Webinar 6 - A system of systems: ENTSO-E's Vision for the future

Housekeeping Rules – ‘A system of Systems: ENTSO-E Vision for the future’

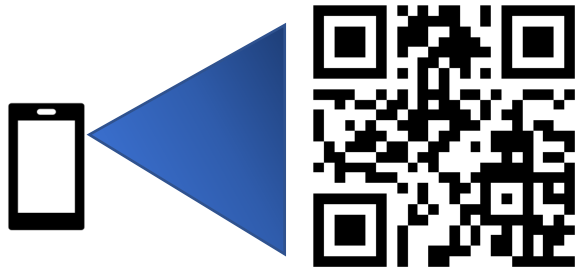
Video and audio

- Video and audio is allowed only for Speakers or Panellists
- Speakers or Panellists will be asked to switch video and audio OFF when not talking

Participants Questions

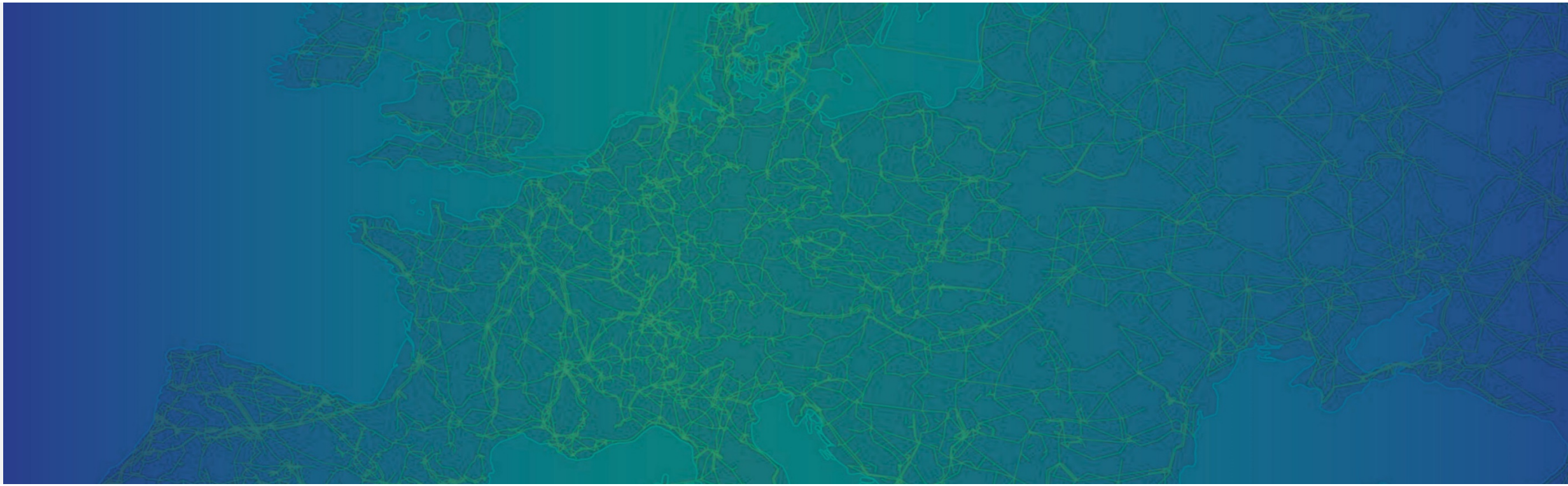
- Participants can place their questions directly through sli.do and not through GoToWebinar. Feel also free to vote for most relevant questions posted.
- Indicate your name and company/institution when posting your question
- You may post questions all trough the various presentations
- Moderators will select questions at the end and ask the relevant speakers or panellists to comment
- Chat and raise the hand feature will not be used

Sli.do **# EWeek-6**



A System of Systems

ENTSO-E Vision for the future



entsoe

Reliable Sustainable Connected

Welcome and introduction

Tahir Kapetanovic

ENTSO-E Chair of System Operation Committee,

Putting all the pieces together : ENTSO-E Vision for the future

- ENTSO-E has developed a comprehensive **Vision for the future** of the European Power System
- A vision reconciling political objectives and technical reality, at the center of the European energy transformation
- After 5 in-depth webinars covering all the key drivers for the future, today we put all the pieces together and draw a comprehensive vision
- This is only the start of the journey – we welcome all feedback, and we will engage further

Agenda

No	Subject	Time	Presenters
1.	Welcome and introduction	5 min	Tahir Kapetanovic, Chair, System Operation Committee, ENTSO-E
2.	Building the future European power system – challenges and priorities	15 min	André Poschmann, Head of Unit for EU electricity affairs, Federal Ministry of Economics and Energy, Germany
3.	Wrap up from the 5 webinars of the Vision Week: main takeaways	40min (8 min each)	Webinar leaders: Timothée Decroix, Konrad Purchala, Robert Paprocki, Dimitrios Chaniotis, Håkon Borgen
4.	Putting all the pieces together: a system of systems, our vision for the future on the path from 2030 to 2050	20 min	Tahir Kapetanovic, Damian Cortinas – Vision 2030 project leader
5.	Discussion with all participants	30 min	Moderated by Sonya Twohig, Head of Operations, ENTSO-E
6.	Conclusions and next steps	10 min	Hervé Laffaye, President, ENTSO-E

Wrap up from the 5 webinars of the Vision Week: main takeaways

Timothée Decroix
Chair of Policy & Communication Expert Group

Konrad Purchala
ENTSO-E Market Committee Chair

Robert Paprocki
Board Member, Vice-Chair of ENTSO-E Steering Group Transmission & Distribution Interface

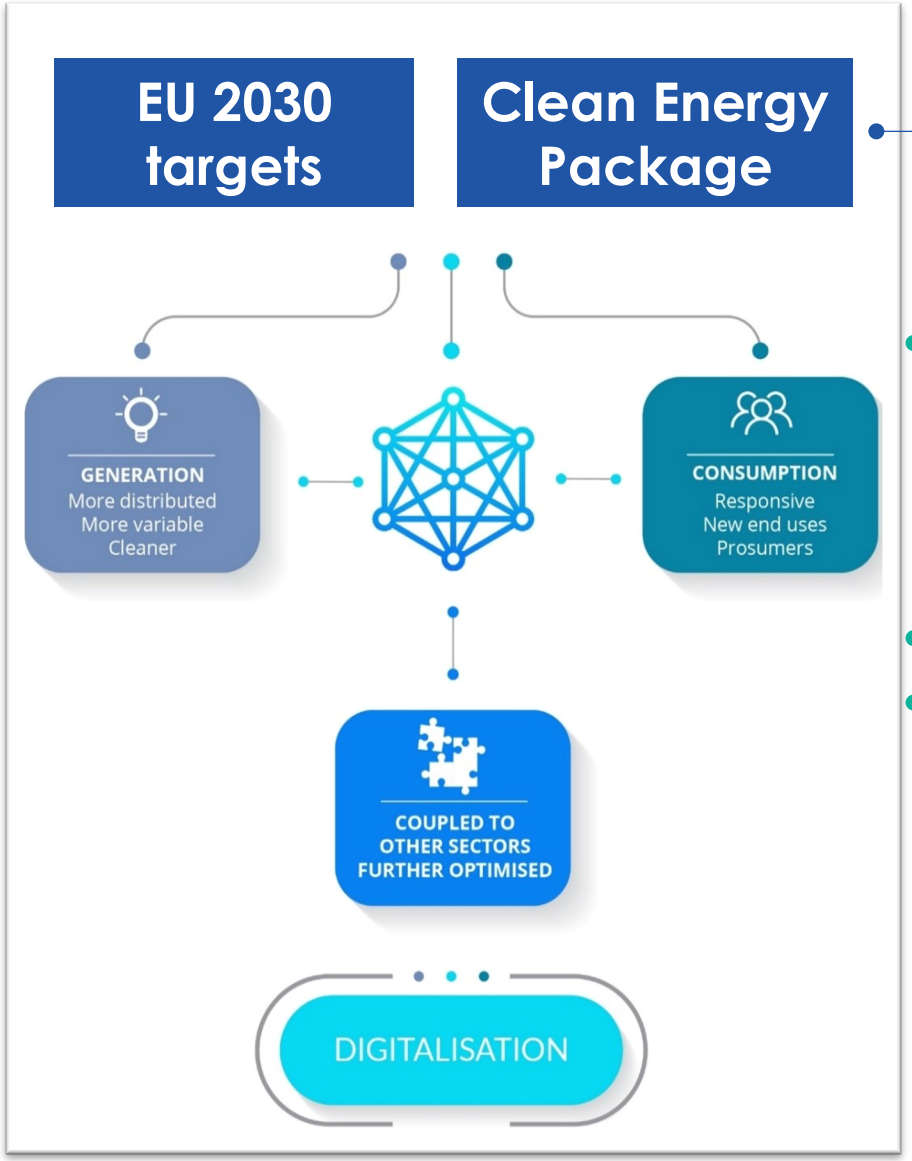
Dimitrios Chaniotis
Chair of ENTSO-E System Development Committee

Håkon Borgen
Chair of ENTSO-E Research, Development & Innovation Committee

Webinar 1 - Summary

Major Trends, 2030 scenarios, 2050 agenda, overall Vision

A Vision reconciling political objectives and technical reality



2030 Scenarios

a shared view of the future

System Operation **Market Design**

Working together towards a closer integration of system operation and markets

A robust and resilient expert-based 2030 vision adapted to a **dynamic future**

Green Deal **Climate law**

Webinar 1 - Key takeaways from stakeholder interactions

Major Trends, 2030 scenarios, 2050 agenda, overall Vision

Timely implementation of existing legislation and infrastructure priorities that are compatible and necessary for the transition of the energy system is key.

It is necessary to have a balanced and a **realistic pathway to net-zero 2050** through aligning infrastructure policy with new targets and the new energy system integration paradigm, and by directing investments into/onto a path that leads to the net zero.

The **right regulatory regime** for new models should be ensured along with implementation to deploy RES to the scale Europe wants.

Very **high levels of electrification** (e.g. the potential of a 100% renewable energy scenario) and looking at how to combine a distributed energy system in Europe with **global developments** will be important challenges on the path to climate neutrality.

We need to **get people on board** to accelerate the uptake of RES in the system and to make the energy transition happen.

The power system will have a more horizontal and cross-cutting impact to support **decarbonisation of all sectors** through both direct & indirect electrification.

Consumers are enablers of the green transition. Ensuring affordability, clarity, a stable environment, safety and cyber protection will be key to facilitate their participation in the energy transition.

Carbon content of energy will be the new currency. Proper tracing, tracking, transparency, tradability, trust, and an updated system of guarantees of origin will enable hydrogen to contribute further to the decarbonization.

Webinar 2

Market design options for the future

Wholesale Markets

- Design of Day-Ahead/Intraday Auctions and Products to be better fit for RES, DSR, and Storage participation
- Incentivize RES to participate to balancing markets and co-optimize energy & reserves procurement
- Reduce complexity of products and pricing requirements in European market coupling to improve speed and robustness of the algorithm and quality of price determination

Congestion Management & Spatial Granularity

- Improve market design to deal with higher and more volatile power flows and avoid costly congestions
- No one-size-fits-all: avoid constraining innovation as market design solutions depend on local specificities with respect to power system, congestions and policy choices
- Ensure overarching role of IEM, while allowing different national/regional detailed implementations

Adequacy and Investment Signals

- Regardless of national policy choices, Energy Only Markets, Strategic Reserves and Capacity Mechanisms need to be enhanced to adapt to future markets & energy mix
- Role, objective and implementation of **scarcity pricing** to be clarified
- **Coherent design** of energy markets, capacity mechanisms, ancillary services, and RES support is needed to ensure efficient & effective investment signals for all resources

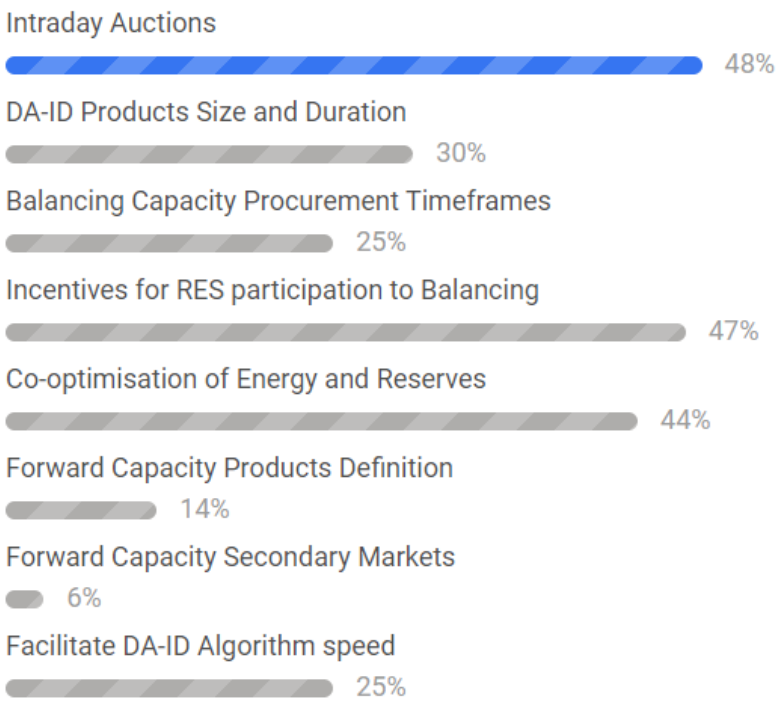
Webinar 2 - Key takeaways from stakeholder interactions

Market design options for the future

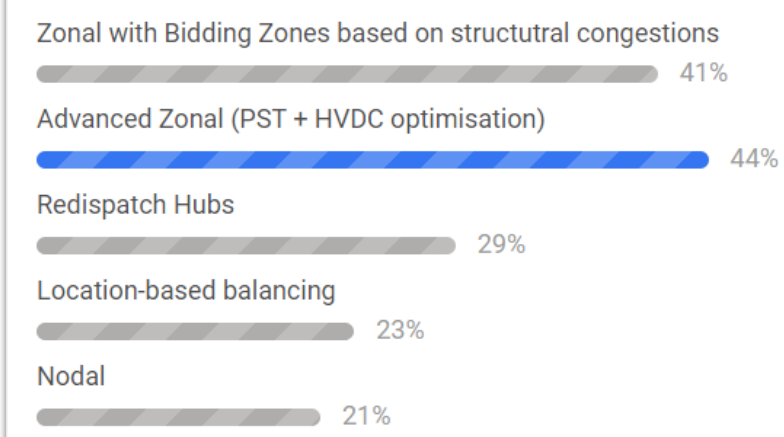
- Consensus that **markets need to evolve** to cope with future requirements and challenges
- Widespread acknowledgement that markets need to reflect physics: **location matters**
- **Avoid dogmatic debates zonal vs. nodal**: pragmatic intermediate solutions are possible and should be further explored
- Current energy price signals not fit for purpose for capital intensive investments to support decarbonisation: **how to price capacity and scarcity**?
- Several calls from market parties to **reduce complexity**: avoiding proliferation of products and overlaps between market segments
- While national specificities justify fit-for-purpose solutions, some participants also asked for more **harmonising some market features** (e.g. on balancing & imbalance pricing)
- Link between wholesale markets, **local flexibility markets and role of consumers** (subject of webinar 3) to be better highlighted

Webinar 2- Key takeaways from stakeholder interactions

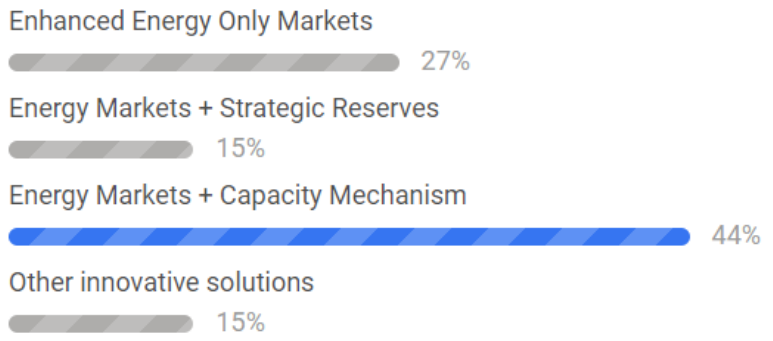
Which area of Wholesale Markets design requires design evolutions to ensure the fit-for-purpose markets in 2030 and beyond? 099



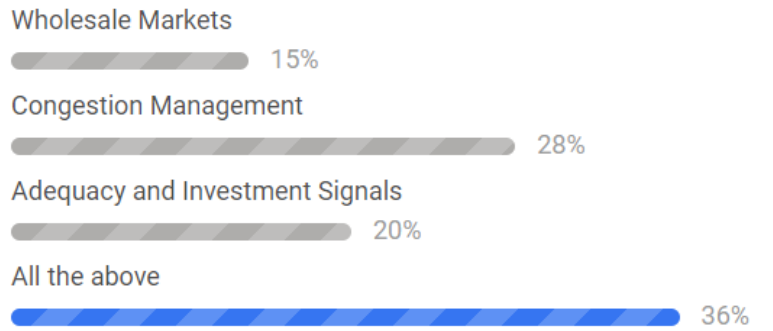
Which of the following market models would fit well with your country policy and level of congestions in 2030? 108



Which of these models would be more efficient and effective to ensure adequacy in 2030 in your country? 110



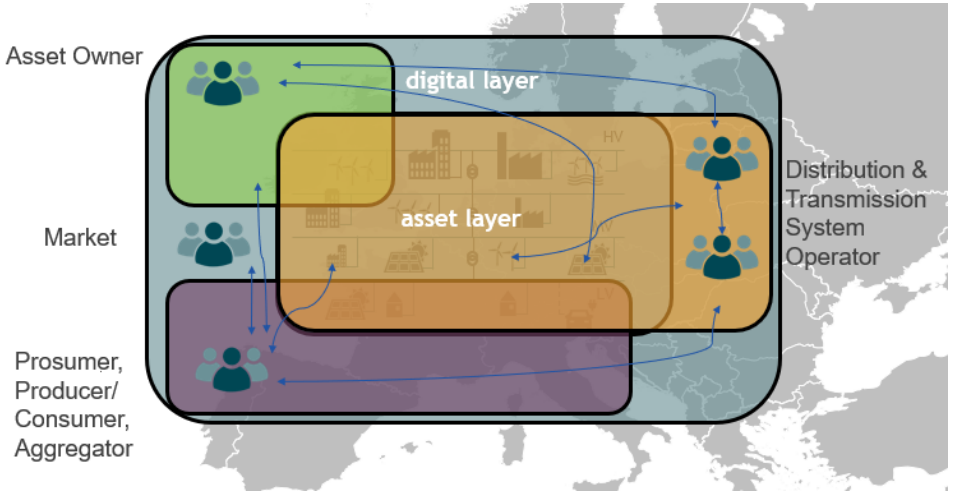
Which market design area should be further discussed and analysed as a priority? 085



Webinar 3 - Summary

Unleashing the potential of flexibilities in the whole network

- Transition of the European Energy System and the rise of renewables:
  - many connected to distribution grids (50% by 2030)
- Traditional paradigm of controllable supply following the demand not valid any more
- More flexibility needed, also on demand side, but storage seems to be a key enabler of transition
- Future interaction between the digital and asset layer
- Evolving flexibility providers over the entire value chain
- Joint task forces to create the shift needed



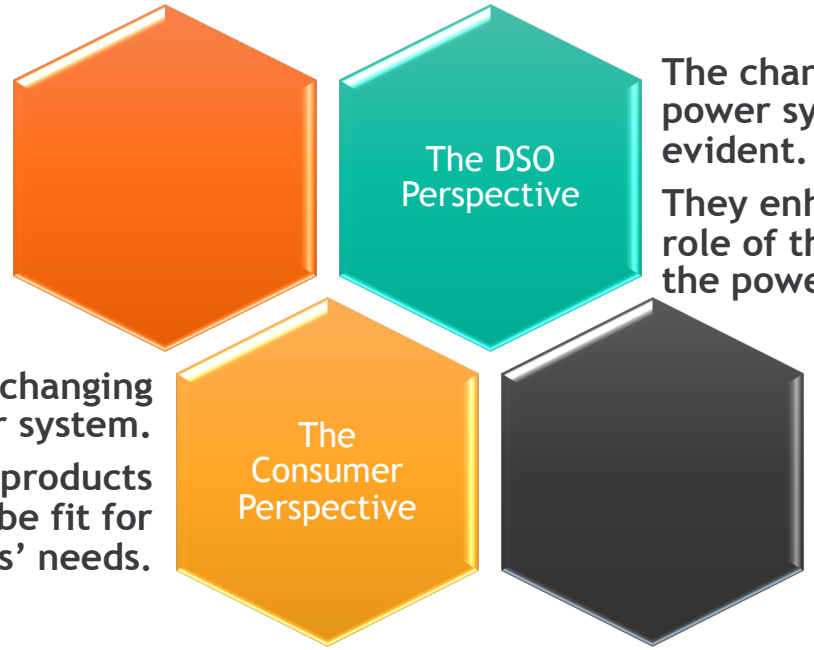
Joint Taskforces

Consisting of:

Webinar 3 - Key takeaways from stakeholder interactions

Unleashing the potential of flexibilities in the whole network

- Increased transparency and oversight needed
  - ✓ Monitor impacts on consumers
  - ✓ Inform of charges.
  - ✓ Ensure consumer protection.
  - ✓ Share information on grid costs with regulators.
  - ✓ Involve consumer organizations.



- Enhance TSO-DSO Cooperation
  - ✓ In order to achieve coordinated access to resources.
- Build platforms to unleash the potential of flexibilities.
  - ✓ Avoid "one size fits all" future model.
- Take the consumer centric approach
  - ✓ Assess: Impact on consumers and the energy system.
  - ✓ Remunerate: Consumers adequately.
  - ✓ Allow: Consumers to choose.
  - ✓ Design: Clear and simple charges.
- Distribution and transmission systems are central in the energy transition
  - ✓ They must further build on a strong foundation of cooperative work.

Webinar 4 - Summary

Energy system integration and offshore development

- **Efficiency** of electrical applications is the first cornerstone for climate neutrality,
- **Abundance** of renewable (wind, solar) electricity is the second cornerstone for climate neutrality,
- The very high installed capacity of variable wind and solar generation past 2030 needs the high **flexibility** of other sectors to get an efficient decarbonized system,
- Optimal use of flexibility is essential to integrate variable renewable energies: the **'one system view'** allows to operate the system in a way that enables further CO2 reduction,
- **Placement of electrolysers** determines energy transport technology and infrastructure costs: planning of electrolysers and hydrogen networks in TYNDPs,
- **ENTSO-E supports efficient system integration** (Multi-Sectorial Planning Support),
- Offshore wind energy needs to be connected to the **load centers** and sector coupling will be essential to deal with variable infeed and transmission needs,
- Offshore requires a holistic view across time, space and sectors: **Plan and operate ONE system**, joint on- and offshore,
- **Interoperability** of (offshore) HVDC grids is key - both technology and vendor interoperability.

Webinar 4 - Key takeaways from guest presentations

Energy system integration and offshore development

European Commission:

- Changing landscape of energy sectors need Energy System Integration to facilitate climate neutrality at the least cost, security of supply, jobs, industrial leadership supporting post-COVID recovery
- 1/ Circular and efficiency; 2/ deep electrification based on RES; 3/ low carbon fuels (H2…) for hard-to-abate sectors
- Proposed detailed action plans with overview of related legislation

Eurelectric:

- Variable generation (wind/sun) and decentralisation (50% on DSO level) will characterise the electricity system
- Strong increase of electrification of demand (up to 60% in 2050), especially in transport, heating and industry
- 60bEuro investment needed in distribution grid: “from pipes to platforms”

WindEurope:

- Offshore capacity to grow 5 times by 2030, onshore even stronger. In 2050 up to 450GW in all seas, not just North Sea
- 1/3 potentially hybrid projects, planning currently is a patchwork
- In case of offshore, bidding zones’ promoters need compensations, e.g. from congestion revenues
- Full support to ENTSO-E’s and T&D Europe’s work on interoperability

Webinar 4 - Key takeaways from stakeholder interactions (Q&A)

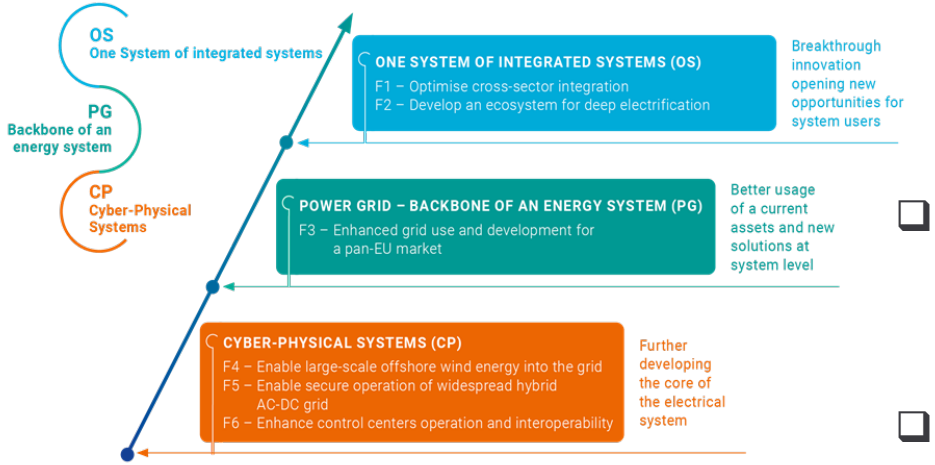
Energy system integration and offshore development

- **Combined use of interconnectors and offshore wind farms (Hybrid projects)**
  - Beneficial for society, generally accepted and supported
  - Potential compensation needs for windfarm promoters (congestion revenues or other mechanisms)
  - If article 16 would not apply to hybrid projects, the compensation requests would go away
  - How to deal with forward markets? Long-term Power Purchase Agreements are essential driven by large industries
- **Large offshore wind generation needs reinforcements onshore**
  - Combined planning of offshore & onshore including electrolysers and refurbished existing gas pipes of importance
  - Current planned projects risk to be undersized
  - Speed is key => Close cooperation of governments, TSOs and other stakeholders is important
- **Barriers to TSO/ DSO cooperation:** TYNDP historically is a TSO process but should be amended to include DSOs
- **Investment needs on TSO and DSO level:** why is ramping up too slow?
  - For DSOs: permitting and regulatory framework
  - For TSOs: 1/ investment do ramp up; 2/ permitting and public acceptance; 3/ lack of forward-looking regulation for cost recovery
- **Job creation:**
  - Wind industry sees strong potential for new jobs
  - On DSO level decarbonisation is seen as a substantial opportunity to create jobs in a meaningful direction
  - On TSO level there is evidence for jobs created. Details will be published soon in TYNDP2020

Webinar 5 - Summary

The innovation challenge and hybrid AC/DC networks

RDI Flagships



Hybrid AC/DC

- Operationally, large scale RES integration means the migration from traditional AC based to hybrid AC/DC system which requires commonly agreed functional requirements, interoperability and demonstrators
- Operational challenges will be coped with by TSOs, automation and decision support, complex forecasting are needed elements
- HVDC grid can/will interconnect Europe's power system different synchronous zones, strengthen existing AC grids, connect large scale renewables and remote loads

Accelerate innovation

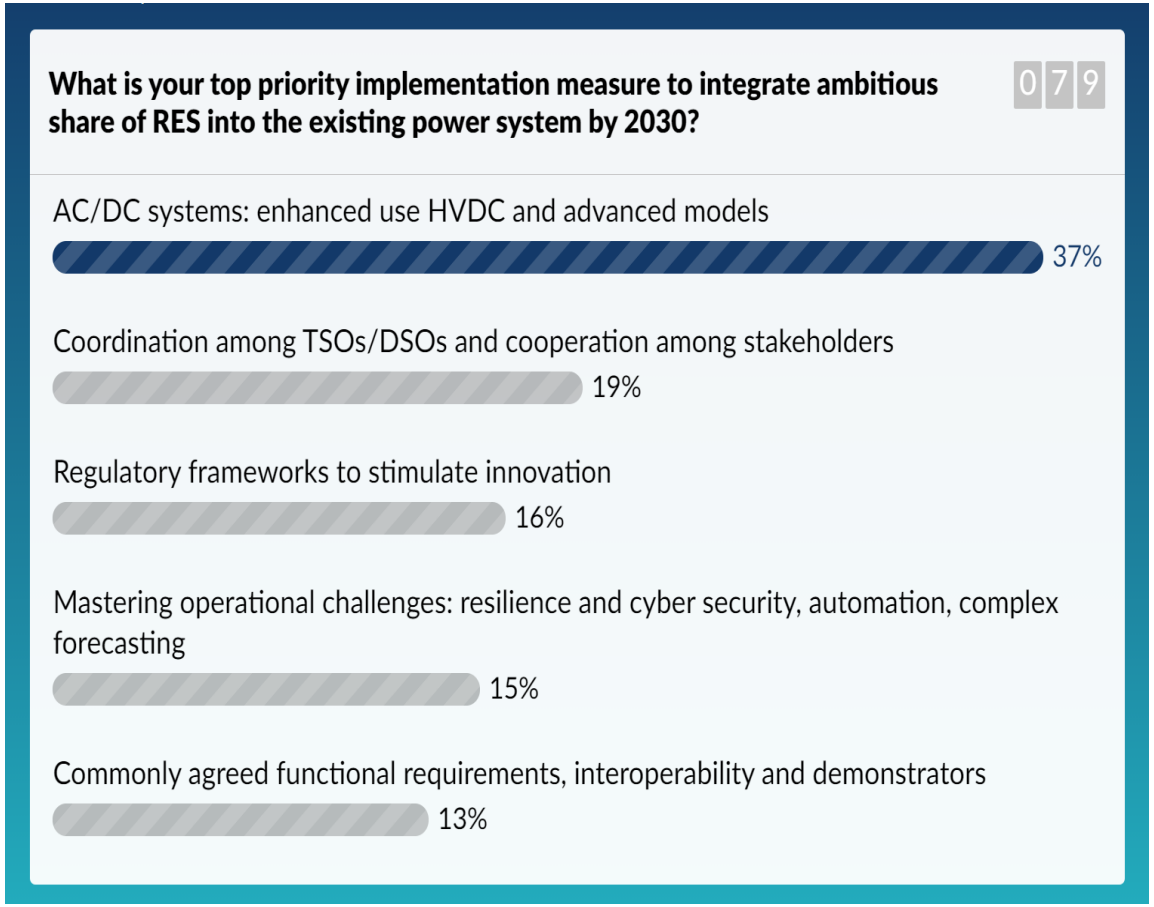
- ENTSO-E RDI Roadmap 2020-2030 aims to accelerate innovation for TSOs in order to reach climate neutrality with high share of RES into the electricity system while keeping its security of supply
- Innovation in regulation is key to ensure that innovative solutions will become the choice in future developments of the power system reaching European climate neutrality by 2050
- Achievements and cooperation among stakeholders are fundamental to deliver on the energy transition and for reaching European climate neutrality by 2050

ENTSO-E and TSOs are committed to ensure the energy transition by building a system of systems with consumers at the heart

Webinar 5 - Key takeaways from stakeholder interactions

The innovation challenge and hybrid AC/DC networks

- **We can not do it alone**: early cooperation with stakeholders such as manufacturers, RES developers, DSOs, research centers and last but not least with regulators is key
- **EU can take leadership on global scale** with multivendor HVDC solutions while moving forward the energy transition but **interoperability is key**
- The integration of **power electronics** brings not only challenges, but also new opportunities **for system management and prediction**
- AC/DC system based on **enhanced use of HVDC** and advanced tools and models are priority measures
- Mastering operational challenges need full consideration of **human-machine relationship**
- The right regulatory incentive framework for TSOs to innovate while delivering maximum benefits for the customer: **reward value of innovative solutions while de-risking innovation**



Putting all the pieces together: a system of systems, our vision for the future

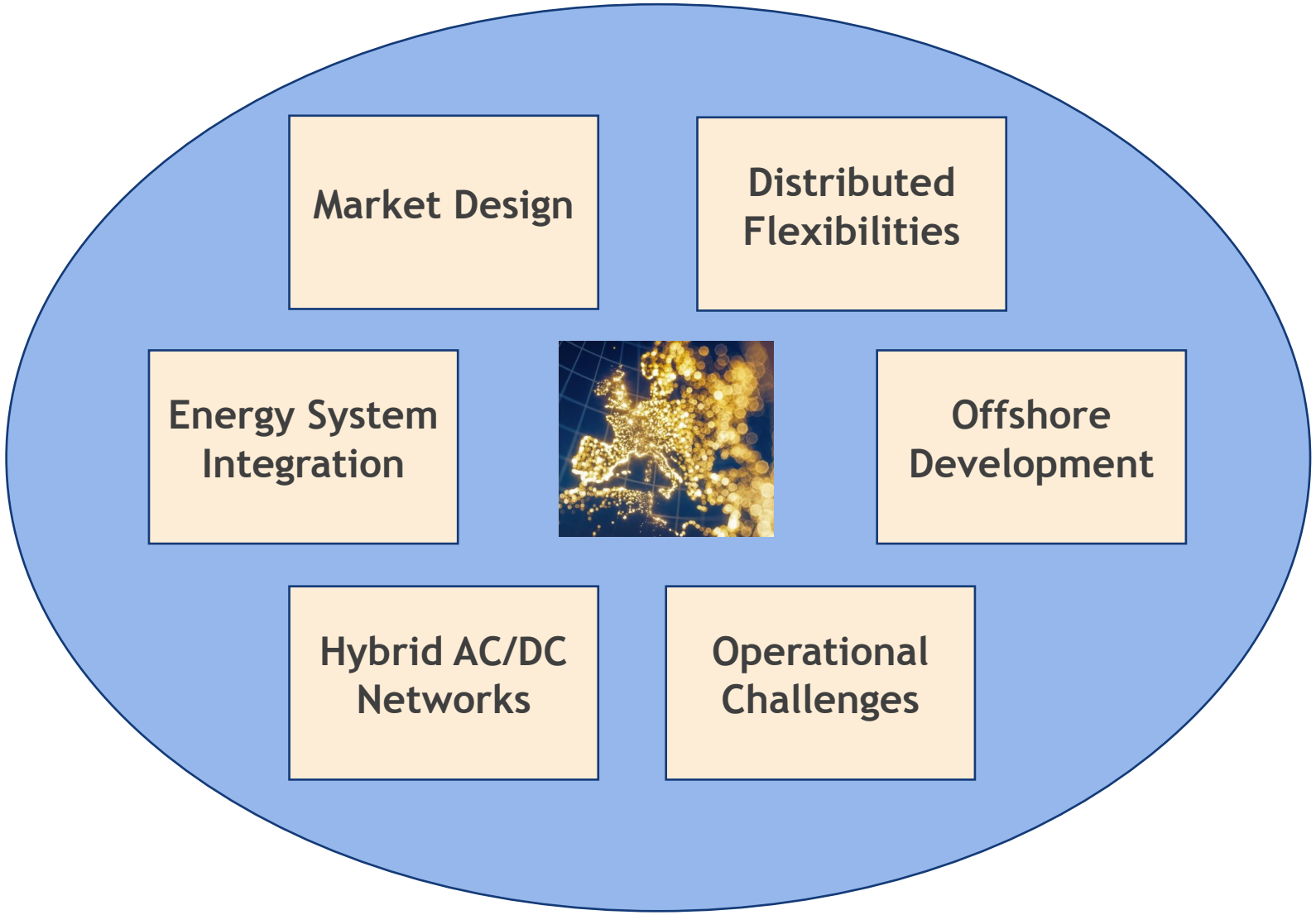
Tahir Kapetanovic

Chair, System Operation Committee, ENTSO-E

Damian Cortinas

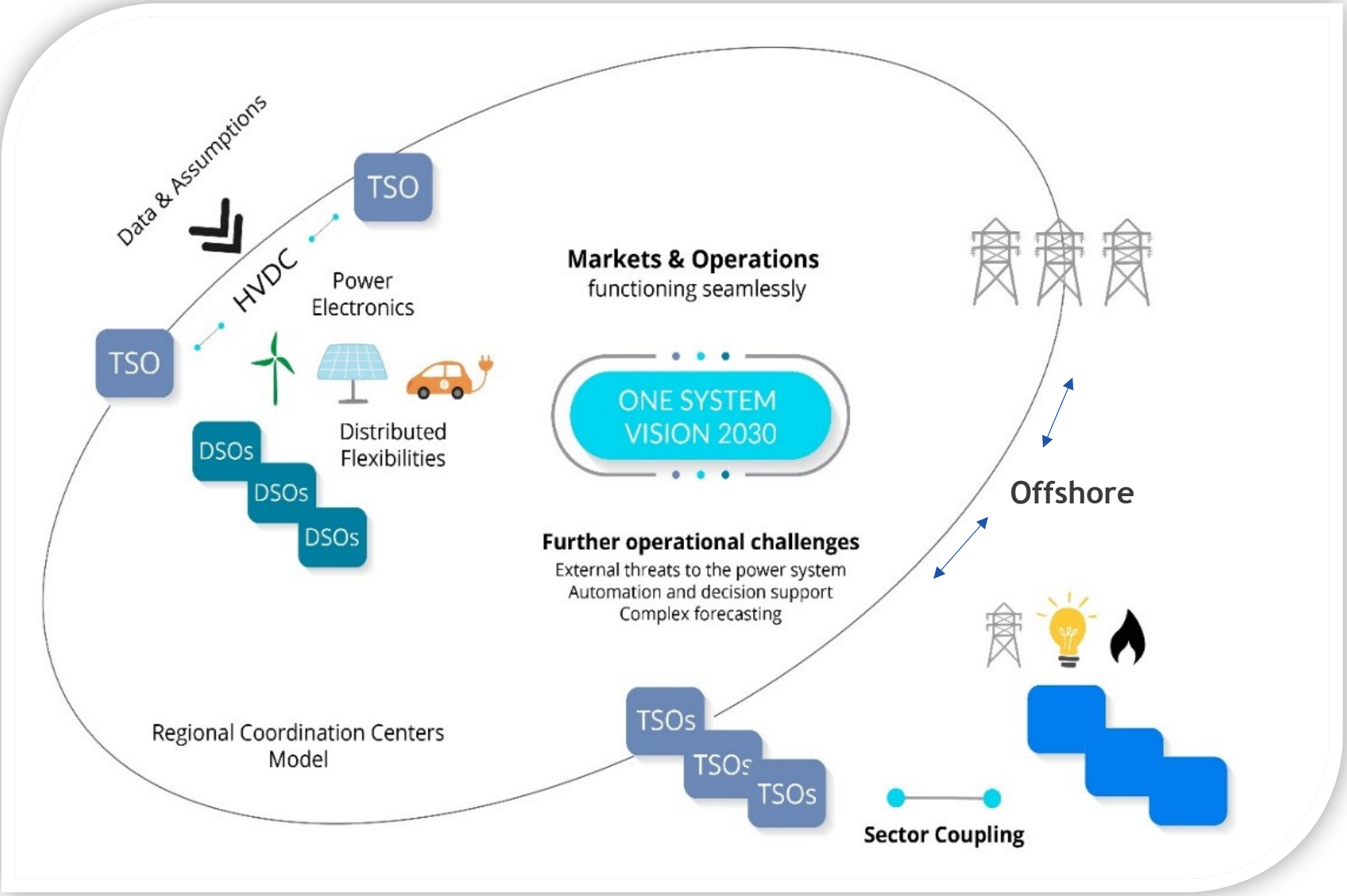
Vision 2030 Project Leader, ENTSO-E

6 key drivers for the European power system towards 2030



A true System of Interconnected Systems

For the benefit of all European consumers



The power system of 2030 will be at the same time more European and more Local

The 2030 power system will need increased cross-border cooperation

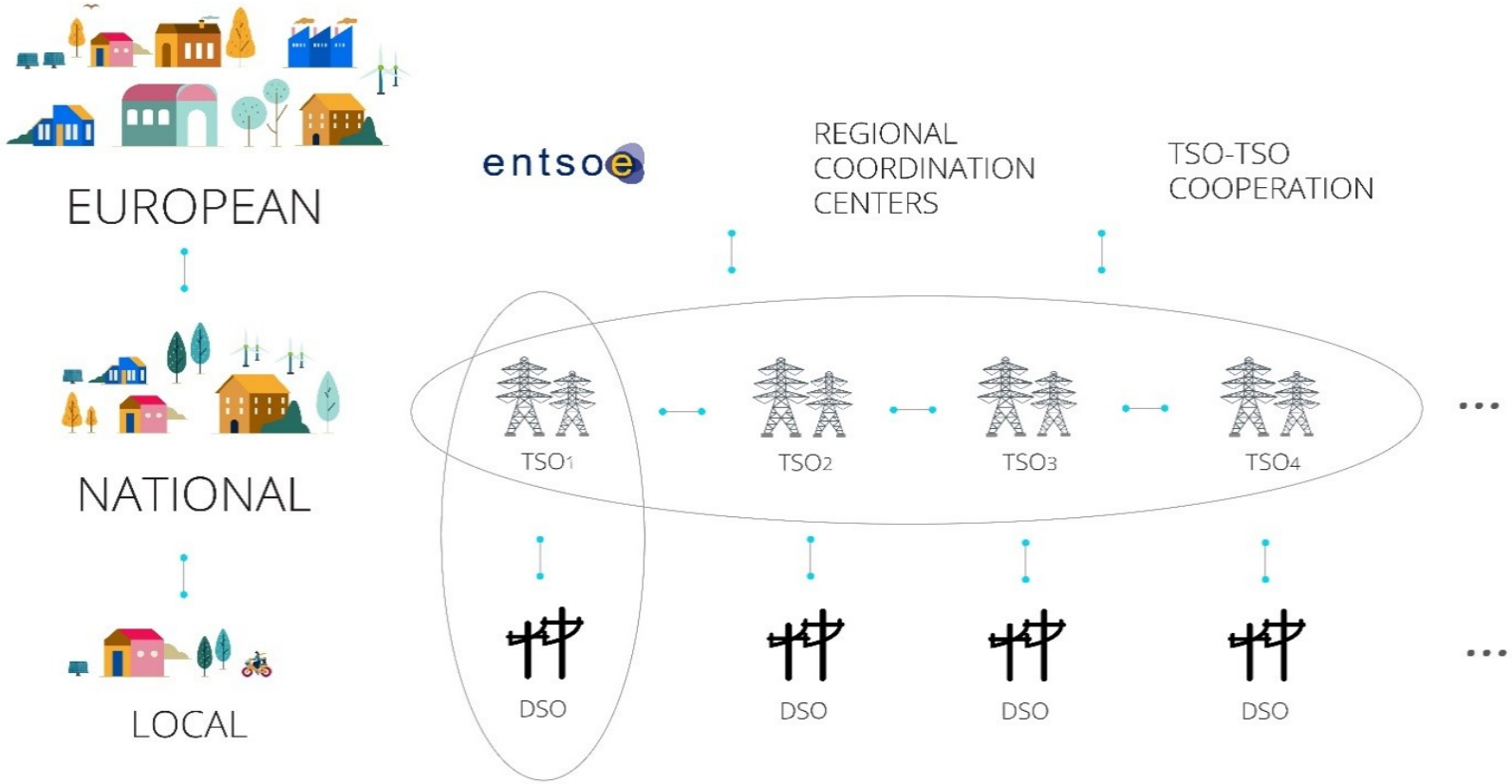
- Market design evolution, hybrid AC/DC networks, offshore development, managing risks and threats, forecasting

The 2030 power system will need stronger adaptation to local needs

- Fulfilling the potential of flexibilities, automation and decision support, energy system integration

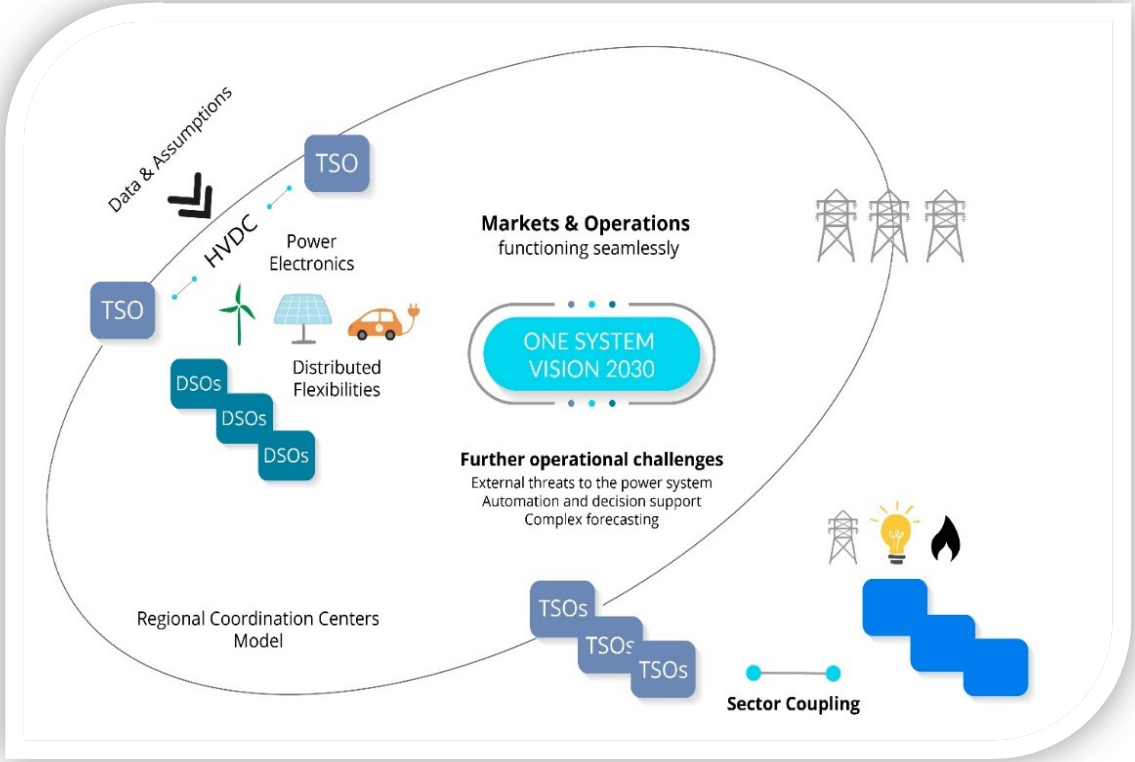
All System Operators will have a key integration and facilitation role to achieve the **European Energy Transition**

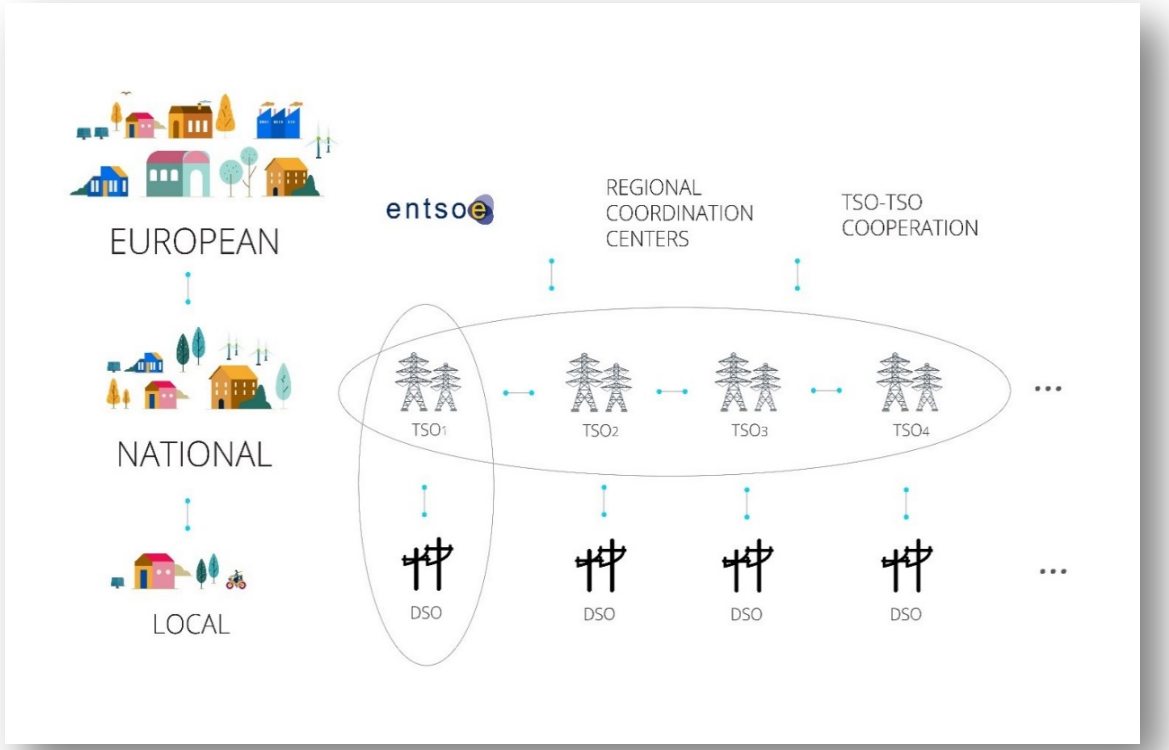
Building a ‘System of Systems’



- Geographical scales
- Multilateral interfaces
- Interoperability
- System operators = key facilitators
- Governance involving stakeholders
- Putting consumers at the heart of the Energy Transition

A true ‘System of Systems’ for the European Energy Transition





Let’s build it together !

Building the future European power system – challenges and priorities

André Poschmann

Head of Unit for EU electricity affairs,
Federal Ministry for Economic Affairs and
Energy, Germany

Discussion with all participants

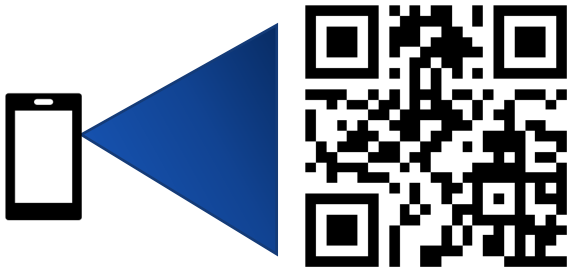
Sonya Twohig

Head of System Operations,
ENTSO-E

Open floor to Questions & Answers

- *For questions and comments use Sli.do!*
- *Don't forget to add your name and title to your question*

Sli.do # EWeek-6



Conclusions and next steps

Hervé Laffaye

ENTSO-E President

A Vision for the future of the power system in Europe

- ENTSO-E is pleased with the level of interest in **Vision for the future** of the European Power System.
  - On average 600 participants for each webinar – in all 3,960 individual registrations!
  - 6 very interesting panel sessions which discussed the major trends and drivers of **System of interconnected systems**.
- We hope that you enjoyed the spirit of ENTSO-E webinar series which allows for **better common understanding** and for **debate** of the major components.
- We warmly thank all the contributors, and speakers, and all of you who provided questions, comments and ideas; and lastly, I would like thank the ENTSO-E team for the hard work.

- **What happens next?** ENTSO-E Vision Week is the start of a great journey….
  - All the feedback is inspiring us in ENTSO-E's work
  - Specific webinars are to be organised for major aspects of the Vision – STAY TUNED.

- Finally, I encourage you all to **stay part of the ENTSO-E Vision 2030** – it is an important step on the road to the transformation horizon of 2050 and all of us need to play our part!