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NAVIGATING POWER GRID SCARCITY IN THE AGE OF RENEWABLE ENERGY

POLICY AND REGULATORY CONTEXT AND TOOLS

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PURPOSE & CONTENTS OF THE STUDY

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PURPOSE:

- Provide guidance on how policies and regulation need to adapt to support the grid integration of large capacities of renewable energy sources.

CONTENTS:

- Practical regulatory toolkit by RAP;
- Grid management issues survey summary from among 11 ERRA member countries;
- 3 case studies for both T&D;
- Policy and regulatory recommendations.

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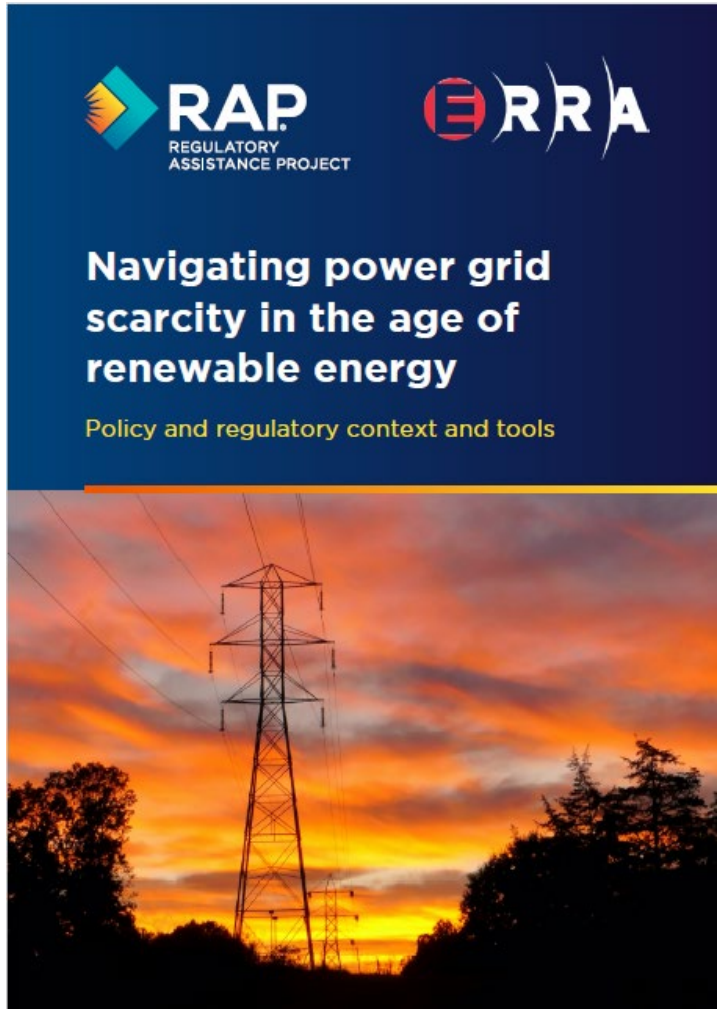

https://erranet.org/erra-online-library/

CONTENTS

POWER GRID CAPACITY SCARCITY

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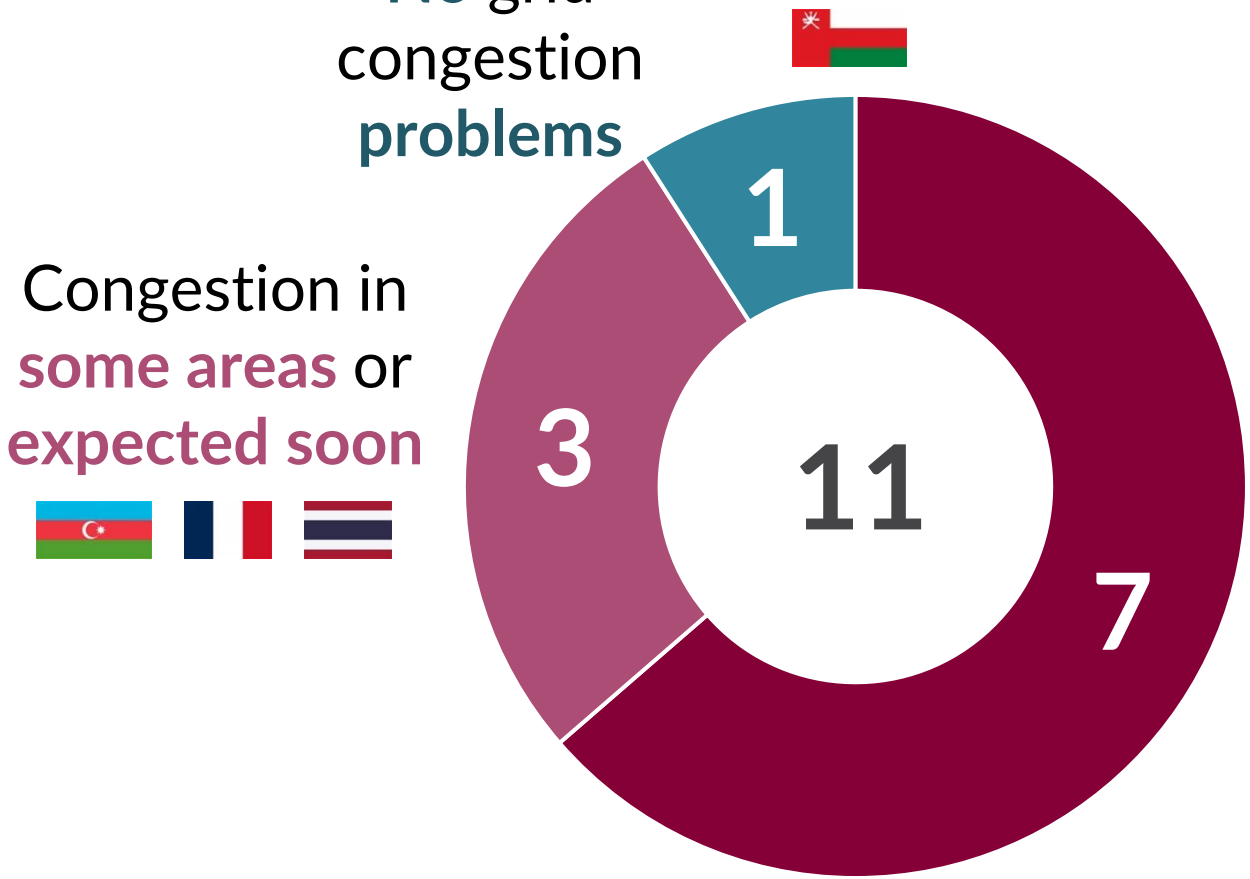
No grid congestion **problems**



Congestion in **some areas** or **expected soon**

Congestion is a **problem now**

REGULATORY TOOLBOX FOR GRID CONGESTION

Categories:

1. Utilizations of existing grid capacities
2. (Re)Allocation of Remaining Grid Capacities
3. Creating New Grid Capacities

Timeframes: ≤ 2 years | 2-3 years | ≥ 3 years

Full toolkit is available at:
https://www.raponline.org/toolkit/rip-first-come-first-served/

1. UTILIZATIONS OF EXISTING GRID CAPACITIES

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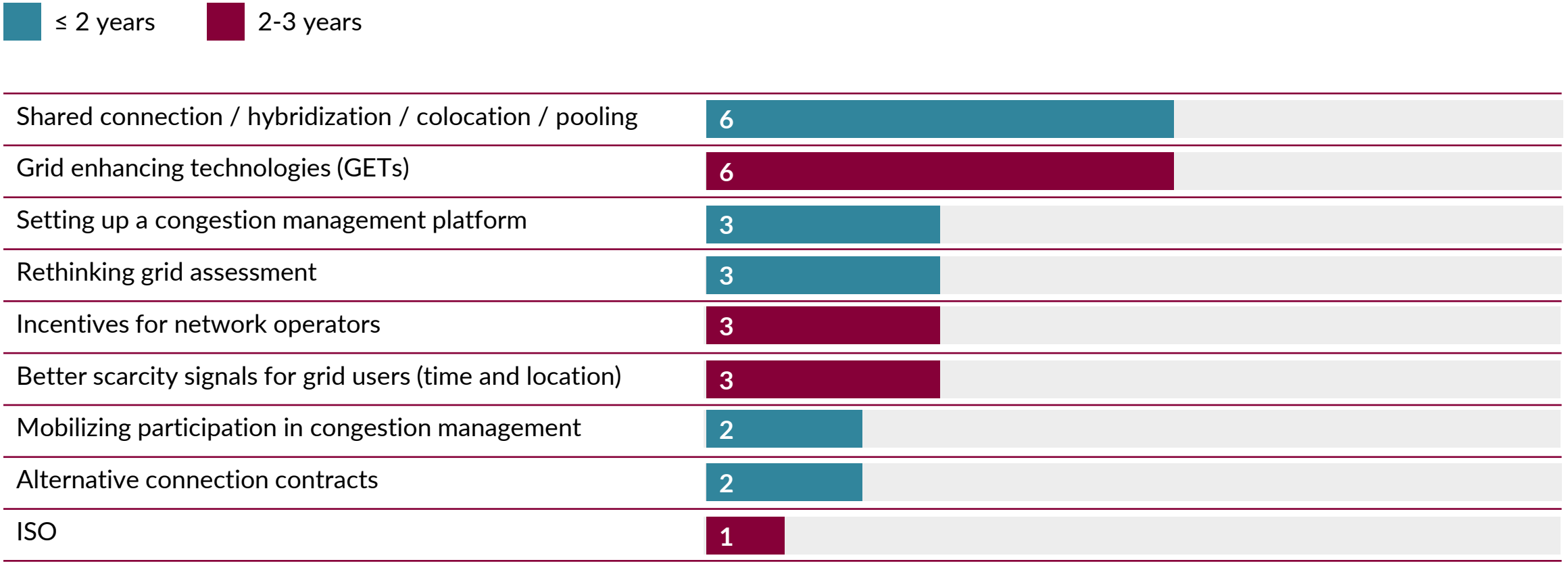

2. (RE)ALLOCATION OF REMAINING GRID CAPACITIES

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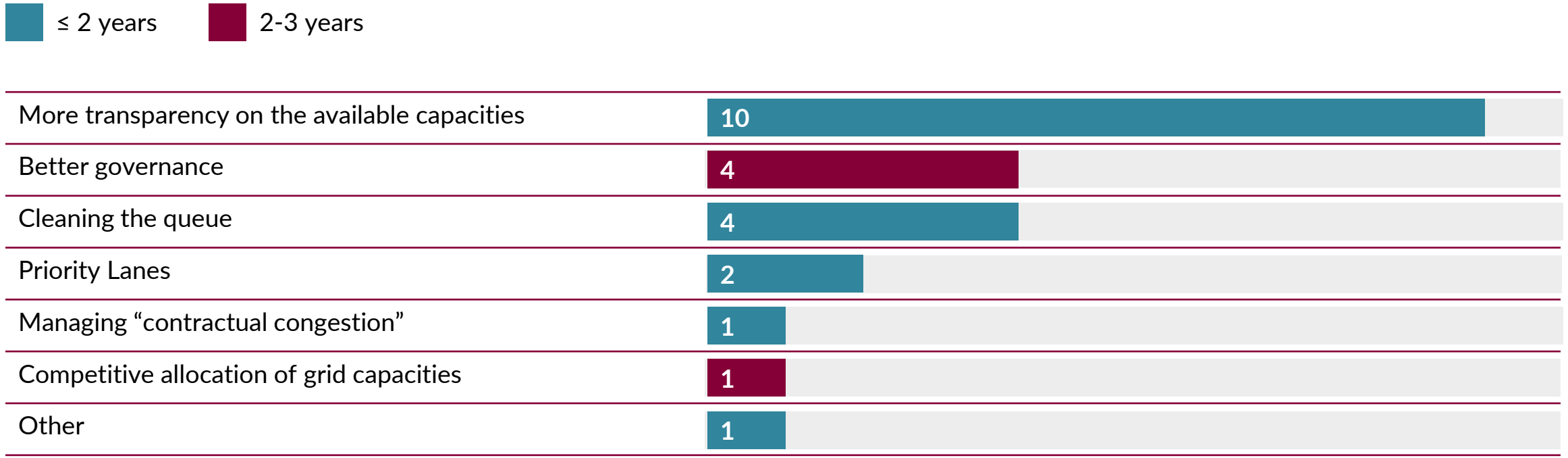

3. CREATING NEW GRID CAPACITIES

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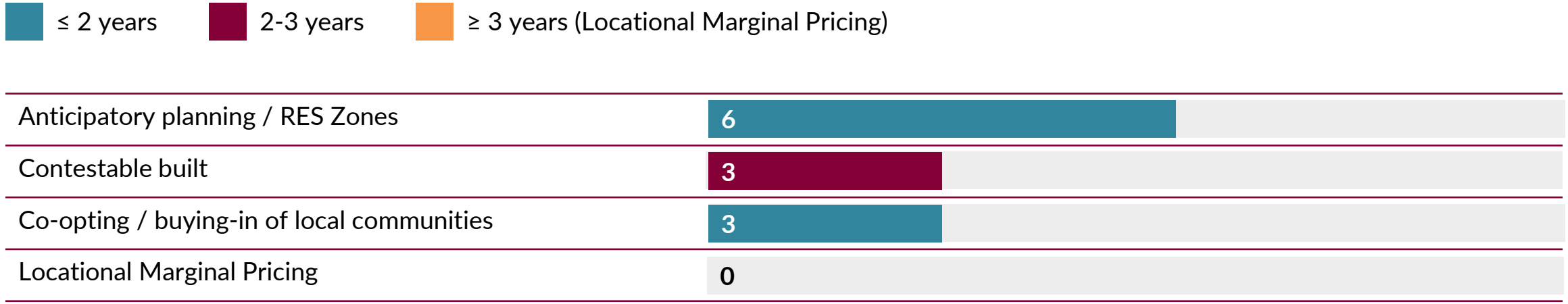

CASE STUDIES

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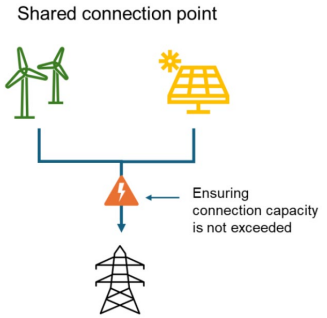
1. UTILIZATIONS OF EXISTING GRID CAPACITIES

Distribution

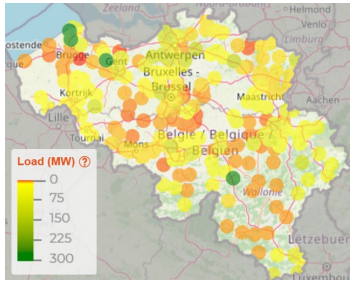
POLAND:
Shared Connection / Cable Pooling



2. (RE)ALLOCATION OF REMAINING GRID CAPACITIES

Transmission and Distribution

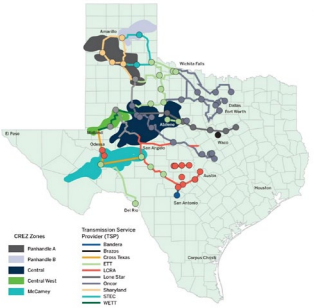
BELGIUM:
Transparency on Available Capacities / Hosting Capacity Maps and Data Sharing



3. CREATING NEW GRID CAPACITIES

Transmission

U.S. (TEXAS):
Renewable Energy Zones



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UTILIZATIONS OF EXISTING GRID CAPACITIES

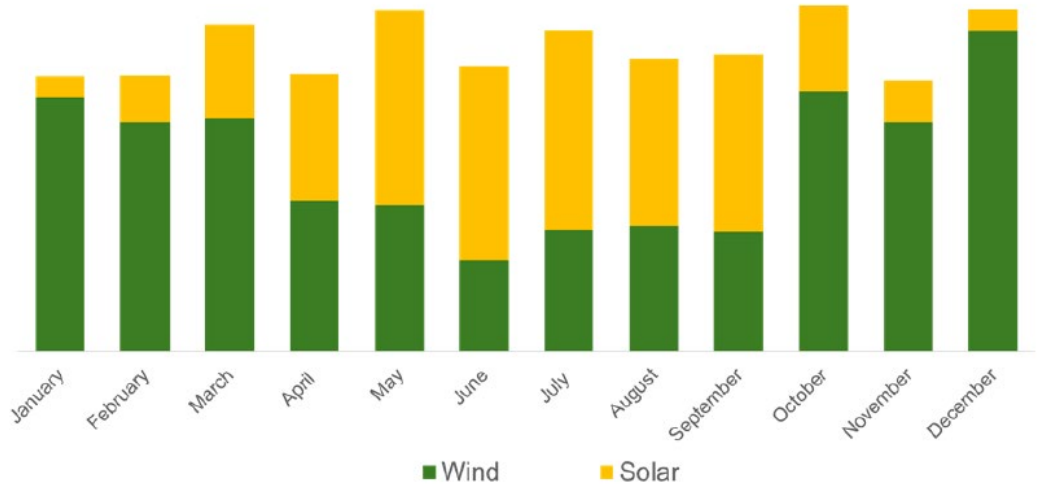
Case Study:

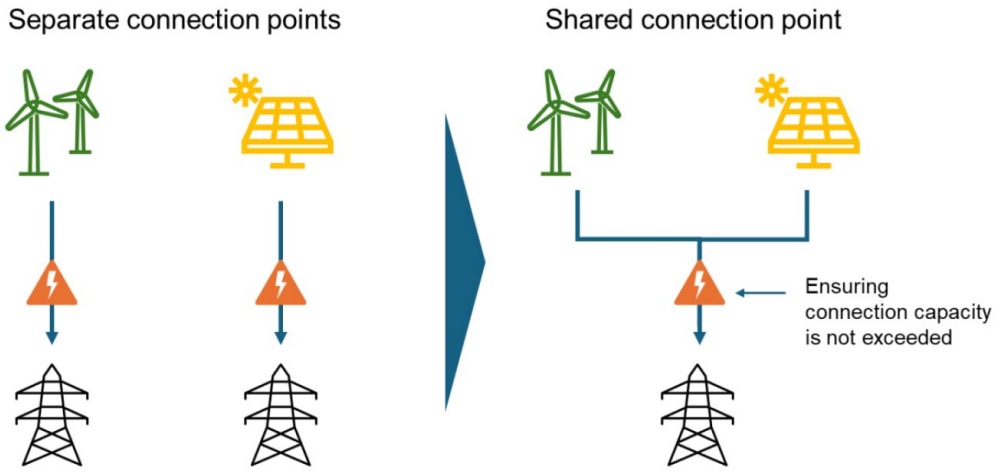
Cable pooling in Poland

CS1: POLAND – CABLE POOLING

- Planned increase from 23% RES in 2023 to 56% RES in electricity generation.
- Lack of available grid capacities to host more renewables.

- The aim of the measure is better utilization of connection capacities, flattening of the generation profile at a given connection point and better use of land.





CS1: POLAND – CABLE POOLING

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- Renewable industry advocated for cable pooling starting in **2021**.
- New rules came into force on 1 October **2023**.
- ERO issued guidance in March **2024** to address inconsistencies in the grid connection process.

- Remaining problems:
  - Exclusion of storage from cable pooling (shared connection can only be granted to two or more generation installations.)
  - Exclusion of installations connected via cable pooling from the contracts for difference (CfD) RES support scheme.
  - Inconsistencies in implementation between DSO's and no guarantee of faster and cheaper procedures for investors.

(RE)ALLOCATION OF REMAINING GRID CAPACITIES

Case Study:

Hosting capacity maps in Belgium

CS2: HOSTING CAPACITY MAPS

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Maps show available grid capacity for connections at certain locations, and various voltage levels.

Benefits:

- Helps project promoters plan by **showing grid availability**, reducing connection queue time.
- **Reduces** multiple grid connection **requests** for operators, streamlining the process.
- **Identifies high-demand areas** for flexibility solutions like storage and demand-side flexibility.

CS2: BELGIUM – TRANSMISSION MAP

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The hosting capacity map (30-380kV) of Elia (TSO) specifies how many additional MW consumption or production could be hosted without additional grid investments:

- per substation
- for a different target years (2026 or 2031),
- for different grid user (load, generation, storage)
- for a given flexibility level (0 or 5% maximum yearly energy curtailment)
- for a set of underlying assumptions such as planned infrastructure, evolution of other grid users.

CS2: BELGIUM – TRANSMISSION MAP

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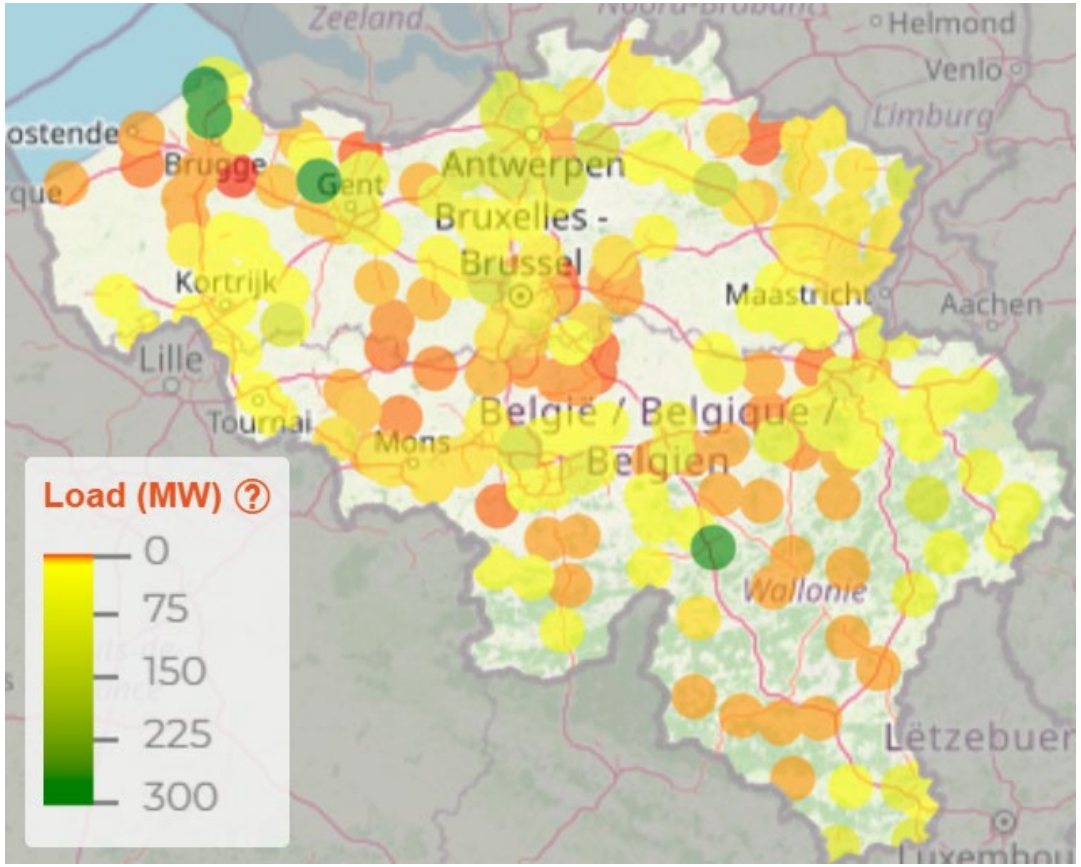
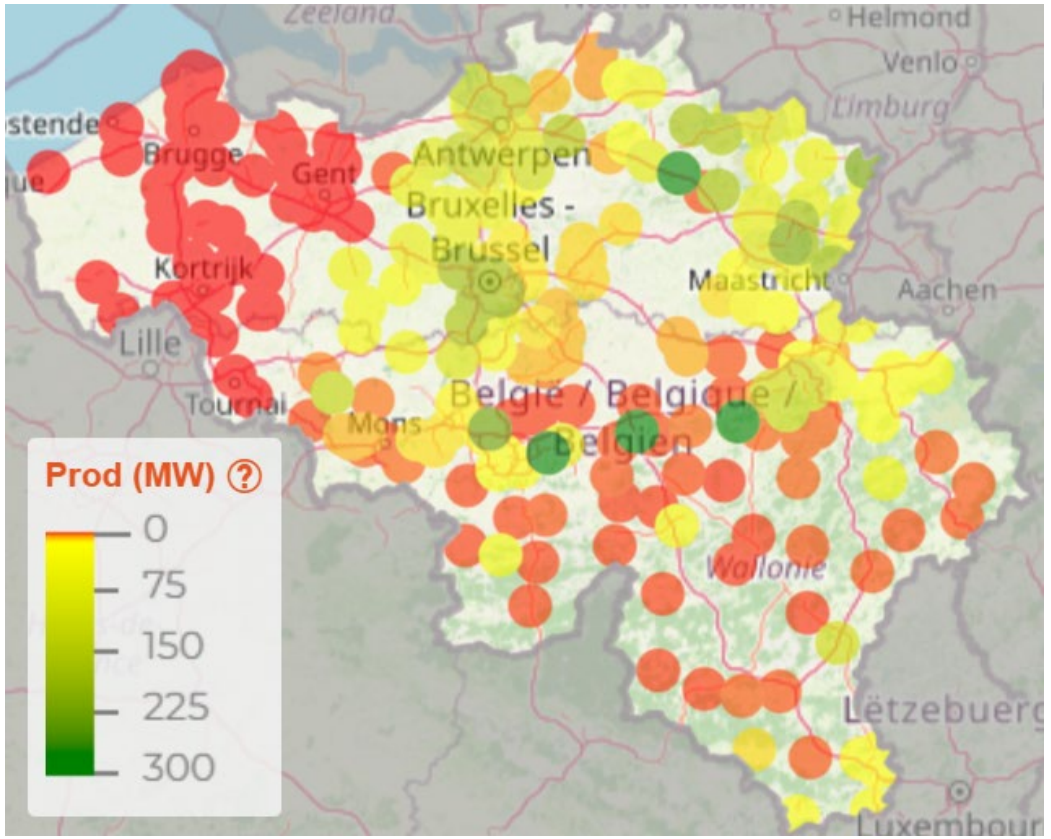
https:/www.elia.be/en/customers/connection/grid-hosting-capacity



Transmission capacity map for Load



Transmission capacity map for Production

CS2: BELGIUM – DISTRIBUTION MAP (FLUVIUS)

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Covers the medium voltage grid in Flanders and shows:

- Remaining **available capacity for load and generation** for each substation.
- Capacity of each transformer with **current and future peak load capacity** and users.
- **Distance to the first connection** point with sufficient available capacity,
- Indicative **lead time** of connection from approval of request, and
- Indicative **connection costs**.

https://opendata.fluvius.be/pages/map_perceel/

CREATING NEW GRID CAPACITIES

Case Study:

Competitive Renewable Energy Zones in Texas

CS3: TEXAS – RENEWABLE ENERGY ZONES

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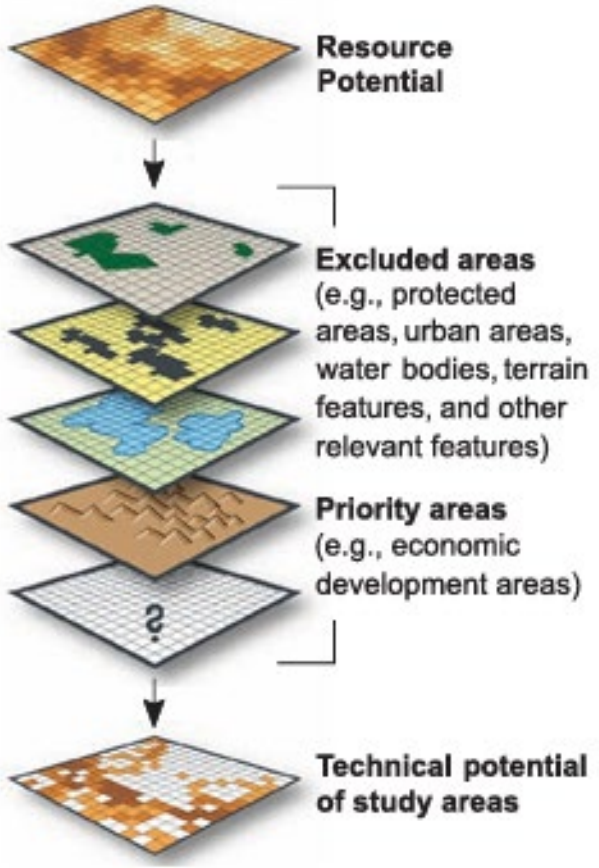
- Spatial planning for renewable energy is a key factor in power grid investment planning, as new RES resources are located far from load centers.
- Competitive Renewable Energy Zone (CREZ) initiative since 2005 supports large-scale wind projects and ensures sufficient transmission capacity.
- The designation of CREZ focused on large-scale wind resources that can be developed in sufficient quantities to warrant transmission system expansion and upgrades.



Source: NREL, Renewable Energy Zone (REZ) transmission planning process.

CS3: TEXAS – RENEWABLE ENERGY ZONES

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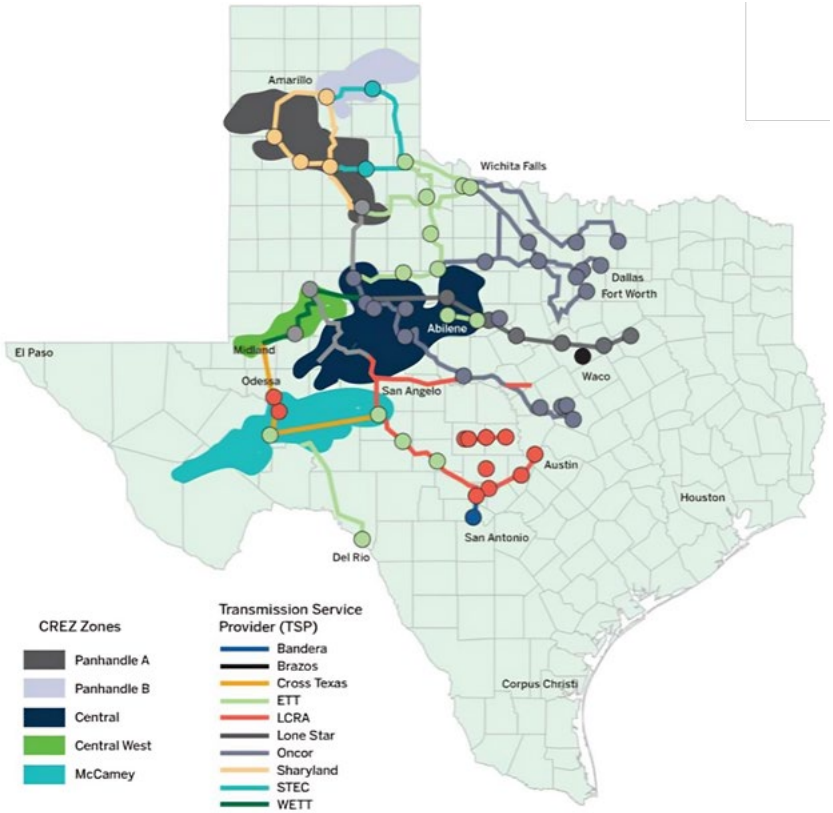
- 5 zones totaling 83.000 km^2 for 23 GW wind development
- 6.100 km new, high-voltage transmission lines, and

- After the implementation of CREZ, curtailment of wind fell from **17% to 1.2%,** and wholesale prices fell to a historic low + prices converged and were less volatile across the state.
- Congestion remains a problem with a rapid shift in the type and location of generation available to serve demand



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RECOMMENDATIONS FOR REGULATORS

RECOMMENDATIONS FOR REGULATORS 1/2

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- Define a ‘net zero’ or **‘target’ grid** together with grid operators.
- Minimize uncertainty for the investors and maximize speed of connections by consulting planned grid scarcity tools with all stakeholders with **minimum discretion remaining** during application.
- Promote **grid transparency** and **digitalization** for connection processes and capacity maps.

RECOMMENDATIONS FOR REGULATORS 2/2

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- Establish incentives for grid operators to use **non-wire solutions** (better use of grids) whenever more cost-efficient than building new infrastructure (‘efficiency first’).

- Combine planning for **renewables** and **transmission lines** with a focus on economic assessments.

- Implement **streamlined administrative processes**, incorporating citizen input for public acceptance.

THANK YOU FOR YOUR ATTENTION!

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Or with the QR code: