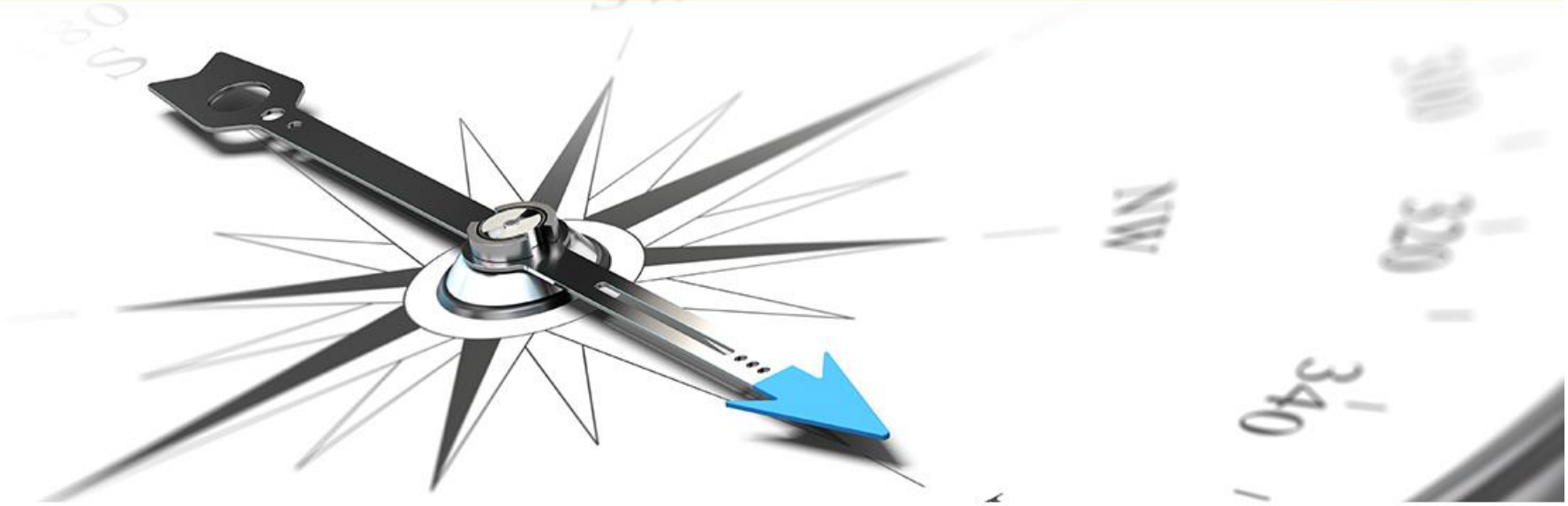


NORDIC ELECTRICITY MARKET DESIGN FORUM

Fingrid Market Committee – 12 September 2017

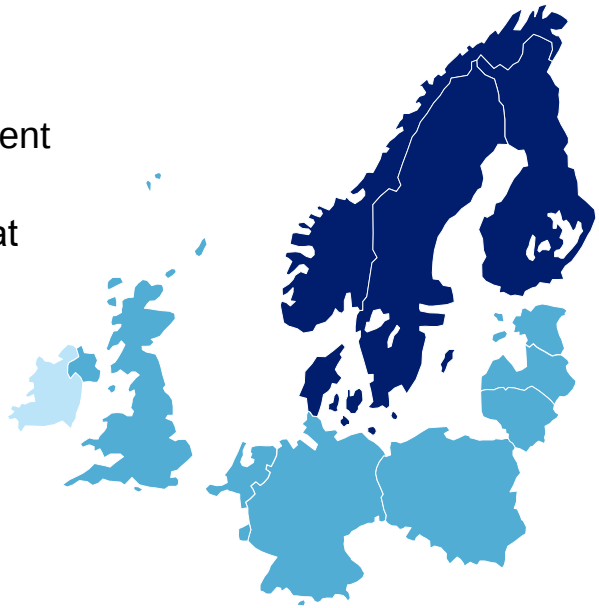
MOTIVATION – NORDIC MARKET DESIGN FORUM

- Nordic electricity market design was the blueprint for Europe, but is being challenged by high levels of renewables and collapsing margins for generation

- Envisioned as a project with the objective of pan-Nordic agreement on market design development
  - Working together the Nordics can get back in the driver's seat
  - Positioning the Nordics as the leading example of market design in Europe again

- Provide a forum for the open discussion regarding feasibility of Nordic market design concepts between stakeholders
  - Opportunity for debate and raising understanding between stakeholders
  - Insight into perspectives of different stakeholders regarding market design

- A view to develop a continuous forum for Nordic market participants, power exchanges, TSOs, Ministries and Regulators to engage on issues of market design



DETAILED OBJECTIVES OF THE FEASIBILITY STUDY

The objective of the feasibility study is to define practical and pragmatic regional market design changes which are implementable before 2020

- Assess the feasibility of the most appealing market design changes that meet the challenges
  - A list of market design topics were identified in the scoping phase
- Focus on solutions for which decisions can be made before 2020 with impacts visible before 2025 (ideally sooner than that)
  - …taking into account solutions that are sustainable in the longer run and broadly compatible with European legislation (e.g. on-going work on Network Codes)
- Come up with a concrete set of proposals for elements of a future Nordic market design which improves and is consistent with the philosophy behind the existing market
- Focus on dissemination and sharing of knowledge to move the debate forward

STUDY PARTICIPANTS

A range of study participants with an emphasis on stakeholder engagement

Study members

DONG energy
ENERGINET.DK
elering ÜHENDAME ENERGIAD
Finnish Energy
fortum
Statkraft
DANISH ENERGY ASSOCIATION
EnergiNorge
FINGRID
VATTENFALL

Study observers

- Danish Energy Agency
- Swedish Ministry
- OED (Norway)
- TEM (Finland)
- Energiavirasto (Finland)

VISION FOR NORDIC MARKET DESIGN

- Early discussion in the region revealed a strong desire among stakeholders to continue with the principle of **energy-only market design**

- The motivation for the proposals therefore centres upon maintaining these principles, and strengthening their implementation, evolving the design of the market to be better aligned to the challenges of today and the future

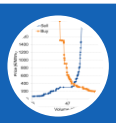
- The Nordic market design should:
  - support system operation;
  - empower consumers;
  - send correct and reliable price signals for efficient resource allocation; and
  - support innovation and the incorporation of new technologies into the market

- The role of the market should also increase. The Nordic market design vision described would give the Nordics an opportunity to be a first mover in providing a high level of security of supply in a market-based and cost-efficient way, and incentivises innovation and investment where needed. The role of the market in balancing timeframes would also increase.

- Overall, the vision will deliver an efficient and competitive Nordic electricity market, thereby minimising the need for political and regulatory interference

SCOPE DEFINITION

The following topic clusters were identified as the main solution areas based on which the scope for further work was defined

	 Real-time price signals and full cost balancing	 Trading flexibility forwards and cross-zone	 Empowering the customer	 Investibility and allocation of market risk	 Regional cooperation from grid perspective
Benefits	Enhanced price signals that reflect scarcity and increased role for the market role in system balancing	Allows hedging against price and volume risk across timeframes and zones	Incentives and possibilities for the customers to contribute to system reliability and flexibility	Improved investment horizon and longer-term stability for investors	More efficient use of resources across the region
Is it covered somewhere else?	Nordic TSOs, Winter Package	Limited attention in the Nordics at the moment, Winter Package	European and Nordic policy makers (to some extent), Winter Package	EU State Aid Guidelines and national policy makers, Winter Package	Nordic TSOs and policy makers, and ENTSO-E, Winter Package
Provisional decision on scope and role of this study	**In**. Provide industry perspective and look at feasibility of changes	**In**, but requires further definition on key issues	**In**, but requires further definition on key issues	**In**. Raise key issues based on quantitative analysis and earlier work done by Pöyry e.g. on CRMs	**Out**. Limited possibility for visible impacts before 2025. Will comment on importance

COMPONENTS OF THE VISION FOR NORDIC MARKET DESIGN

Four market design topic areas support the vision

Balancing and imbalance

- Real time price signals that support system operation and market functioning, especially in times of scarcity
- Increased transparency, shorter lead times and lower barriers for entry to allow a wider range of resources to support TSOs in system balancing

Intraday

- An enhanced intraday market better equipped to facilitate the market functioning
- The proposals for the intraday market will give market participants a better platform to trade into balance closer to real time supporting effective intraday markets

System services

- The objective for market design around non-frequency system services is to move away from the ‘obligation, no payment’ approach which is currently in place for some of these services, and move towards a more market-based approach for all services, as far as this can be made workable

Strategic reserve

- Strategic reserve may have a role to minimise the political intervention in the market as a result of poor demand side response participation in scarcity situations
- Ensure that the rules governing the activation and pricing of this strategic reserve do not have a distorting effect on energy market prices

PROPOSED CHANGES AND IMPLEMENTATION PLAN

BALANCING AND IMBALANCE ARRANGEMENTS

Balancing and imbalance arrangements

Proposed changes

Owner(s): Nordic energy forum

- Single price for imbalance settlement
- Raise price caps in the balancing market
- Estimate any lost load in the imbalance position of the BRPs and the marginal imbalance price
- Remove link between balancing and imbalance prices with day-ahead prices
- Include balancing energy exported outside the Nordics in balancing price formation
- Remove obligation to balance
- Publish information on activations and balancing and imbalance prices in real-time
- Balancing market gate closure closer to real-time
- Balancing market minimum bid size to 1 MW

Next steps

- Input to Nordic TSO 'Full cost balancing project‘
- Input to Nordic TSO project on reducing minimum bid sizes
- Input to work on balancing power market co-operation between the Nordic and Baltic countries

Other comments

- Balancing price publication could be done first on a zone-by-zone basis when there is congestion and balancing zones are separated
- The main dependency is the integration of balancing markets and harmonisation of imbalance settlement rules between Nordics and Baltics, and on a European level as part of EB GL implementation

INTRADAY

Intraday

Proposed changes

Owner(s): Nordic energy forum

- Intraday opening auction with 15-min products, possibly closing auctions
- Intraday gate closure time (GCT) as close to real-time as possible
- Better information transparency between market participants and TSOs
- Price cap in the intraday market to 9999 EUR/MWh
- Start a process to define an approach and test the feasibility of allocation of cross-zone capacity across market timeframes

Next steps

- Start a Nordic process to implement improvements to the intraday market
- Input to Nordic TSO 'Finer time resolution' project where ID auctions are discussed as an option to trade 15-min products

Other comments

- Possible transitional implementation steps:
  - Pilots for ID auctions and/or allocation of cross-zone capacity on a single border to test feasibility
- Dependencies
  - Start of XBID in 2018
  - ENTSO-E proposal on ID capacity pricing

SYSTEM SERVICES

System services

Proposed changes

Owner(s): Nordic energy forum

- Remove requisitioning of services without remuneration through supply and grid connection conditions
- Level playing field between TSOs and market participants providing the same services
- Marginal pricing of availability fees of reserve products

Next steps

- Start a coordinated Nordic process among the stakeholders to go through system services and ways of remuneration
- Later, input to further development of the Nordic aFRR market and other system services products

Other comments

- The aim should be to move all services further along the spectrum toward a market-based approach
- The main dependency is the implementation of the Clean Energy Package on how system services should be remunerated and what are the rules around TSO ownership of assets that provide system services

STRATEGIC RESERVE

Strategic reserve

Proposed changes

Owner(s): Nordic energy forum

- Activation and pricing principles to reflect the value of avoided scarcity
- An explicit target level for power adequacy to define the dimensioning of strategic reserves
- Regional cooperation to utilise strategic reserves more efficiently across countries and transparent protocols to handle scarcity situations

Next steps

- Input to on-going TSO project to harmonise activation rules
- Start a process to harmonise methodologies and principles of cooperation

Other comments

- Possible transitional implementation steps
  - Harmonise pricing principles of Finnish and Swedish peak load capacity and make activation time as late as possible
- Main dependencies are the ENTSO-E work on a common methodology for security of supply and the Commission's views on CRMs

ACHIEVING THE VISION FOR NORDIC MARKET DESIGN

A Nordic forum should be established to progress Nordic market design

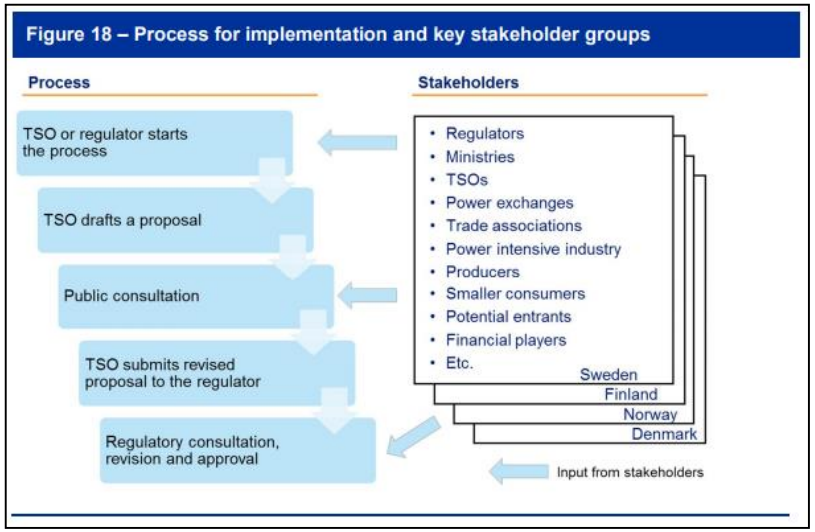
- There is a clear need to continue discussion across borders and stakeholders in the Nordics
- In order to monitor progress and push forward the ideas presented in this work, a Nordic forum should be established with a remit to promote and drive forward Nordic market design
- The forum should bring together ministries, market participants and financiers, regulators, power exchanges and TSOs as well as other appropriate entities such as the EU Commission. The forum should include representation from the Baltic markets.
- The purpose of the forum should be to promote common discussion and implementation of solutions to regional market design challenges.
- The remit of the forum should be to initiate regional discussion of market design issues and drive development of the regional electricity market.
- We see the forum proposed here as complementary feeding into the policy-level forum proposed by Jorma Ollila on topics related to electricity market design as the vision also requires action from the political level i.e. complementary energy policy to enable the market design to work.

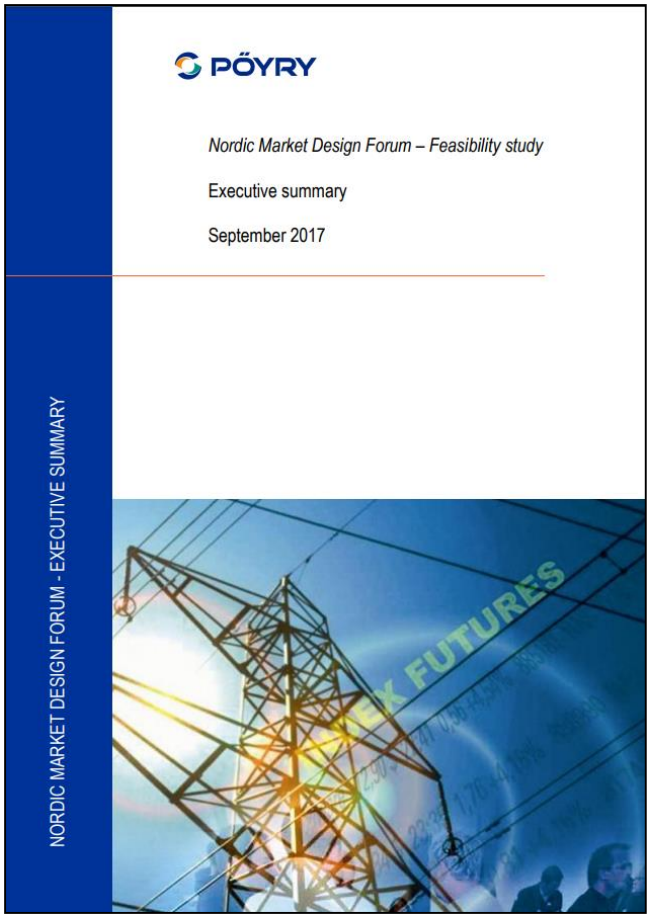
REPORT PUBLICATION DETAILS

Report and executive summary has now been published on Pöyry website

Link to report and executive summary:

http://www.poyry.com/news/nordic-market-design-forum-enhancing-the-world-s-first-regional-electricity-market





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ANNEX

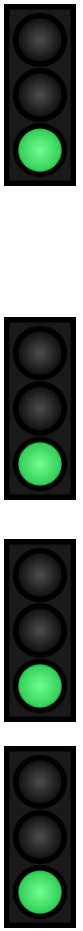
BALANCING AND IMBALANCE

BALANCING AND IMBALANCE ARRANGEMENTS

Real time price signals that support system operation and market functioning

PRICE FORMATION

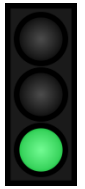
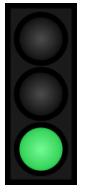
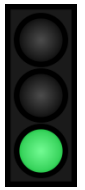
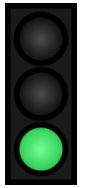
Topic	Proposed changes	General feedback
Single price for imbalance settlement	• Move to single-price and single portfolio imbalance settlement	• Recommend to implement
Remove direct link between balancing and imbalance prices and day-ahead prices	• Remove the condition that the day-ahead price sets the floor for the up-regulation price and the cap for the down-regulation price, and consequently for imbalance prices (except as a backstop price in the event that there are no balancing trades, and if an intraday price cannot be used)	• Recommend to implement
Include balancing energy exported from Nordics	• Whenever balancing energy is exported from one of the price zones in the Nordics to a price zone outside the Nordics, the exported energy should be included in the marginal price formation for balancing energy as is currently done with imported balancing energy (similarly as in day-ahead price coupling)	• Recommend to implement
Raise price caps in balancing market	• Raise the price cap in the Nordic Regulating Power Market from 5,000 EUR/MWh to better reflect Value of Lost Load • This price should be higher than the Intraday price cap	• Recommend to implement
Estimate any lost load in the imbalance position of the BRPs and the marginal imbalance price	• In the event of involuntary load curtailments, any lost load should be estimated and included in the imbalance positions of individual BRPs and the calculation of the system imbalance volume and the marginal imbalance price	• Recommend to implement



BALANCING AND IMBALANCE ARRANGEMENTS

Real time price signals that support system operation and market functioning

MARKET FACILITATION

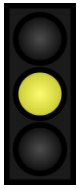
Topic	Proposed changes	General feedback	
Remove obligation on BRPs to balance	• Remove any balancing obligations at the day-ahead and any other stage, better allowing the market to support system balancing	• Recommend to implement	
Balancing transparency	• Balancing activations and prices should be published as close to real-time as possible, which serves as an indication for imbalance prices	• Recommend to implement	
Balancing market gate closure	• The gate closure to submit bids to the Regulating Power Market should be moved as close to the operating hour as possible	• Recommend to implement	
Bid size	• Reduce the minimum bid size in the balancing market to 1 MW and take electronic activation into use	• Recommend to implement	

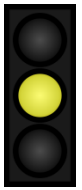
BALANCING AND IMBALANCE ARRANGEMENTS – FURTHER CONSIDERATIONS

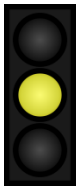
Real time price signals that support system operation and market functioning

PRICE FORMATION

Topic	Proposed changes	General feedback	

Calculation of imbalance and balancing prices	• Inclusion of reservation costs, through:
	  • a scarcity function or a scarcity adder; or
	  • an adder based on expected utilisation
		• Delay
		• Interesting but worries over complexity and challenges of implementation
			

aFRR and mFRR	• Combining activation prices of aFRR and mFRR
	  • Imbalance price based on weighted average of aFRR and mFRR;
	  • Imbalance price based on marginal price of aFRR and mFRR; or
	  • Common merit order list for activation prices of aFRR and mFRR
		• Delay
		• aFRR needs to be in use – time to understand
			

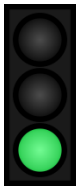
Role of market participants in reserve procurement and provision	• In the longer term, there might even be opportunities to permit market participants to play a role in the procurement and perhaps even the deployment of reserve. • Any such changes must be consistent with secure system operation and the role of the TSOs as having ‘last resort’ responsibility for balancing the system	• Potential long-term development	

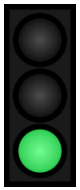
INTRADAY

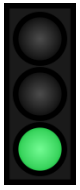
INTRADAY MARKET

An enhanced intraday market better equipped to facilitate the market functioning

Topic	Details / options	General feedback
Intraday auctions	• A single opening auction on day D-1 (no later than 3pm CET) for all market time units for the following day as close as practically possible to the setting of day-ahead prices and recalculation of available capacities. The auction should use 15-min products. • Continuous trading from the resolution of the opening auction until the gate closure time of the ID market, which could be combined with a closing auction (subject to further consideration).	• Recommend to implement • Discuss need for closing auctions
ID gate closure to as close to real-time as possible	• The regional cross-zone intraday GCT in the Nordics should be as close as to the operating hour as possible, using 30 min as a starting point • Shortening the GCT for intraday trading should ideally be accompanied with change to the deadline for submitting production plans.	• Recommend to implement
Remove obligation to balance in the day-ahead market	• Remove any balancing obligations at the day-ahead stage.	• Recommend to implement
Price cap in the intraday market	• In line with the change to the balancing market, the price cap in the intraday market should be set to better reflect the value of lost load (9999 EUR/MWh as outlined in the all NEMO proposal).	• Recommend to implement



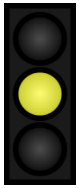




INTRADAY MARKET – FURTHER CONSIDERATIONS

An enhanced intraday market better equipped to facilitate the market functioning

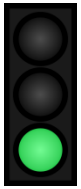
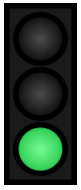
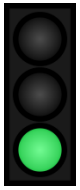
Topic	Details / options	General feedback
Allocation of cross-zone capacity across market timeframes through an explicit cross-zone capacity product	• Introduce a new explicit capacity product for capacity between bidding zones in the day-ahead market. • Allow TSOs and participants to bid to hold capacity to intraday or balancing timeframes if they bid sufficiently to justify deferring a firm energy trade. • Introduce a similar explicit capacity product in the ID market.	• Recommend for further exploration • Concerns over complexity and challenges of implementation



SYSTEM SERVICES

SYSTEM SERVICES

System services that are adequately rewarded and similarly compensated across the Nordic market

Topic	Details / options	General feedback	
Remove requisitioning of services without remuneration through supply and grid connection conditions	• Wherever generators are required to provide system services without remuneration or at below market rates, there should be a review whether there is a demand for the service in the system. • If there is, a market-based procurement approach should be developed as far as possible.. • At minimum, there should be a regulated remuneration and equal requirements for all technologies.	• Recommend to implement	
Level playing field between TSOs and market participants providing the same services	• Service providers should compete with any TSO assets providing system on an equal footing. • Minimum requirement is to increase transparency on the system, cost levels of TSO assets and market participant compensation when they are providing the same services as TSO assets.	• Recommend to implement	
Marginal pricing of availability fees of reserve products	• Marginal pricing should be used for pricing the availability fees of all standard reserve products (FCR, aFRR and mFRR).	• Recommend to implement	

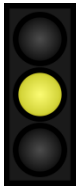
SYSTEM SERVICES – FURTHER CONSIDERATIONS

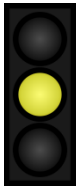
System services that are adequately rewarded and similarly compensated across the Nordic market

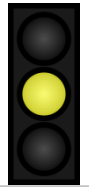
Topic	Details / options	General feedback
Granular reserve products	• Rather than tightly defined products procured in silos, services could be flexed around defined product specs to be offered, which permits the TSO to blend providers to satisfy its overall needs • At minimum, the product definitions should be revisited on a regular basis against the capabilities of different service provider and system needs.	• Requires further assessment

Inertia market and/or the need for faster responding frequency containment reserves	• The Nordic TSOs are currently running a project to define if there might be problems with the adequacy of inertia in the future. If there is value in providing inertia to the system, the following principles should be used in designing the remuneration and procurement:
	  • temporal variation of inertia value to be recognised (i.e. payments made at times deliver when a lot of non-synchronous generation is on and inertia in the system is low);
	  • the value to reflect the full cost of inertia (i.e. not hiding costs of starting units for inertia);
	  • inertia is a system-wide property → regional mechanism as a starting point
	• Markets for providing inertia is one option, but there are other products which may be needed instead (e.g. faster responding FCR), as there is a trade-off between the level of inertia and the rate of response from frequency containment reserves
		• Requires further assessment – what is future need for inertia?

Nordic FCR-N market	• A Nordic FCR-N market could lead to lower overall costs of providing frequency response reserves through a more effective use of resources across price zones	• To be explored in more detail



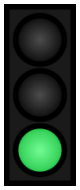


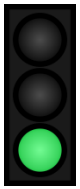


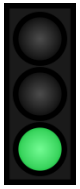
STRATEGIC RESERVE

STRATEGIC RESERVE / PEAK LOAD CAPACITY

A more Nordic market design for strategic reserve that does not distort market price signals

Topic	Details / options	General feedback	
Activation and pricing principles to better reflect the value of avoided scarcity	• Activation of the strategic reserve should happen in the last market possible, the regulating power market, even if the capacity requires a longer warm-up time and the notification for a start-up is given earlier. • If the strategic reserve is actually used to solve an energy shortfall, and not only warmed up, the activation should be reflected in imbalance prices at Value of Lost Load (e.g. balancing market price cap)	• Recommend to implement	

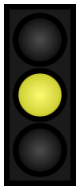
Explicit target level of power adequacy	• The size of strategic reserve should be defined based on:
	  • an explicit target level of power adequacy based on the Value of Lost Load (VOLL, EUR/MWh);
	  • cost of capacity (EUR/MW per year); and
	  • a probabilistic analysis on Expected Unserved Energy (EUE, MWh/a).
		• Recommend to implement	

Regional cooperation	• Adequacy assessments should be done on a regional basis and based on a common methodology. • Strategic reserves in different countries should be seen together and considered as a common strategic reserve including harmonized activation principles. • The Nordic TSOs should have coordinated and transparent protocols to handle scarcity situations and how cross-zone flows are managed these situations.	• Study feasibility • Recommend to implement	

STRATEGIC RESERVE – FURTHER CONSIDERATIONS

A more Nordic market design for strategic reserve that does not distort market price signals

Topic	Details / options	General feedback
Demand side participation	• The current peak load capacity schemes in Finland and Sweden allow for demand-side resources to bid for participation • Incentives could be developed to incentivise demand side to support power adequacy • For example, as an alternative and a complement to the strategic reserve, consumers could promise to bid a volume into the day-ahead or the balancing market, or choose to curtail their load in real-time, whenever the TSO finds it necessary and receive an annual payment from the TSOs – this could be a transitional measure to stimulate demand response	• Needs further study



NEXT STEPS TOWARDS IMPLEMENTATION

Topic area	What are the next steps?	What does it depend on?
Balancing and imbalance	• Input to Nordic TSO projects on full cost balancing and reducing minimum bid size • Input to balancing market co-operation between Nordic and Baltic markets	• Main dependency is on integration of balancing markets and settlement rules under Electricity Balancing Guideline and Nordic-Baltic markets
Intraday	• Start a Nordic process to implement ID market improvements • Input to Nordic TSO finer time resolution project	• Main dependencies: start of XBID in 2018 and ENTSO-E proposal on ID capacity pricing • Transitional arrangements – pilots for ID auctions and or cross zone capacity allocation

NEXT STEPS TOWARDS IMPLEMENTATION

Topic area	What are the next steps?	What does it depend on?
System services	• Start a Nordic process among stakeholders to look at system services • Input to further development of Nordic aFRR and other system products	• Main dependency is the implementation of the clean energy package; how services should remunerated and TSO ownership of assets
Strategic reserve	• Input to Nordic TSO project to harmonise activation rules • Process to harmonise methodologies and principles of co-operation	• Main dependencies are ENTSO-E work on a common methodology for security of supply and Commission view on CRMs

BALANCING AND IMBALANCE ARRANGEMENTS

All of the changes are allowed within the current EU regulation and most are supported or even required

Topic area	Proposal	Reference	Status
Prices	Single price for imbalance settlement	EB GL: Article 52	✓
Prices	Raise price caps in the balancing market	EB GL: Article 30	✓
Prices	Estimate any lost load in the imbalance position of the BRPs and the marginal imbalance price	-	✓
Prices	Remove link between balancing and imbalance prices with day-ahead prices	-	✓
Facilitation	Include balancing energy exported outside the Nordics in balancing price formation	EB GL: Article 30	✓
Facilitation	Information on activations and balancing and imbalance prices closer to real-time	CEP Regulation, Art. 5(10)	✓
Facilitation	Gate closure closer to real-time	CEP Regulation, Art. 5(5)	✓
Facilitation	Balancing market minimum bid size to 1 MW	-	✓

INTRADAY MARKET AND CONSEQUENCES FOR THE DAY-AHEAD AND BALANCING MARKETS

Topics related to intraday market are currently under development

Topic area	Proposal	Reference	Status
Intraday	Intraday opening auction with 15-min products, possibly closing auctions	Partly: All TSOs' proposal for the single methodology for pricing ID cross-zonal Capacity (CACM Art. 55)	**Open**
Intraday	Intraday gate closure time (GCT) as close to real-time as possible	All TSOs' proposal for intraday cross-zonal gate opening and gate closure times (CACM Art. 59)	✘
Intraday	Raise caps in the intraday market	CACM Article 9(12) All NEMO proposal and Energy Regulators' amendment request CEP Regulation, Article 9-10	**Open**
DA	Remove obligation to balance in the day-ahead market	-	✓
DA → ID → Balancing	Start a process to define an approach and test the feasibility of allocation of cross-zone capacity across market timeframes	CEP Regulation, Article 15 EB GL Article 41	**Open**

SYSTEM SERVICES AND STRATEGIC RESERVE

RfG gives TSOs the right to define grid connection requirements, but the Clean Energy Package emphasises market-based procurement of ancillary services

Topic area	Proposal	Reference	Status
System services	Remove requisitioning of services without remuneration through supply and grid connection conditions	CEP Directive, Art. 40	✓
System services	Level playing field between TSOs and market participants providing the same services	CEP Directive, Art. 40 and 54	✓
System services	Marginal pricing of availability fees of reserve products	-	✓
Strategic reserve	Activation and pricing principles to reflect the value of avoided scarcity	CEP Regulation, Art. 2 (definition of strategic reserve)	✓
Strategic reserve	An explicit target level for power adequacy to define the dimensioning of strategic reserves	CEP Regulation, Art. 19-20	✓
Strategic reserve	Regional cooperation to utilise strategic reserves more efficiently across countries	CEP Regulation, Art. 34 (ROCs)	✓