Welcome to the

TYNDP 2022

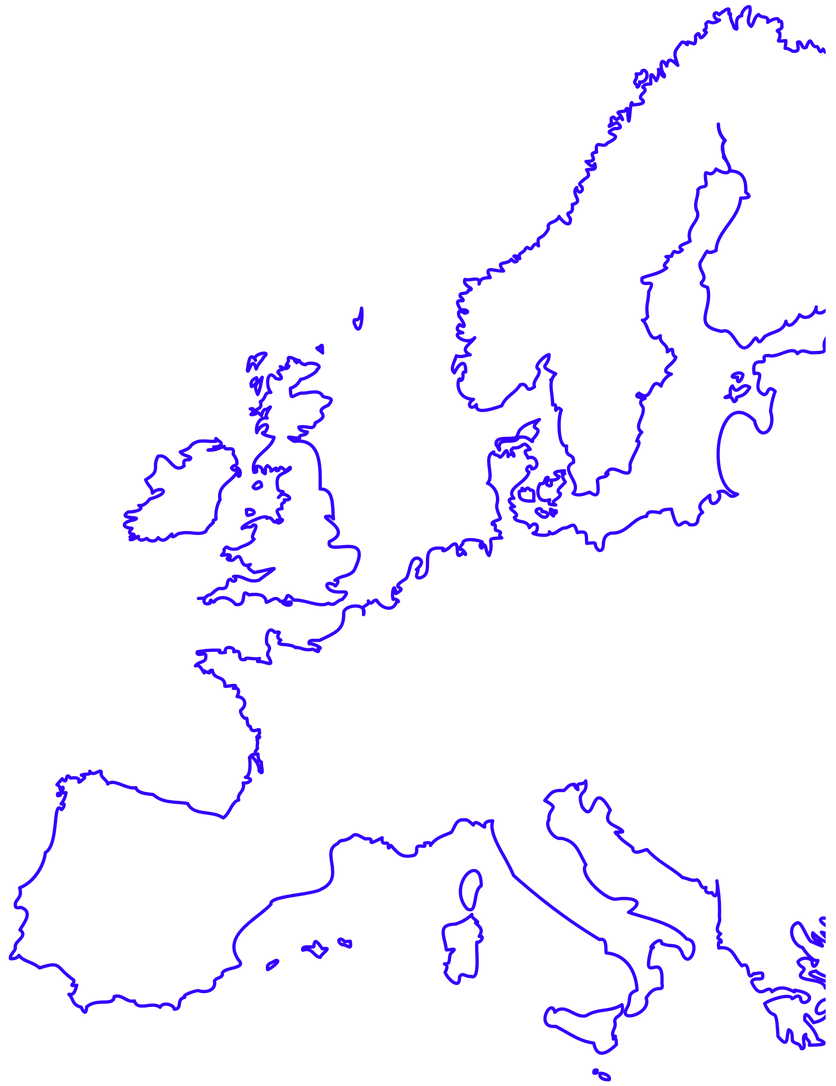
entsoe

European Network of Transmission
System Operators for Electricity

Join at

slido.com

#3306 443



6 September 2022

Agenda

Join at
slido.com
#3306 443

10:00 → Welcome and introduction
Patricia Labra, Red Electrica

10:10 → TYNDP 2022 development process and main findings
Lea Dehaudt, ENTSO-E
Dimitrios Chaniotis, RTE
Arthur Burlin, RTE
Vladan Ristic, JSC EMS

10:55 → Q&A

6 September 2022

Agenda

Join at
slido.com
#3306 443

11:15 → Panel debate - How to plan a decade ahead when the close future becomes unpredictable ?

Antonella Battaglini, Renewables Grid Initiative (moderator)
Pierre Tardieu, Wind Europe
Diederik Peereboom, T&D Europe
Irina Minciuna, European Commission
Lisa Fisher, E3G
Dimitrios Chaniotis, ENTSO-E

11:55 → Conclusion

Patricia Labra, Red Electrica

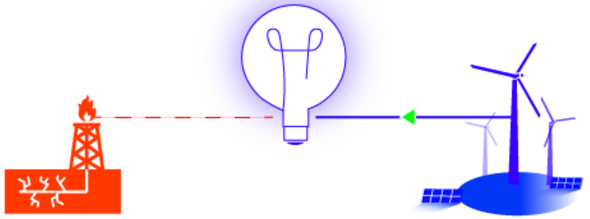
The TYNDP is the European electricity infrastructure development plan.

It provides a pan-European vision of the future power system and investigates how power links and storage can be used to make the energy transition happen in a cost-effective and secure way.

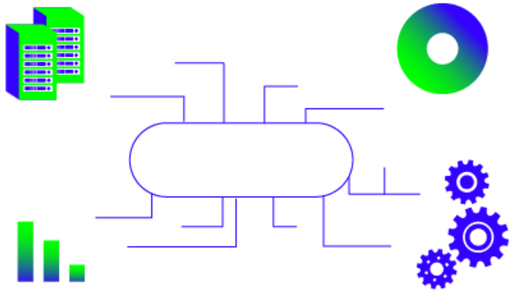
Three key findings

1. Opportunities for improving the power system exist all over Europe.

2. Addressing system needs reduces Europe's dependance on gas-based power generation



3. Coordinated planning will be needed across sectors.



Polling survey

For what purpose do you use the TYNDP ?

Answer on sli.do

Join at
slido.com
#3306 443

6th September Workshop
High-Level TYNDP Introduction

TYNDP 2022 development process & content

European Network of Transmission System Operators for Electricity

The Process behind the Ten Year Network Development Plan at ENTSO-E

Process of European Projects of Common Interest led by the European Commission

Defining plausible futures, which we call **Scenarios**

Project collection and identification

European Projects of Common Interest

SCENARIOS 1. NEEDS 2. COLLECTION 3. COST BENEFIT 4. SELECTION 5.

Identification of the needs based on our scenarios

Cost benefits analysis of projects

Main shortcomings identified in 2020

No early consultation of methodologies

Tedious data search through variety of reports

Many reports on system needs, at pan-European, regional and country level, making it difficult for stakeholders to find the information they need.

Actions taken by ENTSO-E in 2022

Possibilities for stakeholders to provide input at early stage

During the development of the system needs identification methodology and of the TYNDP 2022 Implementation Guidelines

Online system needs visualisation platform

ENTSO-E released an online data visualisation platform allowing to view data at pan-European, PCI corridor and country level. Data is downloadable in spreadsheet format.

Main shortcomings identified in 2020

New methodology implemented to identify system needs, with simplified assumptions

No hybrid offshore needs

The methodology did not allow for a proper identification of hybrid offshore needs.

Actions taken by ENTSO-E in 2022

Significant methodological improvements to the identification of future system needs

New methodology to identify hybrid offshore needs

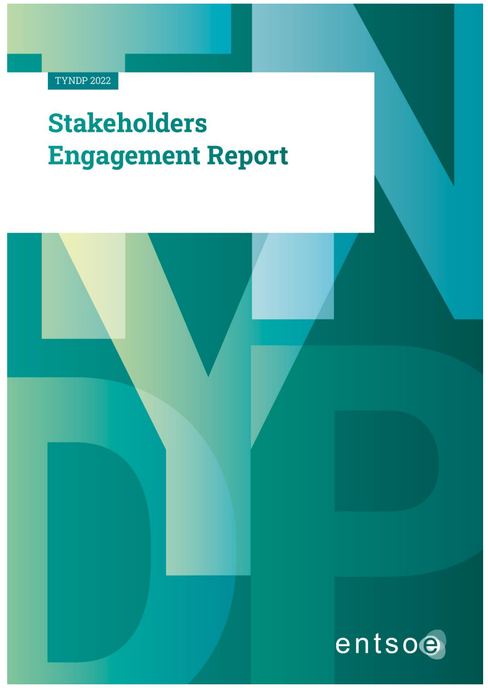
An overview of the draft methodology is released with TYNDP 2022, and its implementation is foreseen in TYNDP 2024.

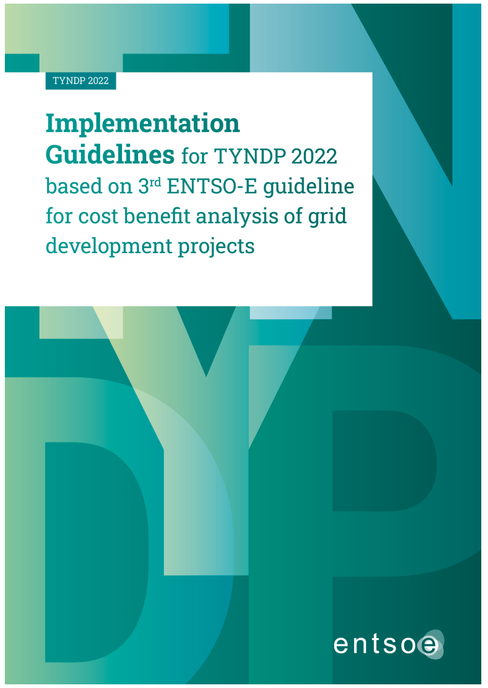
Package content

Dive deeper into the TYNDP 2022

High-Level report TYNDP 2022

Your entrance key to the TYNDP 2022, with the main findings, process overview, Q&A and next steps.



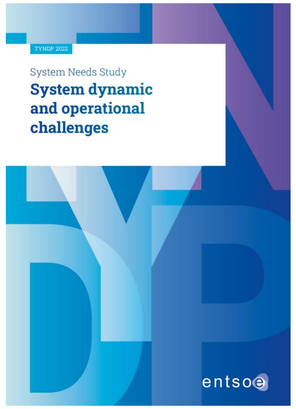


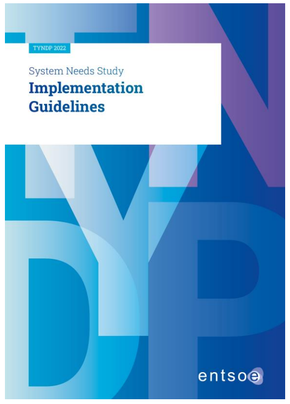
Package content

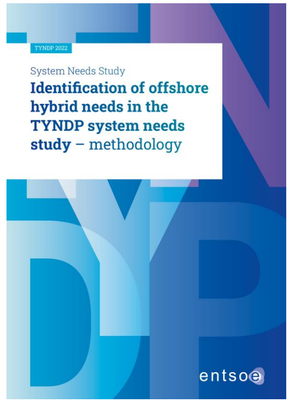
Get a closer look at the System Needs study 2022

System Needs Study 2022

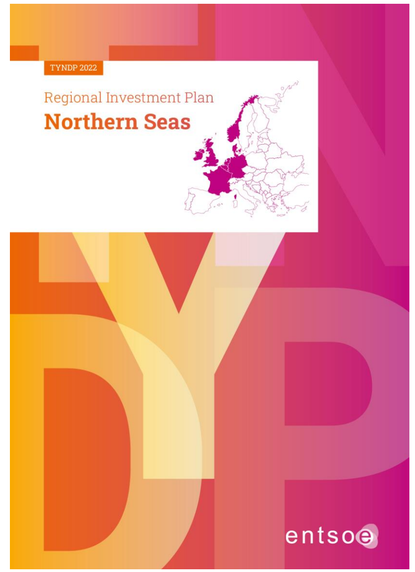
What should the European power system be like in 2030 and 2040 to create maximum value for Europeans and deliver on the climate agenda?







Six Regional Investment Plans



Polling survey

Which TYNDP documents or platforms are most useful to you?

Answer on sli.do

Join at
slido.com
#3306 443

TYNDP 2022

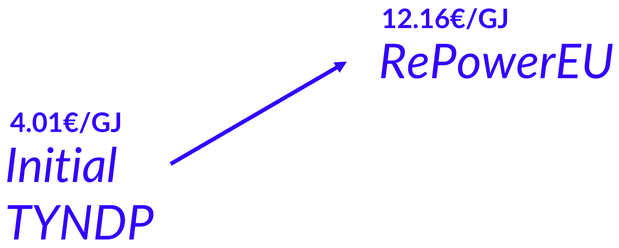
Scenarios

entsoe European Network of Transmission System Operators for Electricity

SCENARIOS 1. NEEDS 2. COLLECTION 3.

How to plan a decade ahead when the close future becomes unpredictable ?

Back to the study table



Additional study made:

Cost Benefit Analysis with a sensitivity on gas prices

(December 2022)

Think and analyse

In the current energy crisis, electrification is needed more than ever.

Infrastructure in the pipeline should not be slowed down.

TYNDP 2024 will assess need for an even larger portfolio of projects.

Comparison with Distributed Energy scenario confirms needs exist in very different potential futures

National Trends 2040

Based on National Energy and Climate Plans and national long-term strategies

Two very different futures

Distributed Energy 2040

Pathway to EU27 carbon neutrality" by 2050 and at least 55 % emission reduction in 2030.

Identified needs in DE2040 is only 11% lower than in NT2040, well within the boundaries of uncertainty margins.

The comparison confirms the immediate need for significant network reinforcements under any plausible scenario relying on the massive development of decentralized resources.

TYNDP 2022

Identification of Needs

Based on our scenarios

SCENARIOS 1. NEEDS 2. COLLECTION 3.

entsoe European Network of Transmission System Operators for Electricity

Identification of Needs

Study process overview

Input

Calculation

Output

Starting grid

Investment candidates

PEMMDB*

*Scenario National Trends 2030 and 2040

Optimization with Antares simulator

Minimum of operational costs + investment costs*

*Zonal market study 2030, NTC market study 2040

Needs in 2030 and 2040

Main shortcomings identified in 2020

Only 1 climate year for the identification of needs

No comparison with other scenarios

Actions taken by ENTSO-E in 2022

3 Climate years in 2030 - 10 in 2040

Studying several climate years strengthens the results and allows to get first insights into how addressing system needs benefits security of supply.

Comparison with optimised capacities in Distributed Energy scenario

Comparing with Distributed Energy confirms the immediate need for significant network reinforcements under any plausible scenario relying on the massive development of decentralized resources.

Main shortcomings identified in 2020

Only cross-border capacity increases as investment candidates

Zonal clustering based on administrative boundaries

Actions taken by ENTSO-E in 2022

Cross-border capacity increases, storage and peaking units in 2040

A diverse portfolio of investment candidates provides insights into how different technologies complement each other to provide system benefits.

Zonal clustering accounting for grid contingencies

The zonal model has been entirely reviewed to better account for grid contingencies, therefore providing a more accurate reflection of the 2030 power network.

Identified needs in 2030 show the immediate economic interest of investing in Europe's grid

The study finds that **64 additional GW of cross border reinforcements** after 2025 **would be cost efficient to support Europe's power system.**

These capacity increases represent about **2 billion euro of investment per year.**

And would deliver a yearly **gain** in socio-economic welfare **of 5 billion euro**

Gaps and opportunities for Europe's power system in 2030 and 2040

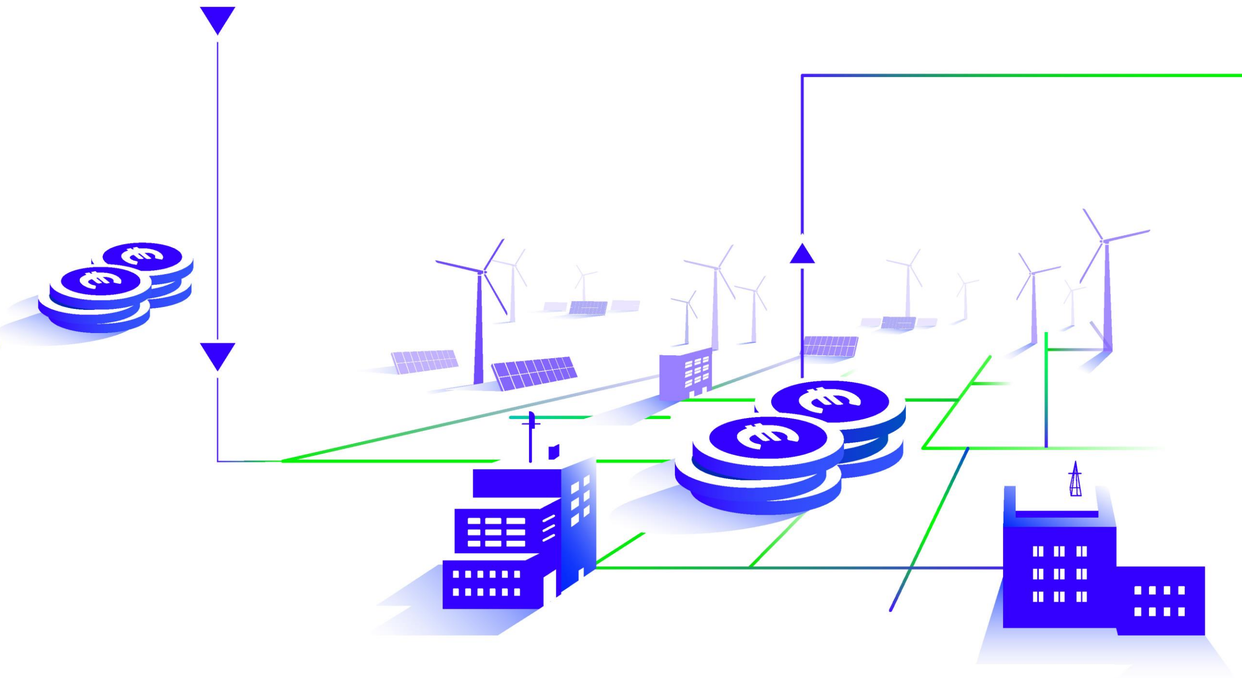
Additional capacity increases and flexibility assets by 2040 bring economic benefits and support security of supply

By 2040

The study finds that **88 GW of additional cross-border capacity** increases after 2025, **41 GW of storage** and **3 GW of CO2-free peaking units would be needed to support Europe's move towards a carbon-free power system** and ensure continuous and cost-effective access to electricity.

Investment

These capacity increases represent an investment of **6 billion euro per year.**



Gains

And would deliver a yearly **increase** in socio-economic welfare **of 9 billion euro.**

entsoe

Gaps and opportunities for Europe's power system in 2030 and 2040

Opportunities for increased cross-border transmission, storage and peaking capacity exist all over Europe

Map for the 2040 study

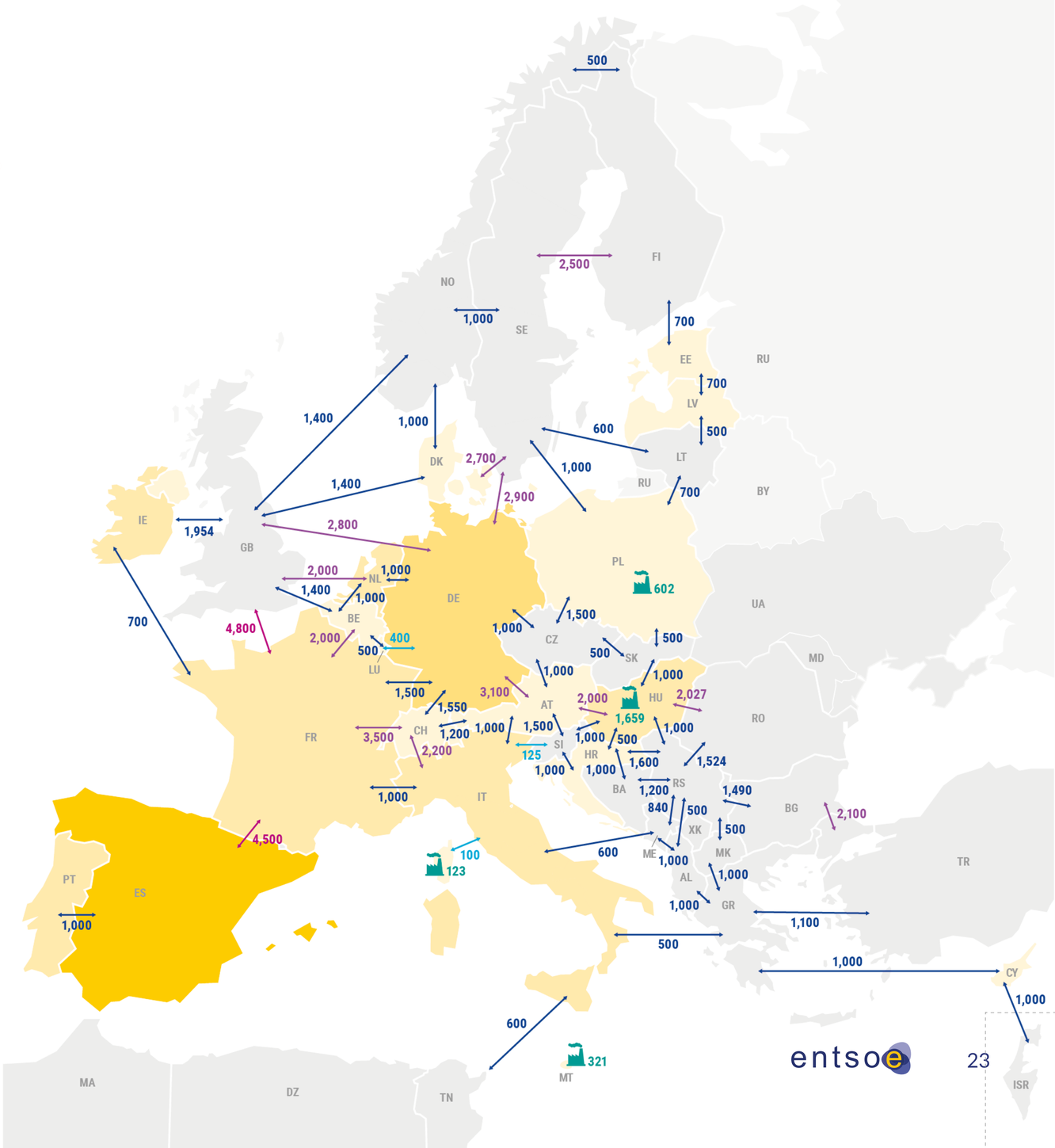
CROSS-BORDER CAPACITY INCREASES NEEDS IN MW (ADDITIONAL TO THE STARTING GRID 2025)

- < 500 MW
- 500 → 2,000 MW
- 2,000 → 4,000 MW
- > 4,000 MW

STORAGE NEEDS IN MW (ADDITIONAL TO BATTERY CAPACITIES IN NT2030 AND TO 2040 CAPACITIES FOR OTHER STORAGE TECHNOLOGIES)

- < 1,000 MW
- 1,000 → 5,000 MW
- 5,000 → 10,000 MW
- > 10,000 MW

CO_2-FREE PEAKING UNIT NEEDS PER COUNTRY IN MW



One economic needs configuration, multiple solutions

Non-infrastructure solutions

Addressing tomorrow's challenges will require the parallel development of a diverse range of solutions, including for example storage, the role of prosumers and generation, in addition to reinforcing the transmission grid.

- Demand side response
- Regulation
- Smart Grids
- Storage
- Smart Sector Integration
- Market design
- Operational measures

Electricity infrastructure solutions

Our study uses interconnection transmission capacity and storage and peaking flexibility to express the needs because it is based on electricity TSOs' expertise, data and models, but solutions extend beyond electricity infrastructure.

- Transmission lines
- Energy Storage
- Peak units
- Hybrid solutions

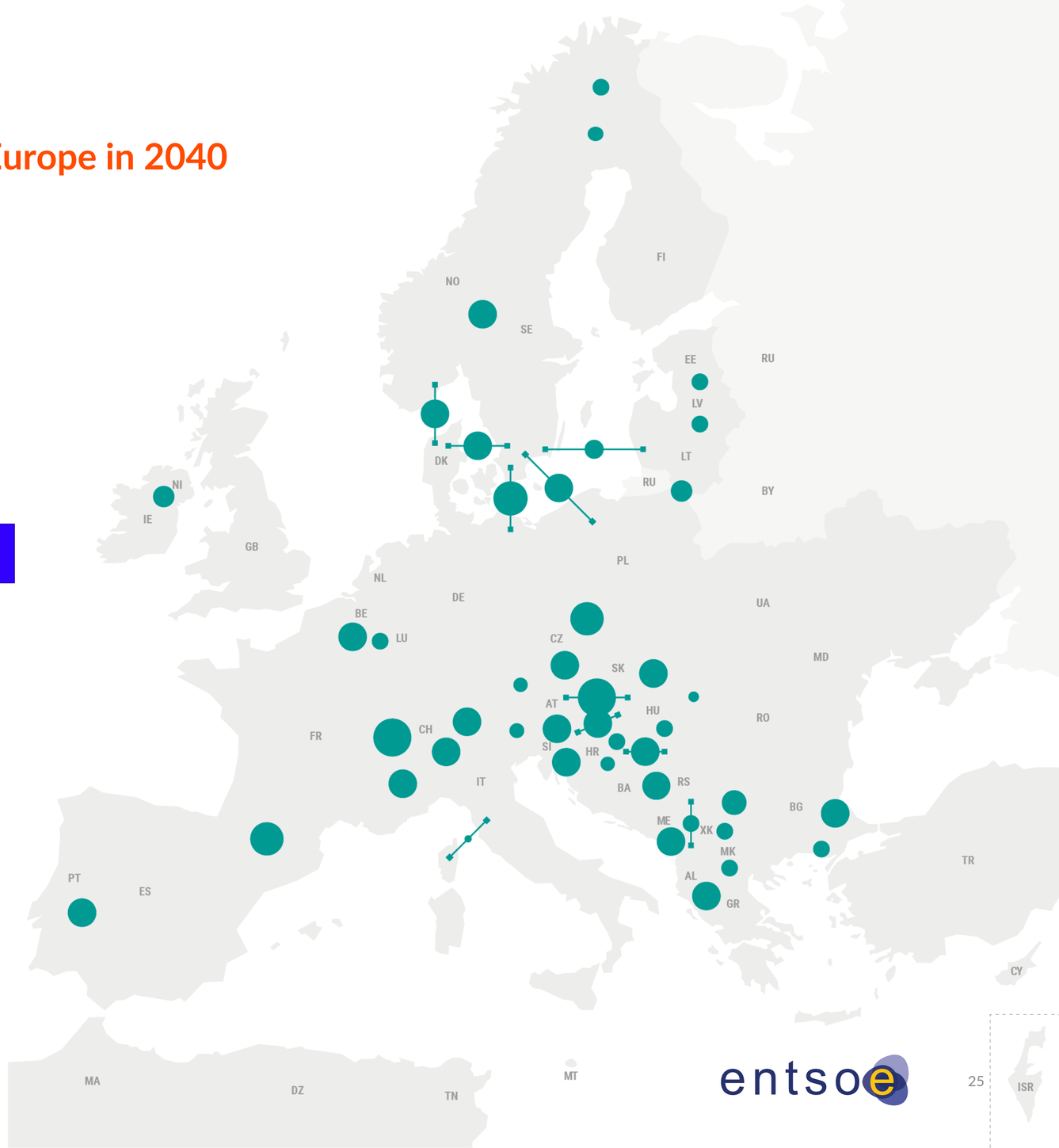
There are opportunities for new solutions all over Europe in 2040

Needs not covered by existing transmission projects in 2040

DIFFERENCE BETWEEN NEEDS AND EXPECTED CAPACITY IN 2040 (MW)

100 250 500 750 1,000 1,500 2,000

The bigger the circle, the higher the need for additional solutions.



How addressing system needs benefits Europe

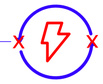
What would happen in 2040 if...

We stopped investing in the power system in 2025?

EU Energy bill rising to **132 Billion euro per year**

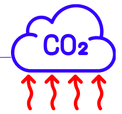
System **instability** and risk of **blackout**

78 TWh of renewable energy curtailed each year



Dependence on gas with 366 TWh of gas-based power generation per year

Grid not sufficient → Leads to no decarbonisation



What would happen in 2040 if...

We addressed system needs?

Investing 6 Billion euro per year cuts generation costs by 9 Billion each year

Ensuring stability and security of electricity supply in Europe, with 1.6 TWh of avoided energy-not-served

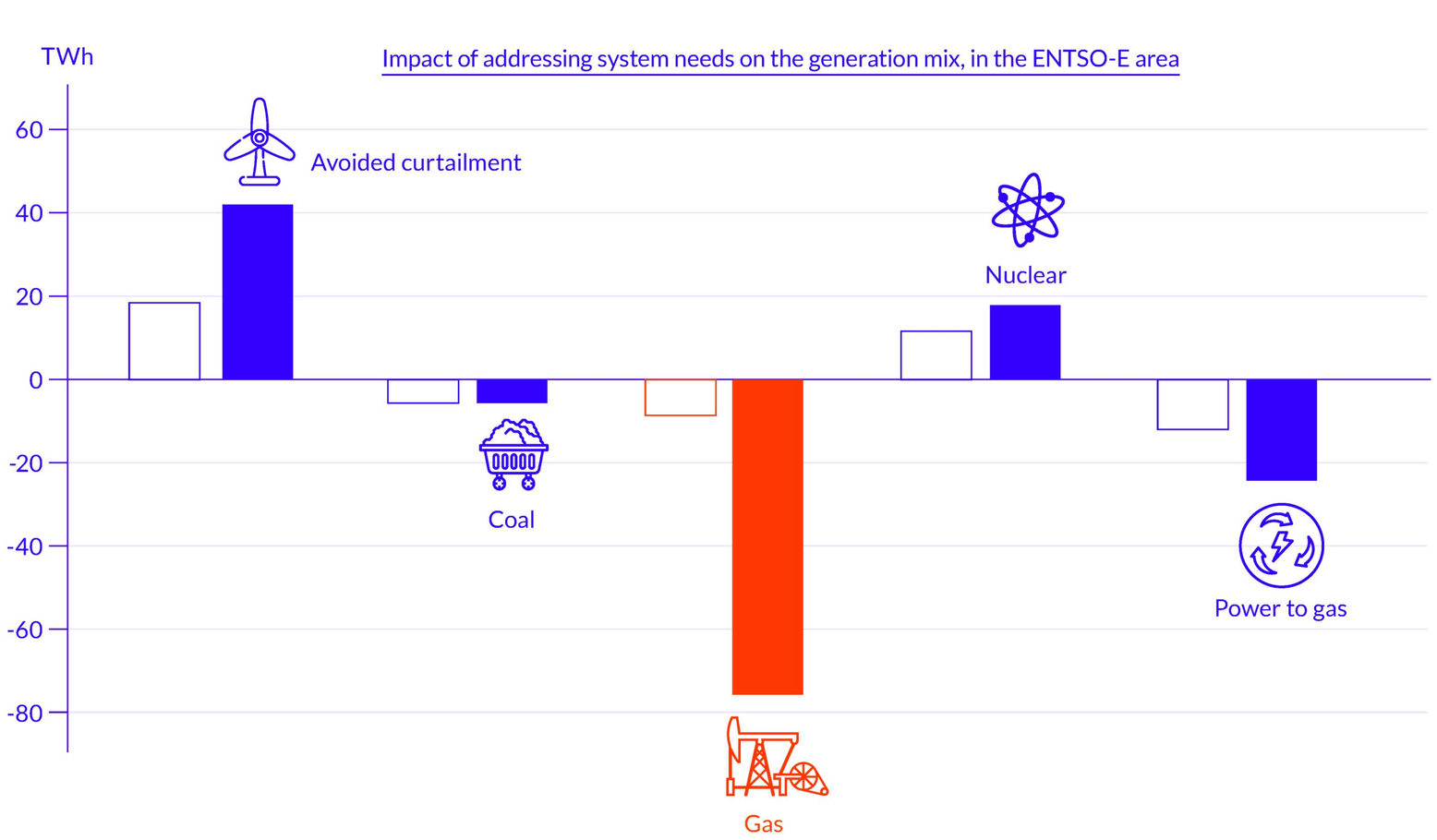
Avoiding the curtailment of 42TWh of renewable energy each year

Gas-based power generation is **reduced by 75TWh per year**

Grid welcoming the expected development of renewables
→ CO2 emissions cut by 31Mton per year

How addressing system needs benefits Europe

Reduced dependance on gas for power generation



Context

By connecting more consumers with more producers, grid development allows a better use of the cheapest generation.

As a result, European countries can exchange electricity to replace expensive generation (gas and coal) with cheaper one (mainly renewable).

entsoe

TYNDP 2022

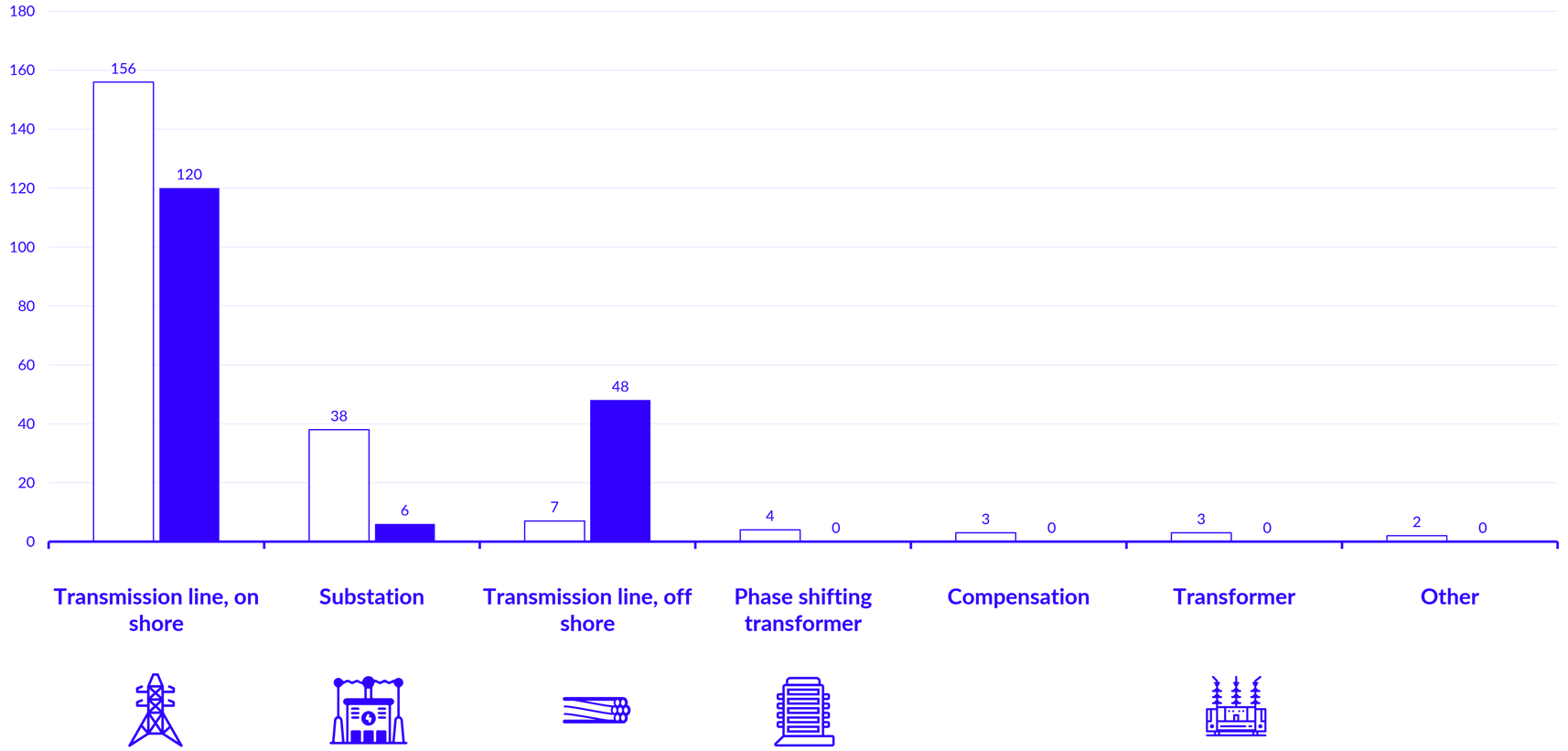
Project collection and identification

entsoe European Network of Transmission System Operators for Electricity

Project collection

Project portfolio: 141 Transmission projects

TYNDP 2022 investments per type of element and technology.

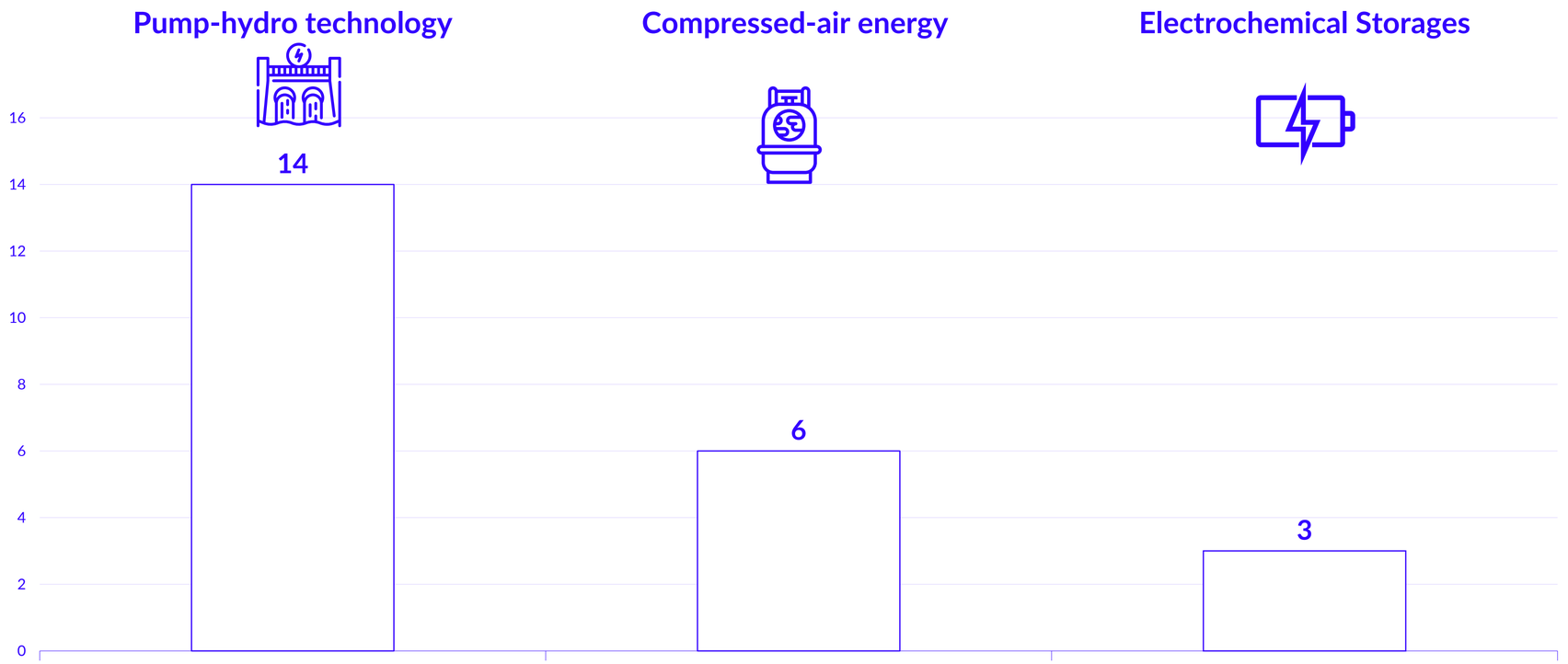


Context

TYNDP 2022's portfolio projects with over 43,000 km of potential additional cables and lines, of which 18,000 km (42%) are AC and 25,000 km (58%) encompassesare DC. The rapid advancement of DC technology has led to improved uptake of this technology and seen its portfolio share grow since TYNDP 2018. The ongoing development of offshore infrastructure is expected to require increased investment in subsea DC cables.

Project collection

Project portfolio – 23 Storage Projects



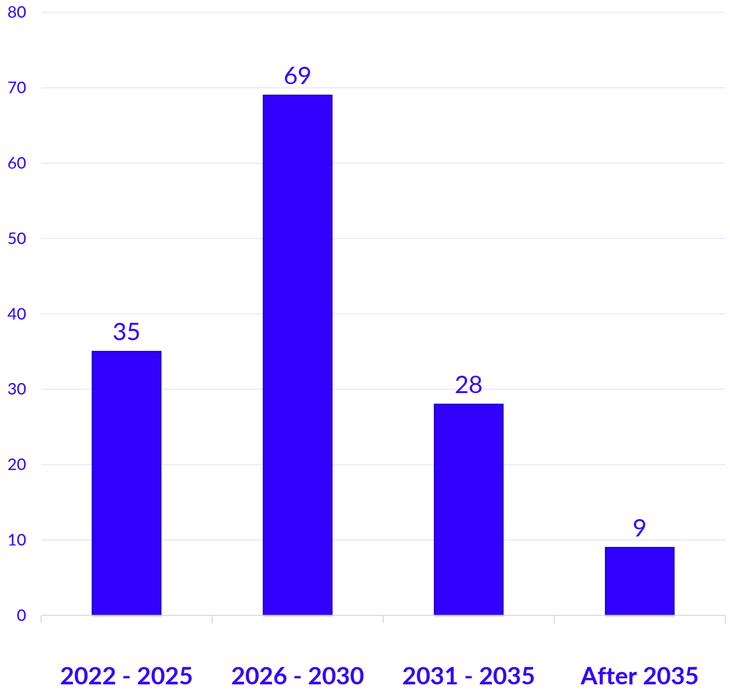
Context

The TYNDP 2022 portfolio includes 23 storage projects, of which 14 use pump-hydro technology. six compressed-air energy storage projects and three electrochemical storage projects complete the portfolio.

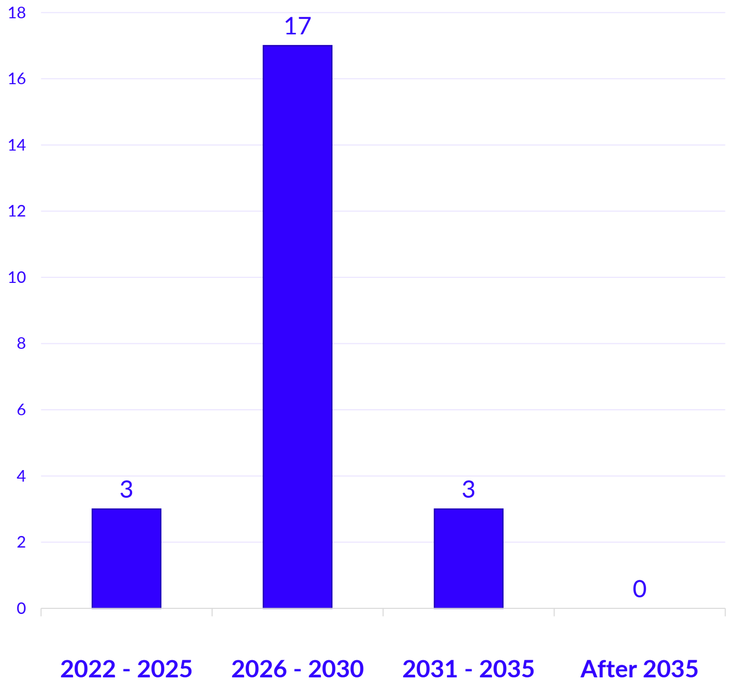
None of the projects has started the construction phase, while 12 are under consideration. One is in planning but has not completed the permitting phase, and 10 are in permitting. TYNDP 2022 includes three fewer storage projects than in 2020.

Projects' expected commissioning year

Transmission Projects



Storage Projects



Context

- 35 % of transmission projects are expected by promoters to come into service within the next five years.
- Of the 43 transmission projects in the permitting phase, 34 were already in the permitting phase in TYNDP 2020.
- 55 transmission projects under consideration, of which 18 are new projects in this TYNDP.
- Of the 287 transmission investments, 40 (14 %) suffered delays in the past two years.

TYNDP 2022

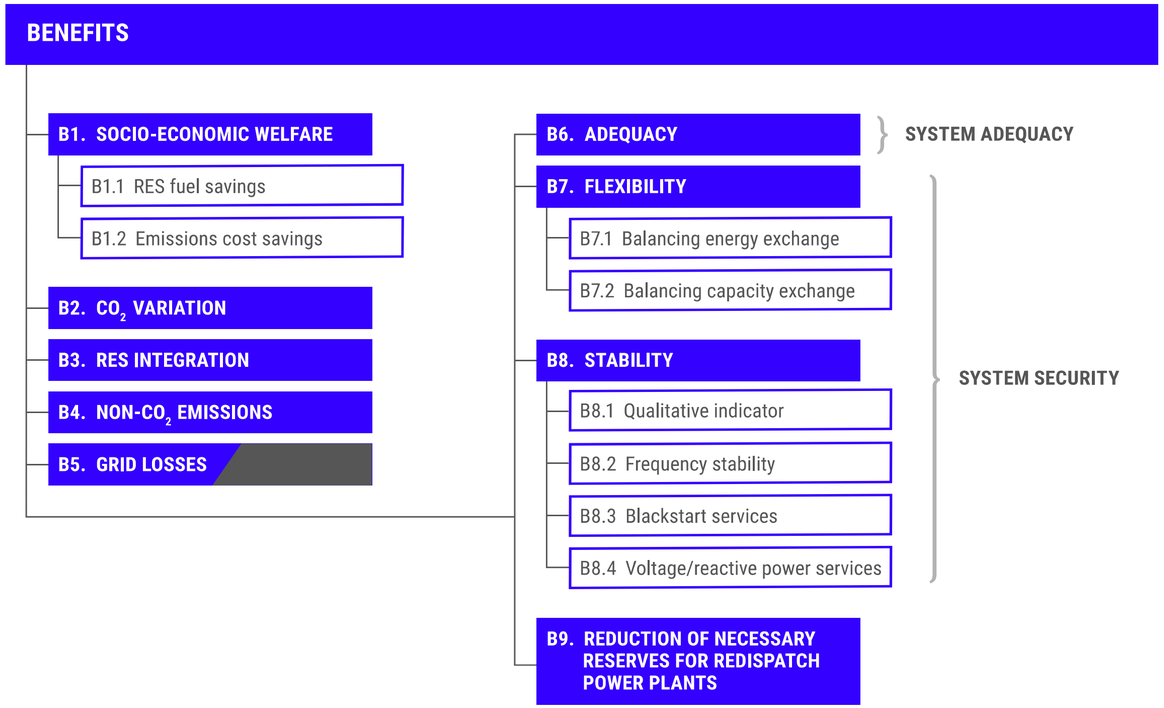
Cost benefits analysis of projects

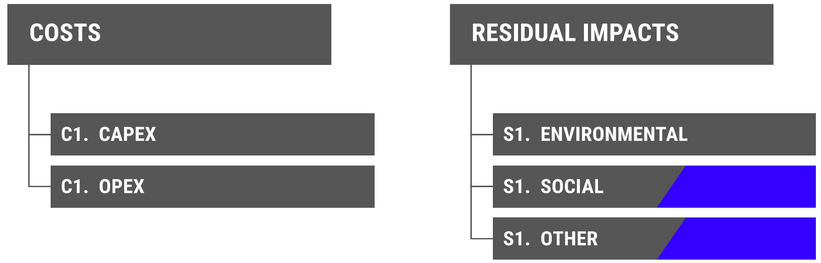
entsoe

European Network of Transmission System Operators for Electricity

Cost Benefit analysis

What indicators do we use?





JEEP study

Investing in electricity infrastruture will contribute to the European economic recovery

CAPEX

142 Billion €

PRODUCTION

240 Billion €

EU GDP increase

100 Billion €

EMPLOYMENT

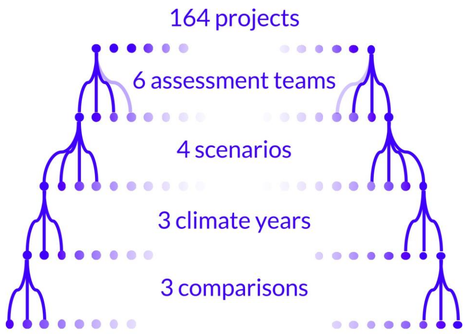
1.6 Million Jobs

Tax Revenues

45 Billion €

TYNDP 2022 Cost-benefit analysis of projects – Simulation details

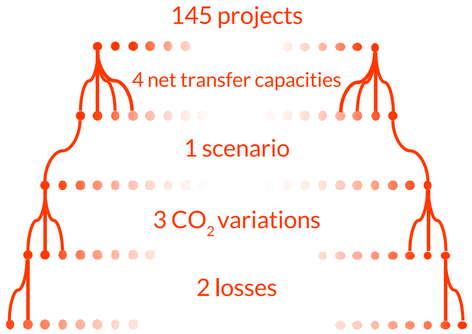
Market studies



35.424 simulations

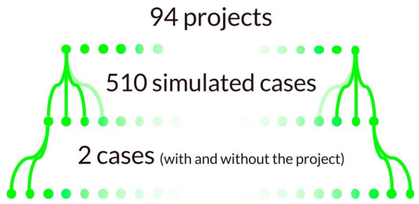
+216 reference cases

Network studies



3480 simulations

Security of supply studies



95.880 simulations

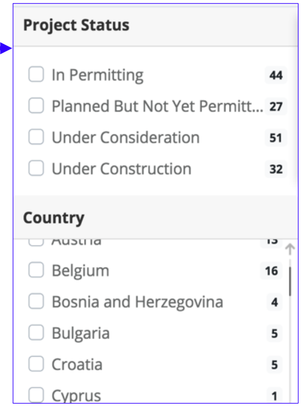
Each simulation is conducted for **the entire continent** over a year, ie. **8 760 hours.**

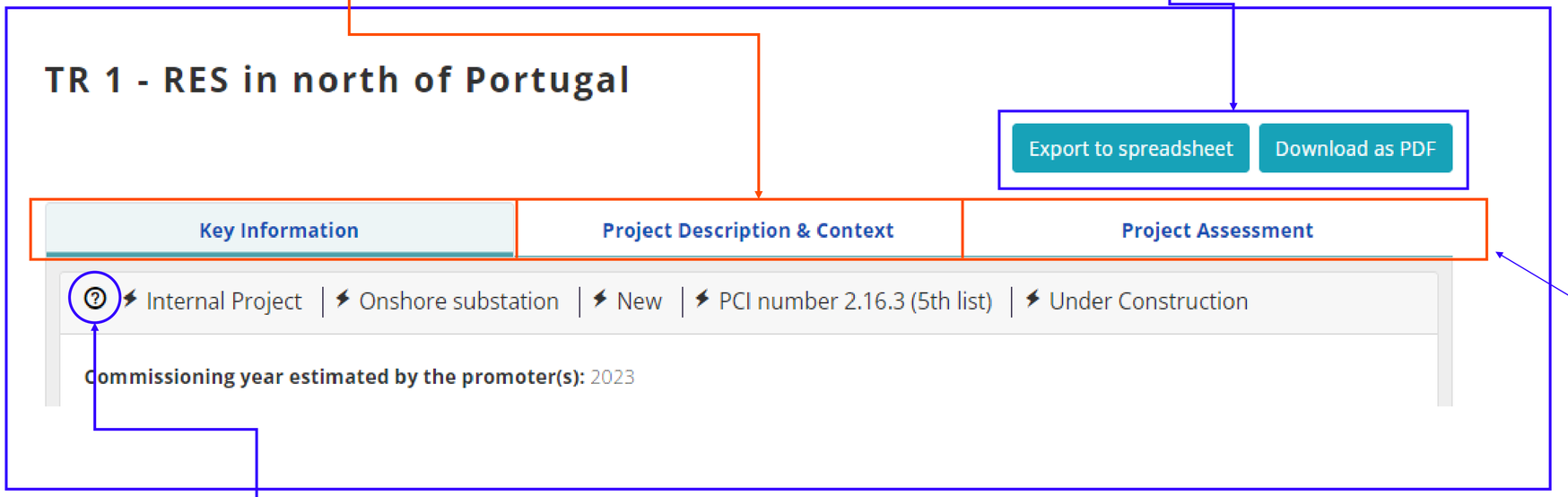
> 1 Billion instant renderings of the European electricity system

What is in the project sheets?

Information distributed in 3 pages

User friendly search/filter/export options



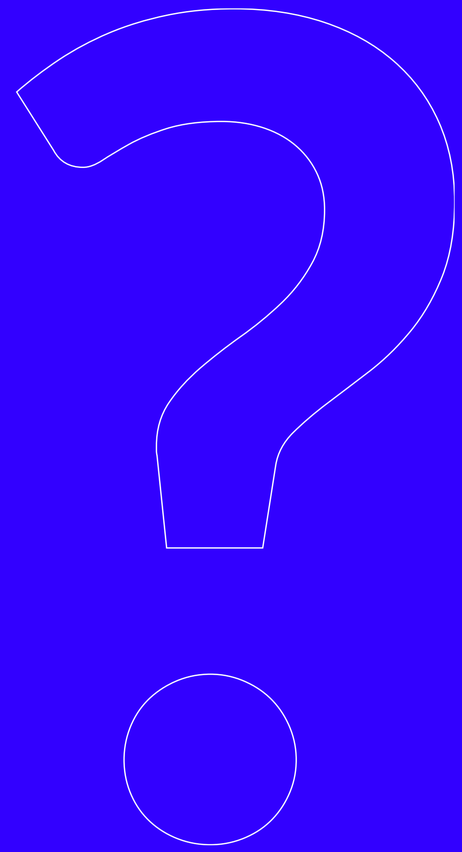


Cost-benefit analysis results

Pop-up with explanation on technical elements

Q&A

Ask your questions on sli.do



Join at

slido.com

#3306 443

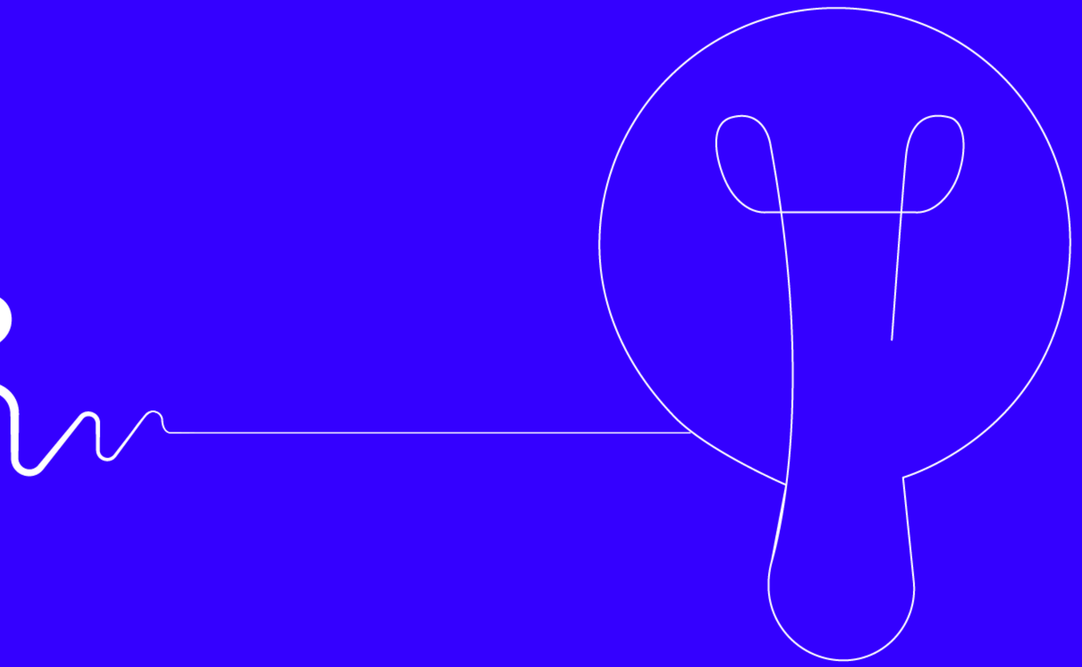
Panel discussion

How to plan a decade ahead when the close future becomes unpredictable ?

- Antonella Battaglini, Renewables Grid Initiative (moderator)
- Pierre Tardieu, Wind Europe
- Diederik Peereboom, T&D Europe
- Irina Minciuna, European Commission
- Lisa Fisher, E3G
- Dimitrios Chaniotis, ENTSO-E

TYNDP 2022

What's Next?



entsoe

European Network of Transmission
System Operators for Electricity

Public consultation

The TYNDP lays out our perspective, but now we want to hear from you

Give us your contribution now!

Share your views on tyndp.entsoe.eu

The consultations runs until 16 September.

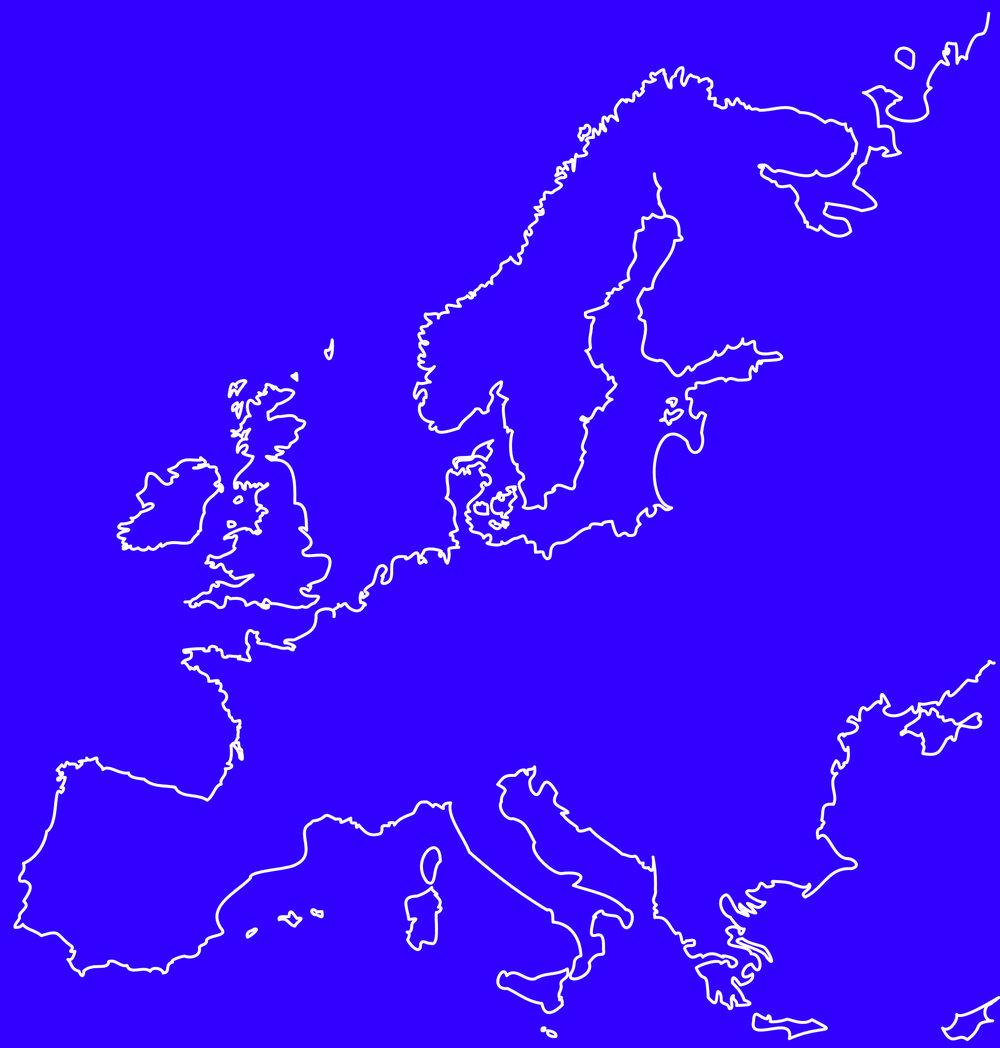
What will change in 2024?

Conclusion

We hope today's presentation will allow you to
make confident and impactful decisions for the future of energy in Europe!

entsoe

European Network of Transmission
System Operators for Electricity

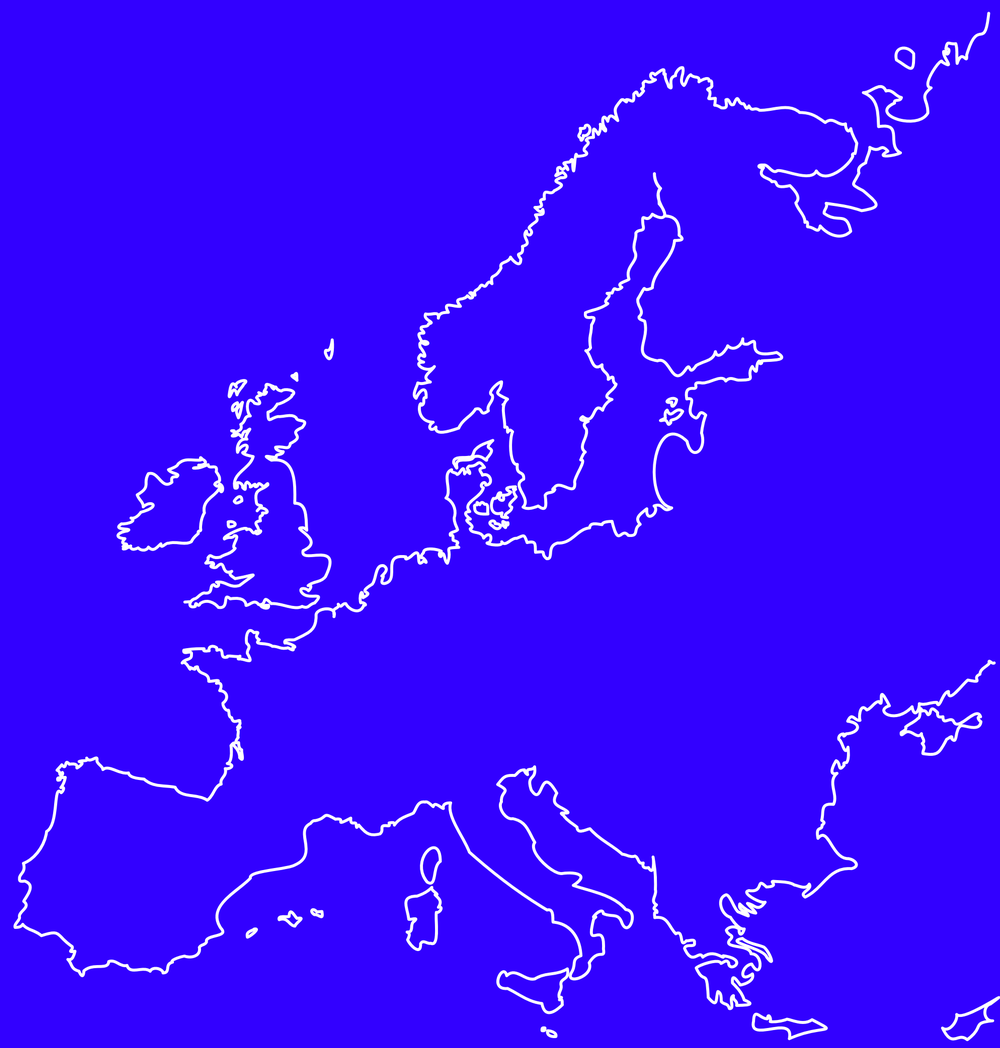


Collaboration and questions at

tyndp@entsoe.eu

Find the key messages and data you need to make a change on

tyndp.entsoe.eu



entsoe

European Network of Transmission System Operators for Electricity