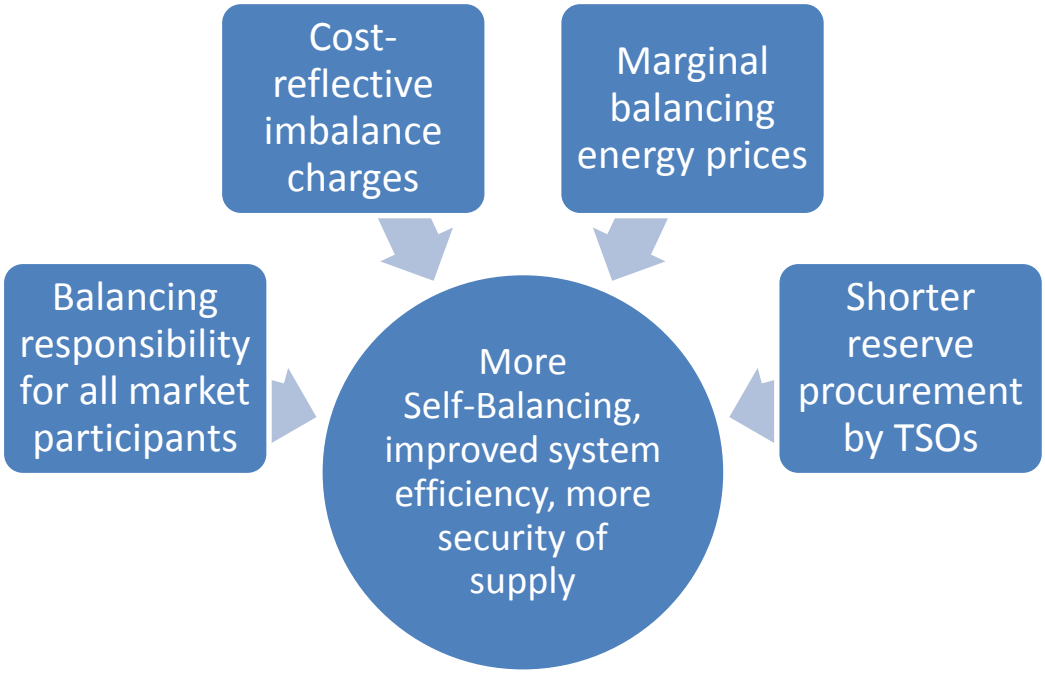
3. Towards an Improved Energy Only Market

Because flexible power plants (and other providers of flexibility) rely on fewer running hours to recover capital costs, price spikes in situations of tight capacity margins are an important metric. Generally it can be expected that intraday markets are more spikey than the day-ahead. This is because the available supply of generation diminishes closer to the time of use: fewer plants are able to turn on in short-time frames (technical and economic restrictions) and others will have already committed their maximum generation. Those plants that remain available oftentimes have higher marginal generating costs (which is also the reason why they are still available). Negative spikes can also be expected, e.g. when excessive wind generation requires incentives to increase demand or pay plant to turn down.

Through these signals market participants are incentivised to self-balance and thus contribute to system security. As a general principle, incentives for market participants to buy and sell flexibility are strongest when there is a known risk of high imbalance charges. This drives market participants to procure flexibility in the short-term markets close to the point of delivery, when generating capacity shortages or surpluses usually emerge as a result of forecasting errors or plant outages.

The main characteristics of an improved EOM are:

- Balancing responsibility for all market participants
- Cost reflective imbalance charges
- Marginal balancing energy prices
- Shorter reserve procurement by TSOs



We describe each of these characteristics in more detail below.

3.1. Balancing Responsibility and Imbalance Charges

In an improved EOM, all market participants connected to high-voltage grid have the obligation to balance their own position. Market participants that are out of balance at gate closure pay the imbalance charge (sometimes referred to as cash-out price). Therefore, they must make an economic trade-off between balancing in the intraday market or facing the imbalance price.

As stated by the European Network of Transmission System Operators for Electricity (ENTSO-E):

"*Producers of renewable energy should have the same duties and responsibilities as all other electricity generators. Giving producers of renewables incentives to correctly forecast their feed-in and hedge their volatility leads to higher grid stability*."[1]

Furthermore, imbalance pricing should be transparent and fully cost-reflective. This creates incentives for market participants to balance by trading in intraday markets, or by taking other actions to balance before TSO-led balancing takes place (for example calling upon flexible

[1] ENTSO-E, "ENTSO-E's recommendations to help achieve Europe's energy and climate policy objectives", October 2014, p.6

resources such as demand-side response, or starting up other generating resources where it is economic to do so).

The full costs of TSO-contracted reserve capacity (availability fee and utilisation fee) need to be reflected in the balancing energy price.[2] This is important to create a level playing field between pre-contracted reserve by the TSOs and 'pure' balancing energy, but also from the point of view of reflecting the full marginal costs of system scarcity and encouraging self-balancing ahead of gate closure.

To avoid distortions, the European imbalance settlement (cash-out) arrangements will need to be harmonised along with balancing energy markets. If differences in imbalance settlement remain, the incentives on market participants to offer balancing services to the common merit order may be distorted[3]. This could lower the efficiency of cross-border trade.

3.2. Balancing Energy Pricing

The pricing method for balancing energy should be based on a marginal (pay-as-cleared) pricing methodology. Marginal pricing has the following advantages:

- It is more cost reflective, allowing market participants to adjust their positions based on costs at the margin,
- It encourages self-balancing and drives liquidity in intra-day and spot markets, and
- It provides correct incentives to invest in flexible capacity and demand-side response, and to offer balancing energy and reserve services.

3.3. Shorter reserve procurement timeframes by TSOs

We recognise there are differences in reserve procurement timeframes across Europe. To avoid potential distortions resulting from different reserve procurement processes and timeframes we believe reserve procurement arrangements should be harmonised across Europe.

With a high penetration of intermittent renewable generation, the future reserve requirements are likely to vary on a much more dynamic basis. For example National Grid (the British system operator) estimates that the reserves needed to manage wind variability in Great-Britain in 2020 could fluctuate by up to 6GW on a daily and intra-day basis.
Given the increasingly dynamic needs of the system, in our view reserve procurement should take place as close to real-time as possible. This would have the following advantages:

[2] ENTSO, "Market design policy paper", 15 September 2014, p.3
[3] Market participants may be reluctant to offer balancing services cross-border if they simultaneously expose themselves to differential imbalance penalties.

- It would allow TSOs (and possibly also market participants) to procure reserves on a more dynamic basis, consistent with increasingly dynamic needs as the penetration of intermittent renewable generation increases.
- It would lower barriers to entry for and promote competition among flexibility providers, avoiding the potential market foreclosure associated with longer term contracting.
- It would create a liquid near-term reference price for flexibility, useful for the purpose of long-term hedging.

Shorter term reserve contracting should also make the availability fee allocation process much more straight-forward, minimising distortions to the common merit order. This view is supported in the consultants' report commissioned by ACER in 2009:
"…the longer the terms of capacity reservation, the less accurate the additive component [availability fees in energy bids] will be. Therefore, from a cost allocation point of view, capacities are preferably procured on a short-term basis, e.g. daily rather than yearly capacity payments. Short capacity reservation periods also involve a fast learning curve with respect to the necessary amount of reserves, making capacity payments a more 'controllable cost."[4]

4. An Improved EOM, Rather than a Strategic Reserve

In a well-designed EOM, spot and balancing markets are good vehicles to incentivise flexibility through market forces. Market participants are incentivised to balance when prices reflect the availability of capacity at the time when it is needed. However, some market commentators are considering additional 'insurance policy' for the system to improve security of supply, such as the creation of a strategic reserve.

In considering major market interventions such as strategic reserves, it is important that these do not blunt the short-term signals from the EOM. If market participants know that in situations of shortage another reserve "outside" the energy market is ready to step in, they might not sufficiently value flexibility in their own portfolios. In other words, while a strategic reserve could provide an effective 'insurance policy' for the system as a whole, individual market participants may have reduced incentives to insure themselves by contracting flexible resources. When greater volumes of flexibility are contracted bilaterally through TSOs in the form of a centralised administrator, markets may suffer because price discovery is distorted and market-driven innovation is stifled.

[4] Katholieke Universiteit & Tractebel Engineering Suez, "Study of the interactions and dependencies of balancing markets, intra-day trade and automatically activated reserves", February 2009, p.9

To mitigate these unintended consequences, if extra reserve capacity is required, the cost of providing it should feed through to energy markets. If designed well, such an intervention can be complementary to incentivising flexibility: when market participants know that relying on a strategic reserve to balance in extreme situations will be costly, they can contribute to the system's security by procuring back-up capacity or demand-response on the market. This would allow market participants to hedge themselves against extreme situations and provide investment signals for new flexibility in the system.

To sum up: EUGINE regards it as doubtful, if strategic reserves are really needed to ensure the security of supply in an improved EOM. However, should there be political desire to create a strategic reserve as a fallback solution during a transition period, there are possibilities to organise this in a way that does not distort the market-driven approach.

5. Next steps

The EU and National Governments should consider the advantages that an improved EOM will have in expediting the transition of the electricity system to one that is predominantly supplied by renewables balanced with a diverse range of flexible resources. An improved EOM provides efficient entry and exit signals while creating stronger incentives for the right type of capacity required by the market to integrate the growing shares of renewable energy sources. It also eliminates the need for political involvement and the administrative burden associated with designing, implementing and running a CM (with recent experience in the UK providing a case in point). This makes an EOM more efficient compared to a CM, resulting in improved system efficiency and lower electricity costs to EU consumers and industry, without jeopardising security of supply.

Given these advantages, we believe that EU and national governments should implement the improved EOM without delay. As part of this, we also recommend to help facilitate industry-led adaptation to the adjusted market, such as promoting the use of short and long term hedging instruments traded between market participants, as recently proposed by EEX[5]. Such initiatives are also aligned with discussions that are currently taking place at a European level.

[5] EEX, "Energy Turnaround Products", February 2015

EUGINE is the centre of knowledge for engine power plant technology and electricity market design. Its members are the leading European manufacturers of engine power plants and their key components. They provide forward looking solutions for flexible electricity generation.

EUGINE works with EU and national institutions in order to help the European electricity system to meet the challenges of today and tomorrow.

efficient

Best form: The efficiency of engine power plants is up to 95 per cent in cogeneration applications.

responsive

Ready, steady, go: The energy supplied by engine power plants corresponds dynamically with actual energy demand.

fast

Flash into action: engine power plants provide energy right away at any time even in emergency situations.

reliable

Green light: engine power plants guarantee a safe and stable power supply everywhere: from vibrant cities to remote locations.

environmentally sound

Flower power: engine power plants operate with very low emission levels and are CO_2-neutral with biofuels.

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