System Operation European Stakeholder Committee

Materials for meeting 23 September 2021

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Reliable Sustainable Connected

1. Review of the Agenda

Subject	Timing	Lead
1. Opening • Review of the agenda • Review and approval of minutes from previous meeting • Review of actions	13.30 – 13.45	ACER, Uros Gabrijel ENTSO-E, Victor Charbonnier
2. Update on the implementation actions at pan-EU level	13.45 – 13.55	ENTSO-E, Victor Charbonnier
3. Cybersecurity Network Code • Update on drafting process	13.55 – 14.25	ENTSO-E, Andrea Foschini
4. Report on CGM Program Implementation	14.25 – 14.40	ENTSO-E, Markus Besser
5. Wind eclipse • Way forward	14.40 – 15.00	ENTSO-E, Walter Sattinger and Bernard Malfliet
6. Insights on ENTSO-E papers on offshore developments	15.00 – 15.20	ENTSO-E, Antje Gesa Orths
7. FCR LER • Update on process and proposal	15.20 – 15.35	ENTSO-E, Luca Ortolano
8. Report on the separation of the Continental Europe power system on 8 January 2021: market aspects	15.35 – 15.50	TBD
9. AOB • NC E&R update (no presentation) • Next meetings	15.50 – 16.00	ACER, Uros Gabrijel

1. Review of actions

ENTSO-E, Victor Charbonnier

1 Review of actions

ACTION	ANSWER	STATUS
ENTSO-E to come back in next SO ESC on question on impact on imbalance on bidding zones to which hybrid assets are connected	ENTSO-E to present at September ESC its views on offshore developments incl. market and system operation aspects.	Ongoing
ENTSO-E will propose an action plan on how to organise the discussion on the wind eclipse in the next SO ESC meeting.	ENTSO-E to provide a high-level proposal for how to define and tackle the topic at the September ESC.	Ongoing
ENTSO-E will provide further details on the list of mitigation measures for deterministic frequency deviations by end of June.	ENTSO-E to provide views during the wind eclipse presentation at September ESC. Information was also shared with members of the System Operation Coordination Group.	Ongoing

2. Update on the Implementation Actions

ENTSO-E, Victor Charbonnier

Black – update compared to last meeting

Grey – no update compared to last meeting

Pan-European or regional deliverables 2021: SOGL

CSAm Amendments (Article 21 & 27)	Discussions with ACER and NRAs were finalised in May 2021, and amendments were approved in June 2021. A dedicated workshop with CCRs is planned in October 2021 to share information and awareness of those amendments and their impact on the regional implementation.
Regional Coordination Assessment	ENTSO-E published on 26 July its annual report on ‘’Regional Coordination Assessment’’. It contains key-performance indicators (KPIs) for the services provided by the Regional Security Coordinators (RSCs).
FCR LER (article 156.11)	ENTSO-E has run a public consultation to collect stakeholders’ views on the proposal of the LER time period to be applied in Continental Europe. The proposal is available here.

Pan-European deliverables 2021: CEP

RCC Establishment proposals (Art 35 ER)	The approval of the RCC establishment proposals by regulators of each SOR is expected by summer 2021.
Risk Preparedness	On 7th of September ENTSO-E submitted the “Report assessing the need for development of computational methods and tools for assessment of regional electricity crisis scenarios” to the European Commission and ACER. The report was presented at the last Electricity Coordination Group meeting (15 September).

National Implementation

KORRR	No update
Operational Agreements	No update

Transparency Platform and Active Library

Transparency Platform	The Manual of Procedures went through public consultation until 13 August. No changes were requested to the proposal of SO GL DDD. The document is to be approved by ENTSO-E relevant bodies and sent to ACER for opinion.
Active Library	The Active Library is operational since early September. It is accessible here: https://www.entsoe.eu/active-library/codes/so/

3. Cybersecurity Network Code

Update on drafting process

ENTSO-E, Andrea Foschini

Network Code Cybersecurity – drafting process

Main Topics of the Network Code

Network Code on Cybersecurity aims to establish:

- An impact assessment methodology to evaluate the relevance of electricity undertakings (Electricity Cybersecurity Risk Index);
- A cyber risk assessment methodology to assess risks on cross-border electricity flows;
- A common Electricity Cybersecurity Framework to establish minimum cybersecurity requirements;
- A Supply Chain security framework that aims to verification of products and services that are relevant for cross-border electricity flows;
- A common scheme for sharing of cybersecurity-related information, Incident and Crisis Management.

GOVERNANCE MONITORING BENCHMARKING REPORTING

Network Code Cybersecurity – drafting process

Timeline and where we are today

Milestones
June 2020: First Interim Report on NCCS
Nov 2020: Second Interim Report on NCCS
Dec 2020: Wide stakeholders consultation on 2° Int. Rep.
Feb 2021: Final Interim Report
July 2021: Framework Guidelines by ACER

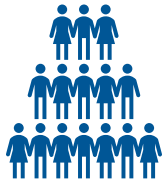
Informal Drafting

July 23° 2021 EC requests ENTSO-E, in collaboration with EU-DSO, to formally start Drafting the Network Code.

Formal Drafting

PROJECT	TASK	START	PLAN END
Phase 1 NC CS v1	Drafting NC CS Version 1 (DT) Drafting Committee review Transpose the NC CS v1 in legal text Deliver the revised NC CS v1 (DT)	27/07/2021	11/11/2021
Phase 2 NC CS public consultation	Stakeholders' updates NC CS public consultation Public Consultation Workshop 1 Public Consultation Workshop 2	12/11/2021	10/12/2021
Phase 3 NC CS v2	Incorporate all comments from public consultation (DT) Deliver NC CS v2 (DT0 Drafting Committee' review Submit NC CS final to ACER	13/12/2021	14/01/2022

Drafting Committee Kick-off Meeting Takeaways



Current constituency: ACER, CEER, EC, ENISA, ENTSO-E, EU DSO Entity, NEMO Committee, NIS Cooperation Group Work Stream 8, RCCs

Contacts are in progress with other relevant association of Energy, Industrial and Cybersecurity Industries.

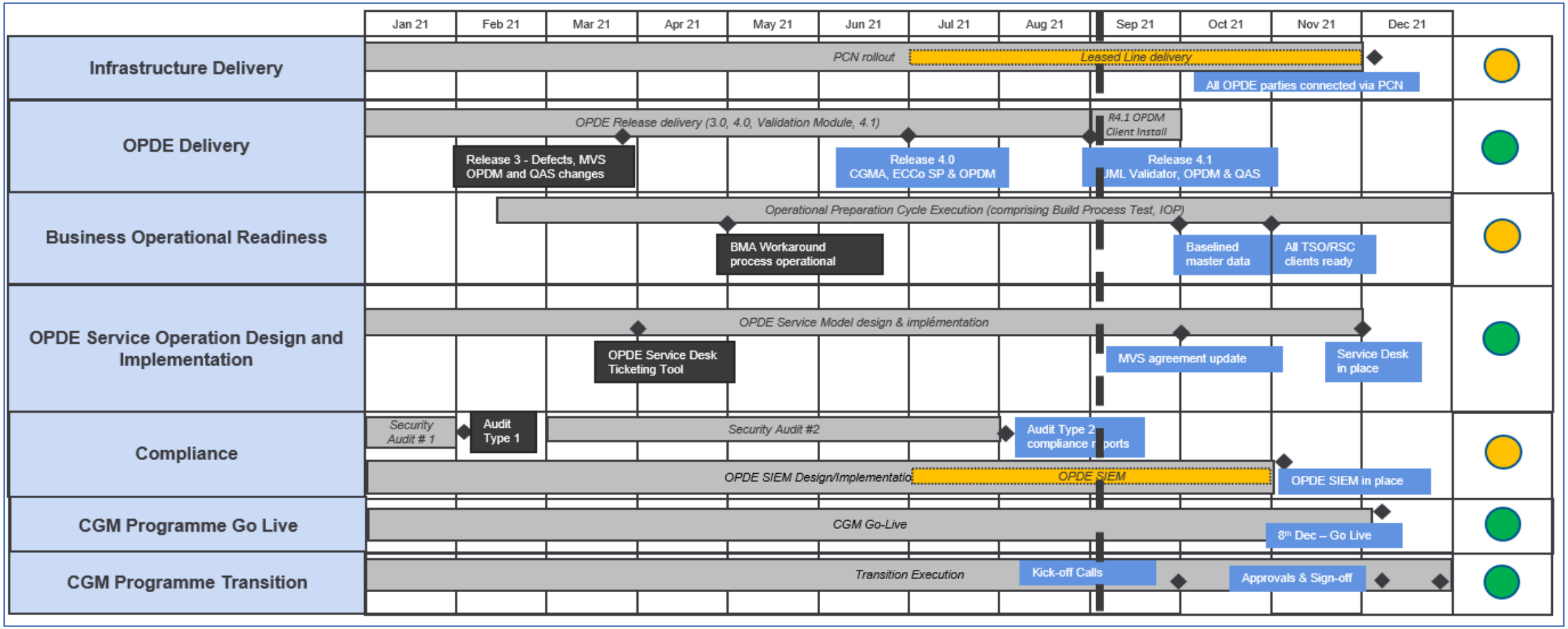
Chaired by ENTSO-E, Vice-chaired by EU DSO Entity

Success on finding a common language
Establishing long lasting partnership
Backbone for a strong and united approach to cross border cybersecurity

4. Report on CGM Program Implementation

ENTSO-E, Markus Besser

CGM Programme: Timeline of key activities in 2021



The journey towards an integrated and harmonised service operation

The CGM Programme's deliverables enable TSOs and RSCs to produce **consistent and synchronised calculations using harmonised pan-European CGM data.** The CGM building process and all dependent services will be operated using:

- the CGMES as a data format;
- ENTSO-E's OPDE for data exchange.

As implementation schedules vary across services and regions, a phased approach is:

- putting each service into operation as quickly as possible;
- allowing flexible adaptation to a changing environment;
- enabling a profound integration of all streams

The journey towards an integrated and harmonised service operation

The phased approach is structured around three major phases:

1. **Delivery of the CGM building process and dependent services.** The CGMES and ENTSO-E's OPDE will be used wherever possible. Some services may be based on different data formats and/or different communication means.

2. **Migration or implementation of services to the CGMES and/or ENTSO-E's OPDE.**

3. **Integrated operation** of the CGM building process and dependent services based on the CGMES and ENTSO-E's OPDE.

The CGM and associated services will increase efficiency in system operations, allow the reduction of network costs by minimising the risk of wide-ranging events, strengthens the security of supply and maximises the availability of transmission capacity to support market efficiency.

Questions?

5. Wind Eclipse

ENTSO-E, Bernard Malfiet & Walter Sattinger

Identification of the problem

Wind eclipse is a new name for the fast changes in renewable infeed that occur for expected reasons like:

1. New regulations related to negative prices can impact the profit of solar and wind which will shut down if there is no profit margin. Some regulations even introduce penalties if they stay on the grid
2. Environmental regulations can also lead to wind shutdown. For instance noise regulations on wind farms requires them to stop during the night

Both of these regulations can cause a very rapid shutdown and (later on) restart of a large volume of renewable generation

Very fast shutdown of a large volume of renewable can lead to very fast frequency decreases, and a very large DFD as they may correlate with schedule change, tariff change hours too

Analysis of the situation

ENTSO-E has discussed this new phenomenon and proposes an action plan

- What kind of regulations can cause a wind eclipse
- Clarify if it applicable to all kinds of renewables or just a subset
- Acquire specific measurements from suspected infeed connection points and correlate those measurements with affected control block ACE and CE system frequency
- Identify the size of the problem: how much renewable is involved in each country.
  - Perform a data collection on current rules and regulations (both environmental and market related)
- Analyse the impact on the frequency both in terms of RoCoF and absolute variation (DFD)
- Estimate the evolution of the problem in the coming years
- Perform model calculations in order to reproduce the observed behaviour

Next steps analysis process

1. Collection of significant events
2. Evaluation of SCADA and some PMU recordings (voltage phase and magnitude, frequency)
3. Information about wind plants involved in the phenomena (size, location, electrical measurands)
4. Evaluation of main electrical drivers of phenomena (RoCof, Angles displacements, flows, frequency, voltage, …)
5. Decision about need of simulations and, in positive case, set up of a proper model
6. Run of simulations and identification of possible contermeaurers/constraints/reccommendations

Tackle the problem

Discuss with representatives from the sector on how the impact can be limited

Discuss with stakeholders from the market on possible solutions

Propose solutions that can reduce the problem

Test in simulations of the solutions will lead to reduced RoCoF and reduced DFD

Discuss with local legislative bodies to change regulations to incorporate the solutions

6. Insights on ENTSO-E papers on offshore developments

ENTSO-E, Antje Gesa Orths

Context

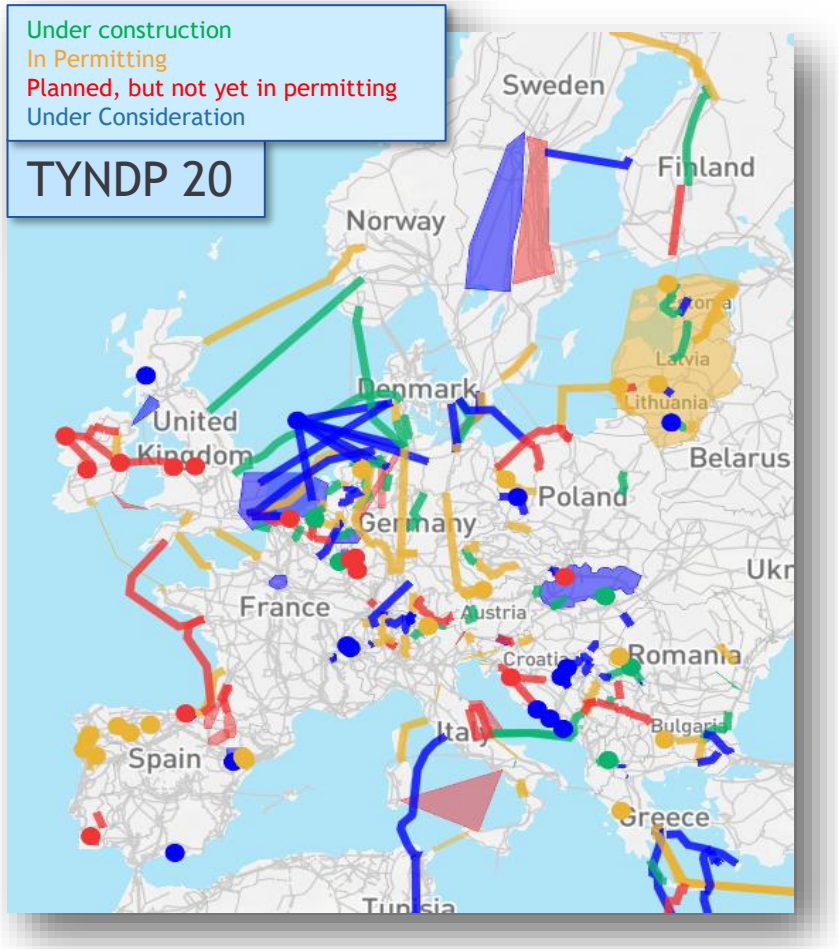
Click on the pictures to open the papers

- EC expects 300 GW offshore wind + 40 GW ocean energies by 2050 according to their EC offshore RES strategy
- ENTSO-E is joining the public debate via
  - ✓ Position Papers
  - ✓ Dedicated Web Section on offshore development

TSOs face a complete Remake of the European Electricity Production

This impacts the transmission infrastructure, which must evolve simultaneously.

Offshore is *one out of multiple aspects* necessary to consider when developing future energy systems
=> Application of a holistic view across time, space and sectors



ENTSO-E Position on Offshore Development (#1)

Unprecedented grid- and spatial planning, engineering, construction and financing efforts are required on- and offshore to facilitate reaching the EU's decarbonisation targets

Key challenges:

- Costs
- Spatial Planning
- Integrated perspective over time, space and sectors
- System Balancing
- System Security
- Environmental protection and public acceptance

ENTSO-E's view of basic Pillars & Needs:

1. Holistic Planning to ensure Timeliness
2. Modular & Stepwise Approach based on Consistent Planning Methods
3. Develop Interoperability to unlock Smarter Integrated System Operations
4. Keep the Energy Bills & Environmental Footprint low through Innovation

TSOs

5. A Future-Proof Regulatory Framework
   - Consistent Unbundling Rules
   - Incentivize forward-looking and Anticipatory Investments
   - Governments to ensure Confidence in Market- and System Operation Setups to provide a Robust Framework and Financial Security for Investors.
   - Offshore Hybrid Projects: Flexible Rules regarding contribution of MSs to EU climate target. Offshore Bidding Zones may be a promising solution for Market Integration

EC & Governments

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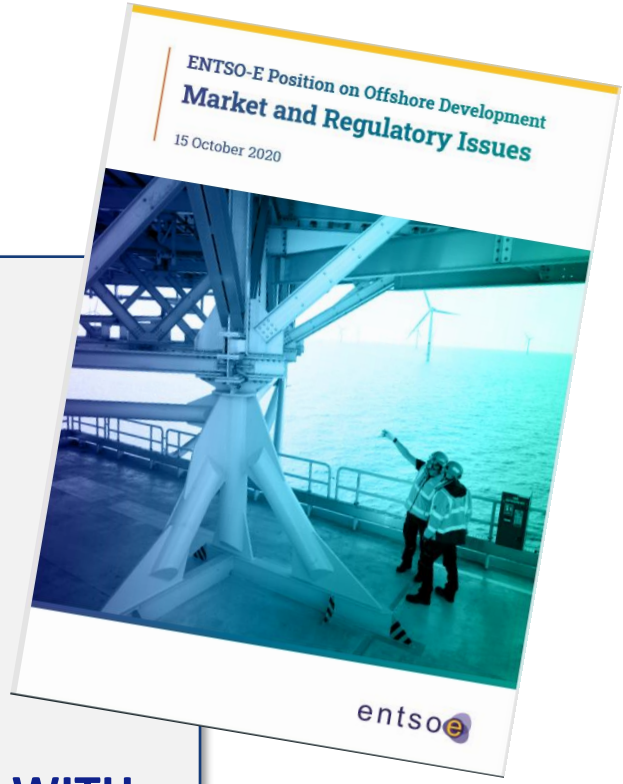
Market Design Objectives - Trilemma

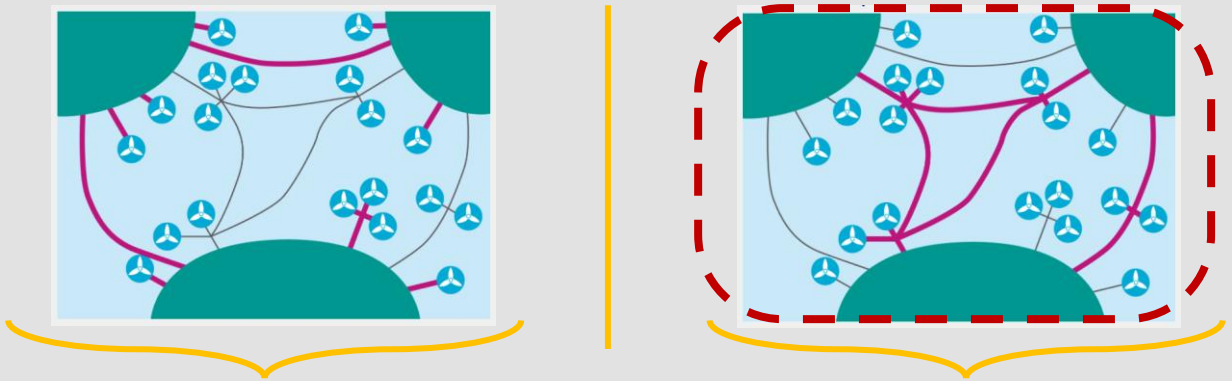


MARKET DESIGN EFFICIENCY

CREATING SOCIAL WELFARE

SYSTEM OPERATION EFFICIENCY

ALIGNMENT WITH POLICY OBJECTIVES



ENTSO-E Offshore Position # 2:

ENTSO-E wants a market design that accommodates social welfare and resource efficiency through efficient markets and system operations that also deliver on the policy objectives of the EU Green Deal.

Two market design concepts for hybrid and multi-terminal configurations with *dual purpose* have been investigated: OBZ and HM

Both concepts have pros and cons and require further analysis.

- **The OBZ concept appears to be the prominent solution** when considering the efficiency of markets and system operations; mainly as it better reflects physical congestions and physical flows.
- However, it provide less market revenue to OWFs compared to the HM concept => *it could require stronger support mechanisms to realise investments in socioeconomic efficient hybrid projects.*

Policy makers would have to apply a holistic perspective, considering how to best cater for all three key perspectives:

- Efficiency of markets
- Efficiency of system operations
- Realising the political targets of the EU Green Deal.

	Issues	Offshore Bidding Zone Concept (OBZ)	Homemarket Concept (HM)	Tentative Conclusions & Further Work	
SYSTEM OPERATION EFFICIENCY	Demand for TSO intervention	Less redispatch and counter trading than for HM	More redispatch and countertrading than for OBZ	OBZ provides the more efficient solution as it requires less TSO redispatch and counter-trading. Further analysis is required.	
MARKET DESIGN EFFICIENCY	Distribution of roles and responsibilities between TSOs and OWF developers	Clear and transparent. No additional need for TSOs to forecast wind generation for capacity calculation	Mixed TSO role. Need for TSOs to forecast wind generation for capacity calculation	OBZ seems to provide the more efficient solution. Some Issues require further analysis.	Tasks for TSOs
	Scalability to meshed offshore system	Theoretically, transparent and no major increase in complexity, thus scalable. No major impact on capacity calculation expected. Impact on market coupling algorithm runtimes needs to be investigated.	Theoretically, complex and potentially intransparent. Major impact on capacity calculation expected. However, no major impact on market coupling algorithm runtimes expected.		
	CEP 70 % requirement	Full compatibility. 100% capacity allocted to the market.	Not compatible. < 70 % allocated to the market during significant wind infeed		
	Flow-based compatibility (Advanced Hybrid Coupling)	Full compatibility.	Hardly compatible (not yet analysed in depth)		
	Competition and equal market access to capacity	Full competition across onshore and offshore, also when flow towards "home market". Markets reflect physics and costs.	Unconstrained access to offshore wind limits competition across onshore and offshore when flow towards home market. Markets don't fully reflect physics and costs.		
ALIGNMENT WITH POLICY OBJECTIVES	Market Revenues to OWF	Lower market revenues than in HM when energy flows towards "home market" (else equal)	Higher market revenues than in OBZ when flow towards home market (else equal)	Policymakers to consider policy options (e.g. subsidy schemes for OWFs (who pays?) and allocation of CO_2 credits to be clarified in the GREEN DEAL context). Related impacts on efficiency of market and system operations to be considered as well.	Tasks for Politicians
	Allocation of CO_2 credits	Allocation of credits unclear for multi-national setups.	Allocation of credits unclear for multi-national setups.		

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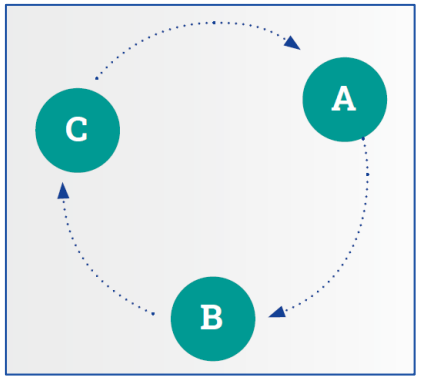
Vicious circle needs to be broken

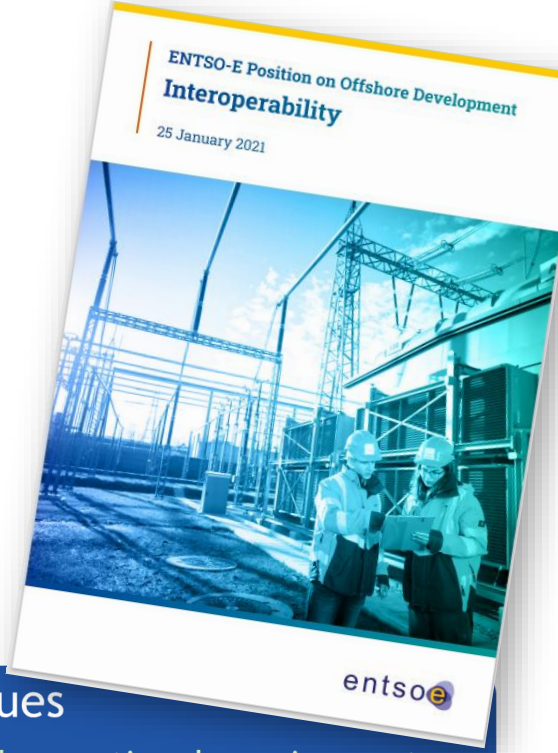
A. To offer technological solutions, manufacturers require specifications which cover the required asset capabilities and performance in compliance with system needs

B. Up to this point, TSOs cannot yet draft detailed specifications for HVDC multi-terminal, multi-vendor multi-purpose systems due to limited operational experience with these technologies, especially under interoperating conditions

C. Finally, manufacturers cannot develop products without specifications at a sufficient level of detail. As a consequence, position A appears again.



Interoperability of a transmission system, its subsystems and components is defined as their **ability to function together, seamlessly** allowing the transmission of electricity at the required power quality and level of security of supply.



Technical issues

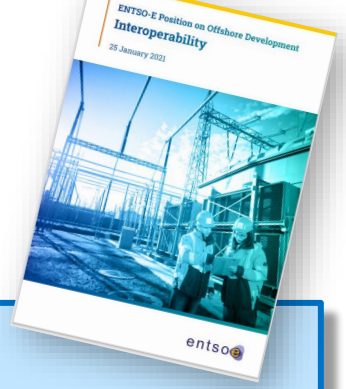
- Functional and operational requirements
- Demonstration in target environment
- Power system engineering and planning
- Standardization of systems and equipment

Legal issues

- Intellectual property rights
- Contractual relations and warranties
- Regulation and Legal Framework

ENTSO-E Offshore Position # 3 - Interoperability

Towards unlocking multivendor multiterminal HVDC systems– Mutual Development Effort



What will be developed by TSOs:

- Adaption of planning approaches.
- Drafting functional specifications for the DC side.
- Definition of clear interfaces for interaction studies (electrical as well as control signal interfaces).
- Coordinating & performing interaction studies in a multi-vendor environment.
- Adaptation of existing network codes (NC HVDC, NC ER & formulation of new guidelines operating MT-MV HVDC systems
- Drive the development towards a full-scale demonstrator project to achieve higher TRL and facilitate standardisation of systems and equipment

TSOs and Manufacturers intent to jointly break the vicious circle

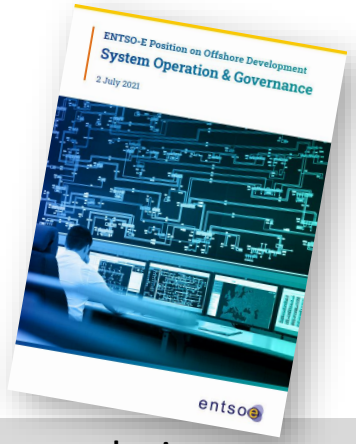
Tasks for Manufacturers:

- Support TSOs in defining coverage, level of detail and model interfaces for interaction studies in a multi-vendor environment, incl. electrical and control signal interfaces.
- Definition of contractual and legal relations necessary to establish a multi-vendor cooperation framework
- Standardisation of components of systems and equipment when technology readiness level is reasonable.

Tasks for Policy Makers

- Create a sound legal and regulatory governance for developing a full-scale, multi-vendor multi-terminal, multi-purpose demonstration.
  - Such a project should define and execute the implementation in a harmonised manner and facilitate the dissemination of findings to subsequent projects under a market-driven environment.
- Initiate funding to facilitate the relevant research and development and demonstration activities before a commercially viable infrastructure can be implemented.

Offshore System Operation Helps Facilitate the Green Deal



Guiding Principles

Act locally	• Market parties remain responsible for their imbalances • TSOs remain responsible for system operation and for balancing the system real-time
Coordinate regionally	• Regional coordination of system operation in RCCs
Think European	• Existing EU regulation define roles and responsibilities onshore and offshore

Benefits of extending existing onshore solutions to offshore include e.g.:

- ✓ *Promote efficient integration across onshore and offshore*
- ✓ *Make use of well-established solutions (no need to reinvent the wheel, less risk)*
- ✓ *Provide market players and developers with a predictable regulatory framework*
- ✓ *Stable and consistent regulation promote secure operations*

Systematic Assessment of System Definitions & System Operational Tasks

System Definitions	Issues	Solution	Regulation / code
Definition of Bidding Zones Offshore	› Reflect offshore congestions to ensure efficient competition and utilisation of resources across onshore and offshore › Respect TSOs control area, national bor… ders / EEZ also offsh… clear responsibilities… system operation › Promote a stepwise … integrated / meshed …	› Member states determine the Bidding Zones, also offshore	› Already defined in CEP article 14 › CACM article 33 (1)
Calculation Regions	› Stepwise developme… installations and new… calculation in existin… › Evaluate frequency c… › Ensure efficient integ… onshore BZs		
Definition of System Operation Regions	› Stepwise developme… grids in existing SOR… approach		
Definition of Standards and System Requirements	› Need for harmonisat… system requirements… ty and efficient syste… › Requirement of data… together with genera… system settings for …		

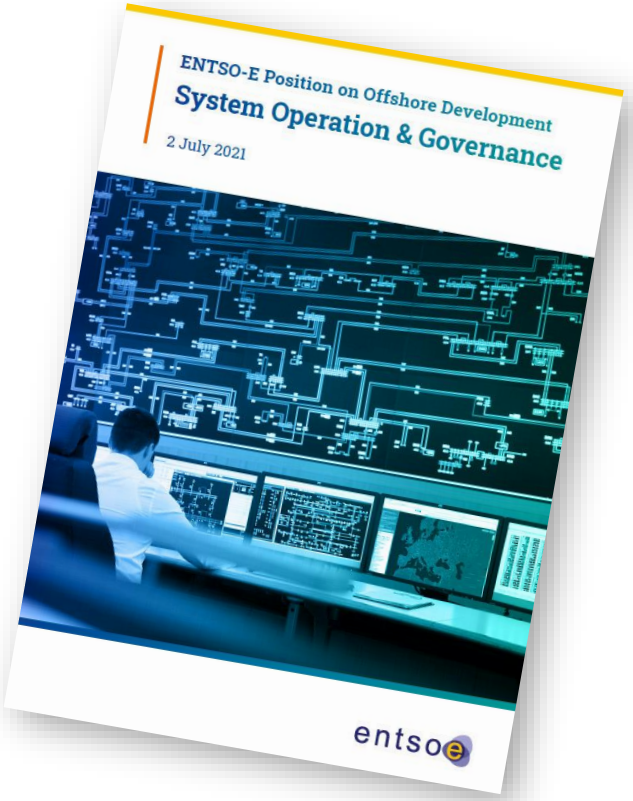
System Operation Tasks (Operational Planning)	Issues	Solution	Regulation / code
Outage Planning Coordination	› Coordination within Outage Coordination Region (OCR) and between OCRs (SOGL) › Expansion of task and more complexity, but no change of task compared to onshore coordination › New offshore interconnectors added to the process in the same way as new onshore interconnectors	› TSOs collect and report › RCCs carry out regional outage coordination in order to monitor the availability status of the relevant assets and coordinate their availability plans to ensure the operational security	› SO GL
Capacity Calculation Coordination	› Calculation of Day ahea… capacities for all BZ ons… designated CCR(s)		
Coordinated (Operational) Security Analyses	› Coordination of remedia… between CCRs. All biddi… offshore, will belong to …		
Forecasting (CSAm)	› Depending on the existe… control areas offshore t… common understanding… across CCRs		

System Operation Tasks (Market And Operation)	Issues	Solution	Regulatio…
Market Performance and Input	› Day ahead and Intraday markets provide necessary input for operation per BZ and OBZ	› Market actors are responsible for their imbalances	› CACM › CEP › EBGL
Reserves Dimensioning	› Reserves needs and responsibilities need to be clearly defined › Clarification of the definition of LFC blocks and synchronous areas in the SO GL is needed › Development of offshore LFC areas / blocks (islands) with demand leads to discussions of sharing of responsibilities among TSOs	› TSOs are responsible for reserves within their control area onshore and offshore › TSOs perform reserves dimensioning for their LFC block (including offshore parts) › RCCs facilitate regional sizing › Slight adaptation of definitions to include offshore grid in existing synchronous areas in the SO GL	› SOGL LFCaR › CEP article 6 › Definition #18 in SOGL › EBGL
Real Time System Operation	› Offshore development introduces more interaction › Different technical solutions will evolve and may lead to different solutions in the future	› TSOs are responsible for the real-time system operation within their control area	› SOGL Art 38 and 39
Real Time Balancing	› How to deal with synchronous areas (islands) needs to be developed further	› European balancing platforms are important tools for market based dispatch onshore as well as offshore	› EB GL
Coordinated Security Analyses – Cost Sharing	› Remedial actions cost sharing between TSOs and CCRs	› Regional approach › Inter-regional approach	› CACM

ENTSO-E Offshore Position # 4 – System Operation and Governance

Main Takeaways

- EU Regulations define system operation tasks, which must be performed both off- and onshore. CEP & NC & guidelines define roles and responsibilities to be used onshore as well as offshore.
- There are no fundamental differences between the general tasks related to onshore and offshore system operation. TSOs can transfer existing processes and concepts to meet the technical challenges of a meshed DC offshore grid infrastructure.
- Offshore developments will impact the processes involved in managing imbalances offshore and onshore. Market parties remain responsible for their imbalances and TSOs for balancing the system in real time.
- Offshore developments will require TSOs' close regional coordination of system operation together with RCCs.



The current regulatory setup is suitable for coping with the stepwise development of offshore grid infrastructure.

Moreover, stability in the regulatory design for system operation will facilitate secure and stable operation, as TSOs and RCCs can continue to coordinate efficiently, building on experience gained by using a well-established coordination model.


A New Position Paper soon to be published …

Thank you!

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[ENTSO-E's views on offshore development (entsoe.eu)]

7. Update on FCR LER

ENTSO-E, Luca Ortolano

FCR LER Minimum Activation Time Period – Main updates

Consultation:

It has been prolonged from the 6th of September to the **12th of September,** as request by some SH during the consultation period.

More than 40 SH participated to the consultation; answers will be submitted together with the proposal to the NRAs.

Proposal:

TSOs are working on SH comments with the goal to meet the deadline for submitting the decision on the minimum activation time period for LER (TminLER, Art.156(11) SO GL) on the **7th of October 2021**.

Next steps

TSOs will setup a workshop to explain the rationale behind the proposal they will submit to NRAs. Date still to be agreed.

TSOs wish to wormly thank all the SH for the fruitful and wide discussion had among the whole project and for the contribution to the last consultation

8. Report on the separation of the Continental Europe power system on 8 January 2021: market aspects

9. AOB

ACER, Uros Gabrijel

Next meetings

SO ESC
10 March
09 June
23 September
06 December

TOP 7
NC ER implementation – update

SO ESC
23.09.2021

Article 4(2) of NC ER – summary (status on 15.11.2019)

	Y	N	NA
Article 4(2)(a) – defence service provider - contract	7	9	14
Article 4(2)(b) – restoration service provider - contract	10	16	4
Article 4(2)(c) – list of SGUs and list of measures	13	12	5
Article 4(2)(d) – list of high priority SGUs	12	10	8
Article 4(2)(e) – suspension and restoration of market activities	11	19	0
Article 4(2)(f) – imbalance settlement	11	19	0
30 EU (TSOs)			
Y - approved by NRA			
N - submitted to NRA			
NA - not applicable			

Article 4(2) of NC ER – summary (status on 15.02.2020)

	Y	N	NA
Article 4(2)(a) – defence service provider - contract	7	9	14
Article 4(2)(b) – restoration service provider - contract	11	15	4
Article 4(2)(c) – list of SGUs and list of measures	15	10	5
Article 4(2)(d) – list of high priority SGUs	14	8	8
Article 4(2)(e) – suspension and restoration of market activities	13	17	0
Article 4(2)(f) – imbalance settlement	13	17	0
Article 4(2)(g) – test plan – missed due to extraordinary situation	1	21	
30 EU (TSOs) – red colour new value compare to 15.11.2019			
Y - approved by NRA			
N - submitted to NRA			
NA - not applicable			

Article 4(2) of NC ER – summary (status on 31.07.2020)

	Y	N	NA
Article 4(2)(a) – defence service provider - contract	8	7	15
Article 4(2)(b) – restoration service provider - contract	17	8	5
Article 4(2)(c) – list of SGUs and list of measures	17	8	5
Article 4(2)(d) – list of high priority SGUs	17	6	7
Article 4(2)(e) – suspension and restoration of market activities	14	16	0
Article 4(2)(f) – imbalance settlement	14	16	0
Article 4(2)(g) – test plan (Transelectrica, NGESO & IPTO missed)	11	14	2
30 EU (TSOs) – green colour new value compare to 15.02.2020			
Y - approved by NRA			
N - submitted to NRA			
NA - not applicable			

Article 4(2) of NC ER – summary (status on 15.01.2021)

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Article 4(2)(c) – list of SGUs and list of measures	17	6	5
Article 4(2)(d) – list of high priority SGUs	17	3	8
Article 4(2)(e) – suspension and restoration of market activities	20	8	0
Article 4(2)(f) – imbalance settlement	20	8	0
Article 4(2)(g) – test plan (Transelectrica & IPTO missed)	15	10	1
28 EU (TSOs) – blue colour new value compare to 31.07.2020 (NG ESO and SONI excluded)			
Y - approved by NRA			
N - submitted to NRA			
NA - not applicable			

Article 4(2) of NC ER – summary (status on 31.07.2021)

	Y	N	NA
Article 4(2)(a) – defence service provider - contract	9	4	15
Article 4(2)(b) – restoration service provider - contract	18	5	5
Article 4(2)(c) – list of SGUs and list of measures	18	5	5
Article 4(2)(d) – list of high priority SGUs	17	3	8
Article 4(2)(e) – suspension and restoration of market activities	21	7	0
Article 4(2)(f) – imbalance settlement	21	7	0
Article 4(2)(g) – test plan (Transelectrica & IPTO missed)	15	11	0
28 EU (TSOs) – orange colour new value compare to 15.01.2021 (NG ESO and SONI excluded)			
Y - approved by NRA			
N - submitted to NRA			
NA - not applicable			

Article 4(2) of NC ER – details (1)

	Article 4(2)(a) – defence service provider - contract
Approved by NRA	AT (APG), BG (ESO), CZ (CEPS), EE (Elering), FI (Fingrid), FR (RTE), HR (HOPS), IE (EirGrid), LV (AST)
Submitted to the NRA, not yet approved	DK (energinet), ES (REE), EL (IPTO), RO (Transelectrica)
Not Applicable	BE (Elia), DE (Amprion, 50Hertz, TenneT DE, Transnet BW), HU (Mavir), IT (Terna), LT (Litgrid), LU (Creos), NL (TenneT NL), PL (PSE), PT (REN), SE (SvK), SI (ELES), SK (SEPS)

Article 4(2) of NC ER – details (2)

	Article 4(2)(b) – restoration service provider - contract
Approved by NRA	AT (APG), BE (Elia), BG (ESO), CZ (CEPS), DE (Amprion, 50Hertz, TenneT DE, Transnet BW), EE (Elering), FI (Fingrid), FR (RTE), HR (HOPS), HU (Mavir), IE (EirGrid), LV (AST), NL (Tennet NL), PL (PSE), SK (SEPS)
Submitted to the NRA, not yet approved	DK (energinet), ES (REE), EL (IPTO), PT (REN), RO (Transelectrica),
Not Applicable	IT (Terna), LT (Litgrid), LU (Creos), SE (SvK), SI (ELES)

Article 4(2) of NC ER – details (3)

	Article 4(2)(c) – list of SGUs and list of measures
Approved by NRA	AT (APG), BE (Elia), BG (ESO), CZ (CEPS), EE (Elering), FI (Fingrid), FR (RTE), HR (HOPS), HU (Mavir), IE (EirGrid), IT (Terna), LT (Litgrid), LV (AST), NL (Tennet NL), PL (PSE), SE (SvK), SI (ELES), SK (SEPS)
Submitted to the NRA, not yet approved	DK (energinet), ES (REE), EL (IPTO), LT (Litgrid), PT (REN), RO (Transelectrica)
Not Applicable	DE (Amprion, 50Hertz, TenneT DE, Transnet BW), LU (Creos)

Article 4(2) of NC ER – details (4)

	Article 4(2)(d) – list of high priority SGUs
Approved by NRA	AT (APG), BE (Elia), BG (ESO), CZ (CEPS), EE (Elering), FI (Fingrid), FR (RTE), HR (HOPS), HU (Mavir), IT (Terna), LT (Litgrid), LV (AST), NL (Tennet NL), PT (REN), SE (SvK), SI (ELES), SK (SEPS)
Submitted to the NRA, not yet approved	ES (REE), EL (IPTO), RO (Transelectrica),
Not Applicable	DE (Amprion, 50Hertz, TenneT DE, Transnet BW), DK (energinet), IE (EirGrid), LU (Creos), PL (PSE),

Article 4(2) of NC ER – details (5)

	Article 4(2)(e) – suspension and restoration of market activities
Approved by NRA	AT (APG), BG (ESO), CZ (CEPS), DE (Amprion, 50Hertz, TenneT DE, Transnet BW), EE (Elering), ES (REE) ,FI (Fingrid), FR (RTE), HR (HOPS), HU (Mavir), IE (EirGrid), IT (Terna), LV (AST), TennetT NL, PL (PSE), SE (SvK), SI (ELES), SK (SEPS)
Submitted to the NRA, not yet approved	BE (Elia), DK (energinet), EL (IPTO), LT (Litgrid), LU (Creos), PT (REN), RO (Transelectrica)
Not Applicable	

Article 4(2) of NC ER – details (6)

	Article 4(2)(f) – imbalance settlement
Approved by NRA	AT (APG), BG (ESO), CZ (CEPS), DE (Amprion, 50Hertz, TenneT DE, Transnet BW), EE (Elering), ES (REE) ,FI (Fingrid), FR (RTE), HR (HOPS), HU (Mavir), IE (EirGrid), IT (Terna), LV (AST), TennetT NL, PL (PSE), SE (SvK), SI (ELES), SK (SEPS)
Submitted to the NRA, not yet approved	BE (Elia), DK (energinet), EL (IPTO), LT (Litgrid), LU (Creos), PT (REN), RO (Transelectrica)
Not Applicable	

Article 4(2) of NC ER – details (7)

	Article 4(2)(g) – test plan
Approved by NRA	AT (APG), BG (ESO), CZ (CEPS), DE (Amprion, 50Hertz, TenneT DE, Transnet BW), FI (Fingrid), HR (HOPS), IT (Terna), LT (Litgrid), NL (Tennet NL), PL (PSE), SI (ELES), SK (SEPS)
Submitted to the NRA, not yet approved	BE (Elia), DK (energinet), EE (Elering), ES (REE), FR (RTE), HU (Mavir), IE (EirGrid), LU (Creos), LV (AST), PT (REN), SE (SvK)
Not Applicable	

Article 4(2) of NC ER – links to the appoved TCM

Document on national implementation are available on ENTSO-E public web page :

https://www.entsoe.eu/active-library/codes/er/

Next update (status of NC ER implementation on 15.01.2022)