ACER

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A response from Wärtsilä Corporation on:

# ACER Consultation: European Energy Regulation: A Bridge to 2025

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# Chapter 1 Introduction

The following paper illustrates our comments on the consultation paper European Energy Regulation: A Bridge to 2025 published by Agency for the Cooperation of Energy Regulators (ACER) on 29th of April 2014. The paper follows as much as possible the structure of the ACER consultation paper and comments on those issues we feel need priority.

## 1.1 Experience and Involvement

As a major European technology provider, Wärtsilä has proactively participated in the EU energy policy debate with EU institutions in Brussels. Wärtsilä has worked with ACER and European Network of Transmission System Operators for Electricity (ENTSO-E) in the network code development process and participated in the relevant consultations. Wärtsilä has been especially active in the debate on the 2050 Energy Roadmap, and issues related to the balancing challenges brought about by increasing the amount of intermittent renewables in the electricity system.

We are keen to engage directly on the issues on which we feel most strongly, in particular the demand for and provision of efficient and flexible generation capacity across all timescales. We believe that the Energy only Market (EoM) needs to incorporate correct signals that would value the need for flexibility. At this moment in time the signals we see are mostly adapted to showing the needs for capacity not capability.

From the work Wärtsilä has performed on market modelling and our involvement in different market design consultations, we have an in-depth understanding of the close interaction between electricity markets. We believe the Energy only Market (including Balancing Arrangements) is critical for providing investment signals, to indicate what type of capacity is required. Especially in combination with existing or developing Capacity Mechanisms, these signals are important. We are therefore pleased to see that ACER has taken a holistic approach on the electricity market in its paper, highlighting key capability issues that need to be addressed when defining future energy regulation.

## 1.2 Wärtsilä Corporation

### 1.2.1 Wärtsilä

Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximizes the environmental and economic performance of the vessels and power plants of its customers.

Wärtsilä's key figures in 2013

- Net sales EUR 4,654 million
- Operating result EUR 552 million
- Order intake EUR 4,872 million
- Order book 31 Dec 2013 EUR 4,426 million
- Personnel 18,663

Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland

### 1.2.2 Power plants division

Wärtsilä Power Plants is a leading global supplier of flexible power plants operating on various gaseous and liquid fuels. Our portfolio includes unique solutions for base load, peaking, reserve and load-following power generation, as well as for balancing intermittent power production. Wärtsilä Power Plants also provides liquefied natural gas (LNG) terminals and distribution systems. In addition to the technical advantages, our fast track deliveries of complete power plants, together with long-term operation and maintenance agreements, provide our customers with complete solutions in urban areas as well as in the most demanding remote environments.

As of 2014, Wärtsilä has 55 GW of installed power plant capacity in 169 countries around the world.

Wärtsilä Power Plants Key figures in 2013

- Net sales EUR 1,459 million
- Order intake EUR 1,292 million
- Order book, end of period EUR 1,367 million
- Personnel, end of period 1,053

## 1.3 The need for flexibility

### 1.3.1 Drivers for flexibility

Traditionally, there have been three main causes for imbalances between electricity supply and demand that require actions from TSOs:

1) Predictable variations in load patterns throughout the day (which requires active 'energy imbalance management' by the TSO);
2) Unpredictable but constant small fluctuations between load and generation; and
3) Generator and transmission & distribution line outages.

For the latter two categories, TSOs contract reserve capacity and response capability in day-ahead and longer-term markets so as to provide flexibility that can be called upon at short notice to balance the system. Balancing and reserves have been necessary for relatively small volumes (load or thermal generation prediction errors) or fault events of small probabilities (power station failures). This has meant that total requirements have been small relative to the size of the total system peak load (typically 3% to 6%).

The uncertainty of wind and solar generation forecasting increases rapidly when the lead time is prolonged. For example the forecast error for wind production 24 hours ahead can be up to 25-30%. The magnitude of this potential 'error' is something totally different to that faced by the system today. Wind forecasts get more accurate the closer to real-time, however some forecasting error will remain even in very short lead times (minutes). This needs to be taken into consideration when estimating adequate fast reserve levels for system balancing. It is unlikely that today's short term balancing markets are able to provide the necessary response to decreases in wind production, as such fast capacity does not exist in the quantity necessary on the system (as it has not been needed). Ways must be found to procure sufficient balancing capacity which is available fast enough to react to unpredictable changes in intermittent renewable generation.

Wärtsilä believes that short term balancing markets *can* provide the required balancing capacity *provided* that existing market failures in the electricity market arrangements are corrected and as a result the market generates the correct signals to market participants. These market failures and proposed amendments are described in chapter 2.

### 1.3.2 Smart Power Generation

Smart Power Generation (SPG) offers high operational flexibility and high generation efficiency in the same product, a combination which has not been typically available in the past. Such a combination enables the high integration of renewable sources into the power systems at least cost, thus contributing to the transition to a sustainable, reliable and affordable power system.

Wärtsilä Smart Power Generation Power Plants incorporate a multi-unit internal combustion engine (ICE) configuration which can operate with multi fuels (liquid and/or gas) in multiple operation modes: from base load power generation to peaking; from load following to 'wind chasing'; and ultra-fast grid reserve. Such plants can ramp-up rapidly when the wind calms down and the sun sets, and stop in just one minute when the wind starts to blow again. This enables full utilisation of RES. High energy efficiency (~50%) enables SPG to be competitive in terms of generation cost and dispatch in power markets, particularly when running cycles shorten in future.[1]

This is not to say that other spinning reserve such as CCGTs and coal plants should not play a role in providing flexibility to the system in 2020. On the contrary, SPG plants allow a more stable operating regime for these plants, thus maximising their efficiency. With a more fit-for-purpose flexible technology mix, the 'unused' capacity associated with part-loaded plants could be avoided, which could reduce the overall requirement for capacity on the system. Such a technology mix could provide the required responsiveness at a lower total system cost. This can be also seen in our two case studies [ix, x] on the value of flexibility in two large power systems, namely UK and California.

The technology itself is very mature and well positioned for power systems with rising flexibility needs, as stated by the International Energy Agency (IEA)[i] in a recent publication. However, until recently the electricity industry paid little attention to Internal Combustion Engines (ICEs), since utilities traditionally deployed large centralised plants (e.g. 300 to 500MW) such as hydro, coal, nuclear and CCGT's, rather than distributed assets, to realise economies of scale in terms of efficiency and costs.

However, the same IEA report has noted the increasing attractiveness of ICE's:

*"Rising flexibility needs make internal combustion engines (ICEs) increasingly attractive for power, as single-unit plants (< 20 MW), stacked in so-called "bank" or "cascade" plants (20 MW to 200 MW), or operated with a combined steam cycle (> 250 MW)."*

This is where SPG falls under; multi-unit configuration, giving optimal flexibility and efficiency in the same product, effectively enabling more RES into existing and future systems. The advantages of which, as stated by IEA are:

*"Key performance indicators for gas-fired plants will depend on the role they play in specific electricity markets. In regions with ambitious deployment plans for renewable electricity, part-load efficiency, ramp rate, turndown ratio and start-up times are more relevant than full-load efficiency. Shifting gas-fired generation away from base-load operation – and towards flexibility – opens up competition among generation technologies. Internal combustion engines (ICEs), open cycle natural gas turbines (OCGTs), combined-cycle natural gas turbines (CCGTs) and even fuel cells could be attractive depending on system characteristics and variability in natural gas composition."*

[1] The combustion engines used in SPG have the highest simple cycle electrical efficiency of any prime mover. Multi-unit configuration enables high net plant efficiency over a wide load range

# Chapter 2 Energy Trends

The EU is committed to decarbonise the economy by 2020. In light of this objective the energy sector has installed significant amounts of variable renewable capacity and more is planned up to 2020.

On the same note, the Renewable Energy Sources (RES) growth is the driving force in changes in generation. This increasing variable capacity increases the need for balancing capabilities in electric power systems to ensure reliable system operation. This is because the output of variable RES is never fully predictable (forecast errors) and has variability that adds to the typical variations in electricity demand. Since RES production generally has priority to dispatch, the remaining capacity has to adjust its output to balance total electricity production and demand. Even without this priority, due to zero or very low Marginal Costs, RES production would be first in the merit order. The impact of RES deployment on electricity systems is significant. The needed generation reserve in the systems have to cope with not only the normal system variations like production trip and load variation, but also with the variability and production forecast errors of renewable power production. This will increase the need for system reserve capacity and place new requirements on the reserve properties.

## 2.1 Electricity Markets

The EU decarbonisation and renewables agenda will radically change the generation mix, leading in particular to a much greater level of intermittent generation on the system (i.e. wind and solar). These fluctuations have to be balanced – or 'mirrored' – with other generation units or with some other source of flexibility (e.g. storage, demand side response) to maintain system balance.

We therefore agree that

> *there are growing concerns about generation adequacy, flexibility and the provision of grid support services*

Quote 1 page 5, 2.1A of the EER

and are happy that this is recognised and emphasized by ACER. We urge ACER to keep flexibility as a main topic in all sector related development issues with ACER involvement.

## 2.2 Fast reaction balancing services

### 2.2.1 Characteristics of flexible generation

Sufficient flexible resources must be scheduled continuously to meet the flexibility requirements. The most efficient operational resources are those that maximise flexibility while minimising cost, emissions and renewables curtailment. This balancing capacity will therefore need to have truly dynamic characteristics to maintain system frequency levels and to support EU decarbonisation and renewable goals. Such characteristics are:

- Fast starting and stopping, without impacting on product reliability and operating costs,
- Fast loading: ramp up / down from standstill (matching the speed of change of wind power output),
- Capability for continuous cyclic operation,
- Wide load range (preferably as close as possible to 0-100%), while maintaining high efficiency,
- Low carbon and other emissions,
- Optimal plant size and location from the total power system point of view, and
- Flexibility in fuel supplies (e.g. natural gas and biofuels).

### 2.2.2 Balancing the system

Various solutions are available to meet the challenges of balancing the system as intermittent generation increases. Some of these solutions are already proven and available (e.g. hydro power, thermal generation), whereas others are as yet untested (e.g. batteries). Different balancing solutions have different characteristics with regard to the time they can be utilized and the amount available.

Continuing on from the statement

> *the requirement for increased fast-reaction balancing services to accommodate rapid changes in NP RES output*

Quote 2 page 6, 2.4 of the EER

We have recognised the need for balancing products in an early stage and have discussed this in more detail in a whitepaper submitted and presented at the PowerGen Europe 2014 [ii] conference. The paper investigates product design properties of fast reaction balancing services and is based on DNV-GL[iii] study commissioned by Wärtsilä.

The study researched the properties and specifications for balancing products for frequency restoration reserves in a system with a high degree of renewable energy sources that provide adequate frequency quality for the Continental European synchronous power system, and concluded that:

- Increasing speed (shortening activation period) improves system response for fast disturbances
- Non-spinning reserves can replace spinning reserves without deteriorating system response

The study continued to investigate how a selection of properties and specifications for balancing products influence the system costs, and concluded that:

- Allowing cross-border sharing of reserve capacity reduces system costs.
- Under Pro-rata activation regime, once sufficient capacity is available, it is more cost effective to improve system response by increasing speed (instead of capacity).

Based on these insights and conclusions, the study makes following recommendation for designing balancing Frequency Restoration Reserve (FRR) products:

1. Once sufficient capacity to resolve the imbalance is available, to further improve system response, FRR product design should focus on reducing full activation time rather than increasing capacity.
2. Fast reacting, non-spinning reserves reduce national system costs and improve system response, given that they are faster than spinning reserves in full activation time. Therefore, fast non-spinning reserves should be allowed to participate in delivery of FRR.

Both the study and whitepaper are publicly available and can be found at http://www.smartpowergeneration.com/

## 2.3 Tools to manage close-to-real-time changes

### 2.3.1 Energy only Markets

We believe that the Energy only Market (EoM) should maintain the market driving economic dispatch of the power system portfolio and provide signals to the market as to which type of capacity is valued in the market. These type of signals are the key for future investments in the EoM. The increasing amounts of intermittent RES require more flexible capacity and the EoM should signals these needs. Therefore, the current Energy only Market should be improved in terms of the following points (in markets where this is necessary):

- Marginal pay-as-cleared prices for balancing energy
- Imbalance charges reflecting the full system costs for balancing
- Balancing responsibility for all market participants
- And transparency on imbalance charges and balancing energy quantities close to real time.

We support the statement made by ACER

> *As the share of RES generation grows, so too will the requirement for additional flexibility to accommodate the less flexible, less-predictable, nature of NP RES generation. Consequently, greater emphasis will be placed on the appropriate tools for market participants and system operators to manage close-to-real-time changes in supply and demand (an important example may be greater emphasis on the provision of balancing or congestion management services by the users connected at distribution levels). These flexible tools will grow in importance with the increase in the share of NP RES generation.*

Quote 3 page 6, 2.5 of the EER

We agree with the analysis by ACER regarding the need for flexibility tools. By introducing balancing responsibility for all market participants together with sharper imbalances charges, an incentive is created for market participants to be 'in balance' before gate closure. This will increase demand for flexible energy in the spot markets, but is also expected to increase the desire from market participants to hedge against the imbalance risk. The introduction of tools to hedge the imbalance risk is a natural result from this.

This observation has also been made by Pöyry in their recent report[iv] "Revealing the value of flexibility". The report makes following recommendations:

- The first is that balancing arrangements have to reveal the full value of flexibility so that participants have strong incentives to trade and avoid exposure to imbalance charges. Subsidised balancing services procured by the TSO should be removed or nullified.
- The second is that intraday markets are in place with a sufficient level of market volatility, both in terms of volume and price.

Pöyry states that the development of (national) energy options markets should emerge naturally when both of these conditions are met as they provide an alternative mechanism for the trading of delivery and risk management close to real time.

We support the introduction of a market for tradable options for flexible energy, where the TSO and other market participants can be active. Below in chapter 2.3.2 we describe the possible set-up of such market in more detail based on our Australian market study.

Neither Pöyry[v] nor Wärtsilä found any barriers for introducing energy-options in the European market. We believe bilateral energy-option trading will emerge when the electricity market failures are fixed (balancing responsibility together with price volatility in the balancing and the intra-day timeframes), and organized market place for option trading would follow naturally. This has been the development path in other markets that have followed a market based approach, like the Australian National Electricity Market (NEM) or Electricity Reliability Council of Texas (ERCOT). Regardless of the differences between the market setups, we don't see any reason why this could not be the long term direction for the European market as well.

### 2.3.2 Flexibility or Energy Options

*Based on a Wärtsilä paper presented at the PowerGen Europe 2014 conference: "Market Design to Reveal the Value of Flexibility" by Matti Rautkivi*

The European electricity market could provide sufficient signals for flexibility through balancing markets, if market failures are fixed. Volatile balancing prices would also increase the volatility in the intra-day timeframes, as the balancing responsible parties try to balance their position before gate closure to avoid exposure to (high) imbalance charges. In this situation, market participants with a large share of intermittent renewable energy sources would try to find ways to mitigate the balancing risk. The balancing risk of a renewable generator is not limited only to the price risk. Thereis also a volume risk. For instance a portfolio with 1,000 MW wind capacity can have a forecast error of 10% of output between the day-ahead commitment and the real time (note that the forecast error can be as high as 25%). The volume risk combined with the high price risk will incentivize renewable generators to hedge against these market based risks, by signing, for example a contract with flexible generation providers. We have seen examples of such behaviour in the Australian National Electricity Market (NEM).

Such contracts ("Energy Options") would cover following parameters:

- **Contracted capacity**
- **Option fee** that is paid by the renewable generator (option holder) to the flexible generator (option seller) for its services. This is like an availability fee and it is defined on a EUR/MW/h basis
- **Contract period**, to define when the flexible generation should be available for the services (e.g. 8000 hours per year or only during some period of time). As the wind generator does not know when it faces the balancing risk, they are probably interested in signing a contract for all hours of the year
- **Utilization fee or strike price** defining the price level for hedging. This is defined on a EUR/MWh basis
- **Notice period**, to define the last point in time when the option holder (renewable generator) can call the option (technology dependent). If the notice period is greater than 15 minutes it limits the opportunities to use the option into the intra-day timeframes. If the option can be called in less than 15 minutes it can still be used in the balancing market (there are differences between the market setups currently)

By signing an energy option contract, the renewable generator (the option holder) has a right to call the option seller (owners of flexible generation capacity) to provide energy in future. The option holder could exercise the option any time between the day-ahead and real time markets. This is either to cover its balancing risk or to exploit the market opportunities.

### 2.3.3 Case study: ERCOT EoM changes

The Electricity Reliability Council of Texas (ERCOT) has been struggling with decreasing capacity margins since 2011. Increasing wind generation, low gas prices and an efficient gas fleet has depressed the market prices and made investment in new generation non-feasible. This development boosted a debate regarding the need for implementation of a capacity mechanism.  In early 2014, the Public Utility Commission of Texas (PUCT) announced that a capacity mechanism is not the best solution for Texas, but rather the energy-only market should provide strong signals for new investments.

PUCT has continuously developed the market based approach even though capacity mechanisms were also on the table. Recently, several market enhancements were implemented with a target of creating more price signals for investments. The latest market enhancements are:

- Increase the market offer cap gradually from 3,000 $/MWh to 9,000 $/MWh by 2015.
- Implement Operating Reserve Demand Curve (ORDC) by 1 June 2014. The ORDC will create more price volatility into the real time balancing timeframes, since the actions of the system operator that intervene with the market will be priced in. For instance, if the system operator uses pre-contracted reserves (ancillary services) to balance the system in real time even though market based balancing energy is available, the real time market price will spike. The ORDC should limit the actions of the system operator in cases when market based balancing capacity is available, and consequently creates more price signals to market
- Future Ancillary Services (A/S) Team (FAST) is a task force set up to design new ancillary services products. ERCOT clearly states that the existing A/S products are based on the technical capabilities of thermal steam assets, not on the fundamental needs of the system. FAST is designing new A/S products which would provide the right tools to the system operator, but also leave more room for market based balancing by limiting the activation of A/S.

The intention of the proposed or already implemented market enhancements is to create more price signals for new investments. It is expected that the future prices will be more volatile due to increasing offer caps and a more limited role of the system operator in balancing timeframes. The expectation on the future price volatility has created a lot of activity among market players and it has attracted new players into the market. Investors are signing financial bilateral agreements with existing load serving entities that are looking for tools to hedge against the price spikes. On the other hand, investors are looking for a tool to enable the bankability of new power plant investments.

The typical bilateral agreement is a call option either against day-ahead or real-time balancing price. The call option gives an option to the buyer to get the contracted amount of energy with a pre-contracted price. The option seller receives an option fee for its availability even though the option does not typically require physical delivery, as the options are only financial products. For instance, a real time call option contract with a strike price of 300 $/MWh means that:

- The option holder (buyer) is hedged against the Real time prices above 300 $/MWh.
- The option seller has a financial obligation to pay the difference between the market price and the strike price (300 $/MWh) to the option holder. This gives an incentive to ensure availability when the market price is above the strike price, as the option buyer receives the market based revenue and returns the difference between the market price and the strike price. If the option holder is not available during the price spike, the option holder will not receive any revenues from the market, but needs to still serve the financial contract towards the option holder. As the Real Time market is 5 minute dispatch and 15 minute settlement, the more flexible capacity is valued through the market by higher availability in price spike situation (ability to react the price spikes).

The price of this type of option contract is based on future expectations of the price spikes and the general price level. The more price spikes, the higher the option cost. In ERCOT, the recent market reforms have increased the expected level and number of price spikes in the future, which has increased the prices for call options. Higher option prices have boosted the development of about 7,000 MW of flexible gas projects. The option contracts are traded in the market, but the long term option contract are always bilateral. The long term option contracts are typically signed for 7-10 years, which seems long enough to guarantee financing for the investment.

## 2.4 Adequacy and Flexibility challenges

The biggest impact of the increasing penetration of variable renewable generation is on the (existing) thermal fleet. The operating hours of this fleet are reduced, whilst at the same time the average electricity price is lower. As a result the market based revenues for thermal plants is increasingly uncertain. At the same time however, system operators require flexibility from the generation side to balance the fluctuations of variable renewable generation.

As shown in the case studies in our white paper "Future Market Design for Reliable Electricity Systems in Europe"[vi], flexible capacity can provide savings of several billion Euros annually to European consumers. This is the value of system flexibility, or on the other hand, the cost of system inflexibility. In the foreseen future EU power system, flexibility should no longer be an invisible and low cost side product of power generation taken care by the system operator, but a key factor in the power system design and optimization.

Today capacity mechanisms are at the centre of the EU Electricity debate due to the risk of capacity shortfalls. Whilst it is important to continuously try to ensure capacity adequacy, adding flexibility to the system should be higher in the agenda. As described above, there are potential market based approaches to incentivise investments in flexibility, which do not require administrative cash flows, but call for a reallocation of system costs from the TSO to the market, making the cost of flexibility visible for market players.

This is the reason why Wärtsilä supports the statements:

> *Current concerns regarding the adequacy of generation capacity are compounded by the increasing need to manage greater and more sudden fluctuations in the generation and demand balance. Such adequacy and flexibility challenges are distinct, but related.*

Quote 4 page 7, 2.8 in the EER

> *Further attention must be paid to market designs which enable the pricing of flexibility so that market forces can ensure that balancing can be undertaken in the most efficient way and that flexible assets, essential to any high-RES market, will enter or remain on the market.*

Quote 5 page 7, 2.9 in the EER

And we would recommend the following two key steps to develop a reliable, affordable, and sustainable power system:

1. **Recognize the value of flexibility and make it visible for market players through cost reflective imbalance charges, marginal pay-as-cleared balancing energy prices and by developing short term energy markets.**

The UK electricity market regulator Ofgem has identified the market failures in the current UK Electricity market arrangements and has taken actions correcting (part of) these failures. On May 15th 2014 after an extensive review and consultation period, Ofgem published their Final Policy Decision on imbalance prices (so-called “cash-out”). Ofgem states that:

*"As a result of the shortcomings with the current arrangements, **the market does not sufficiently value flexibility**. As a consequence, market participants have **insufficient incentives to provide flexible capacity (such as flexible generation)**. As the share of intermittent generation grows, **flexibility will only become more important for security supply**."*

*Our decision addresses the problems identified and removes existing inefficiencies in balancing arrangements. It ensures cash-out prices **signal scarcity** accurately and increase incentives to innovate and **invest in flexible technology:***

a) ***Make cash-out prices 'marginal'** by calculating them using the most expensive action the SO takes to balance the system*

b) ***Include a cost for disconnections** and voltage reduction into the cash-out price calculations based on the Value of Lost Load (VoLL)*

c) ***Improve the way reserve costs are priced** by reflecting the value reserve provides to consumers at times of system stress.*

*It shows that consumers will benefit from the reforms as they drive efficiency gains in balancing the system, support security of supply, and realize (small) bills savings. Our modeling suggests **marginal pricing reform improves the incentives to balance and invest in flexibility**, and ultimately supports security of supply.*

2. **Create a transparent market place explicitly for flexibility enabling efficient procurement of system services, and providing clear market signals for investors in flexibility.**

As stated in the ERCOT example in 2.3.3 there should be market signals to promote more investments in flexible energy sources. This will in return cover not only capability but also capacity adequacy.

We acknowledge that security of supply is high on the agenda and therefore Capacity Mechanisms (CM) are being developed. However, to avoid the risk of "locking-in" the 'wrong' type of (non-flexible) capacity and avoid unnecessary costs to consumers, it is important that market failures are corrected before a CM is considered. The UK government has recently decided to implement a CM to address security of supply concerns introduced by the 'missing money' issue. On the interaction between the EoM (including balancing arrangements) and a CM, Ofgem notes in its Final Policy Decision that:

*"The CM is intended to address longer term capacity adequacy by providing capacity providers with a secure revenue stream for their investment. **Cash-out reform complements this by providing efficient signals of the value of flexibility, influencing the type of capacity coming forward**. In addition, sharper cash-out prices have the potential to reduce the cost of procuring capacity in the CM auction."*

## 2.5 Gas Market's role in providing flexibility

### 2.5.1 The need for flexible gas markets

Flexible gas generation offers high operational flexibility and high generation efficiency. This combination enables the high integration of renewable sources into the power systems at the lowest cost, thus contributing to the transition to a sustainable, reliable and affordable power system. It is the missing piece of the low carbon power system puzzle.

### 2.5.2 Role of thermal generation

Different generation technologies have different ways of providing flexible electricity. Some generation technologies are able to start up from zero output and then increase their output ('ramp up') within a matter of seconds. Other technologies may take a number of hours to start up, but once they are generating above a stable level they can quickly flex their output up to meet the system needs (typical of large units such as combined cycle gas turbines (CCGTs), and large coal plants). These slower technologies typically provide the system flexibility requirement today. As a result, such plants need to run 'part-loaded' at their minimum stable export level (typically 50%-70% of capacity) in readiness for dispatch, which in turn add costs to the system in terms of fuel and carbon costs, wear and tear, and maintenance costs. It could also lead to lost renewables output, to the extent that part-loading the CCGTs leads to wind curtailment. Finally, part-loading these plant at their minimum stable export level means that there is less capacity available from these plants for flexibility purposes (i.e. only the upper half of the total name-plate capacity can be used).

While providing flexibility from slower conventional technologies may have been efficient in the past, it is not likely to be the most efficient way to respond to the increased amount of flexibility needed in the future electricity system.

Whether it is Demand Side Response (DSR), Hydro power, Interconnectors or highly dynamic generation such as reciprocating combustion engines, the need for technologies which can provide the necessary flexibility at low costs will steadily increase with the addition of more RES in the system. Gas powered generation will likely continue to play a significant role in providing the needed flexibility in future power systems.

This is why Wärtsilä supports ACER in the following statement:

> *Greater penetration of NP RES in electricity generation will increase the need for flexible tools with an ability to respond rapidly to ensure that system security is maintained during fluctuations in the generation and demand balance. Gas-fired plants are likely to be a major source of this flexibility in many Member States.*

Quote 6 page 9, 2.18 in the EER

## 2.6 Wärtsilä recommended electricity market reforms

Based on the above described developments and insights gained through studies, we believe we are well positioned to make informed recommendations on required reforms to electricity market arrangements.

Our most important recommended reform is to correct identified market failures of current the EoM designs. This is required, if we are to reveal the 'hidden' value of flexibility in power systems and incentivize investments in flexible solutions. In addition to providing the needed flexibility to deal with the intermittency of RES, flexible capacity can also provide system adequacy.

We see following reforms to be highly important:

- **Balancing responsibility for all market participants**
- **Imbalance charges reflecting the full costs of system balancing and marginal pay-as-cleared pricing for balancing energy**
- **Short term procurement of reserves**

Each of these adjustments and their effect on investments in flexible solutions are discussed in 2.6.1 below.

### 2.6.1 Electricity Market Reforms

*Based on a Wärtsilä paper presented at the PowerGen Europe 2014 conference: "Market Design to Reveal the Value of Flexibility" by Matti Rautkivi*

One of the key targets for electricity markets (with high shares of renewables) is to generate price signals for much needed flexibility. These price signals are currently missing from the European markets due to existing market failures. Discussed below are the market failures and potential market enhancements.

**Balancing responsibility for all market participants:** When intermittent renewable generators such as wind and solar are not exposed to imbalance volumes and/or prices, the incentive for such generation to trade directly with flexible resources (even within the intraday timeframe), so as to be 'in balance' at gate closure is missing. Rather the burden is with the TSO to manage variations in RES output. **From a flexible capacity investor perspective** this means that demand for market based procurement of flexibility is weakened, either on spot markets or through long term option based financial contracts.

**Imbalance charges reflecting the full costs of system balancing and marginal pay-as-cleared pricing for balancing energy:** When balancing prices and imbalance charges do not reflect the marginal cost of actions taken to balance the system, the financial incentives for parties to trade out their imbalances in the intraday markets is missing. For example, pay as bid arrangements are often used for balancing, with imbalance prices not being fully marginal. **From a flexible capacity investor perspective** this market failure directly affects the profitability of flexible capacity. In addition, lower price spikes reduce the revenues for flexible solutions, also reducing the willingness of other market participants to hedge against the imbalance price exposure.

**Short term procurement of reserves:** Balancing and imbalance prices can be dampened by long-term reserve procurement of the TSO. Long-term reserve procurement can act as a tool for the TSO to hedge the volume and/or price risk around the availability of Balancing Energy. Such long-term contracts typically consist of a reserve fee and a pre-agreed activation fee. Therefore, when the contracted reserve is activated, the pre-agreed activation fee is used in the calculation of balancing and imbalance prices. However, it typically reflects only short-run costs of the balancing energy. The remaining costs are reflected in the reserve fee which are generally socialized through general TSO charges rather than being incorporated in imbalance charges, dampening such charges by not reflecting the full system costs. **From a flexible capacity investor perspective** this market failure significantly limits the trading possibilities of flexible solutions because pre-contracted capacity is used to balance the system even when market based supply is available.

We believe that correcting these identified market failures should be the top priority for ACER and therefore we urge ACER to continue with the already on-going process of implementing the European Network Codes (NC) addressing these issues, and creating the Internal Electricity Market (IEM). We would like to draw specific attention to the short term procurement of reserves. Though this is addressed in the Electricity Balancing Network Code, we do not consider that the latest published drafting by ENTSOE reflects the intent of the Framework Guideline to procure as many reserves as possible in the short term. Short term procurement of at least some[2] of a TSO's reserve requirement will allow it to dynamically procure reserves according to its needs – which will increasingly fluctuate with the variable output of wind and solar energy.  This will allow savings to be made[3] compared to the carrying cost of holding reserves throughout the year. Further, it will attract new entry from reserve providers who may not be able to commit to providing a service for longer periods of time (particularly new providers of Demand Side Response with the advent of smarter metering and networks technologies).

Once corrected, the electricity market will signal the value of flexibility and improve incentives to invest in flexible solutions.

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[2] As we have discussed with ACER previously, we understand that for some forms of reserve, it is critical that the TSO has security around whether resource will be available, and therefore short-term procurement is probably not sensible.  However, for reserves that can be procured on a short term basis from a liquid pool of suppliers, we advocate shorter term procurement activities.

[3] For TSOs, who are funded through network charges paid by consumers.

# Chapter 3 Actions for Europe's regulators

## 3.1 Remuneration for flexible assets

Wärtsilä supports the fact that ACER has remuneration for flexibility and the importance of developing transparent short-term markets, high on the agenda. This would also entail the balancing responsibility for all parties. As stated by ACER:

> *Stakeholders' feedback stressed the importance of simple, market-based approaches to tackle future challenges, such as remuneration for flexibility. In particular, there was a strong emphasis on the importance of developing transparent short-term markets through the full and effective implementation of the existing network codes. ACER and NRAs should focus on creating a level playing field for all parties; ensure that the rules for participation in markets are applicable and appropriate for demand, for renewables and for conventional generators; promote balance responsibility for all parties; and contribute to the debates on possible policy interventions.*

Quote 7 page 15, 3A Regulatory Impacts, in the EER

This is in line with the statement made by ACER:

> *European-wide implementation of fully coordinated short-term trading, through liquid intraday and balancing markets, will create routes to signal the value that markets place on flexibility, as well as offering a greater range of balancing tools that can provide market-based solutions to the NP RES challenges.*

Quote 8 page 15, 3.1 in the EER

We also fully support the reasoning behind the creation of market based hedging tools, such as energy options, to create possible risk management tools for short term price risks and portfolio volume risk. The increased incentives on market participants to self-balance would also allow gate closure closer to real time because the remaining balancing actions of the TSO are reduced. Closer to real time gate closure allows an improved forecast of RES production at real time.

## 3.2 Gas Markets

We recognize the interaction between the gas market and electricity markets and the 'connecting' position of gas fired generation in between. Gas fired generation has an important role as provider of balancing energy to deal with the intermittency of Renewable Energy Sources and maintain a stable and secure power system.

The revenues for such flexible power plants will be based on the electricity trading arrangements as described above. At the same time, a major portion of the costs of gas fired generation is based on fuel costs. If trading arrangements on the fuel supply side limit the flexibility of the plant in such a way that it will limit its (flexible) operation in the electricity markets and therefore limits its possibilities to capture value from these markets, the overall effect is likely to be an increase in the overall power system costs. Flexibility in this case will have to be provided by other resources that are ranked lower in the merit order for flexible energy.

In addition, an operator of gas fired generation will take any exposure to imbalance risk as a result of gas trading arrangements into account when bidding into electricity markets. If such imbalance risk is higher for bidding into short term electricity markets, the operator might choose not to place a bid or require a premium for its bid to cover the imbalance risk on the gas market. In the end this may lead to less revenue for flexible gas fired generation, and as a result into less investment into such generation.

Both effects described above represent a risk for investments in flexibility. A further analysis to understand these risks and investigate mitigations therefore seems justified.

## 3.3 Key Priorities setting

Wärtsilä agrees with the priorities mentioned:

> *Promoting a rapid transition to a system in which all parties are balance responsible, facing imbalance charges that reflect the cost of system balancing and where parties have appropriate incentives to manage their risk via well-functioning markets.*

Quote 9 page 16, 3.5 in the EER

With the following notes:

- **Balancing markets are critical for sending market-based signals for the value of flexibility and the reforms described in the Electricity Framework Guidelines should be reflected in the Electricity Balancing Network Code currently under development by ENTSOE.**
- **To allow the market to function, regulatory interventions such as price caps should be avoided**
- **We believe that the proposed reforms to the EoM will result in improved incentives in flexible solutions and create a natural demand by market participants for tools to hedge against imbalance risks. ACER should monitor and where needed support or enable this development, for example by introducing a market place for Energy Options. Such a flexibility market would be 'on top' of the IEM.**
- **Further investigate the interaction between the gas market and electricity market, especially on potential hurdles from the gas market arrangements that can limit the investment signals into flexible power generation capacity.**

The correct implementation process for these key reforms is important for their success and for the ability of the electricity markets to deliver the required capacity. As the development of Capacity Mechanisms is going forward within certain EU member states, it is important that the above described reform to the EoM are considered and implemented as soon as possible to avoid "locking-in" the 'wrong' type of (non-flexible) capacity leading to unnecessary costs to consumers or even unwanted curtailment of RES due to system stability requirements.

We believe these recommendations to be in line with the below mentioned ACER statement:

> *Balancing markets are critical for sending market-based signals about the value of flexibility and in making the best use of available resources. However, cross-border European balancing markets need to be further developed.*
>
> *.....We will undertake further analysis to develop and improve the common European balancing target model defined in the Network Code.*

Quote 10 page 16, 3.5 in the EER

## Chapter 4 Implications for Governance

We see an important role for NRAs and ACER to follow-up on the implementation process of the Network Codes, and enforcing the agreed network code provisions. An appropriate role for market stakeholders should be taken into account during this process to make sure relevant feedback is taken into account and the implementation and further development of the Network Codes is not unnecessarily delayed.

This is in line with ACER statement:

> *Critical in fulfilling this fundamental role will be a robust, speedy and fit-for-purpose process for governing and monitoring the implementation process and enforcing the agreed network code provisions.*

Quote 11 page 29, 4.4 in the ERR

We also support the plan from ACER to review the ENTSO-E governance to make sure that the EU-dimension of their responsibility prevails over the specific interest of their individual members.

This relates to the statement:

> *In particular, the ENTSOs' governance arrangements will be reviewed to ensure that the EU-dimension of their responsibilities prevails over the specific interests of their individual members*

Quote 12 page 30, 4.10 in the ERR

National, non-market based support mechanisms can create major distortions to market functioning. Even though we recognize the need for support mechanisms in the development of new technologies and possibly introducing these to the market, such mechanisms should be designed in such a way that any undesired effect on the market is minimized and that the mechanism is stopped as soon as possible.

NRA's can take guidance from this approach, and at the same time provide the market with a holistic view on the (longer term) developments on the gas and electricity market rules and regulation in order to increase investor confidence.

## Annex: Comments on Summary

We notice that in the summary of the Consultation paper important elements from chapter 2A: *electricity Wholesale Markets* of the paper are missing. We would encourage the addition of these identified flexibility issues in the summary. Otherwise these might seem less important, while in fact we think they are the most important aspects of this paper.

In addition we support the further development of the IEM and Balancing Model, but further details are required as to which process would be followed. It needs to be ensured that stakeholders have sufficient opportunity to provide comments and suggestions.

We call upon ACER to ensure the timely implementation of the new Network Codes. Given the changes and challenges due to the increasing amounts of RES, the balancing arrangements are especially important to incentivize flexible solutions.

## List of Abbreviations

ACER = Agency for the Cooperation of Energy Regulators

A/S = Ancillary Services

CM = Capacity Mechanism

DAH = Day Ahead Market

DSR = Demand Side Response

EoM = Energy Only Market

ENTSO-E = European Network of Transmission System Operators for Electricity

ENTSO-G = European Network of Transmission System Operators for Gas

ERCOT = Electricity Reliability Council of Texas

FAST = Future Ancillary Services Team, ERCOT

FRR = Frequency Replacement Reserves

GW = Gigawatt, 1000 megawatts

ICE = Internal Combustion Engine(s)

IEM = Internal Energy Market

LNG = Liquefied Natural Gas

NEM = Australian National Energy Market

NC = Network Code

NP RES = Non Programmable Renewable Energy Sources

NRA = National Regulatory Authorities

Ofgem = UK electricity regulator

ORDC = Operating Reserve Demand Curve, ERCOT

PUCT = Public Utility Commission of Texas

RES = Renewable Energy Sources

SPG = Smart Power Generation

TSO = Transmission System Operator

VOLL = Value of Lost Load

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