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NEW ENERGY MARKET DESIGN

TOWARDS MORE
SECURITY AND
FLEXIBILITY





EDITORIAL

New energy market design

Today's energy market is fundamentally different from the one of five years ago. Along with an ambitious Energy package, the European Commission will propose a new Market Design initiative to respond adequately to the rapid evolution of the electricity market. Implementation of the Paris Agreement is now at the forefront of decision-making. These new challenges revolve around incorporating more renewables in energy grids. This reform is essential for building a more performant market allowing consumers to play a more active role. Security not only depends on the mitigation of external threats but also on a strong and responsive market. Europe's energy prices must remain competitive to ensure a bright future for its consumers. All of these concerns must be addressed by a new Energy Market design. This measure is important for the long-term success of a secure, sustainable, and competitive Energy Union.

The core transformation of the energy network and its operations is grounded in a more flexible and reactive market. This focus is aligned with a framework for greater securitization. Whether energy supplies come from foreign sources and their diplomatic implications or renewable sources, a new market design must strike a balance for the benefits of its consumers. This implies an infrastructure that can support a variety of sources that are able to meet consumer demands. In addition, the market needs price signals in order to facilitate new investments both for generation, transmission and distribution. This mechanism will optimize investment flows to the sectors that need it the most. It will help identify the areas that require increased capacity as well as help maintain a sufficient level of production in response to demand. Price signals will provide more foresight when it comes to times

of peak consumption or renewable energy variability guaranteeing a more secure market.

Regional cooperation between Member States, Regulators, TSO/DSO, and operators, will bring actors closer together through improved governance as well as infrastructure. Regional cooperation on policies and capacity mechanisms or consumer empowerment through smart pricing and active participation in the market should facilitate the transition to low carbon economy and innovative market. To achieve this, the role of market participants must be adapted so that they are best aligned with this new framework of operations. Essentially, governance should be based in transparency.

Europe's energy market has changed drastically in recent years, in part due to external shocks such as diplomatic crises and fluctuating markets. However, technological innovation continues to drive the EU's economy forward. This New Energy Market Design Package is an opportunity to combine more efficient technology with a more integrated framework of cooperation. Successfully delivering on the Energy Union depends on the EU's ability to take advantage of this opportunity.

LAURENT ULMANN

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Investment in a European Energy Market to Benefit its Citizens



Peter ŽIGA

Minister of Economy, Slovakia

European Union today faces many challenges that influence its appearance, consistency including the ability to find common solutions. Strengthening confidence in the common European project, developing its tangible benefits and removing barriers are the key values, to which Slovak presidency wants to contribute. In the energy sector, it is the Energy Union, which has the potential to become an important player to achieve these objectives. Building the Energy Union with emphasis on completion of the internal energy market ensuring higher competitiveness, and reliable energy supply from low-carbon sources at affordable prices, has therefore become the key priority of our presidency.

An integral part of the Energy Union is an ambitious climate change policy. Paris Agreement of 2015 confirmed the transition trend towards low-carbon economy. The appropriate system setting of the EU ETS trading scheme is therefore very important for the EU, and it should function as the cost-effective tool to encourage investment into low-carbon technologies, while taking into account the differences in the energy mix and economic structure in the EU.

New energy market design, as one of the most important initiatives of the European Commission in the field of energy policy, has to reflect the changing landscape of the EU electricity market, as well as the transition to low-carbon economy. It has to ensure

cost effective and safe integration of RES and better involvement of customers to provide reaction on the demand side. We need to tap the potential of digitalization as well as deeper between regional electricity markets. Completion of the necessary infrastructure allowing cross-border flows and full integration of low-carbon sources, in particular RES, into energy system is a precondition for achieving the EU energy and climate targets.

Ensuring sufficiently robust and safely operated infrastructure is the key area, where the adequate investments are needed. In order to build functioning electricity network able to provide services to increase low-carbon variable production with the necessary backup sources, efficient cooperation among all actors is necessary, Member States, European Commission, TSOs and ENTSO-E. We should ensure progress in the implementation of current projects of common interest with an emphasis on projects aimed at removing critical bottlenecks and unplanned flows in our region. Timely implementation of PCI projects is essential in this regard. Long-term vision and stability are fundamental to provide sufficient certainty for investors. It is equally important to enhance cross-border cooperation of individual transmission system operators within ENTSO-E.

Wholesale and retail markets should provide the correct signals for investment decisions and encourage the development of new services and flexible products. These are particularly important for the greater involvement of customers in the market, thus ensuring appropriate demand side response. New market design should concern mainly the investment into new supporting technologies, such as smart grids, smart metering, smart homes, own energy generation and storage facilities. These technologies might empower the position of citizens, who will be thanks to them able to actively participate in the market as well as the transition of the energy system, and control their energy bills. Transition of the energy system will enable a full use of new technologies by the system operators, producers and consumers not only in the households, but also in the industry.

In the context of the new market design investment, it is necessary to have both the cost-effectiveness and technological neutrality

on mind particularly with regard to strengthen the competitiveness and respect the right of member states on their energy mix.

Investments in the area of energy are currently under the surveillance of the EU, as according to recent report published by the IEA showed a decline in the recent period. Therefore, we have focused the discussion on the contribution of the investments and financial mechanisms to the completion of the energy market and achievement of EU targets in the area of climate change and energy under the Slovak presidency. We have devoted necessary space to this topic at the informal meeting of ministers for climate change and energy in July 2016 in Bratislava.

Ministers appreciated the opportunity to discuss the new system of governance and planned financial mechanisms for green investments, especially benefits of the Modernization and Innovation Fund. As regards new governance of the Energy Union, ministers called for the establishment of the clear indicators, and also appealed to the possibility to adjust National plans on basis of the diversity of conditions on the energy market. Further discussion was devoted to energy prices and costs and their impact on industry competitiveness. Equally, ministers stressed the need to provide long-term investment signals that would activate the demand side and effectively contribute to the transition to a low carbon economy. Ministers pointed out the growing disproportion between wholesale and retail prices of energy and lack of signals that would be generated by the actual price of commodities.

Space that we devoted to energy prices and investments showed, that open discussions on key issues of the EU, are more than needed today and it is the route to achieve the greatest benefits for all EU citizens.

Leveraging the Internal Energy Market: our greatest asset towards flexibility, security and decarbonisation



Miguel ARIAS CAÑETE

Commissioner for Climate Action and Energy

At the COP21 in Paris, world leaders took a firm commitment in favour of global transition to a low carbon economy. This was a major milestone as all actors worldwide are facing two major challenges: responding to the pressing climate challenge of keeping the increase in global average temperature below 2°C, with an aim of limiting the increase to 1.5°C, whilst also finding answers to geopolitical challenges such as increasing energy security for all energy consumers, citizens and businesses. On October, 6, the European Union officially joined the Paris Agreement and triggered its entry into force.

Concerning the first challenge, we in Europe can claim first-mover status. Already two years ago, the European Council agreed on a 2030 Framework for energy and climate, setting EU-wide targets for 2030 to reduce emissions by at least 40% compared to 1990, to be at least 27% more energy efficient, and to have at least 27% of renewable energy sources in our final energy consumption.

As for the second challenge, a new momentum for the transition towards a low-carbon, secure and competitive economy was created on 25 February 2015, when the Commission adopted a Framework Strategy for a Resilient Energy Union with a forward-looking climate change policy. The Energy Union puts forward a vision of an energy market with citizens at its core, where citizens take ownership of the energy transition, benefit from

new technologies to reduce their bills, participate actively in the market, and where vulnerable consumers are protected. In addition, one of the top political priorities for President Juncker is for the EU to become number one in renewables. Already today, renewables account for over a quarter of the electricity generated!

However, the energy market must keep pace with our ambitions if we are to make good on our decarbonisation goals and to give consumers the tools they need to be active participants. Moreover, we already know that our energy system in 2030 will look completely different to what it does today:

- We will see increasingly variable and decentralised production patterns and more flexible demand;
- We will see around 50% of electricity coming from renewable sources; and
- Consumers producing and consuming their own renewable energy will no longer be an exception.

Thus, we must make certain that our electricity system is ready for the challenges this will bring. It is for this reason that, in 2015, we launched a public consultation on a redesign of our electricity market. The feedback we received showed broad support for our key ideas. It has also allowed us to define our vision of the legislative proposal that will be adopted at the end of this year.

Our vision for a new market design will be based on three key ideas:

- A flexible market with reliable price signals to drive the necessary investments and secure the energy market,
- Increased regional co-operation in market and system operation, together with a stable regulatory framework, and
- Putting the consumer at the heart of our energy system.

Firstly, flexibility will be essential as a growing share of variable renewable energy loads will have to be integrated into the system. Decarbonisation based on wind, solar and distributed resources needs to be supported by well-designed short-term markets. Ultimately, electricity markets should be in a position to set adequate prices by themselves

to allow for investment and the uptake of variable renewables generation. This includes, of course, further adapting – and where possible phasing out – subsidies for renewable investments while protecting investor confidence.

Secondly, increased regional cooperation will help us bring an end to fragmented solutions. We have to move away from national approaches to a true internal market perspective that leverages regional cooperation and Union-wide strengths. In particular, we want interconnections to represent 15% of installed electricity production capacity by 2030. Furthermore, network tariffs and regulatory rules have to be in line with the flexibility needs of the system.

Last but not least, we want to create a market that works for the end user, that is to say the consumer. Today, consumers are not simply passive anymore; they are becoming more and more active market players. We need to encourage this – the more active consumers are, the better it is for a competitive energy market. That includes encouraging demand-response and enabling consumers to produce their own electricity. This is why we are also looking at how the new market design can help to facilitate cost-effective consumer self-generation. We will seek to remove market barriers to new competition and improve access to information. In the meantime, we will further strengthen consumer protection.

The goal is to ensure that consumers are empowered and not restricted by the market. That means promoting smart technologies, like smart metering systems and smart homes that will enable consumers to reap the benefits of the energy market by taking control of their consumption and providing their flexibility to the system. This is part of the “new deal” for consumers that we advocate in the Energy Union.

Real challenges lie ahead of us. We need to adapt our internal market so that it is a key driving force for decarbonisation whilst keeping our energy system competitive and secure. A modern market design will also enable us to meet the ambitious objectives we set ourselves in Paris.

Today, I am convinced that electricity is the energy of our sustainable future.

Competitive markets in the New Energy Market Design



Margrethe VESTAGER
Commissioner for Competition

Achievements

The EU energy markets have seen rapid change. The share of renewable energy sources in the EU's energy mix has increased substantially and is on track to achieve the EU's 2020 target of 20%. More and more energy infrastructure has been put in place, closing critical bottlenecks in the European transmission networks for gas and electricity. Energy islands such as the Baltic States and Malta, for example, are now an integral part of the EU's internal energy market. More and more electricity and gas is traded on exchanges and organised market platforms, increasing transparency and liquidity for existing market players and attracting new ones.

Challenges

Still, more challenges lie ahead. To make almost full decarbonisation of the energy system by 2050 a reality, to prepare for the depletion of indigenous fossil fuels such as natural gas, and to enable our energy system to meet the increasing demand for flexibility faced with volatile generation and demand, the EU will have to act. Moreover, distortive subsidies and regulatory interventions often weaken price signals that should guide market participants in their investment decisions. The EU needs to adapt its legal framework to cope with these future challenges.

To contain the costs of energy transition, renewable energy sources must be

integrated even more into the market. In future, renewable energy producers will be the main players on the energy market. With their increasing importance comes increasing responsibility to keep the system in balance. With the State aid Guidelines on Energy and Environment, the Commission has taken the first steps, requiring renewables producers to take on balancing responsibilities, and making sure that subsidies react to prices. The new EU legislation on Energy Market Design will need to go further and ensure that renewable generation is prepared for a future with reduced subsidies and where a stronger carbon price supports investment in sustainable energy technologies.

To fully exploit the synergies of the internal energy market, its rulebook needs development. While this includes common rules ranging from third-party access codes to network security rules, the over-arching objective of ensuring smooth operation of the EU energy system from the Baltic Sea to the Mediterranean must be kept in mind. This requires Member States to take into account the impact that their decisions regarding local market design and regulation, energy mix and infrastructure development, have on their neighbours and, more broadly, on the functioning of a European energy market. The institutions created with the Third Energy Package such as the EU's regulatory agency ACER and the network organisations ENTSO-E and ENTSO-G must be put to their full use to create a level playing field in the EU energy market. This will allow consumers to benefit from the lower prices and increased security of supply that undistorted competition and trade in energy can bring.

In the context of security of supply, there is a concern that the current energy system does not provide the right signals for long-term investment. The on-going sector inquiry on capacity mechanisms shows that this is often linked to imperfections in the existing legal and regulatory framework. The first step should therefore be to fix the framework so that it allows markets to function. There may however be persistent market failures that require State intervention in the form of some type of capacity mechanism, and the ongoing sector inquiry also confirms that. In the State aid Guidelines on Energy and Environment, the Commission has set out some criteria

to ensure that capacity mechanisms do not undermine competition and cross-border trade. We presented a possible practical approach to cross-border participation in our interim report of the sector inquiry. A robust legislative framework should be developed in the Market Design initiative. The EU needs common rules on how to assess the security of supply situation beyond national borders, and how Member States should cooperate to allow market players to participate cross-border in capacity mechanisms. The achievements in the integration of the EU energy markets and their contribution to the transition to a low-carbon economy must be preserved, and not put at risk by an uncoordinated introduction of national capacity mechanisms.

Conclusion

The Energy Market Design should allow market players to compete on the merits and should stimulate the creation of better energy products and processes. Because of the long investment cycles, a new market design for the energy markets should lay down transparent market rules that give new technologies and services, as well as different types of suppliers and consumers, a fair chance to compete in the market. In particular, there is a need to ensure fair competition between conventional and renewable energy sources, between demand-side operators and generators, between energy-intensive users and other businesses.

The new Energy Market Design will ultimately be a success only if consumers benefit from the energy transition through an affordable, secure and clean energy supply. Competition policy will play a crucial role in this context, to ensure that the benefits of technological advances and efficiency gains are passed on to the end consumer. In sum, transparent and competitive energy markets that give all market players a fair chance to participate are a necessary to achieve the EU energy and climate targets in a cost-effective manner, and for consumers to continue to support this formidable, cross-generational task, which is the transition to a low-carbon future.

The challenges of the Market Design Initiative



Dr. WERNER LANGEN

MEP (EPP), Rapporteur on the EP own-initiative report "Towards a New Energy Market Design"

A new energy market design is strategically needed for the achievement of a real European Energy Union. A sustainable energy system is the key to a strong industry and Europe's future success in international competition. These are the conclusions of a Report adopted on 13 September by the European Parliament that highlights that only stronger market integration can ensure more energy security for the EU.

Europe's electricity system is facing huge challenges, especially through the integration of renewables into the electricity system. The share of electricity produced by renewables will grow from 25 percent today to 50 percent in 2030. This means that even more and more electricity will have to be traded across national borders which requires an efficient cooperation from all market participants. The grids need to have the capacity for cross border cooperation to reflect this increasing variability of production so that sufficient energy can flow across Europe even when the sun is not shining or the wind not blowing.

Electricity must be able to move freely to where it is most needed, wanted and valued in order to reap maximum benefits from cross-border competition and provide the right signals and incentives to drive the right investments. For that electricity should only be dispatched based on market signals and electricity prices should provide a signal of

scarcity so that electricity is imported from other Member States at the right times.

Beside that, the efficient use of energy storage capacities, network expansions and interconnectors are indispensable and network bottlenecks and uncoordinated loop-flows have to be stopped.

It is important to find the right balance in which Member States can keep the responsibility on security of supply but on the same time will define on regional level the security of supply and commonly assess their capacities and flexibilities. For this, the European Parliament demands that the Agency for Cooperation of Energy Regulators (ACER) is given the power of decision-making to increase coordination for regional cooperation and interregional issues.

One of the main focusses of the European Parliaments' report is the elimination of regulated prices on the one hand and insufficient support schemes on the other. Electricity prices need to reflect the actual costs. Otherwise they will give false signals to investors and consumers. This applies for renewables as well as conventional energy. It has to be ensured that markets are fit for renewables and their participation in electricity markets on an equal footing with conventional generation.

While the European Parliament acknowledge the importance of stable and cost-effective renewable support schemes for long term investments that remain responsive and adaptable in the short time and are tailored for specific national needs and circumstances, we also need the gradual phasing-out of subsidies for mature renewable technologies as a number of these technologies are rapidly becoming cost-competitive with conventional forms of generation. It also needs to be ensured that care should be taken to ensure that support schemes are well designed and that any impact on energy-intensive industries at risk of carbon leakage is kept to a minimum.

One of the main challenges in the discussion in the European Parliament is the question whether national capacity markets should be part of the European energy market design. It is clear that we need a more harmonised approach to generation adequacy and

reliability standards to enable more coordination and cooperation across borders. This includes a harmonised approach towards capacity mechanisms. Depending on how they are designed and implemented in practice, they have the potential to fragment the European Single Market, distort competition, and create barriers to trade across national borders and should only be used as a last resort once all other options have been considered. Regional security of supply monitoring and clear system adequacy standards should be the basis to identify whether capacity mechanism are really needed. If this is the case they should to be designed in a way that allows cross-border participation. They should be open to all types of providers, domestic or foreign, and need to be designed according to harmonised criteria. Capacity mechanisms should therefore only be possible after a prior assessment of regional supply problems and have to be open cross-border participation.

With this report, the European Parliament has formulated clear indications for the legislative proposal on the revision of the European energy market that the European Commission has to submit until the end of this year and proposes solutions for the challenges that hinder the European internal energy market until now.

Re-Powering

Improving the electricity market framework for the transition to a low-carbon power system



Fatih BIROL

Executive Director of IEA

The Paris Agreement is now on track to enter into force with dozens of countries, including the biggest carbon emitters, having now formally ratified it. Delivering on the ambitious objectives that most countries have agreed to requires strong policy actions as many will have to “re-invent” their electricity markets.

Already, electricity markets are undergoing massive transformation, as the push for low-carbon power generation shifts the industry towards higher investment in renewables and other new technologies even as demand stagnates or declines in many places, including in the EU. The next step will be ensuring that market frameworks evolve to take into account these low carbon technologies.

To accelerate this process and inform policymakers of the associated challenges and opportunities, the IEA recently published “Re-powering Markets: Market design and regulation during the transition to low-carbon power systems.”¹ Drawing on the Agency’s review of best practices in electricity

market design, mainly in Europe, the United States and Australia, it offers guidance to governments, regulators, and investors on how to move to low-carbon generation in an economic way while ensuring the security of electricity supply.

Re-powering refers to the process of replacing older power stations with more efficient, cleaner, and more powerful ones. But the term also applies to the evolution of market design whereby older market frameworks are replaced with new ones suitable for decarbonisation. Given the growing importance of wind and solar power, market rules must develop along with the flexibility of the power system.

Improving the market framework for decarbonisation

Much of the transformation will take place in competitive market environments already introduced to varying degrees around the world. Building the electricity markets of the future requires a comprehensive framework that encourages low-carbon investments and operational efficiency while also keeping security of supply as a top priority.

Existing markets rules need to be modernized to unlock the flexibility necessary to deal with the variability of renewables. Markets are adopting technology that allows pricing of electricity in day-ahead, intraday and real-time. More has to be done to provide detailed and transparent prices to communicate the cost of electricity in specific locations and circumstances. Decarbonisation relies extensively on small scale wind and solar plants and distributed generation, battery storage and demand response. Transparent market prices are increasingly needed at the local and distribution level.

Beyond the falling costs of wind and solar power, the market value of electricity produced increasingly matters as the share of renewables increases. Low-carbon generators need to participate in electricity markets as they can – and should – earn a high fraction of their revenues there. Market participation provides important signals, revealing the value of different low-carbon technologies. This will ultimately help mitigate the risk of investing in the wrong technologies deployed in the wrong places.

A new balance between regulation and competitive markets needed

Besides efficient markets, the shift to a low-carbon energy system requires a carbon price

to help determine the appropriate value for various technologies. But introducing a sufficient carbon price will take time and the energy transition is urgent. The window of opportunity to stay on track with a 2C degrees target is rapidly closing and the risk of locking in unsustainable infrastructure remains high.

Given electricity market prices today, long-term arrangements backed by governments remain necessary to attract sufficient levels of low-carbon power generation, at least during the transition period. Low carbon is capital intensive and requires long-term visibility to mitigate risks for investors, in particular the regulatory risk and carbon price risk, and to keep financing costs lower.

Networks are also critical. Improving and expanding power grids, including across borders, will help ensure the integration of wind and solar power as well as increasing electricity security. Proper governance is necessary to see the bigger, often transnational, picture critical to a modern electricity system.

Ensuring electricity security

Security of electricity supply remains a key concern for governments and other stakeholders. As markets evolve, shortages of capacity can result in scarcity prices. While these prices are critical to incentivise generators to produce more power and get consumers to reduce demand, there is a clear need for an adequate regulatory framework during hours of capacity shortage.

In addition to looking at price spikes, most markets are using targeted capacity mechanisms in one form or another. They create a safety net for maintaining adequate generation to meet reliability standards in a context of huge uncertainty of decarbonisation pathways. Such mechanisms have widespread impacts and need to be well-designed to avoid inefficiency.

Leading the clean energy transformation

In the end, there is no one single market design for the low-carbon energy systems of the future. As new technologies prompt constant evolution, governments and industry around the world must adjust. The IEA, with its long history of expertise in electricity markets, will continue to analyse the possible, cost effective and secure pathways to this transition to provide different options to policymakers to design their own markets.

¹ The report “Re-powering Markets” was launched by the IEA Executive Director Fatih Birol on February 18, 2016 in Brussels during an IEA-EC Roundtable, with participation of Commissioner Miguel Arias Canete. The lead author of the report is Manuel Baritaud and co-authors are Sylvia Spruck, Christelle Verstraeten, Matthew Wittenstein, Simon Muller, Noor Miza Razali, Jesse Scott and Charlotte Vailles. The report is accessible at: <https://www.iea.org/publications/freepublications/publication/REPOWERINGMARKETS.pdf>

A view of energy market design from the United States



Norman BAY

Chairman of the Federal Energy Regulatory Commission

Wholesale electricity systems are designed to ensure the reliable delivery of electricity at just and reasonable rates to consumers. Ideally, these systems ensure resource adequacy and grid reliability, while providing sufficient opportunity for resources to recover both fixed and variable costs without overbuilding the system or overcompensating inefficient units.

The electricity industry historically operated as a natural monopoly. However, in the late 1990s, U.S. electricity markets restructured to capture the benefits of competition. The Federal Energy Regulatory Commission's Order No. 888 was the cornerstone in the development of competitive wholesale power markets. Order No. 888 required open-access transmission and promoted the concept of an organized market separating ownership from control of the grid. Shortly after Order No. 888, FERC's Order No. 2000 encouraged utilities to join regional organized markets to facilitate the continued development of competition in the electric sector.

While certain parts of the U.S. are served by bilateral markets with traditional vertically integrated utilities, two-thirds of the nation's electricity load is served by one of the seven regional organized markets. There are differences among the market rules in each region, but there are also similarities. The common design framework consists of a pool-based market with a two-settlement process

for day-ahead and real-time energy and ancillary service markets.

The day-ahead energy market produces financially binding schedules for the production and consumption of electricity one day before the operating day. It permits resources and load-serving entities to schedule their activities sufficiently ahead of their operations based on forecast needs. Typically, 95 percent of all energy transactions are scheduled and settled at the day-ahead market prices. The day-ahead market provides a hedge against price volatility in the real-time markets caused by changes in load forecast and supply.

The real-time market is used to balance differences between the forecasted day-ahead scheduled demand for electricity and the actual real-time load. The real-time market is run in 5-minute intervals and clears a much smaller volume of energy, typically accounting for only 5 percent of scheduled energy. For supply resources, the real-time market provides additional opportunities to offer energy into the market. Megawatts over- or under-produced relative to the day-ahead commitments are settled at real-time prices.

Virtual trading helps day-ahead and real-time prices converge and helps mitigate uncompetitive or inefficient behavior. Virtual traders are not required to have physical assets to sell or buy energy in the day-ahead and real-time markets. By participating in the markets, virtual traders can drive down price differences between the day-ahead and real-time markets.

The organized markets also procure ancillary services to ensure grid reliability. Some ancillary services such as frequency regulation and operating reserves are procured competitively through co-optimization with energy markets. In other words, the costs and requirements for both markets are simultaneously considered when clearing the entire market. Other services such as reactive power and black start are not currently procured through market mechanisms.

Clearing prices for energy and market-based ancillary service are determined based on the locational marginal cost of providing each service. Marginal cost pricing is designed to encourage resources to bid their true variable costs. The organized markets use

security-constrained unit commitment and economic dispatch optimization models to determine the least-cost solution to meet energy and ancillary service demands in the day-ahead and real-time markets while also meeting reliability and transmission constraints. When transmission congestion occurs, the highest variable cost unit that must be dispatched to meet load within the constrained boundaries sets the price in that area (or locational marginal price). Pricing for market-based ancillary services is increasingly focused on compensating resources based on the actual service they provide.

Energy markets rely on scarcity pricing to send price signals in real-time when there is a system-wide shortage of power reserves. When following dispatch instructions will cause a shortfall between the resource's offer and the revenue earned through the market clearing prices, make-whole payments are provided. The markets also use mitigation procedures to protect against abuse of market power and to ensure that bids reflect true variable costs. Market participants are able to hedge against transmission congestion costs in the day-ahead market by using financial transmission rights.

The organized markets must also procure sufficient capacity resources to meet peak load. Some have mandatory capacity markets designed to incentivize investments and to allow resources to recover their fixed costs, thus ensuring long-term reliability. Other organized markets do not have mandatory capacity markets and rely on other constructs or revenues earned through energy markets for fixed-cost recovery.

While the basic organized wholesale electric market designs in the United States have now been in place for more than 15 years, there are still opportunities to identify best practices and areas of improvement. One of FERC's priorities has been to improve price formation in the organized electricity markets. As the resource mix and market needs change – driven in part by technological innovation and lower fuel costs, as well as federal and state public policies – it will be important to continue refining policies to ensure reliable delivery of electricity at just and reasonable rates.

Regional cooperation at the heart of a secure, sustainable and competitive energy market



Dominique RISTORI

Director General of DG Energy, European Commission

High energy dependency and energy affordability are of increasing concern to Europe's households and businesses. Ensuring secure, sustainable, affordable and competitive energy for all citizens has become an ever more pressing need and the ultimate goal of the Energy Union. In this context, well-functioning energy markets that ensure secure and sustainable energy supplies at competitive prices are essential for achieving growth and consumer welfare in the European Union.

The Framework Strategy for the Energy Union includes mutually reinforcing initiatives which – when fully implemented – will ensure that the EU is better placed to meet the challenge of ensuring secure, sustainable and affordable energy for EU citizens and businesses based on solidarity and trust between Member States.

Europe's electricity markets are undergoing profound changes. The electricity sector will play an important role in implementing the Paris Agreement and decarbonising the EU economy. Today in Europe, 27% of the electricity generated comes from renewable energy sources. This figure is likely to reach 50% by 2030. Mostly based on wind and solar power, renewable generation is both more variable and decentralised than traditional production. The transition towards low-carbon electricity therefore poses a number of challenges for the secure and cost-efficient organisation of Europe's electricity market and requires the electricity sector to be operated more flexibly and efficiently.

The energy transition will only be successful if consumers are given the power to drive it forward. New technologies and the digitalisation of the energy sector with smart meters and

smart homes appliances offer new opportunities for improving the flexibility of the system and enabling consumers to actively participate in the market and manage their consumption.

Moreover, with electricity markets becoming more integrated and interdependent due to increased interconnection and cross-border trade, national decisions and electricity crisis situations often tend to have an immediate cross-border effect.

As a result, a new framework is needed to address these challenges and opportunities. Reaching the Energy Union's goals involve moving away from a purely national approach to a true internal market perspective.

To live up to this vision, the Commission will come forward before the end of this year with a series of legislative proposals to deepen the integration of the internal energy market and step up regional and EU-wide cooperation.

The new market design together with the revised renewable energy directive will redefine our electricity markets in order to reconcile the integration of the increasing share of renewable energy sources with stability, investments and the growing role of consumers.

In this context, **regional cooperation will be instrumental.** It is already becoming a reality with the rise of cross-border trade, the implementation of projects of common interest and the creation of regional high-level groups to accelerate the implementation of critical energy infrastructures and increase regional coordination. We need to build our policy on these successes and go beyond in order to face the challenges ahead.

In this context, we need to ensure that the necessary hardware is in place to underpin the ambitious new market design, with the objective to reach an electricity interconnection target of at least 15% of installed capacity by 2030. Currently, missing opportunities to exchange energy with neighbours remain an obstacle to the internal energy market. Even where interconnectors are in place, they often remain unused due to a lack of coordination between Member States. Rules are therefore needed to ensure that the use of interconnection is not unduly limited by national interventions.

Member States must coordinate and cooperate with their neighbours when developing their energy policies.

First, in light of the 2030 objectives, considerable new investments in electricity generation capacity will be required. To implement the energy transition, the largest part will be towards variable renewable generation, complemented by more predictable and flexible forms of power generation to ensure the security of the system.

The new market design aims at creating an environment that is favourable to investments by ensuring a level-playing field among all generation technologies and resources and removing existing market distortions. Investments will be market-driven based on reliable price signals that reflect the real value of electricity when generation is scarce and demand is high. This will facilitate the integration of renewable energy into the market and will increase the flexibility and security of the electricity sector.

However, uncoordinated state interventions in the electricity sector remain a key issue in the internal energy market, as they can distort market signals and limit electricity trade across borders. In this context, a more coordinated approach to support schemes to renewable energies across Member States is needed; likewise when it comes to generation adequacy. Currently, we see certain Member States introducing uncoordinated measures to remunerate generation capacity and secure electricity supplies thus risking distorting the internal energy market. For this reason, we need to set out a European framework for capacity remuneration mechanisms that is open to cross-border participation and includes a common approach to adequacy assessment. In other words, we need to ensure that **Member States take into account the contribution of the internal energy market and of their neighbours** in their own adequacy assessment.

Additionally system operation is much more interrelated today than it was in the past. This is due to the increase in variable and decentralised generation, together with closer market integration, especially in shorter market time intervals. More cooperation is therefore needed in the way we organise the work of system operators. **Transmission system operators need to cooperate closely** in order to coordinate investments and raise efficiency in network planning and operation.

Finally, in an integrated and rapidly evolving electricity market, **security of supply cannot be considered as a national issue anymore;** it requires us to develop a more integrated and coordinated approach, based on the principles of solidarity and cross-border, regional co-operation, particularly when dealing with crisis situations. Member States need to be better prepared for unexpected events and this is where a European approach is also necessary.

In a nutshell, regional cooperation is the main driving force for market integration and contributes to reaching the objectives of security, sustainability and competitiveness of energy in the European Union. And most importantly, regional cooperation brings people and population closer together.

Gas and Renewable Energies, the Best Allies for Generating Power



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Patrick POUYANNÉ
Chairman and CEO of TOTAL

Demand for electricity is growing faster than primary energy demand overall. To square with the history-making target set by 195 nations at COP21 in Paris in December 2015 to keep global warming below 2°C, gas and renewable energies will have to gain ground in the power mix. The International Energy Agency expects gas to make up 22% and solar and wind power 8% of the global energy mix in 2035, compared respectively to 21% and 1% today.

Through our affiliate SunPower, we rank among the top three globally in the solar industry and want to keep growing across the photovoltaic value chain, by designing and manufacturing cells, building utility-scale solar power plants and marketing integrated solar solutions that combine solar energy, storage, digital optimization tools for distributed power generation. All told, SunPower has deployed more than 6 gigawatts of photovoltaic capacity worldwide.

But if renewable energies are to be developed on a large and profitable scale, we must address the challenges associated with their intermittency, and consequently connecting them to grids at a cost that local communities can afford. The availability of solar and wind energy varies greatly depending on the weather and the time of day and does not always match demand, which itself fluctuates.

But consumers have every right to expect to have power when they need it, which means that it always has to be available.

Storage is one solution to offset the intermittency of renewables. What's more, we just recently acquired Saft, an industrial flagship recognized globally for its technological know-how in batteries. Saft will allow us to add electricity storage solutions to our portfolio, absolutely necessary to the profitability of renewable energies.

When it comes to generating power, gas is the best fit for renewables since it can offset the intermittency of solar and wind energy thanks to its flexibility. Gas also has the advantage of being the lowest-carbon fossil fuel, since it emits only half the amount of CO₂ as coal, which is still far too widely used to generate power. That is why it's crucial to send a strong price signal to energies that curtail CO₂ emissions, and therefore global warming, while adding flexibility to the system. Steering private sector investments towards low-carbon technologies is vital if we want to keep global warming under 2°C. Putting a price on carbon is one of the most efficient mechanism to achieve this. The main priority is to switch from coal to gas for power generation. A carbon price of USD 30 to USD 40 per ton would be enough to promote the switch and encourage R&D in low-carbon technologies, such as carbon capture, use and storage. This is why we have campaigned with five other oil and gas companies for the prompt introduction of carbon pricing mechanisms in the world's main regions. At Total, we have applied an internal carbon price to all our capital spending decisions since 2008. It currently varies from USD 30 to USD 40 per ton of carbon, depending on oil prices. And to walk the talk, by the end of 2016, we will no longer be involved in any kind of coal businesses.

Gas now accounts for 50% of our production, up from 35% ten years ago. We want to develop it, by investing in the gas mid-stream and downstream to speed the growth in demand for gas. As we actively promote gas, we are closely tracking and reducing methane emissions. We are also curtailing routine flaring at our facilities, which we cut by 67% between 2010 and 2015, which we want to

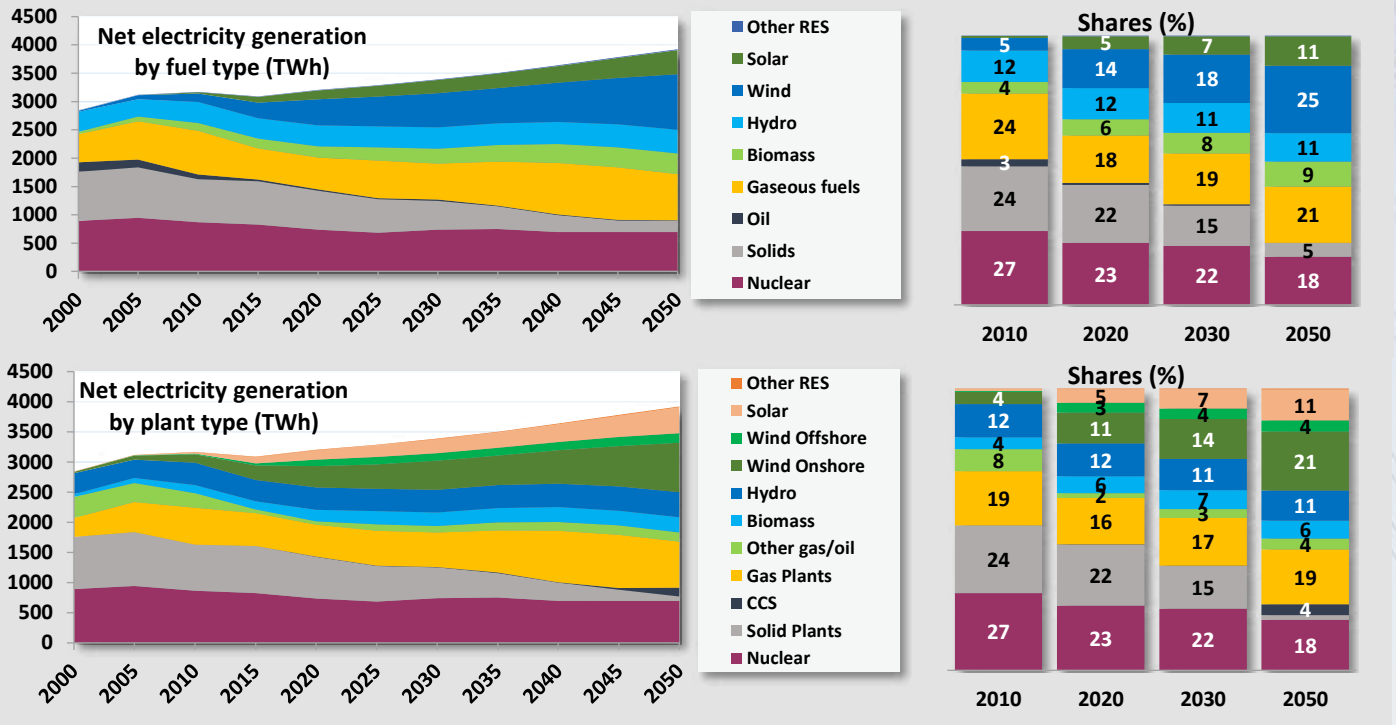
reduce by 80% over the period 2010-2020 and want to eliminate outright by 2030.

Electricity will not be able to meet all energy requirements, particularly those related to transportation. Electric cars will continue to gain ground, particularly in urban areas, but it will take some time before they account for a significant share of passenger cars worldwide. We too often overlook trucks, aircraft and ships which still rely on fossil fuels. The International Energy Agency's 2°C scenario for 2035 predicts that oil will still account for around a quarter of the energy mix and that fuels made from biomass will make up a larger share than today. We've been producing biofuels for over 20 years, are a leading biofuel marketer in Europe and plan to step up our leadership in biodiesels and biojet fuel. By next year, our La Mède refinery in France will have been transformed into a world-class biorefinery. We also invest in second-generation technologies which will complement traditional biofuels in the future.

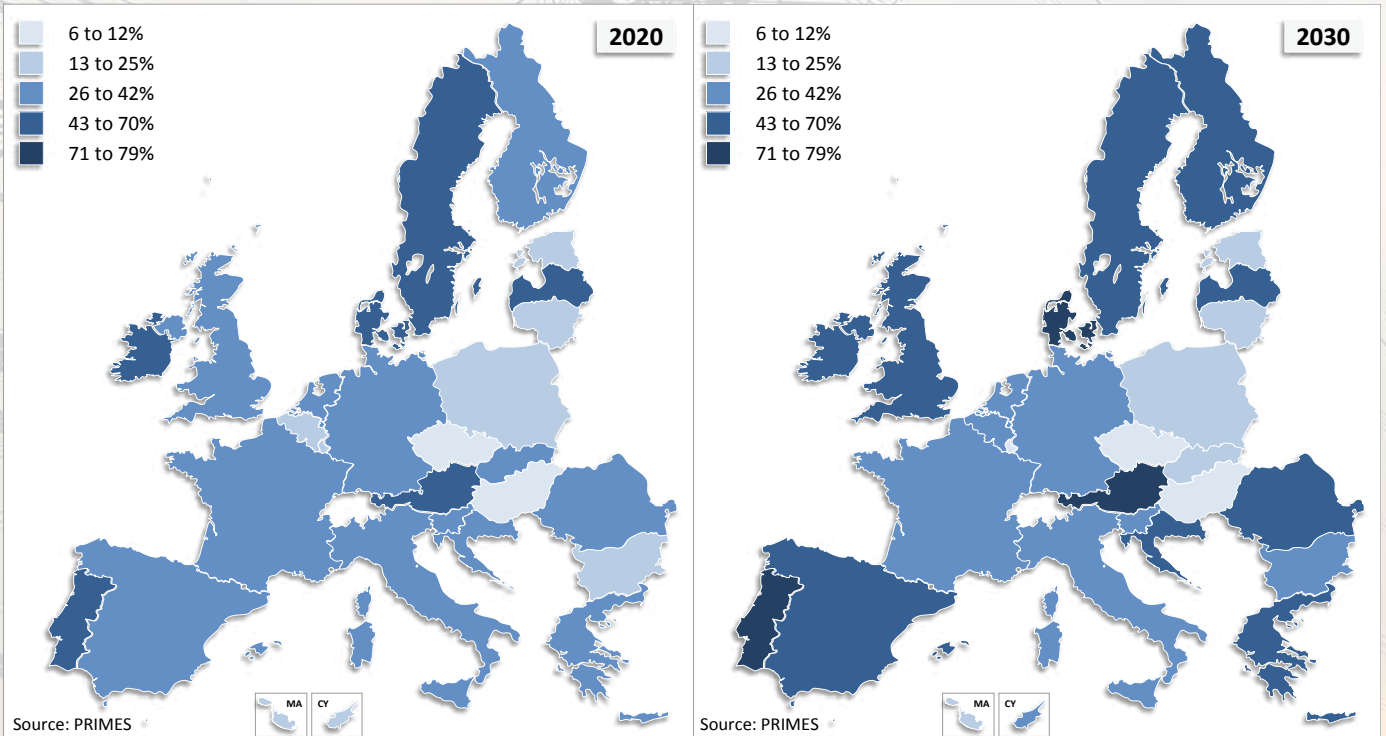
The 2°C goal can only be achieved if we better target how we use energies. Gas and renewables coupled with energy storage are expected to be the power-generation base, replacing coal. The use of oil will have to be concentrated on transportation and petrochemicals, where they're still necessary, but where other energies, mainly gas but also biofuels, will also play an increasingly bigger role.

ELECTRICITY GENERATION BY FUEL AND BY PLANT TYPE

Source : European Commission



RES-E SHARES IN EU MEMBER STATES IN 2020 AND 2030



When hidden costs make market fail



Claude TURMES

MEP (Greens) Shadow rapporteur on the EP own-initiative report "Towards a New Energy Market Design"

There is no doubt that the EU needs to critically change its electricity market organisation to adapt it to the new energy world marked by two trends: a more decentralised and miniaturized generation combined to a more flexible demand.

This cannot be achieved by limited cosmetic adjustments. On the contrary, it requires political courage to address the real challenge: the EU should remove the currently observed electricity generation overcapacity and stop public subsidies to fossil fuels and nuclear energy. I am concerned that the Commission tries to propose some necessary technical improvements without seeing the bigger picture and addressing the most contentious issues.

The integration of a significant amount of renewables in the energy system is the result of the 2008 energy and climate package establishing a vibrant home market for green technologies thanks to a strong governance architecture. Unfortunately, the entry on the market of so much new capacity has not been compensated by a shutdown of equivalent conventional capacity. In conjunction with a stalling or even slightly decreasing electricity demand, this leads us to a situation where available generation capacity is way higher than demand, therefore driving electricity wholesale prices to historically low levels. This assessment of the electricity market is still fiercely combatted by the conventional

operators of this world who intend to keep their old, dirty and inflexible power plants on-grid for as long as possible.

Indeed overcapacity has been poorly documented so far. The recent works of ENTSO-E on Mid-Term Adequacy Forecast is a step in the right direction. But should the crucial task of formulating a common methodology for system adequacy assessment be left to TSOs only? I believe the production of ENTSO-E should be analysed by ACER and, *in fine*, approved by the European Commission so that a truly harmonised methodology is agreed upon. Of course, system adequacy assessment only makes sense when it is done at macro-regional level. We are now progressing towards a better and better interconnected market. It means that electricity can flow from regions where there is a surplus to regions where there is a shortage, making it easier for grid operators to ensure the stability of the whole system.

Conventional power plant operators oppose this vision. They are playing a very dangerous game, pretending that there is not enough generation capacity in Europe and that such a situation could threaten security of electricity supply. In other words, they are blackmailing public authorities to collect even more subsidies via so-called capacity remuneration mechanisms (CRMs). In the absence of a coordinated European methodology assessing system adequacy at macro-regional level, Member States are developing uncoordinated national CRMs which are likely to hinder the achievement of the internal energy market.

How can we phase-out so much conventional capacity rather than subsidising it further? The European carbon market is obviously not an appropriate response. In light of the numerous loopholes introduced in the ETS, the constantly depressed carbon price is not sending operators the right signal. Therefore, complementary measures need to be established at EU or macro-regional level: an emission performance standard and a carbon floor price. The conjunction of these two instruments would resorb over-capacity by pushing most coal and lignite power plants out of the market.

Secondly, Commission and Member States need to tackle market distortions caused by

privileges granted to nuclear. Nuclear energy operators are not in a position to cover the entire cost of the safe management of the radioactive waste they produce nor the one of the decommissioning of existing plants. As long as there is no harmonised framework imposing operators to establish and contribute to segregated decommissioning funds based on a contribution on the kWh of nuclear electricity sold on the market, the situation won't improve. Similarly, more than six years after Fukushima, there is also no common liability regime for nuclear. Contrary to other market participants, nuclear operators are exonerated from the obligation to subscribe insurance that would compensate the entirety of the damage caused by an accident. In a nutshell, nuclear operators are the only ones escaping the polluter-payer principle enshrined in EU treaties.

Fixing these distortions should be the first priority of the Commission when designing a new electricity market. A coordinated phasing-out of conventional capacity would have numerous benefits for the electricity market itself. Firstly, it would contribute to a slight increase of the wholesale electricity price by extending situations of scarcity, hence allowing investors in renewable energy sources to get a higher part of their revenue from the market. Secondly, it would allow getting rid of rigid "must-run" plants incompatible with the modern flexible electricity market. Finally, it would represent a major contribution to the fight against climate change and offer better air quality to European citizens.

In parallel, the EU should of course adapt the way its electricity market is organised by promoting flexibility via several regulatory improvements: incentivising electricity storage, promoting self-generation, developing the intra-day market with shorter gate closure time and near real-time management, opening-up balancing and ancillary services markets to renewables, promoting aggregators to encourage demand-side management.

A combination of all these elements would allow the EU to move away from the old energy world and become a front runner in the establishment of a clean, flexible, efficient, reliable and climate-friendly electricity market based on 100% renewable energy sources.

Getting the electricity market design right to win the challenge of the low-carbon transition



Antonio MEXIA
President of EURELECTRIC

Twenty years after the entry into force of the First Energy Package, the upcoming review of the EU electricity market design is a unique opportunity to push the European agenda forward and anticipate the future challenges of the electricity sector, which is rapidly transitioning towards a low-carbon economy.

Decarbonisation of the power sector is essential to guarantee the long-term sustainability of the EU and global economy as there is currently no energy carrier that can decarbonise to the same extent and scale as electricity. In 2014, 56% of electricity generated in the EU came from low carbon sources: 28% was generated from renewable energy sources (RES) and 27% from nuclear. Given our commitment to a carbon-neutral power sector by 2050 and to help electrify other sectors like transport, heating and cooling, we believe that a revived electricity market design is key.

The internal electricity market must be completed. The Third Energy Package and the integration of wholesale markets across all timeframes through network codes is the cornerstone of the electricity market design. To effectively make the market fit for renewables, we must ensure the full integration of day-ahead, intraday and balancing markets, and implement shorter gate closure. Wholesale prices must also be allowed to adequately reflect scarcity, thus helping to provide investment signals that can be trusted

by market participants. In complement, long-term price signals should be provided to investors so that the investments that are necessary to pursue the decarbonisation agenda come forward, recognising that energy-only markets no longer provide the needed signals for long-term investments.

Next to our decarbonisation objective, we are committed to a European binding objective to achieve at least 27% of renewables by 2030. The post 2020 framework for renewables must therefore ensure a coherent approach that takes into account the contribution of all sectors – heating, cooling, electricity and transport. In the transition phase, the EU ETS should be the main driver for RES investments in the electricity sector. It is an established, technology-neutral instrument that can bring an increasingly EU-wide approach to low-carbon technologies. Strengthening the EU ETS is therefore a no-regret option to increase the competitiveness of low-carbon technologies such as RES and nuclear, and encourage fuel-switching to low-carbon sources. But measures here should be consistent with the desired effects, which has not fully been the case until now. It is likely that some Member States will continue supporting RES after 2020 as the current market conditions and EU ETS price do not provide sufficient investment signals. Support schemes should be market-based, such as competitive tenders, ensure cost-efficiency, minimise distortions in the wholesale market and minimise the capital cost of investments.

Through this transition we will need to provide security of supply to European households and businesses. To this end, we support a more regional approach to the implementation of capacity markets. As made explicit by the DG COMP inquiry into capacity mechanisms, many Member States are already introducing different types of capacity mechanisms to ensure security of supply. This in depth analysis sheds light on the security of supply challenge and on existing instruments. We agree with DG COMP on key features for capacity markets: they should be open to generation, demand response, storage, and also allow for the contribution of capacities across borders. Well-designed capacity markets contribute to giving longer term investment – or divestment - signals to ensure security of supply.

Empowered customers will play a crucial role in the next decades. Using the most modern technologies such as heat pumps, electric vehicles, home management systems and connected objects, customers will have unprecedented control over their energy use. The need to integrate increasing shares of variable renewable energy sources (RES) into the system makes demand side flexibility more and more relevant. These developments require clear rules which enable participation of customers in the market and a fair competition between all resources (generation, demand response, storage). In order to better integrate final consumers into the system, retailers should be allowed to develop innovative products such as retail offers that incentivise efficient response from customers. The structure of retail prices today creates distorted investment signals and losses of social welfare. Most of the costs that are behind customers' bills are fixed and thus do not depend on the volume of electricity consumed. Yet, due to regulatory requirements, they are mostly collected on a volumetric (€/kWh) basis. This price structure leads to distorted investment signals (especially in self-generation) that result in increasing retail prices for all consumers who remain supplied via the grid. This could in the end lead to a "consumer divide" as the number of consumers connected to the grid continues to shrink and the unit price of electricity increases.

To allow for the energy revolution to be carried out in the most cost efficient way, customers, energy companies and policy-makers have the responsibility to help designing a regulatory framework and an adequate governance which is adapted to the needs of the moment, forward-looking and able to flexibly adjust to the challenges ahead. Technology is clearly leading the way, all the others should be able to cope.

How energy markets can integrate



Ambroise FAYOLLE

Vice President, European Investment Bank

Crawl through a tunnel 8.5 km long under the Pyrenees and you will be following the trail of energy integration's future. The tunnel is part of a 63 km interconnector that carries electricity between Santa Llogaia, near Figueres, and Baixas, close to Perpignan. Completed in 2015, this collaboration between RTE and REE, the French and Spanish electricity transmission grid operators, doubled the electricity exchange capacity between Spain and the rest of Europe to 2800 MW. The benefits flow in both directions—exchange of surplus renewable generation from wind and hydro, more efficient use of gas and nuclear plants, higher security of supply during cold winters. The project was the first line to cross a European border using innovative converter technology that turns alternating current into direct current very quickly. Almost half of its EUR 721 million cost was funded by the European Investment Bank.

Energy infrastructure is not cheap, but its development is key to Europe's economic future. It brings savings to consumers and boosts economic growth by making energy cheaper for businesses. The benefits of full market integration by 2030 have been put at EUR 30 billion per year for gas markets and as much as EUR 40 billion a year for electricity markets.

The EIB has extended loans of EUR 19 billion to EU Projects of Common Interest

contributing to the integration of energy markets since 2000, of which EUR 10 billion directly enhance cross-border transport capacities. Support for the construction of infrastructure is the Bank's main role in this vital sector. The EIB invests in projects that support growth, energy security, and the sustainability of energy production, transformation, and use in European markets.

Naturally the EIB embraces the harmonisation and definition of common rules, policies, and incentives, as well as measures to share physical resources underway in the market—such as the current efforts to define EU-wide network codes in electricity and gas. After all, the value of cross-border infrastructure is unrealized whenever there are laws and regulations preventing transmission-system operators from easily contracting for services with the resources located in other Member States. There are still many areas where market integration needs to be enhanced, ranging from market balancing and grid management to increasingly strategic and complex questions of security of supply, the integration of renewables, and investment planning. Value will grow through the effective and efficient use of resources, management of competition, regulatory stability and increased market size. We work closely with the European Commission and tailor all our projects to conform to EU policy. The Commission's leadership in energy markets is inspiring for our engineers, economists and loan officers, as they structure the deals on the ground.

And that's what counts, in the end. The implementation of EU policy through facts on the ground. No amount of harmonisation will be effective without improved infrastructure. You can give consumers and businesses the *right* to do something, but if you don't build the pipes and cables to enable them actually to do it, the benefits will obviously never accrue. This is a vital consideration in areas of Europe which have been less integrated. Before the Santa Llogaia-Baixas connection, the Iberian Peninsula was an appendage stuck on the edge of Europe's network, rather than an integral part of it.

The impact of such projects is tremendous in southern Europe. For the Baltic States it is even more significant, because they remain

part of the old power systems of the Russian Federation and are highly dependent on Russian gas supplies. In the current political situation, that is a risk to their energy security. The EIB is funding a number of projects to integrate the Baltics fully into the EU's internal market.

The Bank loaned EUR 65 million for the Lithuanian part of that country's interconnector with Poland, known as the LitPol Link. The loan backs the 51 km of the route within Lithuania, as well as other infrastructure. The project is now in the final testing stages.

In Klaipėda, the EIB has funded a liquefied natural gas terminal and the 110 km gas pipeline that will connect it to Lithuania's gas network. Like LitPol, the terminal and the pipeline make Lithuania, Latvia and Estonia, less dependent on Russian gas, in this case because they can be supplied by sea. The competition from the new supply option has been key in driving a 20% reduction of Russian gas prices to Lithuania.

It is important for the EU to build efficient links with neighbouring countries too. The EIB put EUR 200 million into a EUR 461 million project for an undersea high-voltage direct current link between Norway and Denmark that was inaugurated last year. The 240 km link beneath the Skagerrak strait increases by about 70 percent the interconnection capacity between the two countries. The Bank is also appraising projects interconnecting Europe with other neighbours, which may be considered under the Investment Plan for Europe's European Fund for Strategic Investments, where they represent innovative technological developments and risk levels beyond the Bank's typical business.

All of this is a massive physical undertaking. These are very long pipelines and cables, linked to enormously complex and technical networks. It is the priority of the EIB, the world's biggest lender, to make the funding available for the task. The gas and electricity that moves through these gigantic projects will be the warmth and light that brings new life to Europe's economy.

National Transmission System Operators (TSO), providing strength through unity for the European electricity market



François BROTTE
CEO of RTE

At a time when the European Union is on decidedly shaky ground, the electricity sector in Europe stands out as one of the major success stories of European development.

By taking steady steps forward, the European Commission, Member States and grid operators have been able to create a vast interconnected system, stretching from Portugal and Ireland to the borders with Russia. In fifteen years, cooperation between Member States has come on in leaps and bounds.

The European electricity sector is founded on physical infrastructures: 305,000 kilometres of electricity lines, 341 interconnections linking 525 million European citizens. The grid continues to grow each year: according to ENTSO-E estimates, a budget of €150 billion will be required for new constructions between now and 2030.

Located at the heart of this grid, France has some 50 cross-border connections. The most recent links France and Spain, with 65 kilometres of direct current line running entirely underground, a world first.

Boosted by Transmission System Operators (TSO) and power exchanges, cross-border electricity exchange mechanisms are also being set up. Nineteen countries are now part of a single exchange area, with several projects

designed to expand the internal market in their early phase of development.

Thanks to these interconnections and market mechanisms, each European consumer has access to the cheapest power generation plants across Europe in real-time. The direction of these exchanges is dictated by price, to such an extent that it is now no longer possible to consume electricity generated exclusively from within our own borders. From one moment to the next, France switches between exporter and importer: electricity without borders.

With the huge drive to develop intermittent renewable energy, electricity exchanges on a European scale have become indispensable. Solar power and wind power are no longer the energies of the future, but are already in place, right here, right now. In Germany, the combined output from wind farms (43 GW) and solar power installations (38 GW) exceeds the generation capacity of the French nuclear fleet (63 GW). In Denmark, wind power has a 51% share of the total national power generation capacity. At all times, the electricity grid is distributing excess power or compensating for shortages caused by weather conditions, and can take advantage of spread phenomena, driven by the diversity

of generation sources and the different consumption behaviours in each country.

The large European grid enhances the electrical system's robustness: each Member State can rely on its neighbours to cope with any failures within its borders. However, this level of interconnection also contributes to the escalation of incidents, such as the one that occurred on 4 November 2006, plunging 15 million European households into darkness. To cope with the ever-increasing need for coordination between the transport system operators, RTE and Elia created CORESO in December 2008, which was later joined by British, Italian, German and Portuguese operators. Located in Brussels, CORESO is the first technical coordination centre to be shared between several TSOs, and operates 7 days a week, 24 hours a day. It provides TSOs with a vision of the electrical networks that extend beyond national borders.

Solidarity on the European electricity market is not just a buzzword.

However, this does not mean that Member States should give up all rights with regard to the management of the electricity system. On a national scale, Transport System Operators



are best equipped to sustain procurement security, both in the long term and the very short term.

As such, **national Transmission System Operators are best qualified to assess requirements in new electricity capacities, thanks to their in-depth knowledge of the grid, acquired through many years of experience.** Furthermore, power capacity requirements vary from one country to another (i.e. Germany, where intermittent renewable electricity generation facilities are now of very considerable size, or the UK, where the aging generation fleet needs to be renewed, or France, where struggles with winter consumption peaks continue. It is truly a case of fully applying the principle of subsidiarity).

The decision to implement capacity mechanisms on a national scale stems from previously-conducted procurement security analyses: **as an extension to existing diagnoses, each Member State is responsible for developing solutions in line with the problems it is facing** on condition that they comply with European rules, for example with regard to State aid.

Current thinking also entails transferring the supply-demand balance in real-time to supra-national bodies. The creation of a European operator would, in some ways, be the ultimate outcome of the European electricity market.

This transformation appears to be based on common sense: today, electricity flows do not stop at national borders, they cross throughout Europe. In that case, why not consider a shared operator? After all, this is very nearly already the case, with different reserve mechanisms being pooled? What would then be the added value of national TSOs, especially with the intraday market looking increasingly like real time?

We must keep from the illusion that we can separate ourselves from physical infrastructure. It is all very well organizing all possible markets, but we will still need to check that the network design basis can handle all the required transactions, and that they are always available at a given time. This is why energy transition needs TSOs that consider operating systems and managing physical infrastructures as one and the same thing. For example, an interconnection should not be organised for maintenance when forecasts indicate that it will be needed at full capacity because of a wind-power peak. In addition to these synergies, looking to the future, this power system will need to be coordinated with a digital network.

National TSOs are best positioned to fulfil this role of mediation between physical networks and the markets, between



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maintenance teams and dispatchers, between local and European level. .

Managing the supply-demand balance in real time requires prompt decision making. Each player has blinkered vision, seeing only its own supply-demand balance perimeter and often in very crude terms - in France, 52% of consumers are characterized by profiling rather than by actual measurements; **national TSOs have full knowledge of the system so they can make the best possible choices by pooling risks and reserves.** We must continue

to provide them with the means to act on behalf of the public.

Solidarity is first and foremost a question of trust: trust in electricity system operations, trust in its stakeholders, trust in progress made possible by European developments. This trust stems from striking the right balance between Europe and its Member States, and between markets and TSOs, which in their turn must be secured and strengthened by European directives.

Challenges of National Coordination for an integrated energy market



Morten PETERSEN

MEP (ALDE), Vice-Chair of the ITRE Committee

Energy has been at the heart of the European project since its beginning, binding us together across national borders. However, power is still supplied from national markets, and as electricity demand rises in Europe, we are faced with a series of challenges, which we can only address collectively.

To reach a fully integrated energy market, we must deliver on our Energy Union Objectives – Security, Decarbonisation and Competitiveness, which will only be possible if we reach our interconnection objectives - 10% of installed electricity production capacity of the Member States by 2020, in which regional cooperation is crucial.

An integrated energy market means more choice, lower prices and a more resilient power network. This creates huge opportunities for the integration of intermittent renewables, but only where our energy markets are modernised and outdated approaches to base load power are replaced by a far more flexible, inclusive and collective approach to energy supply and demand.

We can identify several main challenges that Member States will have to address in order to succeed in having a more sustainable and secure energy market with affordable prices for its citizens.

The first is the significant work required to achieve a better interconnected energy

infrastructure, which is already happening at regional level, for example, between the UK, Ireland and France (FUI regional market), by building undersea interconnectors. In 2014, 33 infrastructure projects were identified by the Commission as essential to improve security of supply and better connected energy markets. To end the situation of energy islands within Europe's energy market, we need to do more.

Improving infrastructure between countries involves major investments in generation, networks and energy efficiency. While the European Commission's Connecting Europe Facility will provide almost 6 Billion Euros until 2020, in total 200€ billion per year will be necessary, and therefore granting access to finance for the private sector will be the real challenge.

The European Investment bank is already providing the means for financing projects in energy networks, but small projects often don't have the knowhow to access such funds or the minimum loan amounts set are too high. This is something we need to address at European level, as well as reducing administrative burdens which arguably make the EU less attractive to investors.

The current market design does not ensure sufficient investments, as weak competition and fragmentation persists. This past April an internal study of the European Parliament found that diverging national energy policies and market rules are delaying market integration and EU legislation is not implemented effectively or in a timely manner. As such, a key challenge for better national coordination will be to move towards a more harmonised regulatory framework.

We have to take action and address these challenges. To remove bottlenecks and give a real impulse to cross-border energy trade, establishing smart grids and synchronising electricity systems would be the first step. Liberalisation of energy markets and free competition can become a reality by effectively applying the 3rd Internal Energy Market Package, in particular independence of regulators and cooperation among TSOs.

In order to ensure a better functioning of cross-border energy markets, the 3rd Package also includes the adoption of Network Codes, which once completed will help harmonise

the flow of electricity and gas across different transmission systems. The Agency for Cooperation of Energy Regulators (ACER) plays a key role in assisting national regulators, in particular on cross-border issues, but in its present form, and with its currently thinly stretched resources it can only provide opinions and recommendations. By strengthening its powers, it would be better suited to help MS with cross-border issues. The European Networks of Transmission System Operators for Electricity and Gas (ENTSO-E/G) needs to be upgraded. We have to create regional operational centres, so that they can effectively plan and manage cross-border electricity and gas flows.

Completing a successful energy transition integrating renewable electricity to the grid is calling for further flexibility of national energy markets, both on the supply and demand side, requiring an evolution of the electricity grids. Our decarbonisation goals can only be reached under the right market conditions for investing in energy efficiency. Moreover, we must find innovative market based solutions, as they will be the best remedy against uncoordinated national action and at the same time will help renewable support schemes become fully integrated and efficient.

Ending "subsidy shopping" and harmonising support schemes, subsidies tax incentives, would be a concrete action that Member States should implement to increase competition and develop the most adequate technologies at regional level. At the same time, eliminating environmentally harmful subsidies would make the support for renewables much more coordinated and compatible with the internal market, ultimately, much more efficient.

The Energy Union can only work if policy is developed and implemented in a coherent way. Europe needs a holistic approach to addressing these challenges. The broad failure to implement the 3rd energy package, demonstrates the weakness in the current system, and therefore we must aim for a tougher system of scrutiny, monitoring and sanctions in order to ensure a coherent approach. Member States will have to accept that solidarity and security can only be achieved through more supranational action and oversight.

Regional Cooperation – it is in our DNA



Dr KLAUS KLEINEKORTE
Chief Technical Officer of Amprion

Since its beginning in the early 1920s the European energy system grew from a system consisting of several separate power lines in different countries to one big interconnected system in Europe. Nowadays more than ever a close cooperation and coordination of transmission system operators (TSOs) is necessary to securely operate, maintain and develop the European transmission system. Therefore European TSOs strongly foster the regional cross-border cooperation and continuously intensify their efforts to secure grid stability for more than 525 million customers across Europe. They also contribute to achieve the completion of the single European Energy market.

In this respect, the European TSOs are in line with the European Commission (EC) that it is important to build up a closer cooperation between all involved parties as intended in the Energy Union concept.

The “Norwegian Pearl” – lessons learned

One of the biggest disturbances across Europe was caused in November 2006 when a power line in Northern Germany was turned off as a safety precaution to let the newly built cruise ship “Norwegian Pearl” pass underneath on its way to the North Sea. Following an in-depth analysis of the incident European TSOs took the initiative to establish a closer and strictly harmonized

regional cooperation. The main intention was to fully reflect the increasing impact of neighboring systems on each other and to best contribute to an uninterrupted energy supply. Within the European Network of Transmission System Operators for Electricity (ENTSO-E) they developed the so-called EAS (European Awareness System) which enables every TSO in Europe to exchange important operational information in real time and to check the system status and the frequency of each country as well as the exchange on each cross-border line.

Regional Security Coordinator – the TSOs’ prevention squad

In addition, within the past decade TSOs built up the so-called Regional Security Coordinations (RSCs) to support their work. CORESO (six TSOs, e.g. RTE (France) and Terna (Italy)) and TSCNET (13 TSOs, e.g. Amprion (Germany) and PSE (Poland)) are two well-known examples. These RSCs have been put in place to provide coordinated services particularly for cross-border issues in the operational planning phase. This voluntary approach became binding for TSOs with the signature of a Multi-lateral agreement (MLA) of ENTSO-E in December 2015 and adoption of the system operational guidelines. Based on this agreement TSOs work to implement the RSC model all over Europe by the end of 2017. The agreement also ensures that the main tasks of the RSCs are developed and employed in a harmonised and standardised way through coordination, management support, standards, methodologies and tools developed by and with TSOs.

In establishing the RSCs extensive efforts have been undertaken to set up the right frame for coordinated action. This includes building up and educating the necessary staff or creating and installing the necessary IT infrastructure and tools.

Until the end of 2017 the RSCs will have fully developed and implemented five core services (operational planning in the five areas: common grid model, capacity calculation, security analysis, outage planning and adequacy). They are an essential element for the day to day work of the operators in the control centres of the TSOs. Via the RSCs the TSOs are able to best use the existing grid infrastructure in Europe. This guarantees

citizens an extremely stable energy supply across Europe as the following example shows:

TSOs are strongly supported in their real-time operation by the preceding planning processes coordinated by the RSCs. In doing so, RSCs help to use the transmission system in the most efficient way and are an integral part of the security evaluation of the TSOs. They perform analyses that otherwise TSOs would have to do by themselves in a less optimal way as they would have to coordinate separately with each other.

Regional cooperation - but in full respect of the national liabilities

RSCs cannot replace TSOs. They are designed to support TSOs within the operational planning timeframe in order to have the best possible forecast of the situation across Europe in real-time. In order to perform real-time operation, TSOs over decades developed explicit knowledge of all details and specifics of their own system. The full decision-making power remains with the TSOs according to national regulations. In EU Member States the responsibility for system security is given to the TSOs by national legislation. Therefore, it is indispensable that TSOs must be able to operate within their national regulations. They are subject to national legal liabilities which cannot be transferred to a cross-border regional level. In addition, a so-called Regional Operational Centre (ROC) would in fact duplicate existing structures and would not cover the legal liabilities.

Outlook: never change a winning approach

The recent adaptation of European TSOs’ cooperation has been the main reason why the “Norwegian Pearl” incident did not happen again. The TSOs have drawn the necessary consequences without any need of being carried to the hunt by European legislation. Pursuing regional cooperation is the best approach to further improve the stability of the European grid without unduly interfering in complex national responsibilities. The TSOs are ready to walk the talk because electricity regionalization is in their DNA.

Energy market design: yes but without electric myopia !



David BERMAN

Deputy Company Representative to the EU institutions, Veolia

When it comes to the energy market design some key facts need to be taken into consideration so the focus is not narrowed to the important but not unique question of electricity markets.

Heat used in buildings and for industrial purposes represents more than 6000 TWh/year in Europe, twice the amount of electricity produced. Fifty percent of fossil fuels are consumed for heat generation purposes (for gas: 75%). It is then obvious that the highest potential in reducing fossil fuels consumption and correlated CO₂ emissions lies in reducing heat consumption and switching its production from “dirty” heat to renewables: in particular via reuse of waste heat from incineration or industrial processes, and combustion of biomass, biogas or non-recyclable waste.

District heating and cooling networks (DHCN) enable a progressive transition to these renewable sources at a scale and pace that no individual solution at dwelling or building level can match. They represent a huge proportion of the cogenerated electricity capacity installed in the EU (113 GW) – power that is produced and consumed locally, limiting the need for expanding the grids.

The progressive increase of the share of renewable energy sources in gross final consumption from 8.5% in 2004 to 16% at present illustrates that there is a need to adapt the organization of electricity markets. However, this process should be conducted while taking

into consideration that currently biomass accounts for 63% of this 16% share.

DHCN also offer the possibility to store cheaply and efficiently excess power generated by intermittent renewables such as wind and solar, under the form of hot water or ice.

From our perspective - as an operator and energy provider - designing energy markets fit for the future involves a number of pre-requisites enabling to take full advantage of DHCN as a useful balancing tool for electricity networks, both for generation and storage needs.

1 - District heating and cooling networks, cogeneration and biomass: a game changer for designing a sustainable energy market in Europe

In order to achieve the 27% renewable target in the energy consumption by 2030, electricity generation should tap into locally available renewable sources. **District heating networks coupled with cogeneration systems** allow the combined production of heat and power (CHP), delivering electricity at high efficiency (around 90%¹) and are particularly adapted to renewable fuel sources, whose availability is continuous, storable and scalable.

CHP also reduces the need to invest in transmission networks – a relevant argument at a time of scarce public resources.

Eurostat data from 2013 shows that about 12% of Europe’s electricity is generated in CHP plants, with a cumulative electrical CHP capacity in the EU amounting to 113 GW². However, we believe this potential is not sufficiently exploited and can be vastly expanded by taking into account the particular needs of cogeneration installations:

- **The design of electricity markets should be based on market principles** so that high prices signal the need for additional investments while lower prices indicate

over-capacities. Wholesale price signals would then be better reflected into retail prices, hence improving the profitability of conventional capacities providing flexible back-up, including cogeneration plants.

- **Recent development of capacity mechanisms is a worrying phenomenon**, which could run counter to the overall goal of opening and interconnecting Europe’s energy markets. The Commission interim report on capacity mechanisms³ shows that when the price paid for electricity capacity is set by the Member State it creates a serious risk of overpayment, thereby subsidising the capacity provider. In addition, **many capacity mechanisms do not allow all potential capacity providers or technologies to enter the market**. That can reduce the competition among suppliers or raise the price paid for the capacity. Therefore, these instruments should in addition to taking low market distorting forms, being open to cross-border participation and allowing for the participation of demand response and storage promoting schemes.



In Pecs, Hungary, Veolia turns wood and straw into energy to fuel the city’s district heating network. This 100% green network provides heating for 31,000 houses and 450 public buildings, hence, avoiding the emission of 400 000 metric tons of CO₂ per year. More than 170 local jobs have been created thanks to this activity alone. The built-in heat generating capacity of the installation is 70 MW, while its cogenerated power capacity amounts to 35 MW.

1 European Commission, DG ENERGY, Cogeneration of heat and power, <https://ec.europa.eu/energy/en/topics/energy-efficiency/cogeneration-heat-and-power>, retrieved 14 September 2016

2 Eurostat, Data on CHP (2012), retrieved 14 September 2016, <http://ec.europa.eu/eurostat/documents/38154/4956229/CHP+data+2005-2013/62e87958-0b9a-4195-af70-356493e12233>

3 http://ec.europa.eu/competition/sectors/energy/state_aid_to_secure_electricity_supply_en.html

➤ Ensure that consumers **remain connected to DHCN, while developing them further, where and when economically and technically relevant**, would help clients, operators and the general public strengthen confidence into that type of infrastructure.

Another crucial advantage of cogenerated electricity from biomass over other forms of renewable electricity stems from the fact that its production can be easily adjusted to demand.

Therefore, **energy storage should be given proper attention** if Europe is to achieve resilient, demand-responsive and flexible electricity generation.

2 - Energy storage should be an investment priority for the EU

To develop energy storage systems, **adequate public support mechanisms are necessary**. Drawing upon the track record renewable support has had in reducing the cost of innovative technologies; the use of energy storage should also be adequately incentivized.

District heating and cooling installations allow heat and cold storage, which can provide a very cost-effective solution in balancing the grid. That is why tailored instruments should be directed at power-to-heat, heat and ice storage as well as efficient cogeneration technologies. A broad definition of the concept of energy storage would help take full advantage from network-based solutions in this area.

The mid-term review of the State aid guidelines for environmental protection and energy could be an opportunity to accelerate the transition toward measures aiming storage technologies.

3 - Ensure all renewable technologies compete on a level playing field

While power generated from intermittent renewable sources (wind and solar) is at times in oversupply, the challenge of storing it as electricity is yet to be tackled economically.

National support mechanisms designed to favour intermittent renewable electricity sources reduced wholesale electricity prices to unsustainable levels and actually put both conventional (gas-fired) and non-intermittent renewable (biomass) CHP installations at risk, while the latter remain necessary to ensure back-up capacities. For this reason, EU legislation should level the playing field and **abolish grid priority dispatch so as to expose equally all generators to market signals**.

In an urban environment the **use of renewables should be considered at the district** and not at the dwelling or building level. Adding solar thermal or photovoltaic to a “leaky” building using individual gas boilers will do little to reduce its primary energy consumption – if compared to its connection to an efficient biomass powered DHCN. To make sure the optimal solutions are being privileged in urban contexts, we advocate that the **Energy Efficiency Directives (EED and EPBD) express energy efficiency targets in terms of primary energy**.

4 - Facilitate demand-response through smart management

Demand response management should be a central pillar of the upcoming energy legislative package.

Accelerating the roll-out of smart metering for all types of energy consumption (electricity, heat, and cold) is necessary in

order to achieve an adequate level of flexibility in terms of demand-side management. To this end, legislation should carefully look into concrete measures to strengthen the deployment of digital technologies, which are essential in helping Europe achieve its 2030 energy efficiency target. Indeed, smart meters are suitable and necessary instruments to help operators identify and eliminate system inconsistencies and energy leaks on networks.

Innovations in the realm of information and communications technology (ICT) also make possible the development of **smart, demand-responsive, energy management systems**.

Conclusion:

An efficient energy market design should not focus on “electricity-only”. It also requires support mechanisms for highly efficient DHCH and CHP systems, using biomass and enabling reliable storage capacities for electricity produced from intermittent renewable energy sources. Such market should also allow for the emergence of proper conditions for a fair competition among renewable-based technologies and foster demand-response mechanisms, in particular smart energy management tools. With all those conditions met, the EU will be effectively on the path towards a less-energy intensive future.



In Braunschweig, Germany, Veolia converted fossil fuel powered central heating installations into a biomass cogeneration plant and a wood boiler. Two thermal storage units with innovative insulation also help ensure low heat losses. In total, the new installation provides 8,000 T of CO₂ savings annually. It relies on locally available waste wood supplies.



In December 2015, Veolia inaugurated its Hubgrade in Bilbao, Spain. This platform oversees, remotely and in real time, over 2,000 of the Group’s energy facilities across Spain. It collects and analyses data, set the interventions of Veolia technicians in motion on customer sites, and as a result help achieve up to 15% additional energy savings.

“Challenges of the IT-Smart Grids on reaching their full potential in the Energy Market”



Pilar DEL CASTILLO

MEP (EPP), Member of the ITRE Committee

Today there is no doubt that the digital revolution permeates all sectors of the economy, the energy sector is for sure not an exception.

Indeed ICTs have a major role to play. Not only is their potential great, regarding energy efficiency at the source (in primary energy production), tackling losses of (electrical), the

benefits that ICTs have to offer in efficiency, when referring to energy during transport through the grids, can be of such a volume that it should be considered a priority.

In addition ICTs can and should play a major role in promoting responsible energy consumption in households, transport and manufacturing. Smart meters, efficient lighting, cloud computing and distributed software have the potential to transform energy use patterns.

However in order to seize all the potential that the Digital environment has to offer there is a need for policy action in many fields, for example:

Firstly, one of the main issues that must be faced is that the ongoing deployment of smart meters and other elements of smart grids will generate massive amounts of data that will raise important questions in terms particularly in the management of the e-energy data streams, and responsibilities in terms of access rights, data privacy and cybersecurity.

Secondly, an integrated standardisation plan to identify and define key priorities for standardisation with a focus on essential sectorial interoperability and standards in areas such as energy must be developed.

And thirdly, Europe must be at the cutting edge in the development of energy-related Internet technologies and low-carbon ICT applications.

Nevertheless, as it happens in all other sectors of the economy, the potential of ICTs in terms of economic growth and competitiveness will not be a reality if we do not achieve a truly functioning Digital Single Market.

In this regard there is a need, for example, to: encourage large scale investments in fixed and mobile networks, ensure full access to the digital single market for consumers, irrespective of their place of residence or nationality and guarantee more capacity in our wireless networks.

Lastly it will be crucial to promote the different levels of skills. Regarding this last point, if consumers are not empowered through skills, the potential for smart meters, efficient lighting, Cloud computing and distributed software to transform energy use patterns will be very limited.



How can the Energy Market Design empower citizens?



Theresa GRIFFIN
MEP (S&D), ITRE Member

The European Commission should present before the end of the year a legislative proposal on a *New Energy Market Design*. This new regulatory framework is much needed, at a time when so many aspects of our energy system are changing: incredible growth of renewables and storage driven by our 2030 targets; digitisation of our economies enabling the development of smart homes, smart meters and demand side management; and a growing consciousness among Europeans that green energy and creating high quality green jobs is the way forward. Achieving the European Union 2030 energy and climate objectives could even mean that the share of renewable energy is likely to reach up to 50% of electricity produced.

In this context, citizens will of course have a key role to play as active participants in the energy system. A recent study¹ estimates that about 83% of EU households could potentially become prosumers, which amounts to 187 million energy citizens producing renewable energy, adapting their electricity demand to production or storing energy at times of over-supply. The European Commission has already highlighted that active participation in the EU's energy transition should be "one of the goals of the new market design".

Besides those objectives some concrete obstacles remain: untapped demand response potential, uncertain self-generation regulatory frameworks and retroactive changes in some Member States, limited and unclear offers. For each of these challenges, Europe needs to think how the energy transition will benefit citizens and how can the Energy Market Design empower citizens?

1. Building an appropriate framework to incentivise self-generation

Self-generation can bring real economic benefits to a growing share of European consumers. In 2013, Bristol Council became, for example, the first local authority in the UK to own a wind farm which powers around 2.500 households, helps the city reduce its carbon footprint and generates important income.

There is, however, a real need to establish the right incentives and conditions in order to promote self-generation and duplicate the Bristol example across the EU. This could be done through developing a common operational definition of prosumers as well as a common legal EU framework for the right to store and sell electricity at a fair price. Indeed, when opting for self-generation, citizens play an additional role as power producers; as such, and on top of their additional responsibilities, they should be given rights and safeguards.

There is also a need to simplify administrative procedures and encourage innovative financing. Upfront investment costs are high for self-generation and third-party financing, on bill financing or joint purchasing programmes, should be considered and incentivised at EU level.

Finally, when promoting self-generation, we should take into account potential perverse incentives: consumers who rely exclusively on the network should not be unduly disadvantaged compared to prosumers. Similarly, it is crucial to provide opportunities for all. Currently there are huge discrepancies in consumers' ability to self-generate, depending on whether they live in cities or in rural areas, whether they are home owners or tenants. Regulation should ensure that the benefits of self-generation can be realised by as broad a base of citizens as possible and provide at

the same time opportunities for low-income communities.

2. Ensuring consumers have a proper choice

A precondition for citizens' empowerment is giving consumers a choice and the ability to compare offers on the market. For this purpose, consumers should firstly have easy and timely access to their consumption data and related costs. Secondly, tariffs should be as transparent, comparable and clearly explained as possible, through access to trustworthy, relevant and independent price comparison tools. Finally, consumers should be able to opt-in for dynamic pricing and demand-side management through a choice of aggregators and energy service companies independent from their energy suppliers. The Energy Market Design should play a key role in giving consumers the opportunity to adapt their use of energy to take advantage of real-time changes in supply and demand. The development of smart technologies will be crucial for the energy transition and can also help consumers reduce their energy costs and improve energy efficiency. In this context, however, we also need to ensure that smart appliances ensure high levels of data protection.

Recent political developments have shown that Europe crucially needs to build confidence, give back hope and empower citizens. If rightly focused on citizens, the Energy Union and the Energy Market Design can be very powerful tools to achieve those objectives.

¹ *The potential of energy citizens in the European Union* ; CE Delft, September 2016

Putting Consumers at the Centre of a Changing Energy Sector



Lord MOGG

President of CEER and Chair of CEER's General Assembly, and is also Chair Of the Board of Regulators at ACER

The energy sector in Europe is undergoing significant change, driven by the interplay of market, technological and environmental developments. This change presents both opportunities and challenges for the sector. The Council of European Energy Regulators (CEER) and Europe's national energy regulators have a key role to play in overseeing the transition in a manner that benefits energy customers. As President and Chair of CEER, as well as Chair of the Board of Regulators at the Agency for the Cooperation of Energy Regulators (ACER), I am providing these observations primarily from a CEER perspective.

Clearly, there is already a welcome move in Europe towards putting consumers at the centre of the energy system. The full liberalisation of Europe's energy markets, which in many countries only became a reality about a decade ago, is empowering customers to choose suppliers that best meet their needs. This liberalisation is overseen by energy regulators and encourages innovation and efficiency in the sector. In addition, technological innovation is driving the planned roll-out of new Smart Meters in many European countries. This should further empower customers by giving them more active control over their energy demand and bills. By managing energy demand more effectively, Smart Meters should facilitate a more efficient and environmentally-friendly energy sector.

Recent years have also witnessed a rapidly changing electricity generation mix in Europe, with large increases in wind and solar power as countries strive to meet their environmental obligations. Some of this increase has been in the form of small-scale wind and solar generation in customers' homes, which can be referred to as "self-generation", altering the traditional distinction between generators and consumers. Much of this new renewable generation has been assisted by Government-mandated subsidy schemes.

While these developments are generally positive, they also represent a challenge for the sector and need to be managed carefully. For example, CEER believes that subsidy schemes for renewable generators, if necessary, should be cost-efficient and market-based, resulting in minimal distortions to Europe's energy markets. This is important for ensuring Europe's cost competitiveness in energy. Similarly, any move to more self-generation should be market-based and progressed in a manner that protects energy customers, including the most vulnerable. CEER has also identified the need for a stronger link between energy wholesale and retail prices so that customers face appropriate price signals.

Against this changing landscape, CEER continues to focus on placing customers at the heart of energy regulatory policy across Europe. Through CEER, European energy regulators cooperate and take a leading role in promoting customer protection and empowerment in energy markets. CEER has developed, with consumer bodies, a 2020 vision for Europe's energy customers, setting out principles for the energy market that place customers first: by providing a reliable supply at an affordable price, through simple to use energy services and in a way that protects customer interests and empowers them to participate in the market. Using these principles, CEER and Europe's energy regulators advance energy consumer policy.

Empowering customers to engage

To give an example from our current work, CEER encourages customers to compare energy offers and switch suppliers in order to benefit from competition in the market. Switching offers customers the most direct way to benefit from the energy market. Yet in practice only a few European countries have annual supplier switching rates above 10%. CEER has identified two potential barriers to supplier switching – customer perception of insufficient monetary gain or a complex

switching process; and commercial contract conditions such as unjustified termination fees. CEER supports energy regulators as they identify the switching barriers in their markets and choose the right tools to remove them.

Removing barriers to a well-functioning retail market

CEER's priority is to create a single, competitive, efficient and sustainable EU market which will benefit customers. In a well-functioning retail energy market, suppliers compete to attract and retain customers, and can do so by competing on prices, innovative services and products, or in other ways responding to customers' needs.

In 2016, CEER has focused on identifying existing barriers to entry for energy suppliers in European markets and ways of overcoming them. This includes issues such as access to customer and market information, regulated prices and the appropriate separation of network businesses from incumbent market players known as "unbundling". CEER has long considered that end-user energy regulated prices are not compatible with establishing liberal competitive retail markets and should be phased out as soon as practicable. With regards to unbundling, CEER advocates the effective implementation of existing EU energy law, including effective "re-branding" for vertically integrated undertakings, as the minimum necessary to avoid market distortion.

Promoting multi-sectoral, cross-authority cooperation

Energy regulators cannot achieve all of their objectives on their own. Hence CEER works closely with and engages the EU institutions, the energy industry, and consumer bodies in our annual work programme which has a core customer focus. We recognise that enhanced inter-authority cooperation on issues such as Smart Meters, the Internet of Things, data privacy and dispute resolution will help further Europe's Energy Union and Digital Single Market goals. This is why at CEER we have recently announced a new Partnership for the Enforcement of Energy Rights (PEER), a new forum which aims to enhance multi-sectoral, cross-authority collaboration to help consumers benefit from the new energy transition and increasingly interconnected digital world in which we live. We look forward to PEER commencing in the months ahead.

Making the way to prosumers



Dario TAMBURRANO
MEP- Movimento 5 Stelle - Italy - EFDD

Since the turn of the millennium, the technological advances and renewables installation cost reductions have opened the possibilities for citizens' active participation in the energy market. Numerous individuals, public entities and small enterprises have increasingly started, alone or collectively, either to produce, store or distribute renewable energy at a local level. These entities, generally referred to as "prosumers" or "energy citizens", are the cells of the increasingly decentralised energy market and essential players for the achievement of the EU's climate and energy goal towards a fully decarbonised economy, which we need as soon as possible. Moreover, energy production by citizens create a stream of value and benefits that can stay within the local level, in terms of resources freed up by fossil fuel expenses, creation of jobs and ultimately reduction of energy bills.

In 2015, it was recorded that 24,000 renewable energy cooperatives exist in Europe¹, an ever-increasing figure in recent years. Other research² estimates that photovoltaic (PV) panels on rooftops of buildings alone could meet 11% of Europe's energy needs over the

years to come. A recent study³ provides for the first ever estimates about the potential of decentralised energy production by citizens at European Level. Data are striking: by 2050, half of the EU citizens (including schools, local communities and hospitals) would be able to produce their own renewable electricity, and by doing so, they would be able to meet the 45% of the EU's energy demand.

These promising figures signals the huge potential of energy citizens and, thus, that further actions are needed at the EU level to fully unlock their potential for the energy transition. In fact, only a few countries in Europe have put in place stable policies supporting prosumers. Other countries are either not doing anything or even hindering the opportunities of active participation, by restricting the right to self-produce, self-consume and store, imposing heavy administrative burdens, punitive taxes or even retroactively changing the support schemes for generating renewable energies (one example is the *Spanish Sun Tax*). Unfortunately, we find some of these bad practices are also in Italy. Uneven and variable measures across Member States pose major challenges for investments certainty and further expansion of prosumers across the EU.

This is why the European prosumers need an ambitious and fair European Energy Union. The European Commission has set out its Energy Union strategy whereby one of its objectives is for "citizens [to] take ownership of the energy transition benefit from new technologies to reduce their bills, participate actively in the market, and where vulnerable consumers are protected"⁴. If this objective is to be achieved lessons must be drawn from past years and a legal framework should be established to protect, support and promote prosumers at EU level, as they are particularly vulnerable to governments policy changes and abuses from big market players.

The pivotal steps in developing an EU legal framework would be to reach a common definition at EU level setting prosumers' basic

rights and to put in place measures that would ensure a harmonised approach across Europe. Together with other colleagues, we strongly advocated and, finally managed, to have this message supported by a strong majority in the recent EP's non-legislative reports on "New Deal for Energy Consumers" and the "Renewable energy progress report". The importance of prosumers is mentioned also in the "Heating and cooling strategy" and even recognised in the far less progressive "Toward a new energy market design" report.

I am confident that the Commission will not disappoint European citizens and will translate the European Parliament calls in a clear and consistent EU legal framework for prosumers within the forthcoming winter package. I am in fact encouraged to hear Ms. Mary Donnelly (Director for Renewables, R&I, Energy Efficiency of DG Energy) answering our call when she recently declared, "the active participation of citizens and local communities will be the leitmotiv of the forthcoming EU legislations in the electricity sector". If this is will not be the case, I am ready to fight for make it happening.

Prosumers may be still considered a "side show" by many, but on the contrary, I am convinced that, with the growing grass roots involvement coupled with the needed political and economic support, they are set to be the key driver for the transition towards a 100% renewable-based and democratised economy in a very short time.

1 REScoop, "The energy transition to energy democracy", March 2015. http://www.collective-action.info/sites/default/files/webmaster/PUB_The-energy-transition-to-energy-democracy.pdf

2 Greenpeace Briefing, "Putting energy citizens at the heart of the energy union", April 2016.

3 CE Delf, "The potential of energy citizens in the European Union", September 2016. http://www.cedelft.eu/publicatie/the_potential_of_energy_citizens_in_the_european_union/1845

4 COM/2015/80 final.

Consumers deserve a better energy market



Monique GOYENS

Director General of BEUC, the European Consumer Organisation

Energy is an essential commodity. It heats our homes and powers our appliances, our phones, our lives. We would be lost without it. And yet our relationship with it is far from straightforward.

Today energy services hardly rhyme with simplicity, or with transparency. A recent European Commission survey among consumers placed the electricity market as the fourth lowest ranked service [1]. And who genuinely understands their electricity or gas bill? Why do our bills keep going up? Why is the process of switching energy suppliers sometimes so long or are the fees for doing so justified?

Time for change, says the European Commission. It has launched an Energy Union strategy and a 'New Deal for Energy Consumers', a blueprint outlining where it intends to take legislative action to put consumers at the centre of the energy market. Some competences lie with Member States. But the EU can make a big difference. Now that the Commission has said a lot of the right things, consumers' expectations are high. Lights, camera, action!

Understandable bills

Clearer, more understandable bills are the first step. Many Europeans still receive bills for electricity and gas that are several pages long. The layout is often confusing. The Commission should push energy suppliers to provide all information in simple, understandable language and in a format that is useful to consumers. For instance, there should be a box

displaying the key information. Consumers would then be able to compare different energy offers and switch suppliers.

Easier switching

Switching suppliers in the telecoms sector is relatively straight forward so why does it need to be more complicated in the energy sector?

The Commission has to put an end to switching practices that cause consumers a headache. Switching fees, long switching times or misleading practices only limit competition and wear down consumers who want a change in supplier.

'Green' tariffs

Consumers need accessible and understandable information with a clear description of the service available on the market. That means tackling so-called 'green' tariffs.

Today around 15 million households have opted for a so-called 'green tariff' which, suppliers say, supports electricity made from renewable energy. But, at the moment, current legislation allows suppliers to market tariffs as 'green' even though they may, in fact, be supporting coal or nuclear power plants [2]. Ask consumers what they think of that and you'll be met with disbelief at best, or anger at worst. The Commission should make suppliers substantiate their green claims and set up standards to clarify what can and can't be considered 'green' in a 'green tariff.'

These are just a few examples where we need better rules to get the basics right. When we talk about a more decentralised, decarbonised energy system, this must be a win-win situation.

Renewables

There is a recognition that consumers are not getting the best out of renewables at the moment. Millions of Europeans have over the past ten years installed solar panels on their roofs. But because the rules change so frequently and the price consumers get for selling their electricity to the grid is so low, it will take too long before the investment pays off, if ever. First, consumers deserve a fair price for the electricity they sell to the grid.

Secondly, the Commission should prepare a set of rules ensuring simplified installation, and priority grid connection and dispatch (which is the 'upload' of electricity to the grid). Consumers are not energy market experts and they should not be expected to meet the same

administrative requirements as large power plant operators.

Why the preferential treatment? Because the advantages of more consumers producing electricity are numerous. A more decentralised energy system, with millions of small, electricity-producing solar installations, would help clean up Europe's energy mix and reduce our energy dependence on often unstable foreign countries. In other words, it would be good for the consumer's energy bill, good for the environment and our energy security. A triple win!

New technologies and new energy offers

Energy market analysts see consumers playing an increasingly important role in balancing energy supply and demand in the future. By consenting to provide their flexibility to the market, consumers would allow an external operator to decide when some of their home appliances can be turned off. This is just an example of what is called demand-side flexibility. It would reduce pressure on the grid and save energy. But experts should not overestimate the role consumers can play.

Some consumers simply can not be flexible. That means there should be opt-in mechanism for this type of scheme. Consumers need to clearly see what's in it for them and it's only fair for them to expect a lower bill. The choice must always remain with the consumer. They should be able to choose from a range of offers the one that best accommodates their lifestyle.

All eyes on the Commission

Soon the Commission will issue a serious revamp of the EU's energy rules. It is much needed. Consumers struggle with even the most basic of energy issues and deserve better. The Commission seems to have understood that and is using all the right soundbites to underline that change for consumers is afoot. The time for action is just around the corner.

[1] See the European Commission's Consumer Markets Scoreboard 2016.

[2] To compile statistics on the production of electricity from renewable energy sources, the EU introduced a certificate called a Guarantee of Origin (GO) for every renewable megawatt-hour. However, because these certificates can be traded separately from the electricity, there is no guarantee that the money spent on a green tariff is actually supporting renewable energy, even if the supplier can present many GOs.

Toward a new market design: enhancing competition and security of supply for the success of energy transition



Xavier CAÏTUCOLI

CEO and co-founder of Direct Energie

The ambition to build the “Energy Union” officially announced in February 2015 as one of the 10 priorities of the Juncker Commission, is about to take a very important step with the adoption of the new “Market Design Directive” by the end of next year.

Why is this new text so important? Over the last few years, many significant questions have been deeply challenging the entire organization of electricity market: before all, the reinforcement of consumer’s place and the development of new electrical uses such as electric mobility, self-consumption or the growing use of renewable energies have directly questioned the entire market design. Moreover, the objectives of security of supply and competition, which today still aren’t completely achieved at European scale, also legitimates that a new regulatory frame be defined on both upstream and downstream sides, and that public authorities conduct necessary reforms to improve the functioning of the internal electricity market.

As the third actor of energy supply in France and Belgium and electricity producer, Direct Energie expects with interest this new set of reforms and the ambition of developing a “resilient Energy Union with a forward looking climate policy” expressed by the Commission. However, it is essential that the new market design enhances a strict balance between the new challenges of the energy transition, the

development of competition and the security of supply.

Before all, the question of security of supply requires that the issue of generation capacity is properly addressed. Over the last few years, many Member States have chosen to introduce national capacity mechanisms in order to ensure security of supply by guaranteeing sufficient remuneration to capacity providers. In fact, energy-only market today does not send sufficiently relevant price signals to foster capacity investment and efficiently contribute to security of supply. The implementation of capacity mechanism thus appears as an essential component of an efficient market design in Europe. To properly achieve this goal, they therefore should enhance both the sending of an intelligible price signal for investing in generation and demand-response capacity. However, as long as a relevant European answer has not been given, national initiatives are to be adopted in order to “ensure a high level of security of electricity supply”¹. The new Market Design directive should therefore be the opportunity to address the question of security of supply at a European scale by giving a clear definition of a common capacity reward mechanism.

In addition to those regulatory issues, other deep technological changes challenge the functioning of the whole market by strengthening consumer’s role and place. In fact, the growing use of data technologies and the development of smart-metering systems allow consumers to benefit from concrete leverages to become real actors of their energy consumption. It also enhances a complete redefinition of the supplier-consumer relationship: thanks to a better access to its personal energy data, the consumer will therefore become more willing to control its consumption and more demanding of energy efficiency innovations. This new energy empowerment, combined with the appearance of new electrical uses such as electric mobility or auto-consumption, represents a deep revolution on the electricity market which must be supported. However, it also requires a relevant definition of the

regulatory frame so that all actors can play their specific roles on the market and that suppliers can provide their customers with innovative energy efficiency services. The existence of a true competitive economic environment in the new market design could therefore directly benefit to consumers and to the environmental challenge.

The adoption of the new Market Design directive therefore provides an ideal occasion to answer the three objectives of promotion of the energy transition, security of supply and competition. The building of an efficient European regulatory frame is a major condition to guarantee that all three are being properly completed at national levels.

Direct Energie is the 3rd player on the French electricity and gas market, with a client portfolio of over 1.8 million customers on mass market. Direct Energie also launched the commercialization of its offers (electricity and gas) on the totality of Belgium territory in 2015.

As an integrated player in energy, the group pursues an industrial development strategy of its generation means. Since the 1st January 2016, Direct Energie has though completed the acquisition of a Combined Cycle Gas Turbine (CCGT) of 400 MW located in Bayet (France).

¹ DIRECTIVE 2005/89/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment



From COP21 to COP22 : it's time to deliver



Gilles PARGNEAUX
MEP (S&D), Vice-chair
of the ENVI committee

From 7th November to 18th November, we will have the first meeting of the countries who decided to contain climate change one year ago in Paris. 195 countries that have committed themselves to develop a low-carbon world.

We have to say it again: the Paris agreement was a huge success. Bringing together 195 parties with sometimes as many different views on climate change was no easy task. The famous quote of Mandela is relevant to describe how we felt then: *"it always seems impossible until it's done"*.

Nevertheless, in Marrakesh begins another hard work: delivering our commitments and transform our society into a low-carbon economy, able to contain global warming under 1.5 degree by the end of the century. To define this roadmap is one of the key challenges we will have to face in COP22.

The EU has been a leader in the negotiations to reach an agreement in Paris. Nevertheless, today, member states have been lagging behind the process of ratification. It's a very non positive signal for our commitment to a paradigmatic shift of our economy, more eco-friendly, geared towards a new economy and a new and powerful kind of growth.

Obviously, as I wrote it down in my report on COP21 adopted last year by the European

parliament, the EU must be a leader and a role-model in the fight against climate change. It means we have to redesign our electricity market, this is mostly what we are discussing in this review. But overall, to be a role-model in the wake of COP21 can also be made through a review of our European commitment to mitigate our emissions of greenhouse gases. To transform our electricity market goes hand in hand with a stronger environmental policy, these are two sides of the same medal.

It also means we have to rethink our relationship with our neighbourhood. The financing of the fight against climate change is central here. Our financial commitment here in Europe will embody our willingness to really cope with climate change, to help our neighbour and especially the ones who suffer the most climate change while they contribute the less to it. We have to bear in mind this single figure: Marshall Islands, who led the group of small islands, is responsible for 0.00001% of global emission of greenhouse gas. China and USA together represent 38%.

This is why we should step up our financial commitment and develop new innovative way to do so. In this year resolution of the European parliament, I call for, through my amendments, the setting up of a financial transaction tax, of which a large amount could be dedicated to the fight against climate change. This is another paradigmatic shift toward a new society, geared toward low carbon emission in all its aspects.

On the external aspect of our European policy, COP22 must emphasize on the

development of renewable energies in Africa. The new funds presented by president Juncker during his speech on the state of the Union, gathering up to 88 billion euros in order to fight the root causes of migration is a good news. We must make the most of it and call for the inclusion of a strong energy aspect in it.

Indeed, we already know that climate change and access to energy are deeply linked in Africa and must be tackled together. We also know that climate refugee are every day more numerous: between 2008 and 2013, 166 million persons have been displaced because of climatic catastrophes. According to the UN, by 2020, 60 million persons may be forced to move from sub-Saharan countries to northern Africa in the wake of an intense climate change in their home country.

This is why we must help our neighbour to cope with climate change, to face water scarcity, to mitigate their greenhouse gas emissions, to develop a new agriculture. On the other side, we should accompany them in developing the tremendous renewables energy they have: sun, heat, wind. All this can be done, inter alia, through this funds. Let's use it.

To work on our policies at home, like the electricity market design, and to help our neighbour to tackle climate change, in order to allow the emergence of whole area of low-carbon emission, a low-carbon society. It was the spirit of COP21. It must become the actions of COP22.



What role can energy efficiency play in the security of supply in Europe?



Monica FRASSONI

President of the European Alliance to Save Energy (EU-ASE)

Since the 1973 oil crisis several Member States have adopted national policies to reduce their import dependency and vulnerability to oil and gas price shocks. Energy efficiency and alternative energy sources were some of the solutions identified by legislators to address this issue. Unfortunately, the much more recent crisis in Ukraine in 2014 showed that measures already put in place are fragmented, insufficient and limited to national dimensions.

The EU is the world's largest energy importer with an annual import bill of €545bn¹. EU leaders are therefore aware that security of supply can be successfully addressed only at EU level.

As such, security of supply became one of the five interlinked and mutually dependant dimensions of the Energy Union, a top priority in the EU political agenda and EU leaders decided to address the issue calling for a comprehensive plan for reducing the current energy imports of about 60% of the gas and 80% of the oil the EU consumes².

A mix of different energy solutions and technologies can contribute to secure energy supply. New investments in gas and other infrastructures require a careful evaluation

and need to be compared against more cost-effective energy efficiency projects. Indeed, recent projections foresee a reduction in gas demand and an increase in electricity demand, so the risk is that some investments would become stranded before the end of their lifetime. The benefits of an integrated perspective on infrastructure and energy security are compelling³.

In this sense, key drivers of energy security are the completion of the internal market and notably more efficient energy consumption and production which need to be modernized and updated to reflect the energy transition from a fossil-based centralised system to a smart, low carbon and decentralised energy system.

The less energy Europe uses, the less it needs to import, and through energy efficiency technologies and services Europe can achieve energy security, but also energy saving, climate change and economic goals in the most cost-effective way.

Putting "Efficiency First" would contribute to gas import reductions by 2.6% for every additional 1% in energy savings. Along with this positive outcome, investing in the EU's full energy efficiency potential would save the EU over €200 billion net savings per year by 2020, leading to €250 billion per year by 2030, and would trigger over €714 billion worth of investment in the European economy and create or maintain over 11 million jobs in the EU⁴.

Energy efficiency makes economic sense, but it does not develop by itself due to several market and administrative barriers and lack of information. An EU long-term legislative framework that provides certainty for investments and removes barriers is therefore necessary. But such framework would require a firm choice between different long-term visions for EU development and energy system.

A first opportunity is the comprehensive set of energy legislations that will be published by the Commission in the Autumn which have the potential of increasing the energy efficiency market, by placing efficiency on a level playing field with energy production. The

proposed legislation must be part of a much wider set of structural reforms to really unlock market opportunities and align, with a holistic approach, different policies, also the ones not directly related to energy policies, but with the potential to increase energy efficiency investments.

Reforming accounting rules to take account the productive nature and competitiveness contribution of energy efficiency investments is an example of a structural reform which would boost demand for products, further spurring supply chain investment by innovative businesses.

Treating energy efficiency on a like-for-like basis with other infrastructures and reforming state aid treatment is another example as it would enable cities and governments to invest – particularly in larger scale buildings refurbishment programmes.

To conclude, security of supply must not be addressed as an isolated goal, but within a holistic long-term framework which covers different policies and objectives, identifies and boosts sectors with the highest potential.

There is growing consensus within industry that a binding EU energy efficiency target at 40% would further contribute to the political and financial prioritization of such investments and tap the EU cost-effective potential.

A lower energy efficiency target would be simply a political "non-target" as it will require destructive policy measures that slow down investments, innovation and employment. Indeed, the current evolutionary rate of energy efficiency improvement is about 1.5% per year, which brings us, by using existing available technologies, to 20% by 2020 and to 35% by 2030. Current discussions around a 27% by 2030 would be equivalent to a mere 7% increase in the period from 2020 towards 2030 and would therefore imply halving the current improvement rate to 0.7% per year.

Businesses gathered in the European Alliance to Save Energy (EU-ASE) are ready to invest in order to double the annual energy efficiency improvement rate to at least 3% per year in view of EU commitments to the Paris Agreement and the Sustainable Development Goals. If this happens gradually, such framework will boost re-industrialization driven by competitive low-carbon business models, sustainable investments, innovation and new skills for the good of European society and economy.

1 European Commission, 22 January 2014: Energy Economic Developments in Europe

2 European Commission, 2050 Energy Roadmap

3 "Energy Union Choices – A perspective on Infrastructure and Energy Security in the Transition", 2016

4 Fraunhofer ISI, on behalf of DG ENER, 2014

Investment infrastructure for network companies



Stephen BEEL
Partner OFGEM

As Europe continues to pursue its ambitions in relation to a low carbon economy and the delivery of the internal energy market, requirements for delivery of new infrastructure remain an enormous challenge. Many tens of billions of euros will be required over coming decades and securing this all from public resources is inconceivable.

Whilst there are often many other barriers to the delivery of such major infrastructure needs, such as in the supply chain or skills, finding ways in which to both fund and finance this infrastructure is a critical challenge. It is also important to differentiate between what those two terms, funding and financing, mean.

In the energy industry, we often talk about financing as the key barrier to the delivery of projects. Within Europe, there has been a particular focus on whether some network operators such as Transmission System Operators have the finances necessary to deliver major new infrastructure investment, particularly across borders.

In practice, in the majority of instances “finance” tends not to be the problem - there are significant levels of financing available for infrastructure projects in Europe. This is partly driven by the wider low-interest rate environment and lack of alternative investment options, but also by the inherent long-term stable characteristics of infrastructure. However, there are a number of related challenges which include:

- › Funding gaps – funding refers to how we actually pay for new infrastructure and for the financing costs that come with major capital expenditure. Improving the way in which we capture the economic value created by infrastructure and turn it into commercial revenue streams is a key challenge
- › High costs – too many infrastructure proposals suffer from unreasonably high costs that are not subject to sufficient competitive pressure
- › Structuring – investment opportunities may not be appropriately structured to maximise financing options and competition

There are many examples from the past where the commercial gains to be made from new infrastructure allowed the private sector to bring forward investment, based on the economic gains being created. In the UK and other countries the build out of canals and railways in the 19th century was largely funded privately and they continue to be a vital public good even today.

More currently, if we look at the trade in goods between European countries we can see perfectly well how infrastructure can be delivered through the private sector, with little or no recourse to public funds. Such models are able to deliver the financing necessary by securing visibility on the funding (i.e. the revenues they earn in the market). Around the northern seas of Europe there are multiple private container port operators and shipping lines, many of them European but additionally from further afield. In the container ports industry, operators from the UK, Denmark, Germany, Hong Kong, Singapore, Dubai and elsewhere are all active, investing significant sums of private finance in order to create the infrastructure necessary to take advantage of the gains to be had from trade, and more recently from the era of ultra large container ships. Is it possible that we could see similar markets develop to resolve Europe’s challenges in delivering greater cross-border investment in the energy sector?

One such approach currently being applied by the UK energy regulator Ofgem on electricity interconnectors, seeks to resolve this funding question by ensuring that the gains of trade in energy are similarly deployed. Electricity interconnectors for the UK all involve high cost subsea cable connections. The

so-called “cap and floor” mechanism acts as a type of insurance product. Where revenues earned by an interconnector operator (mostly from congestion rents, effectively passage of electricity across the interconnector) exceed the cap level, then the excess income is used to decrease wider network tariffs (and therefore benefit consumers). Whereas if revenues fall short of a stated floor level, then network tariffs are used to top-up the earned revenue to the floor level. So the core revenue received by the operator in order to pay for the asset comes from the value that the interconnector provides to the wider energy system.

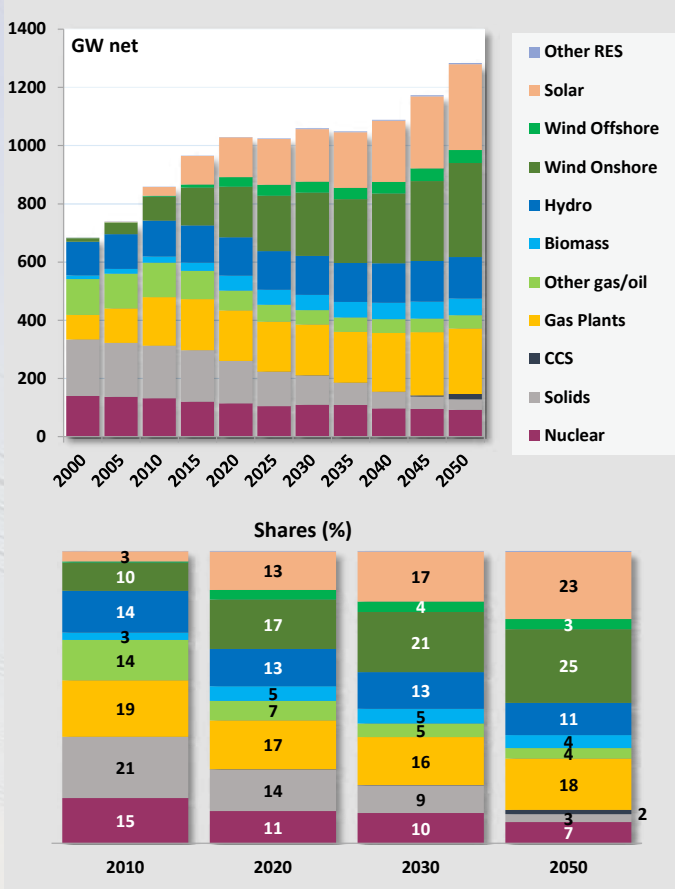
One of the consequences of this approach is that public or consumer funds are not used to pay up-front for capital expenditure. In addition, even where revenues fall below the floor level, consumers are only exposed to the incremental amount between the earned income and the floor. This significantly reduces any consumer funds input, even in low-income periods.

Just as with ports and shipping lines and the choices they make about where to invest, the cap and floor regime leaves the choice of where to build interconnectors to the market – this ensures that investment naturally flows to where it is needed and leaves the private sector exposed to the risk of making the wrong choices.

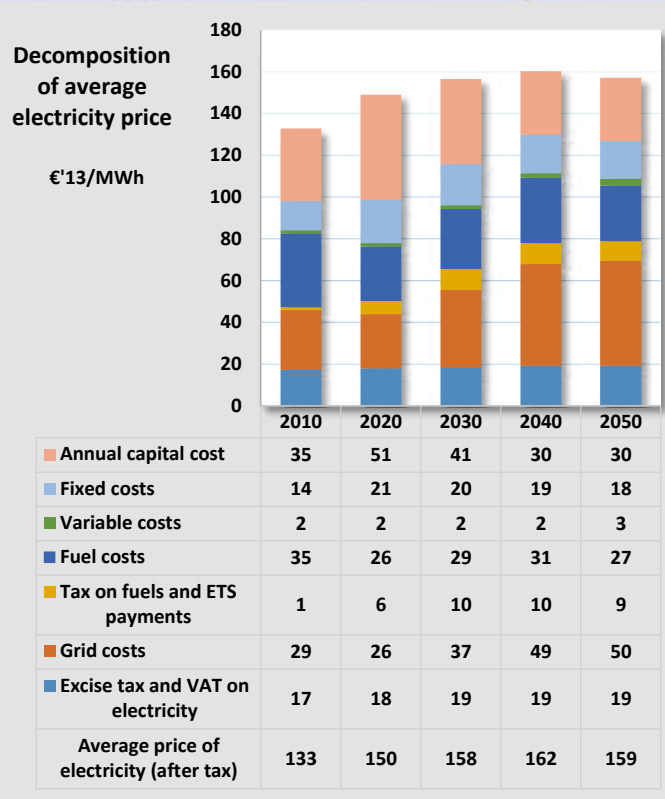
To date this approach has already brought forward around 7GW of new interconnection projects with further capacity in the pipeline. It is enabling a range of investors to participate and effectively complete in the market to provide the most cost effective and appropriate cross-border interconnection capacity.

In conclusion, delivering on our ambitions in the energy sector presents significant challenges but also opportunities. Ensuring the private sector is properly incentivised to seek out profitable ventures will aid us in delivering this future as efficiently as possible. In some cases innovative regulatory frameworks can help direct and support these developments whilst ensuring that consumers get a fair outcome for the risks they take and funds they contribute.

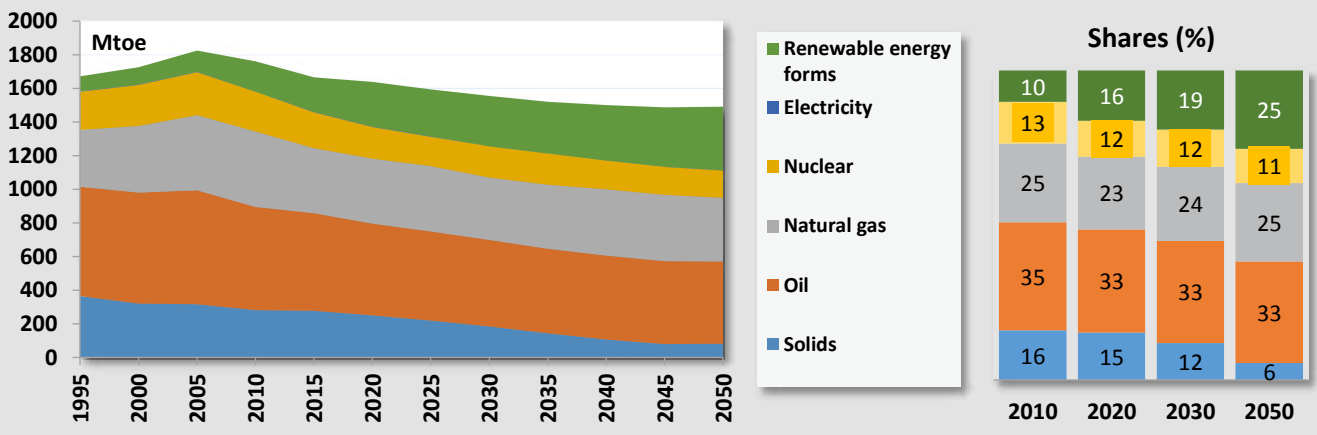
OPERATING POWER CAPACITIES



COST COMPONENTS OF AVERAGE ELECTRICITY PRICE

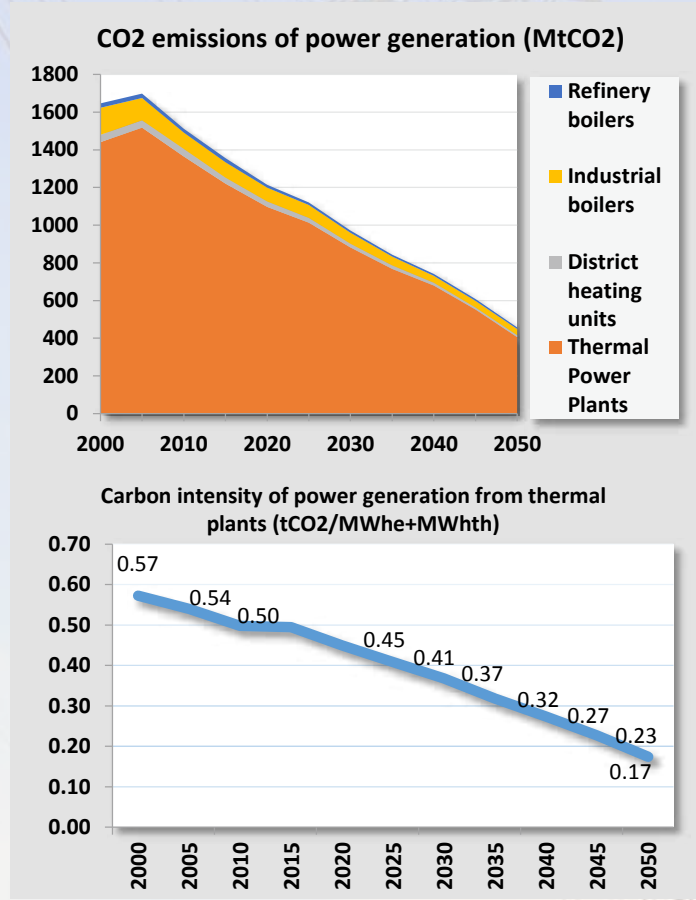


PRIMARY ENERGY DEMAND AND SUPPLY



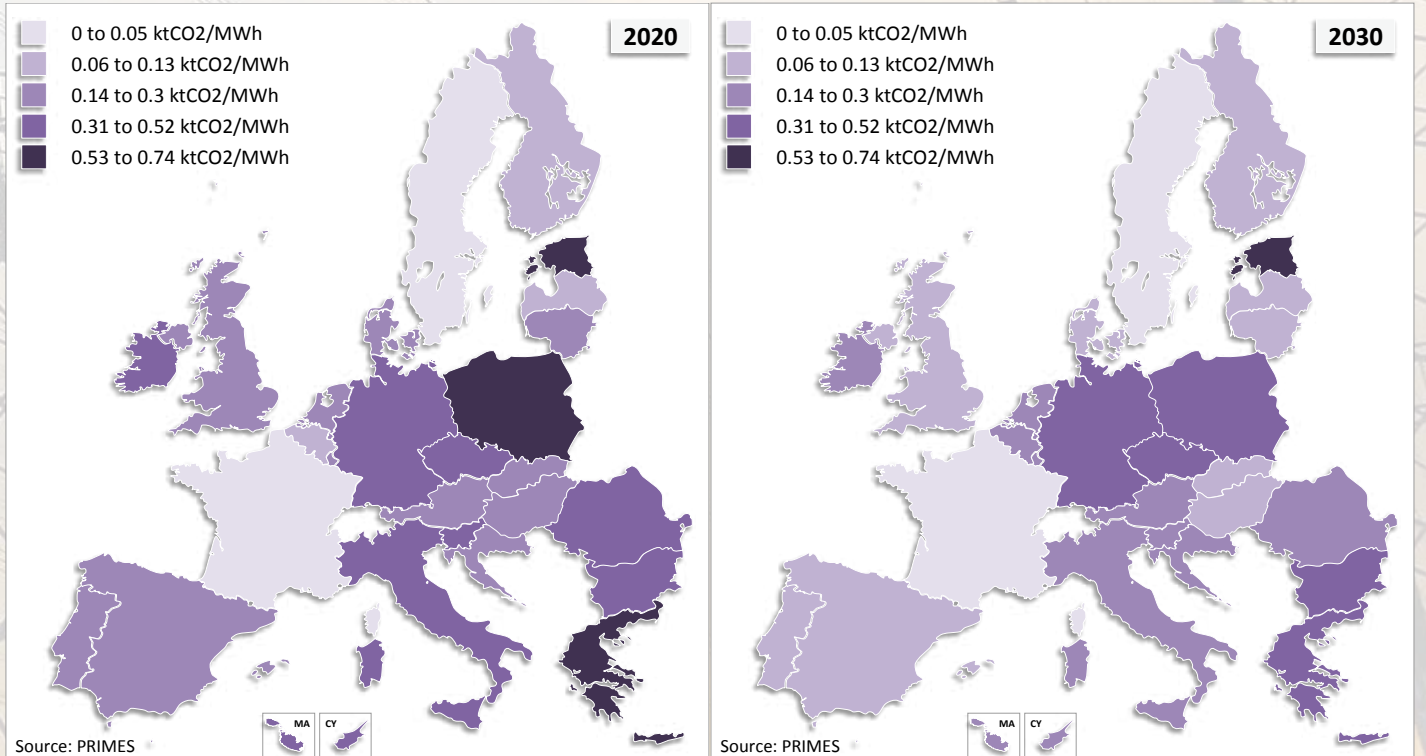
Source : European Commission

CO₂ EMISSIONS OF POWER GENERATION AND ENERGY TRANSFORMATION



Source : European Commission

CARBON INTENSITY OF POWER GENERATION BY MEMBER STATE IN 2020 AND 2030



“An electricity market that serves the needs of a competitive EU industry”



Annette LOSKE

President of IFIEC Europe

The functioning of the electricity market is of vital interest for the members of IFIEC Europe, the International Federation of Industrial Energy Consumers. IFIEC was founded 26 years ago on the belief that competitive energy supply, responsible use of energy and consumer choice and flexibility, are the necessary ground rules for competitive and sustainable industrial activity in Europe. A new market design for the electricity market is of vital interest for the organisation. The same applies to the framework for potential Capacity Remuneration Schemes (CRS).

IFIEC stresses that energy and climate policy needs to take into account EU competitiveness as one of its guiding principles. Electricity market design should be based on balancing the traditional three pillars: competitiveness, security of supply and sustainability. This is essential for the attractiveness of industrial activities in Europe as well as future investments. Worries arising for industrial energy consumers are mainly linked to the high costs of subsidies to renewable energy sources (RES) and the technological challenges caused by the input of their intermittent production. IFIEC strongly insists that, as for all technologies, RES should be integrated into the market as soon as possible without subsidies. IFIEC is therefore in favour of rapidly phasing out RES support. If RES support is continued, it should be allocated on market-based procedures. Furthermore, RES producers should respect the same balancing requirements as

other producers and priority dispatch should be ended. IFIEC also clearly points out that the current European carbon Emissions Trading Scheme (ETS) must not be used as a tool to promote renewables. This would require very high CO₂ prices unbearable for manufacturing industry in the current ETS frame.

On the need to introduce CRSs, IFIEC takes note of the ongoing discussions on the ability of Energy-Only Markets (EOMs) to deliver competitive prices and security of supply at the lowest possible cost. Although IFIEC remains a supporter of EOMs note must be taken of several major interventions (e.g. renewable subsidies, artificial price zones, nuclear / coal phase out in regions) being the root cause for insufficient results of the liberalization process both in terms of competitive prices and security of supply concerns. In more detail:

- RES is pushed into the system via substantial direct and indirect subsidies, often without balancing responsibilities and with priority access to the grid;
- Public Service Obligations of all kinds are imposed to generators, suppliers and grid operators in many countries, and often environmental and even social policy is financed at the expense of electricity consumers through grid charges, surcharges and taxes, etc.;
- Technology choices are not left to the market (within norms set by the authorities, such as environmental requirements, safety rules, technical requirements, ...) but governments prefer to determine the required volumes of technologies, which leads to higher system costs (more expensive technologies, higher than necessary capacity reserve margins, no or limited market access for demand response, ...);
- Market integration is not optimised, and interconnector capacities are not optimally used for market coupling;
- In general, energy policy is insufficiently harmonized on the European or even at regional level, and all too often national authorities take decisions that are not fully aligned with their neighbours'.

In this environment the market cannot lead to correct price signals. This can only be corrected by even more market distortions and government intervention. IFIEC regrets that rather than aiming at getting rid of distortions that prohibit the EOM to function correctly,

authorities are concentrating on introducing additional measures that will lead us further away from the competitive, liberalized and integrated markets that were the objective of the successive electricity market liberalization directives. For IFIEC first the root causes of the problem, namely market distortions, should be resolved by:

- Phase out subsidies for current RES (which should rapidly become fit for the market) and, in general, support only R&D and small-scale demonstration projects;
- Allow and promote voluntary demand response in all market segments;
- Fully integrate all generation plants of all technologies into the market, and impose balancing responsibility on all producers;
- Removal of all disturbing government interference with market functioning;
- Removal of conditions for sustained market abuse by dominant players;
- Improve competitiveness of the European natural gas market by diversifying supply sources - e.g. by allowing exploration of shale gas where economically and environmentally justified - in a well-functioning market, in order to improve economic viability of existing and foster investment in new flexible gas-fired power plants;
- Increase transmission and interconnection capacity wherever economically justified and optimize allocation and congestion mechanisms in a non-discriminatory, cost effective way, a.o. to allow for the common use of spare capacity on a larger geographical scale; and
- Stimulate research into economically viable storage.

IFIEC Europe will advocate also in the future the development of a liberalised EU electricity market in the interest of energy intensive businesses all over Europe. RES development and the framework for CRSs will have to fit into the objectives linked to the liberalisation project that has not yet fully delivered.

New Energy Market Design?

In fact, we have no other option



Pavel TELIČKA

MEP (ALDE), Vice-Chair of the ALDE Group

On 13th September the European Parliament adopted a report setting out its position on the future design of Europe's energy market. The report responds to the release of the European Commission's strategy in July 2015 to help meet the EU's 2030 climate and energy targets, which will require a fundamental transformation of Europe's energy system, including notably redesigning the European power market.

By the end of 2016, the European Commission will publish the new 'winter package'. In this respect, the own initiative report on the New Energy market Design is a key document contributing to this important, yet complex debate and bringing forward ideas but also concerns. It is in fact doubtful whether we today have a functioning internal market without barriers. Therefore it is highly topical and timely to talk about Energy Market Design. The current system doesn't provide necessary conditions for any investments and we witness more and more national interventions. This is the time to find a truly European solution which will make investments into renewable technologies viable.

Energy policy has for long been one of the cornerstones of the European integration process and one of the most important policy areas for the EU institutions. It therefore seems obvious that the current challenges in the field of energy policy are discussed at different political levels, among policy makers, producers, and consumers. In fact, the 'New

Energy Market Design' report was a result of substantial debate that included beside policy makers and institutions number of stakeholders from different areas of the EU economy.

We should not forget the geopolitical dimension that also plays an important role in this debate. Even though the overall energy consumption in the EU has dropped over the last decade and we are now relying more on indigenous energy sources, the union is still dependent on external suppliers by more than 50%. This reliance is pressing especially in terms of gas supply, where the stress tests conducted in 2014 showed vulnerability of certain member states. This situation led to the need to prepare special security measures to prevent situations of disruptions of gas supply, similar to one in 2009. But security is not the only challenge we are facing today.

Keeping in mind the EU's 2030 climate and the energy targets, the EU finds itself at a crossroads. The Emissions Trading System (ETS), the EU's flagship climate policy and key instrument to abate emissions, hasn't due to a different reasons proved very successful in the past years. The need to reform this system is obvious, as the current price of CO2 allowance will not provide for necessary incentive to invest in low-carbon systems and technologies. But how can we find the right balance?

The EU claims to lead the world-wide transition towards low-carbon, sustainable and renewable energy. There are many interesting and efficient technologies available and energy generated from renewable sources has become an important source of electricity. The consumption of renewable energy has been steadily increasing in all 28 member states, even though there are still big differences in market share between the Member States. Furthermore, development of new technologies will facilitate a development of green economy and jobs. The key for the development of new renewable technologies is their integration into the system and markets. This implies that subsidies should be phased out, and only those technologies that are not mature may receive public funding.

Decentralizing the energy market and encouraging consumers to become prosumers seems to be a vital option. The transition from few big generators towards many small and decentralized micro-suppliers offers great opportunities and flexibility. The new system

could bring more effective consumption behaviour, less transmission costs and taxes and new business models. But do we really know how to operate such a system effectively? Managing such a system as well as ensuring security of supply may be much more difficult. It will also require much greater flexibility from consumers. We should make sure we can reward such flexibility and allow more demand response in the EU.

On the opposite side of this spectrum we find competitiveness of the EU's industry, which is closely related to the price of energy and also CO2. An unstable investment environment and lack of trust between market players lead to very low investments in the power sector at large. This is becoming a more and more pressing issue. Unless we change this situation, we won't see any progress in this field.

This is not an exhaustive list of changes the EU's energy market is currently going through. The transition of our energy market is real, and I do believe we can find a solution to make it a successful one. However, I also believe that the solution doesn't lie in a simple change of legislation. We cannot go ahead with business as usual and pretend the transformation will inevitably happen.

The new system has to be market-based, building on a bottom-up approach and a change in consumption habits. We cannot rely solely on policy measures anymore, but we will have to include consumers (both households and industry) as well. Consumers should be more involved in the production of their own energy, but should also be ready for a major change of their energy consumption and be rewarded for that.

The EU has set out ambitious targets. We should welcome this ambition and work hard to achieve it. But we also need to take into account that achieving these targets won't come without trade-offs. But what are we ready to sacrifice enough? The EU's industry? Security of supply? Consumer comfort? Our climate targets?

The solution might lie in greater integration of our energy markets and common EU strategy. But can this really be achieved if every single member state chooses its own energy mix and flexibility options? Unless we regain the trust in the market and act together, we will not succeed in making the transformation a success.

Hydrogen and its role in the New Energy Market Design



Jorgo CHATZIMARKAKIS
Secretary General of Hydrogen Europe

Demand for energy is ever increasing whilst the production from conventional sources is likely to decline and requires increasingly expensive extraction technologies, leading to scarcity, higher prices and a growing dependence on oil-exporting countries. Currently, the European Union (EU) imports 53% of all the energy it consumes, boosting its need to develop a domestic, affordable and secure energy supply.

At the core of the arrangements which govern how market actors generate, trade, supply and consume electricity and use the electricity infrastructure, the issue of energy storage has been until very recently neglected. However, as we move away from the conventional fossil fuels power generation and centralised grids, energy storage and flexibility will grow in importance. Using, for example, hydrogen as an alternative fuel in transport or to store domestic renewables can help increase Europe's energy self-reliance.

Over the last 10 years, progress has been made on all the technical fronts from cost reduction to increasing the lifespan of hydrogen technologies. The technology today provides concrete solutions for cities, utilities, citizens and governments around the world as they fight climate change and move towards a new energy era.

In industry, this momentum is being driven by numerous recent breakthroughs including the commercialisation of the first fuel cell electric vehicles by companies such as Toyota and Hyundai and the opening in Mainz by Siemens and Linde of one of the biggest

electrolyser facility to produce hydrogen using wind energy and water, key to storing more and more renewables. Just to mention a couple of examples.

How does this all fit together?

Take the remarkable figures from Germany in 2015 alone: more than one terawatt-hour of excess production of renewable energy was curtailed. If that power had been transformed we would have gained some 20.000 tons of hydrogen, the equivalent of 2 billion km of zero-emission mobility. In fact, we could have run some 150.000 vehicles powered by hydrogen with curtailed power. Because renewable power generation is characterised by variability and intermittency, as the renewables penetration increases the problem of balancing supply and demand will continue to increase for electricity networks operators.

To address this challenge and reach the ultimate goal of the Energy Union, a fully functioning European energy market, we will need storage and flexibility. We will need to make sure that electricity, as the European Commission has put it, can move freely to where it is most needed, wanted and valued. To do that, we may need to introduce a "lingua franca" or "energia franca", a vector which is transferable from one sector to the other. Hydrogen in the future energy system can play exactly that role and become the missing link towards a more sustainable and efficient energy system.

To date our decarbonisation efforts have tended to be sector-specific e.g. blending bio-ethanol into petrol, injecting bio-methane into the gas grid, integrating solar power into electricity networks. Nevertheless the production and use of new energy carriers by synergistically coupling the sectors of the energy system offers enormous potential for achieving a low-carbon economy.

Coupling the power and mobility sectors

Electricity derived from renewables provides the power sector with a profound decarbonisation pathway. It is sustainable, enlargeable, indigenous, and has a vast ultimate potential. The other sectors of the energy system (heat and mobility) do not yet have decarbonisation pathways of equivalent significance. Therefore it is important to consider the production of energy carriers and fuels from renewable electricity. This requires electricity to be converted to hydrogen via the electrolysis of water and then utilised either as hydrogen, or as a

hydrogen-derived fuel. Such an approach may be termed power-to-hydrogen (P2H).

P2H technologies in a high-RE power system can operate throughout long periods of excess renewable energy by feeding hydrogen into one or more energy sinks e.g. the gas grid, the storage tanks of hydrogen refuelling stations, salt caverns. The hydrogen can then be used on various timescales for satisfying demands for heat, transport or power.

The commercial introduction of fuel cell electric vehicles has recently enabled one important P2H solution to commence. Hydrogen refuelling stations incorporating on-site electrolysers are producing, storing and dispensing hydrogen to fuel cell electric vehicles in accordance with grid balancing requirements.

Coupling the power and gas sectors

A second P2H approach, which is usually referred to as power-to-gas (P2G), is currently being demonstrated at approximately 15 sites across Europe. This involves producing hydrogen (or synthetic methane derived from hydrogen and carbon dioxide) for injection into the natural gas grid. As a major energy conveyor the gas grid offers an extant energy sink for excess renewables and, unlike the power system, it has a large inherent storage capacity. Therefore power from the electricity grid can be transferred readily to the gas grid via P2G. P2G is well suited to contributing to the big challenge of how best to decarbonise the gas grid.

In summary, hydrogen technologies available today can help make the Energy Union a reality. It will be up to policymakers, industry and other stakeholders to seize the potential of this "energia franca" for the benefit of all European citizens.

Hydrogen Europe (formerly known as NEW-IG) is the leading industry association representing almost 100 companies, both large and SMEs, working to make hydrogen energy an everyday reality. Hydrogen Europe partners with the European Commission and the research community to accelerate the market introduction of these clean technologies in the energy and transport sectors. Established in 2009, the association will continue to represent the industry in the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), a European public-private partnership worth 1.3 billion euro under Horizon 2020.

Energy storage recommendations for Energy Market Design



Patrick CLERENS
Secretary General, EASE

The European Association for Storage of Energy (EASE) finds this an opportune time to share its recommendations for the Energy Market Design, in view of clarifying some requirements that a functioning Energy Storage Market would need.

1. Establish a definition of energy storage in the EU regulatory framework, e.g., an amendment to the Electricity Directive

A robust and broad definition is needed to create investment security for the European industry. It must be clarified if cross-sectorial interfaces, e.g., electricity in and heat, gas or fuel out, can be considered as energy storage or not. To include this would allow the dynamic operation of the electricity grid with thermal, fuel or gas as flexibility for downward regulation, while making the renewable energy from the electricity sector available for the decarbonisation of other sectors. The definition should reflect all types and applications of energy storage and not only traditional technologies and uses, such as pumped hydro storage or batteries, in order to allow for the development of new technologies. The same reasoning applies to the applications energy storage may fulfil. A narrow view of the applications will restrict energy storage to some limited applications, while a broader view will allow a myriad of applications to develop according to technological development and system needs.

In this context, EASE supports the following definition of energy storage:

“Energy storage in the electricity system is defined as the act of deferring an amount of the energy that was produced to the moment of use, either as final energy or converted into another energy carrier.”

[See also the definition proposed by DG Energy of the European Commission in June 2016.]

We believe that this definition is general and robust enough to establish the concept firmly under European law.

2. Establish clarity on the rules under which energy storage can access markets

EASE has developed the following position regarding the ownership of energy storage devices:

- One cannot talk about ownership of energy storage by regulated entities in the abstract; instead, positions can be expressed only relative to energy storage applications, or services.
- For energy storage applications deemed to be market services, e.g., arbitrage, only market players should be allowed to own or operate energy storage facilities for their provision. The market should reflect the system needs, which would provide for efficient solutions.
- Energy storage applications deemed to be infrastructure services, i.e., fulfilling services which are today already used by regulated entities with other technologies (e.g., by building a line), should be able to be delivered also with energy storage devices.
- Regarding the ownership of energy storage by regulated entities (e.g., for the provision of system services) in the absence of competitive supply, i.e. if shown that a market-based service procurement is not feasible, such ownership should be exceptional and on a temporary basis, subject to a periodic review of the situation. Unjustified market barriers for energy storage should be removed.
- And, as a general rule, regulated entities could be allowed to own energy storage in this context only upon the approval of

the relevant national regulatory authority. In the longer term, the underlying reason for the market failure should be identified and properly addressed.

3 Eliminate unwarranted/double charging, in particular the application of final consumption fees to energy storage given that it does not constitute final use of the energy

Energy storage is not a load; it is storing energy for later use in the grid, e.g., providing transmission or distribution services, peak capacity or other ancillary services. In this context, energy storage assets should not be allocated consumption/demand charges at transmission and distribution levels. This is also valid for network charges and for any kind of taxes that consumers/load would have to pay.

4 Ensure the procurement of all energy and ancillary services is market-based

System services are not all procured on market based conditions in all EU Member States. This creates a higher cost for the consumer and discriminates against technologies that are not allowed to provide these services, even if the services would be provided cheaper and more accurately. In Italy, for example, the procurement of frequency control response (FCR) is not market based. This, therefore, increases the cost for these FCR services for the consumer. A study quantifying these costs found that a given Italian coal plant could save €1.7m/year by providing the service with energy storage, such as batteries.

The above recommendations stem from in-depth discussion among the EASE members, a diverse group of companies from all sectors of the European energy storage market, on how to address some of the most important barriers hampering the development of energy storage in Europe. It is our hope that these recommendations will be considered in this year's Market Design Initiative. Additional delays in addressing these issues may hamper the rapid growth of the energy storage industry and cause energy storage to fall short of its enormous potential for facilitating the energy transition.

System flexibility is smart and competitive



Frauke THIES

Executive Director | Smart Energy Demand Coalition

With the transition of Europe's energy sector, the need for flexibility is rapidly gaining importance. To integrate variable renewable energy supplies, enable the cost-effective uptake of electric vehicles, relieve pressure on electricity networks and allow for a nimble operation of the power market, new approaches to balancing and storing electricity are required to manage the system in an efficient manner.

The good news is, that a large part of the solution is already accessible within our economy, right where it is needed: substantial amounts of flexibility and storage capacity are hidden in our boilers at home, the air conditioning in our offices, the water treatment plant of our community, or the steel mill in the next city. Enabled by smart automation technology, demand-side flexibility could contribute more than 60GW of flexible capacity to the European power system, and capacities are expected to increase further with the electrification of transport and heating, on-site power generation and storage solutions.¹ The reliability of this resource is demonstrated in different markets in the United States, where demand response rates of 10% of total peak demand are already common today, providing

flexibility with the same reliability as conventional generation resources.²

Successful projects are showing the way in different European countries as well. With help of aggregators, the building materials and construction company Tarmac is turning hot asphalt tanks into fast reacting grid batteries and the steel, supermarket chain Sainsbury's automatically adjusts the electricity consumption of thousands of pieces of equipment at over 200 stores to help balance electricity supply and demand in real-time, and mining company Arcelor Mittal generates value from selling the flexibility of its steel plants, mitigating the need to invest in new peak power plants. In some countries, specialised innovative pricing, automation and aggregation offers have started also to enable residential consumers to take an active role in the energy system and reduce energy costs on their monthly bill.

Despite these success stories, however, the large majority of consumers still have limited opportunities to activate and valorise their flexibility. Most European electricity users pay tariffs that are based on average electricity costs and bear little relation to the stress on the electricity grids and the true generation costs as they vary over time. Energy service offers and engagement offers have remained limited so far, drastically constrained by old regulations and market access barriers.

To tap into the significant demand-side resources in energy, Europe will have to re-think its rules and regulations to allow for their full market-participation. This includes the involvement of demand-side resources in the sourcing of grid services on the local and system level, as much as the unhindered market access for independent service providers, such as Demand Response Aggregators. Most of all, it also includes the free development of market prices to reflect the real value of electricity at any moment. Scarcity prices must be possible, and any consumer

should have the right to choose market-related dynamic pricing.

Such a market opening to demand-side flexibility will not only allow for the integration of growing amounts of renewable energy, it will reduce the need for backup capacity, increase system adequacy, lower costs and optimise efficiency. This is how creating a secure and sustainable energy system means more competition, more openness and more diversity.



¹ Hans Christian Gils, "Assessment of the theoretical demand response potential in Europe", Energy 67, 2014, p. 1-18

² Federal Regulatory Commission (FERC), "Demand Response and Advance Metering. Staff Report", December 2015; North American Electric Reliability Corporation (NERC), "State of Reliability 2016, May 2016.

Scarcity prices are an important ingredient to the market design



Jean-François CONIL-LACOSTE
*Chairman of the Management Board,
EPEX SPOT*

The European electricity market is transforming together with the way we produce power across the continent. Only a free price formation, accurately reflecting scarcity, will provide the necessary flexibility to power this transformation.

Power exchanges such as EPEX SPOT provide a robust market price signal acting as the conductor coordinating the actions of the energy market orchestra. It is this price which gives the right incentives to both producers and consumers, and makes sure that electricity flows to the right place, at any time of the day, into the right direction. It is a truly European price, found through a connection between markets called market coupling, where a national demand is covered by the best-fitting European offer.

For the market to perform its role efficiently it is important that prices are free to reflect the balance between supply and demand. The market determines the price itself, there are no regulatory price limitations or interventions. Power exchanges provide such a fair, transparent and orderly price formation.

At EPEX SPOT our mission is, in simple terms: Provide a concert hall big enough to promote seamless negotiations between market participants, while ensuring the orderly technical operation of the markets.

Under normal market conditions, electricity would be negotiated somewhere between 25 and 80 Euros per MWh. Today, technical price thresholds are largely harmonized across Europe at +3000 and -500 €/MWh. Clearly, these thresholds are far away from normal market conditions, and market players have enough freedom for price movements in any direction.

In the past years, these price boundaries have proven entirely adequate. On the one hand, they have never been reached: in Germany for example, one of the most liquid markets in continental Europe, the historically highest price settled at around 2.400 Euros per MWh in 2006 (before the introduction of Market Coupling). On the other hand, technical thresholds set by power exchanges are necessary to ensure the proper functioning of the market, by limiting collateral requirements for market participants and safeguarding against operational incidents.

In case of scarcity situations and extreme market fundamentals – such as a heavy cold spell in France – prices might move fast and far: 250 €/MWh or more for single hours might sound extreme, but have been observed from time to time in the past few years. Such economically justified scarcity prices have a negligible impact on the average price of electricity for end consumers – however, they are vital for the profitability of flexible power plants.

Especially with the continued roll-out of renewable energy sources, the average price on European electricity markets has decreased. Some of the conventional capacity is about to be pushed out of the market due to these low price levels. However, it might still be needed in times when the sun doesn't shine and the wind doesn't blow. More importantly, this backup capacity must be able to react quickly and to jump in or out of the market within minutes, to buffer variations in solar and wind.

Scarcity prices are important for stimulating this flexibility. They can provide important signals to the market, as long as they reflect market fundamentals in a competitive and economically justified manner. When scarcity prices are used to price flexibility, they create significant opportunities for the market. They improve operational performance, investment incentives, demand response, market integration of renewables and transmission pricing.

The price signal and the trust in the price formation mechanism are the basis for all market players' decisions and also for new products developed to serve the need for flexibility. In the light of the energy transition happening in Europe, scarcity prices are essential for the profitability of flexible, yet conventional power sources. They are an inherent ingredient of the power market design in Europe, and an integral part of the European price signal.





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ENERGY market design

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