Response to CPM Medium Term Review
Work Package 6 onwards

Discussion Paper
SEM/11/09

A response to NIAUR and CER

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1 OVERVIEW OF WÄRTSILÄ AND OUR SOLUTIONS

1.1 Overview

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

1.1.2 In 2010, Wärtsilä's net sales totalled EUR 4.6 billion. We have more than 17,500 employees, operations in 160 locations in 70 countries around the world, and we are listed on the NASDAQ OMX Helsinki, Finland. We have 3 main business areas:

- **POWER PLANTS** - Wärtsilä is a leading supplier of flexible power plants for the power generation markets.
- **SERVICES** - Wärtsilä supports its customers throughout the lifecycle of their installations by optimising efficiency and performance.
- **SHIP POWER** - Wärtsilä enhances the business of its customers by providing integrated systems, solutions, and products that are efficient, economically sound, and environmentally sustainable for the marine industry.

1.2 Wärtsilä Power Plants

1.2.1 Wärtsilä is a leading supplier of power plants. Our technology enables a global transition to a more sustainable and modern energy infrastructure. We aim to provide superior value to our customers by offering Smart Power Generation which comprises a number of key characteristics, including:

- **Agility of dispatch** reflecting starting reliability, high availability, quick shut down, fast ramp rates, and superior starting performance – for a 10 MW unit, less than 5 minutes up to full load
- **High electrical efficiency:** the highest simple cycle electrical efficiency of any thermal power plant
- **Wide economic load range** ie sustained high efficiency across load levels
- **Low capital cost**
- **Optimal plant location and size** including ability to locate inside distribution networks and major load centres with a low plant footprint
- **Communication with a smart grid** including automatic response, start and stop
- **Low environmental impact** including low CO_2 and other emissions even when ramping and on part load
- **Fuel flexibility** reflecting multi-fuel capabilities

2 RESPONSES TO CONSULTATION

2.1 WORK PACKAGE 6 – QUESTIONS AND ANSWERS

Question: Should the RAs look more closely at a Capacity Credit scenario for the payment of different generation types?
Answer: As mentioned in the paper, implementation of a Capacity Credit system would lead to major changes in the CPM methodology. In Wärtsilä's view, the main problem with the current CPM is its tendency to overcompensate wind power. The simplest method of getting rid of this problem would be to exclude wind (and other intermittent renewables, i.e. solar) from the CPM altogether. Naturally, such a change could be compensated in some other way, e.g. increasing the FIT for intermittent renewables.

Question: Is a Capacity credit methodology appropriate for the CPM?
Answer: It is Wärtsilä's view that any form of Capacity Credit would be an attempt to cover the fact that intermittent renewables cannot be dispatched. While the need to move towards renewable power generation in the medium term – and the government support required for that to happen – are well understood and accepted by Wärtsilä, we also wish to point out that the CPM should promote firm capacity – the kind that is needed to keep the system from collapsing when the wind does not blow or the sun does not shine. For this reason, we do not think that a Capacity Credit is appropriate for the CPM; rather, intermittent renewables should be excluded from the CPM altogether, with possible compensation via another payment structure.

Question: Does the current mechanism fairly reward wind or does it need to be revised?
Answer: Again, it is Wärtsilä's view that wind or, more generally, intermittent renewables, should not be a part of the CPM. Thus, our answer is that the mechanism should be revised.

Question: Should there be a separate stream of capacity payments for wind?
Answer: No. The reason for this is that wind – or any other intermittent renewables – does not contribute to the overall capacity of the system. Regardless of how many gigawatts of wind there is in the system, a corresponding amount will be needed in the form of dispatchable power to cover up for the days and hours when the wind does not blow. And it is exactly this backup capacity for wind that the CPM should help to incentivise, not the building of wind itself.

(CPM IMPACT ON INTERCONNECTORS)
Question: Should interconnector users' payments and charges be treated differently than under the current methodology in the CPM?
Answer: Wärtsilä has no particular views regarding this.

(ENERGY LIMITED UNITS)
Question: Should energy limited and pumped hydro storage units be treated differently to the current methodology in the CPM?

Answer: Wärtsilä has no particular views regarding this.

2.1.1 WORK PACKAGE 6 – GENERAL COMMENTS AND REMARKS

Page 11, paragraph 2: *"should reward all generators -- equitably for the contribution to capacity adequacy that they provide"*

- **COMMENT**: Wind does not provide what is known as firm capacity, i.e. it cannot be dispatched on demand. As a result, the contribution of wind to capacity adequacy is statistical only – from a system control point-of-view, wind does not contribute to capacity. As such, it is Wärtsilä's view that wind generation should not be compensated via the CPM mechanism.

Page 11, paragraph 2: *"The Trading and Settlement Code (T&SC) treats all generation equally and should not be altered"*

- **COMMENT**: This approach is problematic as, from a system point-of-view, generation technologies are not equal: as any system operator will testify, the operational capabilities of various generation technologies make them uniquely suited to certain roles in the grid, i.e. base load, intermediate, and peaking generators. Secondly, from a logical point-of-view, if a system requires more of a certain type of capacity, then the only way to make sure that that capacity materialises is to consider the technology characteristics and positively discriminate in its favour.

Page 11, paragraph 2: *"However, the capacity revenue received by all generators should be reflective of their contribution to generation adequacy in the long term, and also their availability to respond to demand at times of low capacity margin in the system"*

- **COMMENT**: Wind power is not dispatchable, and therefore not able to respond to demand at times of low capacity margin. By the same token, wind power's contribution to generation adequacy in the long term is zero – regardless of how many megawatts of wind get installed, a corresponding amount of backup capacity will always have to be available for those days when the air is completely still. In this chain of developments, the CPM quickly becomes the mechanism needed to attract the backup capacity required for balancing wind. From a regulatory point of view, it would seem odd to reward the side that creates the problem and the side that solves it from the same pool of revenue.

Page 11, paragraph 3: *"Currently the CPM values Eligible Availability within each half-hour equally from all technology sources, irrespective of start-up times, ramp rates, likelihood of tripping during start-up, or the diversity of those technologies"*

- **COMMENT**: Again, this approach is problematic, as not all capacity is alike. It is unclear how a generator that is offline and will take at least three hours to start and as many as eight hours to reach full load (as would a typical coal power plant) can be compensated on a half-hourly basis for Eligible Availability. The same applies to any and all combined cycle gas turbine (CCGT) power plants: while the nameplate capacity of such plant might be 500 MW, it will take between 60 and 90 minutes for it to reach full load. Thus, if the plant is suddenly called into action, at least one but possibly as many as three half-hourly periods will pass before the plant generates at 500 MW. In effect, both of the

aforementioned plants are being compensated for something they cannot provide – surely not what the CPM was meant to do. At the very least, the payment should be based on the expected run-up rate announced in Technical Offer Data: if a plant was able to generate 100 MW in 30 minutes, then 200 MW at 60 minutes, and finally a full load of 300 MW in 90 minutes, it should be compensated accordingly, i.e. for 100 MW in the first half-hourly slot, for 200 MW in the second, and 300 MW only in the third half-hourly slot.

(THE CAPACITY CREDIT SCENARIO)

Page 14, paragraph 3: *"The Capacity Credit would lead to major change in the CPM methodology"*

- **COMMENT**: In Wärtsilä's view, it would be a lot simpler to just remove wind power and other intermittent renewables from the CPM mechanism, as opposed to going through a major overhaul of the whole framework for the single purpose of trying to keep it in.

Page 16, paragraph 1: *"The increased penetration of wind will also increase the variability of its availability and will likely produce uncertainty in the level of payments for conventional generators. As the amount of wind capacity increases it may lead to declines in average energy payments and lower average capacity payments."*

- **COMMENT**: One of the main objectives of the CPM is to encourage investment into new capacity. This objective is, however, being jeopardized with the increased penetration of wind, as detailed in the above quote. This point alone, in Wärtsilä's view, is reason enough to exclude wind power from the CPM as soon as possible.

2.2 WORK PACKAGE 8 – QUESTIONS AND ANSWERS

Question: The CPM and the AS revenue payment streams have two separate objectives and it is the RAs view that these should remain separate. Should the CPM offer payments for Flexibility?
Answer: We do not think it is necessary for the CPM to offer payments for Flexibility, if the same can be handled through the AS mechanism.

(CAPACITY PENALTIES)
Question: Do respondents agree with the SEM Committee, that an appropriate mechanism for penalising generators for not providing capacity when they have declared that they would, would increase the incentive to encourage the availability of generators when actually needed?
Answer: Wärtsilä agrees with the above assessment of the desirability of a penalty mechanism.

Question: Do respondents believe the CDP arrangement as described would fit the SEM CPM design?
Answer: The CDP arrangement would fit the SEM CPM design, with a few adjustments. Firstly, the penalty should be relative to the shortfall as compared to the expected output, i.e. if one unit of a multi-unit plant fails, the operator should only be penalised for the shortfall (see General Comments and Remarks, below, for a more detailed explanation). Secondly, the simplest option would be to have no penalty tests, but to penalise every individual failure.

Question: What should an appeals process involve/include?
Answer: Wärtsilä has no particular views regarding this.

Question: How should the proceeds from penalties be distributed?
Answer: Among the generators which did not fail to generate during the failure.

(NEW ENTRANT SCENARIO)
Question: Should New Entrants be treated differently to incumbents in the CPM?
Answer: Yes. As suggested by Pöyry, the CPM payment to a new entrant should be fixed for 5 years on the level of the year of market entry. Moreover, this additional incentive should only apply to conventional generation, i.e. not to wind or other intermittent renewables. The CPM should make it feasible to invest in new, modern, flexible, efficient and environmentally friendly capacities (ie. BNEs).

2.2.1 WORK PACKAGE 8 – GENERAL COMMENTS AND REMARKS

(ANCILLARY SERVICES AND THE CPM)

Page 21, paragraph 1: *"Consequentially, if ancillary service payments increase to the BNE peaker, the total capacity payment it will need to receive to recover its long-run costs will decrease. This has the effect of decreasing the CPM total pot, and therefore the CPM payments to all other generation."*

- **COMMENT 1**: It is not a given that the BNE peaker would receive additional revenue from the potential Ancillary Services categories. The current BNE modelling is heavily focused on cost, producing the cheapest possible option. Consequently, many of the gas turbines on the BNE shortlist are somewhat outdated, leaving them poorly placed to offer a wide range of capabilities, such as some of the Ancillary Service models currently under consultation.
- **COMMENT 2**: If the BNE peaker received additional revenue from Ancillary Services, thus decreasing CPM payments to other generation, it would mean that the regulatory structure incentivises capacity that is capable of functioning in a wide array of settings. This is exactly as it should be: with an increasing penetration of wind in the coming years, the SEM does not just need capacity, but capacity capable of balancing the system. Thus, it would be entirely desirable for the incentive structure to reward flexible capacity more than inflexible units, e.g. nuclear plants.

Page 23, paragraph 2: *"As the SEM develops, the RAs believe that the CPM is not an appropriate mechanism to incentivise generator flexibility and that the best long term signals for conventional generators and new generators for the incentive for reliability or flexibility is the development of new or modified Ancillary Services."*

- **COMMENT**: We concur with the RAs' assessment of the situation. The CPM should be a very simple and straightforward system rewarding firm capacity and nothing else.

(CAPACITY PENALTIES)

Page 24, paragraph 8: *"Another option would be to have no penalty tests but to penalize those who fail to be available when required to generate. A period of tight margin would be declared by the System Operators through a pre-established criteria and any generator who failed to generate their committed firm capacity at those times would be liable--."*

- **COMMENT 1**: It is Wärtsilä's opinion that a penalty mechanism of some sort is an essential part of a properly aligned CPM.
- **COMMENT 2**: A system with no penalty tests would be the simpler solution, and also properly encourage generators to be truly available, not just on paper, at all times.
- **COMMENT 3**: The pre-established criteria would naturally have to be carefully considered.

Page 24, footnote: *"-- other types of failure such as failure to ramp or run-up as expected from Technical Offer Data could also be included in the penalty mechanism."*

- **COMMENT 1**: The penalty mechanism should include failure to start steam cycle (for CCGT plants) as a case of failure to run-up as expected.
- **COMMENT 2**: For multi-unit plants, such as CCGT plants with more than one gas turbine, or combustion engine plants, the penalty mechanism should incorporate a "partial failure" event. The penalty should be relative to the output shortfall resulting from the failure. For instance, a Wärtsilä power plant could consist of, say, 20 combustion engines à 19 MW. If one of these engines should fail to start, then the plant owner should be penalised with 1/20 of the fine that would be given to a single-unit plant of similar output (a total failure in that case).

(NEW ENTRANT SCENARIO)

Page 26, paragraph 2: *"There are several ways to provide a new entrant guarantee, these include:*

1. *Guaranteeing the BNE price at the time of commissioning for all new entrants adjusted by capacity credits, for a few years, and leaving the residual pot to be allocated among existing generators;*
2. *Guaranteeing a BNE price only to conventional generators for a period of several years, and allocating the residual to renewable and existing generators*

In this scenario -- [E]ach new entrant is guaranteed a BNE price for 5 years--"

- **COMMENT 1**: It is Wärtsilä's view that any guaranteed level of CPM payment for new entrants should only apply to conventional generators, i.e. not wind power.
- **COMMENT 2**: The time span for which the level of CPM payments is guaranteed should be carefully considered. This is not to say that 5 years wasn't a good starting point: however, in the interest of encouraging investment into new plants, even longer periods should be considered.

Page 26, paragraph 5: *"The new entrant scenario would improve the certainty for new entrants and help to deliver new capacity when it is needed by reducing the cost of capital for these entrants but at a price for the existing generators."*

- **COMMENT 1**: The new entrant scenario would strengthen the aspects of CPM incentivising building of new capacity, and should be pursued.

- **COMMENT 2**: As to the existing generators taking a hit as a result of a new entrant guarantee of some sort, this is not necessarily a problem. Some of the existing generators are likely to already have paid back the original investment, and would therefore not be critically affected by lower CPM revenues.

2.3 WORK PACKAGE 9 – QUESTIONS AND ANSWERS

Wärtsilä has no particular views on the questions raised in this chapter.

2.4 WORK PACKAGE 10 – QUESTIONS AND ANSWERS

Wärtsilä has no particular views on the questions raised in this chapter.

2.5 CHAPTER 7 – GENERAL COMMENTS AND REMARKS

Page 46, paragraph 8: *"The impact of increasing intermittency is likely to be two-fold:*

1. *It will alter the volume and mix of generation available at any point in time. This makes (a) the ex-post constituent of capacity payments more volatile; and (b) the level of aggregate payments less predictable thereby increasing risks in the market.*
2. *Intermittency shifts the nature of capacity required in the system, and compounds the difficulties of having a single signal for capacity and flexibility. It may also change the roles and relationships between ancillary services and capacity payments in delivering flexibility and availability at peak."*

- **COMMENT 1**: Increasing volatility in the ex-post payment and decreasing predictability of the level of aggregate payments will diminish the ability of the CPM to attract investment into new plants. Removing wind from the CPM will mitigate these problems.
- **COMMENT 2**: Wärtsilä concurs with the assessment that intermittency shifts the nature of capacity required in the system. Because of this, it is of utmost importance to devise and implement AS categories incentivising the needed attributes, i.e. flexibility, reliability, firm capacity, etc. This work should begin as soon as possible.

Page 47, paragraph 1: *"Wind changes the distribution of aggregate capacity payments but does not materially mitigate or exacerbate the overall performance of the mechanism. It results in (a) variability of revenues; and (b) leads to low load factors for conventional plants which increases the uncertainty of energy revenues and a greater reliance on capacity payments for cost recovery."*

- **COMMENT**: Low load factors for conventional plants will create problems. This is due to the fact that power plants based on gas turbines and steam turbines are typically optimized for operation on full load. Consequently, operating on lower load factors, these plants exhibit considerably lower levels of net efficiency than in full load operation. As a result, per unit of electricity generated, both fuel costs and emissions are higher in part load operation than in full load operation. To summarize, low load factors for conventional plants will (a) lead to an increase in price of electricity, and (b) endanger the emission

targets. Incentives will need to be put into place to attract investment into technologies, such as Wärtsilä combustion engines, that do not suffer from the above limitations.

3 *APPENDIX – OVERVIEW OF WÄRTSILÄ POWER PLANTS*

3.1.1 Wärtsilä Power Plants is a leading supplier of flexible power plants. We aim to provide superior value to our customers by offering decentralised, flexible, efficient and environmentally advanced energy solutions. Our technology enables a global transition to a more sustainable and modern energy infrastructure and our solutions are modular, tried and tested power plants.

3.1.2 Our energy solutions offer a unique combination of:

- Very fast plant starts and stops
- Energy efficiency
- Fuel flexibility
- Operational flexibility

3.1.3 We offer our customers competitive and reliable solutions that deliver high efficiency. Our power plants engines can run on liquid fuels, a wide range of gases and renewable fuels. Most of our products have multifuel capabilities and all can be converted from one fuel to another. Furthermore, the operational flexibility of our products enables high system efficiency, flexibility in operations with varying loads, low water consumption, as well as the possibility to carry out construction in phases according to the customer's needs. These key features, combined with the full lifecycle support we offer, create the basis for Wärtsilä's strong position within the Power Plants market.

3.1.4 With gas strengthening its potential to be the fuel of the future, our focus is on developing competitive solutions for the gas market. This focus supports our growth ambitions and enables a stronger presence in the broader markets.

3.1.5 Our business is divided into four customer segments

<u>Flexible baseload</u>

3.1.6 Wärtsilä supplies flexible baseload power plants mainly to developing markets, islands, and remote locations. Energy consumption growth in these markets is driving a steadily increasing demand for new power generation solutions. Wärtsilä's customers in this segment are mainly Utilities and Independent Power Producers (IPP). Customer needs typically include competitive lifecycle costs, reliability, world-class product quality and fuel and operational flexibility, as well as operations & management services. Wärtsilä is in a strong position to cater to these needs. Flexible baseload power plants are run on both liquid fuels and gas.

<u>Grid stability and peaking</u>

3.1.7 Wärtsilä's grid stabilising power plants enable the growth of energy solutions based on wind, solar and hydro power. We offer dynamic solutions used for systems support, reserve power, peaking needs, and in regions with rapidly growing wind power capacity. Customers in this segment are mainly Utilities and IPP's. The strengths of Wärtsilä's products include rapid start and ramp up to full speed, the ability to operate at varying loads, competitive electricity generation and capacity costs, as well as 24/7 service. Grid stability and peaking plants are mainly fuelled by gas.

Industrial self-generation

3.1.8 Wärtsilä provides power plant solutions to industrial manufacturers of goods in industries such as cement production, mining, textiles, etc. Customers are mainly private companies and reliability, reduced energy costs, flexible CHP capabilities and independence from the grid are among the key factors in their decision making. Power plants in this segment are run on either gas or liquid fuel, depending on fuel availability.

Solutions for the oil & gas industry

3.1.9 Wärtsilä provides engines for mechanical drive, gas compression stations, and for field power and pumping stations to the oil and gas industry. Typical customer needs include maximum running time, reliability, long term engineering support and 24/7 service. The solutions we offer run on natural gas, associated gas and crude oil.

Power Plants and sustainability

3.1.10 The world is currently seeking more sustainable solutions for energy infrastructure. This development is driven by climate policies, energy security and economics. Carbon intensive energy sources are being replaced by low carbon fuels, such as natural gas and renewable solutions. Energy savings and efficiency improvements are being encouraged, and even legally enforced, at every level.

3.1.11 Wärtsilä's energy solutions offer a unique combination of flexibility, high efficiency, and low emissions. Many different fuels, including bio-fuels, can be used efficiently, which helps in reducing greenhouse gas emissions. The flexibility of Wärtsilä's solutions enables the development of a reliable energy infrastructure, wherein most of the sustainable characteristics are already known.

Efficiency development

3.1.12 We continuously seek improvements in the present engine portfolio, and are developing new engine concepts for the future. As a power plant contractor, we develop our power plants in parallel with the engines. This enables us to optimise both the performance and the reliability of our power plant offering. We offer high efficiency, single cycle solutions and focus on improving efficiency even further through the use of e.g. combined cycle solutions. Power plant net efficiency can be further improved by plant design and by optimising internal power consumption. Such solutions minimise not

only fuel and water consumption, but also the emissions per unit of energy, thereby providing major environmental benefits.

Flexibility

3.1.13 Flexibility is one of the main features of Wärtsilä's power plant solutions. The high modularity of our products makes it easy for our customers to construct an optimally sized plant, and to later expand its size to meet future needs. Fuel flexibility has many advantages for our customers, notably the lowering of energy production costs by using low cost fuels, minimising CO2 emissions, and the ability to convert from one fuel to another based on fuel availability.

3.1.14 The unique operational flexibility of our products comprises:

- Very fast plant starts and stops
- High ramp rates
- High part-load efficiency
- A broad load range

3.1.15 Frequent starting and stopping does not affect the operational costs of the plant. This is unique, no other competing technology offers the same

Towards an optimally sustainable power system

3.1.16 The power generation system of the future will contain a significant percentage of wind power capacity. Such capacity is non-dispatchable and variable, which creates potential for other power units to balance the system. Wärtsilä is in a good position to meet this need, as the operational flexibility of our products makes them easily adaptable to the needs of the grid.

Reducing emissions

3.1.17 Wärtsilä places high priority on developing diverse and flexible emission reduction techniques. Since emission requirements and the fuels used differ widely, a comprehensive range of products is required in order to offer competitive solutions.

3.1.18 Mitigating the effects of climate change will call for substantial reductions in greenhouse gases (GHG). We believe that the importance of natural gas will increase in the future. Consequently, the multi-fuel capability of our power plant solutions becomes an increasingly significant competitive advantage, as it enables the utilisation of all liquid and gaseous bio-fuels that may become available on a wider scale. Wärtsilä focuses on developing decentralised energy solutions that emit fewer GHG emissions.

4 *APPENDIX – WHITE PAPER: COMBUSTION ENGINE POWER PLANTS*

4.1.1 Please see attachment.