CURRENT
Enabling Network Technology throughout Europe

WORKING GROUP FOR OPTIMISING POWER GRIDS

7TH SEPT | 11:30-13:00 CEST

Agenda

Introduction
currENT Board – Susanne Nies

Key note speech
Elia – Markus Berger

Perspectives TSOs, Regulators, Industry
ENTSO–E – Nathan Appleman, ACER/E-Control – Michael Berger, ARERA – Riccardo Vailati, WindEurope – Vasiliki Klonari, currENT – Rena Kuwahata

Working Group Session

Moderator
Alex Houghtaling

Introduction

Susanne Nies

currENT chair,
Smart Wires General Manager for Germany

25 June 2020

Climate proof Europe's power grid

currENT'S SEVEN RECOMMENDATIONS TO POLICY MAKERS

CURRENT
Enabling Network Technology throughout Europe

Key Note

Markus Berger

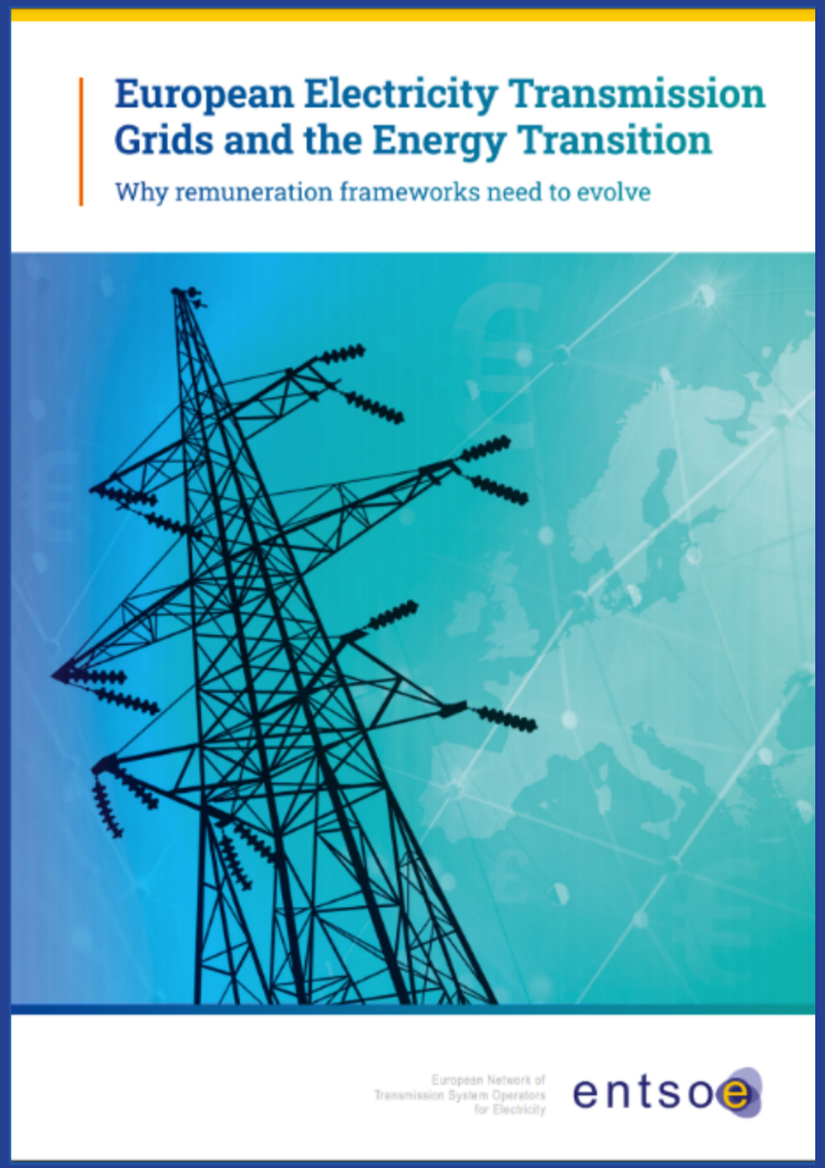
Chief Officer
Infrastructure, Elia

Nathan Appleman

Market Design Specialist
at ENTSO-E

Voice of TSO

A fit-for-purpose regulatory framework for more innovation uptake



Infrastructure development & **innovation** needed for the transformation of the energy sector

–

Regulatory framework to ensure necessary grid investments with particular emphasis on performance and innovation.

Michael Berger

Expert network development E-Control and Co-chair of ACER infrastructure efficiency expert group

Voice of Regulator

ACER and NRA’s current work on innovation in electricity infrastructre

CEER Status Review on Regulatory Frameworks for Innovation

- Work triggert at CIF 2019, focusing on electricity (and gas) transmission infrastructure
- In electricity transmission, **no formal and harmonised definitions of innovation were identified**
  ►The vast majority of National Regulatory Authorities (NRAs) share a common understanding that innovation is mostly correlated with developments that increase grid efficiency and benefits for consumers at the same (or at even lower) cost
- The survey among NRAs revealed that **innovation in electricity transmission is mostly promoted indirectly via the general regulatory framework and/or via specific features** regarding incentives for network performance (output-based regulation). In addition, specific actions for innovation have been or are being adopted in several countries
- About **half of NRAs consider that specific regulatory measures for innovation are appropriate**, while the other half deems that the general regulatory framework already provides a major stimulus to developing innovative solutions

Related ACER and NRA work (1/2)

- **ACER/CEER Paper on Improving the Regulation on Guidelines for Trans-European Energy Networks**
  - ► Promoters bias in scenario development and unequal treatment of non-transmission projects
  - ► Offshore network planning to be included in TYNDP process
  - ► Possible threat of risk related incentives

- **ACER Opinion on CBA for Grid Development Projects**
  - ► Various important aspects for improving the CBA for electricity transmission networks have been repeatedly unaddressed
  - ► A proper CBA could highlight the benefits and the potential faster implementation of innovative projects vs. traditional technologies for new lines

- **ACER/CEER Interaction with TSOs and DSOs on 944/2019 §59(l) Smart Grid Indicators**
  - ► NRA's duty to monitor and assess the performance of TSOs and DSOs in relation to development of smart grids that promotes energy efficiency and the integration of RES, based on a limited set of indicators

Related ACER and NRA work (2/2)

- **CEER Paper on DSO Procedures of Procurement of Flexibility**
  ► Procurement of flexibility by DSOs could lead to an efficient utilisation of network capacity and be an alternative to traditional technologies
  ► Principles of market-based flexibility procurement by DSOs: balanced incentives, adequate neutrality, technical prerequisites and an overall framework for procurement.

- **CEER Paper on Electricity Distribution Network Development Plans (to be published in 2021)**

- **ACER/CEER Infrastructure Efficiency Expert Group**

Riccardo Vailati

Officer, Italian Regulatory Authority for Energy, Networks and Environment

Staff of the Regulatory Authority have the duty to disclaim in public that only personal opinions are presented when speaking in public at conferences, workshops and seminars

Voice of Regulator

ARERA’s measures to support innovation in electricity transmission infrastructure

EXPERIENCE FROM ITALY - PILOT PROJECTS

- In 2012-2013, the Italian NRA introduced a pilot project for TSO-owned storage to reduce RES curtailment in congested 150 kV network areas, and included as a minimum requirement the application of dynamic line rating:
  - 2% premium on top of weighted average cost of capital for 12 years
  - Extra-WACC applicable only to pre-approved CAPEX
  - Extra-WACC subject to output-based conditions (amount of saved RES curtailments)
  - Public dissemination required https://www.terna.it/it/sistema-elettrico/innovazione-sistema/progetti-pilota-accumulo

Voce di costo di investimento	Costo (migliaia di Euro)
Trasduttori, dispositivi PMU, upgrade tecnologico	261
Studi preliminari, sviluppo e rilascio dei modelli termici ed elettrici, evolutive dei modelli e sviluppo piattaforme software	349
Installazione trasduttori e protezioni	139
Costi di project management	91
Totale	**840**

Actual DLR CAPEX (kEur)

Actual DLR benefits in the first year of full operation

Voce	Quantità
Saving di Mancata Produzione Eolica nel 2016	49,11 GWh / anno
Beneficio legato al *saving* (valorizzato @ 43 Eur/MWh)	2,11 MEur / anno

Source: ARERA, Consultation document 542/2017 on output-based regulation of electricity transmission, July 2017 https://www.arera.it/allegati/docs/17/542-17.pdf

EXPERIENCE FROM ITALY - OUTPUT-BASED REGULATION 1

- Since 2015, in addition to pre-existing quality of supply regulation, the Italian NRA started introducing additional output-based incentive mechanisms that promote all investments (under a technology neutral approach) according to their expected benefits. The idea is to **share the (gross or net) benefit of network investments between final customers and the TSO, assigning to the TSO a small part of it**

  Example of benefits: increase of socio-economic welfare, integration of RES, reduction of greenhouse and non-GHG emissions, reduction of energy not supplied, reduction of costs for dispatching/balancing, reduction of must-run-unit costs

Definition of benefits: ARERA Decision 627/2016 including the Italian cost benefit analysis methodology for transmission projects https://www.arera.it/allegati/docs/16/627-16eng.pdf

EXPERIENCE FROM ITALY - OUTPUT-BASED REGULATION 2

In 2018, the Italian NRA introduced a new output-based incentive mechanism for cross-zonal transfer capacity increases:

- Reward-only, up to a “target” capacity increase (no rewards to extra-capacity)
- Rewards will be based mostly on historical congestion revenues in 2016-2017 at the boundary and partly on estimated project benefits as per Italian network planning

In 2019, the Italian NRA introduced a complementary incentive:

- Reward-only, as an adder to the capacity increase reward
- Extra-rewards will be based on the difference between standard CAPEX for capacity increase at the boundary minus actual CAPEX for the realised extra-capacity

The TSO indicated from 1/1/2021 the increase of 4 cross-zonal capacities by special protection schemes, DLR and other low-CAPEX measures (total amount 1600 MW). NRA scrutiny is ongoing

Source: ARERA, Decision 567/2019 on output-based regulation of electricity transmission for years 2020-2023, December 2019 https://www.arera.it/it/docs/19/567-19.htm

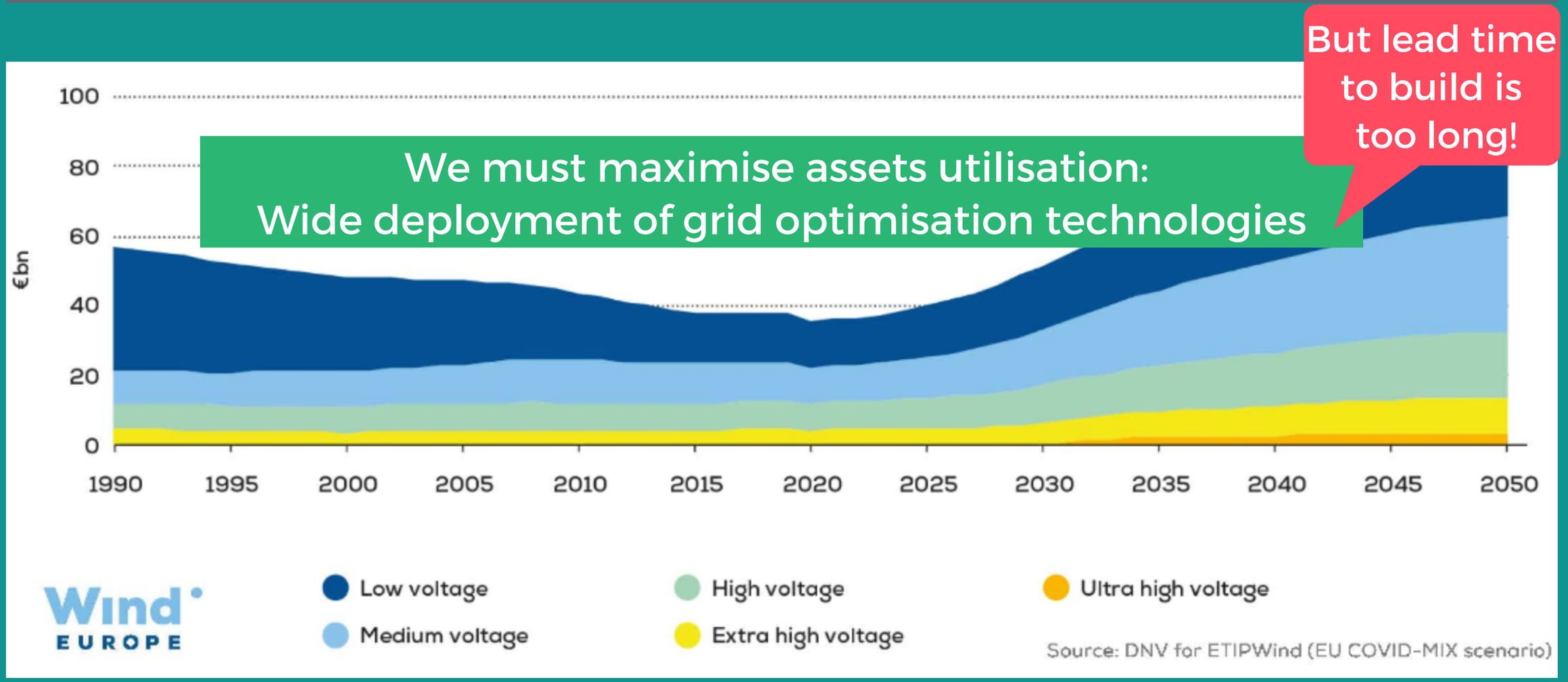
Vasiliki Klonari

Senior Analyst at WindEurope – System Integration & Digitalisation

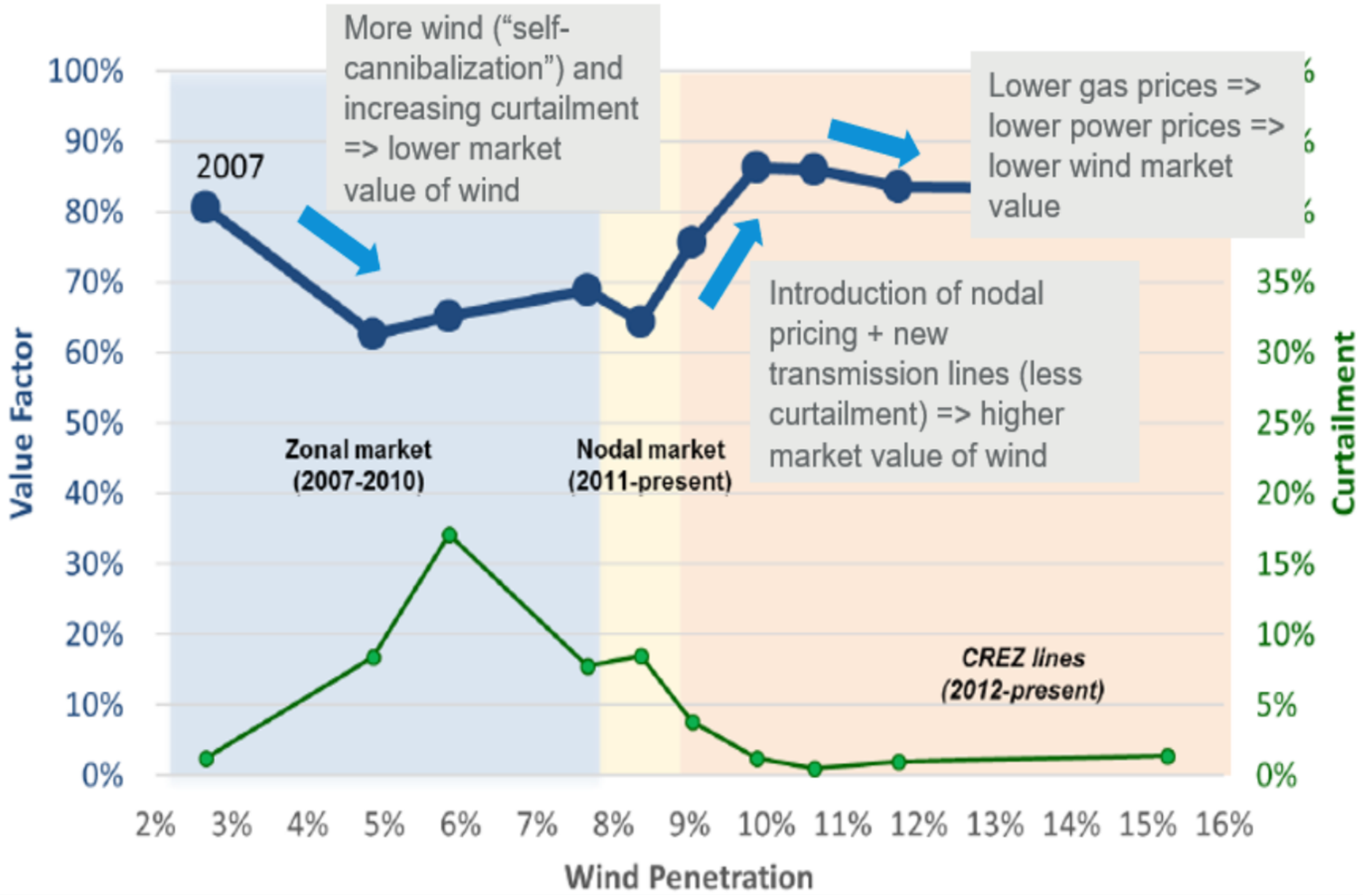
Voice of Industry

Grid optimisation technologies to build a greener future

Europe needs to more than double its annual grid infrastructure investments to deliver climate neutrality



Ensuring investments in renewables goes hand in hand with ensuring the right investments in grids



Not only the increasing penetration of wind and/or solar impacts market values - other factors are important as well - Example: Impact of changes to market design, grid build-out and fuel prices on wind's value factor in Texas (2007-2016)

Source: Wiser, R., Value of Wind: Other Measures to Avoid the Value Drop, 11/2017

Grid optimisation technologies can accelerate wind energy integration

By:

- enabling **closer to limits** system operation and **maximising grid use**
- contributing to **mitigate RES variability and reduce curtailment**

GRID OPTIMISATION TECHNOLOGIES		
Advanced monitoring		• Dynamic Line Rating • Substation Fleet Digitalisation • Asset Performance Management
Advanced system operation control devices		• Phase-Shifting Transformer • Solid-State Transformer • Static Synchronous Series Compensator • Modular Power Flow Control Technology • Thyristor-controlled Series Compensator • Static Synchronous Compensator • Static VAR Compensator • Adaptive Protection Scheme • Synchronous Condensers
Advanced converter technologies		• Grid-forming capabilities • Black-start
Line and voltage upgrades		• High Temperature Low Sag conductors • Voltage uprate
DC transmission		• HVDC technology • AC TO DC line upgrade • Superconductor

Source: ETIPWind, WindEurope, Getting fit for 55 and set for 2050, June 2021

Our recommendations

1. Incentivise TOTEX-saving investments, move away from only CAPEX-based ones

- Re-visit CBA to factor short and long-term grid optimisation
- Include grid optimisation in system planning

2. Align system planning with the EU Green Deal objectives

- continuous, open, flexible
- Incentivise grid-optimisation in cross-border infrastructure planning

3. Apply grid smartness indicators

- to planning, operation, asset management, and innovation

Rena Kuwahata

currENT Europe

Voice of Industry

Incentives that spur positive change - observations from technology providers

Demand and Supply are there … what is preventing faster uptake?

Improve market efficiency: 70% MACZT by 2025

Rising grid congestions and pressure to reduce mitigation costs

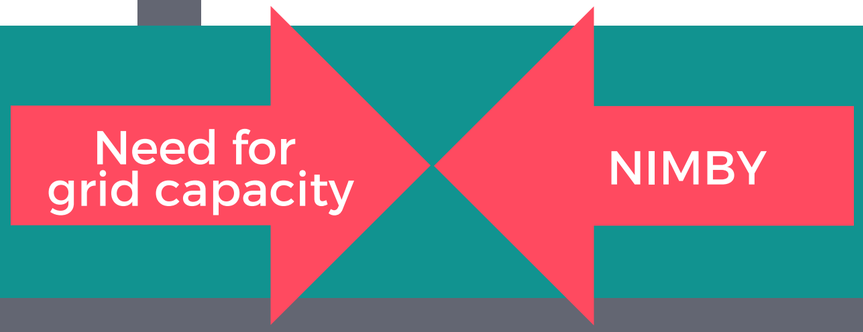
+500 GW wind + solar by 2030

55% emissions reduction by 2030

Carbon neutral by 2050

Grid Enhancing Technologies increase capacity fast and are ready to go:

Dynamic Line Rating
Advanced Power Flow Control
Superconducting transmission
Intelligent sensors



Regulation spurs positive change

- **EU** Regulation demands 70% cross-border capacity for market trade. Suggests GETs to be used, justified with CBA
- **USA (PJM)**
  Congestion relief cost recuperated through improved nodal-price difference
- **Australia**
  Network capability incentive parameter action plan (NCIPAP) require TNSPs to propose investments for 5-year period. Small-scale projects are carved out of this broader 5-year revenue allowance, and receive a 50% greater return on capital than the larger investments.
- **France**
  Renewables curtailment penalty on TSO
- **Belgium**
  Output-based incentive on increase of import/export capacity
- **Netherlands/Belgium**
  Restriction of new builds of overhead line assets
- **Germany**
  Introduction of an incentive instrument to reduce TSO congestion management costs

“Our Vision is a European power network that is the **recognised world leader** in enabling decarbonisation through the efficient use of **modern grid technology**”

CURRENT
Enabling Network Technology throughout Europe

Accelerating the Energy Transition webinar series

CYBERSECURITY, DIGITALISATION AND THE ELECTRICITY GRID IN EUROPE

HOW DYNAMIC LINE RATINGS OPTIMISE THE GRID

THE ROLE THAT DIRECT CURRENT (DC) GRIDS CAN PLAY

OPTIMISED POWER GRIDS FOR A CLEAN AND GREEN FUTURE

WORKING GROUP FOR OPTIMISING POWER GRIDS: ALIGNING INCENTIVE REGULATION WITH PUBLIC INTEREST

Coming up:
TOWARDS A COORDINATED APPROACH: TEN-E AND EUROPEAN GRID INFRASTRUCTURE

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