CEER Consultation on regulatory aspects of the integration of wind generation in European electricity markets

A EURELECTRIC response paper

February 2010

The **Union of the Electricity Industry–EURELECTRIC** is the sector association representing the common interests of the electricity industry at pan-European level, plus its affiliates and associates on several other continents.

In line with its mission, EURELECTRIC seeks to contribute to the competitiveness of the electricity industry, to provide effective representation for the industry in public affairs, and to promote the role of electricity both in the advancement of society and in helping provide solutions to the challenges of sustainable development.

EURELECTRIC's formal opinions, policy positions and reports are formulated in Working Groups, composed of experts from the electricity industry, supervised by five Committees. This "structure of expertise" ensures that EURELECTRIC's published documents are based on high-quality input with up-to-date information.

For further information on EURELECTRIC activities, visit our website, which provides general information on the association and on policy issues relevant to the electricity industry; latest news of our activities; EURELECTRIC positions and statements; a publications catalogue listing EURELECTRIC reports; and information on our events and conferences.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

Economic Development
- Growth, added-value, efficiency

Environmental Leadership
- Commitment, innovation, pro-activeness

Social Responsibility
- Transparency, ethics, accountability

Dépôt légal: D/xxxx/xx.xxx/x

CEER Consultation on regulatory aspects of the integration of wind generation in European electricity markets

---

TF Integration of Renewables

Mr. Marcel CAILLIAU (BE), Chair

Mr. Kai ADAM (BE), Mr. José ARCELUZ OGANDO (ES), Mr. Hakon EGELAND (NO),Mr. Ricardo FERREIRA (PT), Mr. Håkan FEUK (SE),Ing. Federico FIGEL (IT), Mrs. Stine GRENAA JENSEN (DK), Mr. Jaakko KARAS (FI), Dr.. Cornelia KAWANN (CH), Mr. Cesar MARTINEZ VILLAR (ES), Mr. John MCMANUS (IE),Mrs. Simonetta NALETTO (IT), Mrs. Henrike OSTHUS (DE), Dr. Andreas POULLIKKAS (CY), Dr. Jan SUNDELL (SE), Mr. Ruud VROLIJK (NL), Mr. Bernhard WALTER (DE),Dipl.-Ing. Michael ZOGLAUER (AT)

Contact:

Marco FORESTI – mforesti@eurelectric.org

INTRODUCTION

EURELECTRIC welcomes this CEER consultation, which focuses on one of the most urgent challenges of European electricity markets. We fully agree with CEER on the conclusions of the analysis: "*it is no longer practical to consider renewables and electricity markets as 2 separate topics: it is indeed essential to consider their interaction and to promote the integration of renewable generation in the wholesale electricity market"*. Furthermore, we believe that policymakers should make all possible efforts to complete the integration of EU wholesale electricity markets as soon as possible. It is now clear to all key stakeholders that **without integrated markets, not only it will be even more complex to integrate the vast amount of planned wind generation, but also markets functioning, grid operation and security of supply could be seriously affected**, leading to higher costs for end users.

More specifically, in order to cope most efficiently with the growing share of intermittent wind generation, a balanced combination of the following measures will have to be applied:

1. *Establish market coupled day-ahead and continuous intra-day markets*

   The current shortcomings of interconnectors or national infrastructure are well known. Therefore it is of utmost importance to use as efficiently as possible the capacities of existing infrastructure, particularly in the day-ahead and intra-day timeframe. In this light we urge regulators, TSOs and power exchanges **to establish cross-border intra-day trading platform which allows a continuous trading** form one country to another in one step. We see an ELBAS-like approach which includes opportunities for OTC trading as an appropriate solution. However, we also want to draw CEER's attention to the fact that many Member States do not comply with the already existing requirement to establish intra-day markets according to paragraph 1.9 of Congestion Management Guideline.

   As there is an overall agreement that price coupling is the preferred option for the European day-ahead target model, we like to stress the need for long awaited practical steps.

   - The more efficiently day-ahead and intra-day markets are linked across borders, the better hourly surplus and deficit situation can be countertraded and the more price convergence across Europe is supported.
   - The more liquid day-ahead and intra-day markets are (also thanks to the full marketing of wind power via these market segments), the better the opportunity to react on hourly surplus and deficit conditions and to minimize overall balancing costs.

2. *Enhance network and interconnections*

   Increased investments in interconnectors are – as described in the CEER Report – necessary to efficiently cope with fluctuations of wind power generation. A **higher level of cross-border capacities** renders export of surplus energy possible allows neighbouring countries benefitting from

energy sources with low marginal cost. The same applies to internal congestions where they have a direct impact on cross-border capacities or where they are responsible for a separation into several market areas.

- The higher available interconnection capacities are, the better and the more efficiently Day-ahead and intra-day markets will work.

3. *Increase predictability*

   Currently applied Congestion Management Guidelines require generators above 100 MW to report on their output. We assume that this threshold was chosen to cover the main part of the market and to avoid an inappropriate burden for smaller generators. As soon as the total wind generation plays a pivotal role in the market, such an information release would be highly sensible as well. Even if the role of wind generation in the market can be discussed, whether it is pivotal or not already today in the light of negative prices, it is absolutely clear that it will be in the near future. Therefore, we see a great need for improving data collection and analysis on wind patterns. With the experience of an increasing number of wind mills and using the most representative ones for building up a database for wind forecasts the deviation of the prediction from actual wind patterns could be decreased.

   An EU wide **harmonised day-ahead and real-time transparency data on wind generation** as stated above will help the market to foresee and to react to surplus or deficit of intermittent wind power. Demand and production side management supported by smart grids will lower the need for costly peak demand reserves.

4. *Market-based RES support scheme and wind integration into the market*

   We recommend **a progressive introduction of EU-wide market-based support system for renewables** such as direct marketing of wind power via power exchanges, quota, certificates or premiums where the wholesale market price is the key element of wind power generators' remuneration. Therewith combined is the long-term obligation of wind generators to balance themselves in the framework of balancing zones which will drive investment into energy storage options, smart connection of different generation facilities and eventually smart grids and metering, making best use of flexible consumption. This would ease the technical integration into transmission grid and distribution networks and allow a smarter integration into market processes. The more wind generation is also part of the publicly accessible electricity markets, the more markets will be liquid and efficient.

5. *Ensure that price signals incentivise enough investments in flexible and back-up generation*

   Due to the relatively low load factor of wind generation and its intermittent nature, in hours with little wind blowing other generation sources will have to provide enough capacity (back-up generation) in short periods of time (flexible generation). Backup and flexibility needs will therefore require conventional generation investments (peak plants, hydro, storage, etc.). However, RES generation will "push out" some conventional plants of the merit order, reducing considerably load duration (already experienced nowadays), and eventually putting investments at higher risk.

Generators will invest when market prices provided they can expect an appropriate ROI: EURELECTRIC believes that the market will perform adequately if the right regulatory framework is in place. Therefore:

- In "Energy only" market design: Caps and Floors should be avoided as they distort the incentives for investment in peak plants and storage facilities;
- It should be assessed if, how, and on what regional scale "capacity investment incentives" (e.g. capacity payments) may have to be implemented if the prices do not provide enough ROI

ANSWERS TO SPECIFIC QUESTIONS

Question 1:

How will the expected growth in wind generation affect the markets in which you operate?

Directly connected to the intermittent nature of wind generation and to the mandatory priority dispatch, we see a number of different impacts, such as:

- Impact on generation investments: existing and future conventional plants will operate under different market conditions, economic equilibriums and risks. The intermittent nature of wind generation requires significantly increased capacities of flexible generation[1] to be available to call upon at short notice when wind generation increases or decreases unexpectedly (balancing energy). Depending on the specific national system in place, these higher costs of those balancing services are usually socialised and seldom targeted to the wind generators themselves. This may lead to extra costs for consumers.
- Impact on price formation: higher volatility, more frequent negative or zero prices. The increase of wind generation will influence the pricing of the power market: wind generation has one of the lowest short run marginal costs and will therefore displace conventional power plants. In extreme situations with high wind generation output and low demand this can lead to negative prices. Pricing and profitability of conventional power plants will be affected by lower utilization rates.
- Impact on operating costs: lower operating hours for conventional power plants, more frequent start-ups for flexible plants leading to an increased steepness on the merit order curve (and more price volatility as mentioned above).
- Impact on transmission grids: more frequent congestions and redispatch costs. System security is increasingly affected if e.g. the grid extension is not keeping pace with the increasing wind production forcing system operators to

[1] When considering investments in flexible generation it should be noted that most of these will be in CCGT plants. The flexibility needs will therefore have an impact on gas infrastructures (need for more storage), markets and procurement contracts.

apply the right to curtail also the wind production for system security purposes (Art. 16 Section 2 c Directive 2009/28/EC).

- Impact on cross-border capacities: increasing curtailments to maintain grid security due to loop flows and higher unpredictability of wind generation, obliging TSOs to take more conservative long-term allocation approach. Concentration of wind energy in shore regions requires further grid enhancements in order to transport the surplus energy to other regions. In interim periods when grid enhancements are not in line with the increase of wind generation, further congestions will have to be managed at interconnection points or within national grids. Due to the high geographical concentration of wind power in those areas, we have already observed a decreasing availability of cross-border interconnection capacities. This hinders cross-border trading and limits potentials for market integration.
- Increasing importance of intraday and balancing markets.
- Increasing need for regulating power (and increased associated costs).
- Impact on distribution grids: increasing need for smarter grids in order to cope with the higher penetration of distributed generation.
- Increasing differences in the role of TSOs: roles and responsibilities within each national market concerning renewable energy differ to a great extent. Taking Germany as an example, the TSOs are obliged to forecast wind production and to sell the wind energy at the day-ahead exchange as market order (= price independent bid), to balance the actual wind in-feed in the intraday market, taking a role and risk which is not generically part of the operation of a transmission grid.

What are the key challenges you foresee?

- Urgent integration of wholesale markets, especially on shorter timeframes such as Intraday and Balancing markets
- Huge amount of grid investments (new lines, extensions, reinforcements and modernisation in Transmission & Distribution) needed to connect wind farms to centres of demand and areas with balancing resources, to match the increased need of cross-border trading, to alleviate increasing bottlenecks and loop flows.
- Need to improve forecasting tools and clustering techniques to locally connect wind farms in order to improve the predictability of wind generation output.
- Need to improve wind generation technology with regard to resistance to voltage dips and improve dialogue between wind generators and TSOs/DSOs.
- Need to guarantee that there is enough flexible generation and back-up capacity available.
- Need to stimulate active participation of demand via development of smart grids, smart meters and demand side management tools.

- Need to stimulate investments in distributed generation and electrification of transport.

Question 2:

What are the implications for market rules?

We believe current market rules were designed for a generation mix considerably different from the one we are evolving to in 2020 and beyond. In particular, market rules may have to be reviewed to cope with the introduction of priority dispatch and guaranteed access to the grid for RES-E. In any case, market rules should not distort market functioning (e.g. with caps on prices) as this would further contribute to a risk of future shortage of the necessary flexible and back-up generation capacity. The most important goal is the need to ensure correct price signals both for generators - in order to guarantee sufficient generation capacity for the system- and for customers in order to stimulate demand reaction to prices.

Can you identify changes which would better facilitate integration of wind generation, including management of intermittency?

To facilitate the integration of wind generation **all the challenges listed in our response to Question 1 should be addressed**.

EURELECTRIC is fully supportive of the 2020 targets and of RES development policies. On the other hand we believe that support schemes for renewables should be sustainable and oriented to make renewables competitive in the long term: wind generators should become energy market participants provided the compliance with the EU 20-20-20 targets is not compromised[2]. Ensuring a level playing field among generators is fully compatible with a strong support to wind generation development as the experience of some countries demonstrates.

We believe that wind generators should be progressively subject to the same market mechanisms as any other (conventional) generator:

- They should be subject to the same balancing responsibility and scheduling rules applied EU wide.
- They should be incentivised to bid in the market.

It should be noted that the introduction of market mechanisms should not in any case penalise existing RES facilities whose investors have legitimate return expectations based on existing contracts.

Additionally, connection and access rules must be oriented to facilitate sufficient investments in grid infrastructure to accommodate new wind generation efficiently.

[2] In certain countries where wholesale markets are not mature yet or where intraday and balancing markets are not liquid enough, temporary tailor made regime may be designed for wind producers in order not to jeopardize the national RES targets for 2020.

These rules have to tackle also another issue of rising concern in some MS, which is congestion in the distribution network due to the infeed of wind production. The issue is aggravated since DSOs are not entitled to solve the congestion (e.g. through curtailments of wind generation connected to distribution network) and TSOs do not have the view of the affected portion of the grid, since the voltage level could be out of their influence.

Question 3:

Would moving the market's gate-closure closer to real-time facilitate the deployment of wind generation?

Yes, it would partly facilitate a more efficient integration of large share wind generation in the system by encouraging market participation by wind generation and reducing system balancing costs. It is in fact demonstrated that errors in wind forecasting reduce considerably during the last 3-4 hours before real time.

However, we believe that developing liquid and integrated cross-border intraday markets, based on continuous trading platforms, is much more important and should be the top priority for all European electricity markets.

A gate closure time for intra-day markets as close as possible to real time is in the natural interest of all market participants as it allows them to use the latest available information to optimize and balance their portfolios. This, in turn, minimizes the need for balancing energy services and contributes to overall low system costs. Therefore, where not yet existent, national and cross-border intra-day markets with 24/7 operation needs to be established to facilitate such a gate-closure close to real time (H-1). Also integrated cross-border balancing markets would help significantly TSOs to deal with up-coming wind injections.

We do not agree with different (or shorter to real time) gate closures for wind injection as it is suggested in the paper (footnote 52). Indeed, there is a permanent interaction between conventional generation and wind generation, if wind forecast changes, it becomes necessary to readapt at the same time conventional generation scheduling. In general, all kinds of generation should be exposed to the same market rules, and in particular to the same gate closures. Besides, a unique set of rules should be the way to get an "integrated market" (RES +Conventional)

Would this have any adverse consequences on the functioning of the electricity power system?

This would allow more trading opportunities but create also more operational complexity (24hrs trading). On the other hand, it will become more and more a necessity with intermittent RES injection constantly growing.

Referring to figure 4: Time between closure of forward market and real-time delivery should ideally be less than 1 hour.

Question 4:

Are emerging cross-border congestion management models compatible with wind generation?

YES, we believe recent initiatives (e.g. Market Integration Design Project and the work of the Project Coordination Group and of the Ad-Hoc Advisory Group) aimed at integrating markets based on EU target models are a step in the right direction. The main focus should be given to short-term cross-border markets, in particular Intraday.

Should further attention or priority be given to intraday capacity allocation mechanisms and markets, in light of the issues associated with forecasting wind generation?

YES. Continuous Intraday Trading with 1 hour notice (ELBAS model)

Question 5:

Should wind generation be subject to the same balancing obligations and the same types of charges as other types of generation?

YES (see answer to question 2). Experiences in some MS (in which wind generation must provide their schedule to the TSO in advance, pay for the balancing costs which they incur and be connected to a generation control centre for the interface with the TSO), demonstrate that this has led to a significant improvement in wind production forecasting and has led to the development of an industry to support renewable producers including control centres, forecasting services, risk management. This is of course facilitated by the existence of a very liquid intraday market, where RES can correct their position close to real time.

Given the need to move quickly towards a low carbon European economy consistent with the EU's 20-20-20 targets and European legislation to promote renewables, we see merit in Member States providing support schemes for wind and other RES in order to comply with the binding national RES targets. However, wind generation development should be promoted through these support schemes and not through specific grid and market arrangements (including congestion management arrangements) which could generate adverse effects.

Question 6:

Should TSOs engage in research and development (R&D) to address issues associated with a large share of wind generation included in the network?

YES, engaging in R&D is an important role TSOs and DSOs should cover as market facilitators. Costs and benefits must be fairly allocated amongst those who benefit from these investments.

If so, how should the regulatory framework require or support this?

EURELECTRIC strongly believes in promoting R&D and supports schemes that incentivise both R&D as well as the transition from R&D to full implementation. We believe that the EU has a very important role to play by promoting and funding projects, such as the TENs funding and the Framework Programmes for R&D funding.

The regulatory framework of each Member State can play an important role by introducing appropriate R&D incentives. For example, the recent Final Proposals from the GB Distribution Price Control Review introduced radical new incentive arrangements. In a European context, it will be important for any R&D initiatives to be monitored to share best practices and avoid potential duplication of work.

Question 7:

Should wind generators face the same types of network charges as other new generators, calculated using the same methodology?

Yes. All generators and types of power plants should be treated on a level playing field in terms of network access, connection and balancing rules. Moreover, network charges should be consistent across Members States, non discriminatory between new and existing installations and coherent with EU energy policy.

What is needed to provide a sufficient incentive for generation in choosing where to locate? What is needed to provide an appropriate balance of risk among market players? When should this not be the case?

We see a conflict in subsidising the network cost of connection, and thereby promoting renewables, against setting network charges that reflect the real economic cost of connection. As we have stated previously, wind generation development should be promoted through support schemes and not through specific grid arrangements.

Wind generation should be located in the areas with the best wind conditions. However, concentration of RES in areas ideal for generation but where there is little consumption and/or grid development could lead to excessive investment costs in grid infrastructure and overall loss of social welfare. This should be appropriately considered if there are signs that problems are likely to occur.

Question 8:

Broadly, what is the appropriate allocation of responsibilities, risk and cost among market players in developing new network infrastructure (e.g. ahead of or in response to new generation connections)?

TSOs should play a proactive role in planning and developing the network with a long term approach, considering that it takes much longer to build lines than wind farms. Planning of network expansion shall take into account existing scenarios of expected installations both in RES and in conventional generation. Moreover investment and licensing timing of RES installations and grid development should be aligned. In

order to minimise risks for investors and reduce inefficiencies, we cannot afford to have RES installations ready when there is no connection available yet (or vice versa).

Regulators and governments should limit uncertainty and investments risks as much as possible. First of all they should recognise the need to reinforce networks, authorising investments on a timely basis and allocating the appropriate remuneration (or authorizing the necessary grid tariffs) to TSOs and DSOs.

Regulators should make sure that transmission investments with positive socio economic welfare are made and decide on sharing of costs between TSOs. This could also mean that third country TSOs, not involved in the construction of a transmission line, but benefiting from it, could take part in financing it. A common incentive scheme (for all grid investments with regional/EU perspective, also non-RES related) would need to be put in place.

Should this be different for wind generation? Where is harmonisation required?

NO. However, new governance and funding models may be needed for developing offshore supergrids.

Question 9:

Do you agree that the "supergrid" issues for regulators identified in 5.1 are relevant? Is there anything else European regulators should be considering?

We are pleased that European regulators see the advantages of North Sea and Mediterranean grids. However given the expected complexity and high cost, we believe that they should be developed in a modular, phased approach to ensure that stranded costs are avoided and the benefits of applying new technologies, and improvements in existing technologies, can be maximized.

We believe that any "supergrid" must be seen from a pan-European point of view. Such an additional grid could also relieve the already constrained European transmission network by directly connecting RES generation and load centres and improving efficiency of RES development. Moreover, developments in this part of the grid will be larger than national, raising a number of issues (as who pays, who benefits, the distorting effects from different support schemes, etc.). We therefore agree that the development of a "blueprint" for the North Sea Grid, for example, is important in order to bring out particular issues associated with the development of this project.

Although we believe that the right issues are addressed in paragraph 5.1, we deem it essential that section 5 not only looks at the offshore part of the grid but also investigates the needs also to invest in the onshore continental grid in order to manage the intermittent injection.

Question 10:

Is the current ownership structure of the offshore lines or their regulatory framework a potential issue for the integration of offshore network? Are there other considerations affecting this ownership structure?

CEER's paper brings to the attention the issues related to the offshore network, like

- The problems related to ownership of wind plant connections and of sea cable links between offshore plants
- The problems related to different balancing regimes when wind farms are connected in between 2 markets
- Problems related to different support schemes in this situation
- Problems related to connection charges
- The international dimension of grids built outside the territorial waters

We believe the analysis is complete, but would also expect ERGEG to elaborate further on this in order to identify potential remedies and solutions. There is indeed a missing part in the current legislation: the Third Package seems to have ignored to a large extend the impact of the Renewable Directive.

In any case, as a general principle, it is essential that optimal and cost-efficient offshore wind generation is provided. For example, offshore wind farms located within a common zone (e.g Continental Plat of the North Sea) should be connected through a cost-efficient design in order to minimise the overall network costs.

From the regulatory point of view, distortions originated by the simultaneous enforcement of several national regulations should be avoided. Lastly, EU regulation on offshore transmission network property and governance should be established.

Question 11:

Do you agree that the Regional Initiatives should be used to address the issues associated with the development of the regional projects? What challenges does this present?

A Regional dimension approach is definitely necessary for RES development. However, there is a concrete risk that this will not be enough, at least with the current structure of the ERGEG Regional Initiatives. Most of the issues at stake are broader than "regional": they affect almost the whole of Europe. Moreover, ERIs should not be overloaded with additional tasks: they have already a great number of goals still to complete (e.g. congestion management, transparency, etc.)

Tackling the relevant issues related to wind integration in different ways by Member States or by Regions will neither be efficient nor effective. An overarching structure and coordination is necessary to address the key issues in a consistent manner.

For that purpose, we welcome some Member States' initiatives (like the signature of MoUs) to cooperate: we hope they will soon realise all issues at stake and take the necessary measures that will allow to handle the offshore grid challenges (in the

North Sea first of all), but also the continental grid reinforcements, the increase of capacity of interconnections, the need for harmonisation of support schemes, balancing regimes and so on.

Question 12:

What other issues should European regulators consider in relation to the integration of wind generation?

Authorisation procedures

We unfortunately observe that obtaining authorizations for major network reinforcement projects and new wind parks can often be an inefficient and slow process where the consideration of applications can take many years, and the process often involves lengthy discussions over the 'need' for a particular type of infrastructure, rather than focusing on the specifics of a proposed project., In most countries, this results in the authorization process for major network reinforcement projects to take on average around 5 years but is often well over 10 years. If this continues, European energy policy targets will be seriously compromised.

Many countries now recognize that their planning systems need to be enhanced for nationally significant infrastructure by improving the strategic context (i.e. national policy) against which individual planning decisions should be made. We therefore believe that an essential prerequisite for obtaining authorizations must be clear national criteria on which a decision must be made and should include a strategic framework and transparent guidelines for the process to reach a decision and for setting clear deadlines.

Accordingly, a 'National Policy Statement' agreed by the national government, could set out the criteria against which the body making a planning decision will judge applications for development consent. The use of such a statement would mean that applicants no longer have to demonstrate either the overall need for a project or for their particular proposal to be sited in a particular location, and would create a more efficient, transparent and accessible planning regime. The benefit of such a statement would give applicants a clearer framework with a higher degree of predictability and a planning environment in which they can make investment decisions with more confidence. Both investors and the public would have a clearer view about what to expect from the planning process.

Role of distribution networks

Moving towards a low carbon electricity system will require radical changes on both the supply side (high penetration of variable renewable generation resources at all voltages) and the demand side (energy efficiency, load shedding and the potential electrification of transport). As the network operator is the common link between these changing inputs/outputs there will need to be an evolutionary change in both network design and network operation from the largely passive (fit-and-forget) system of today.

Generally, electricity networks have been designed to deliver energy via high voltage and low voltage systems, with a 'top down' direction of power flows. Distribution networks that were originally designed as "passive" transport networks to accept electricity from the transmission system will need to become more "active" as more embedded renewable generation - from domestic micro-generation to larger scale commercial units - connects. Increasing levels of distributed generation (DG) in distribution networks will initially displace local demand but in certain locations will ultimately result in 'export' onto the transmission system, this in turn will have implications for the requirements for transmission infrastructure.

DG will also pose operational and control challenges for traditionally designed and operated distribution network and so the Distribution System Operators (DSOs) will have to become much more involved in real time distribution system operation, making use of innovative solutions such as smart metering, voltage control, power flow management, dynamic circuit ratings and energy storage technologies. The key technical issues will be power flow management, voltage control and fault level management.

This change will need to be managed both by the transmission system operator and also by the DSOs. The move towards more active system management at distribution voltages will complement and support the transmission system operator (TSO). However, a pre-requisite of meeting this challenge will be to ensure that there continues to be effective, two-way communications between the DSOs and the TSO.

Union of the Electricity Industry - EURELECTRIC aisbl
Boulevard de l'Impératrice, 66 - bte 2
B - 1000 Brussels • Belgium
Tel: + 32 2 515 10 00 • Fax: + 32 2 515 10 10
VAT: BE 0462 679 112 • www.eurelectric.org