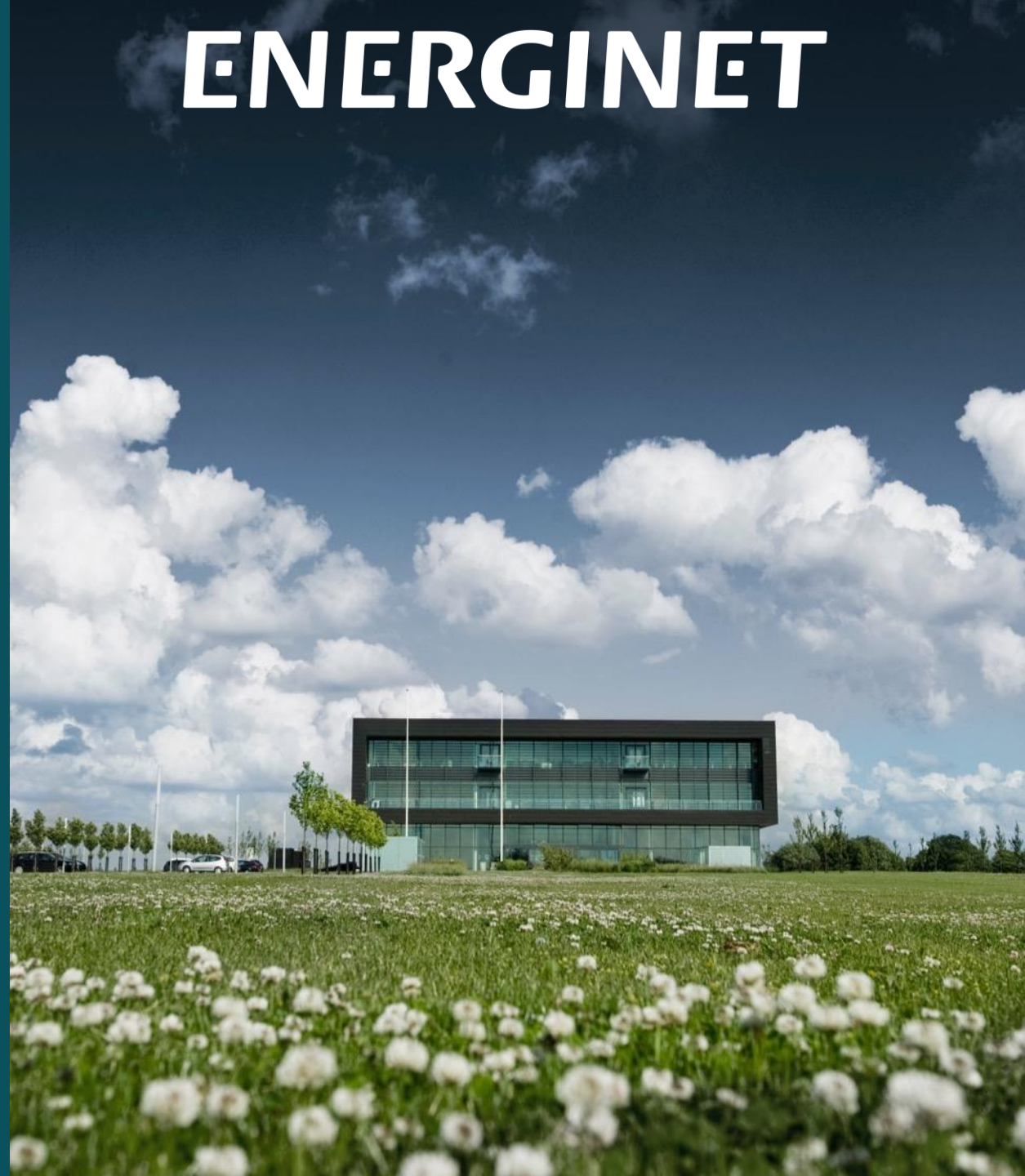


INTER-REGIONAL TRANSMISSION PLANNING - WHY IS IT IMPORTANT AND HOW DO WE MAKE IT HAPPEN?

October 2022

*Peter Markussen, Senior director, Energinet Transmission System
Operator, Denmark
(pmr@energinet.dk)*

ENERGINET



ENERGINET

THE ENERGY BACKBONE

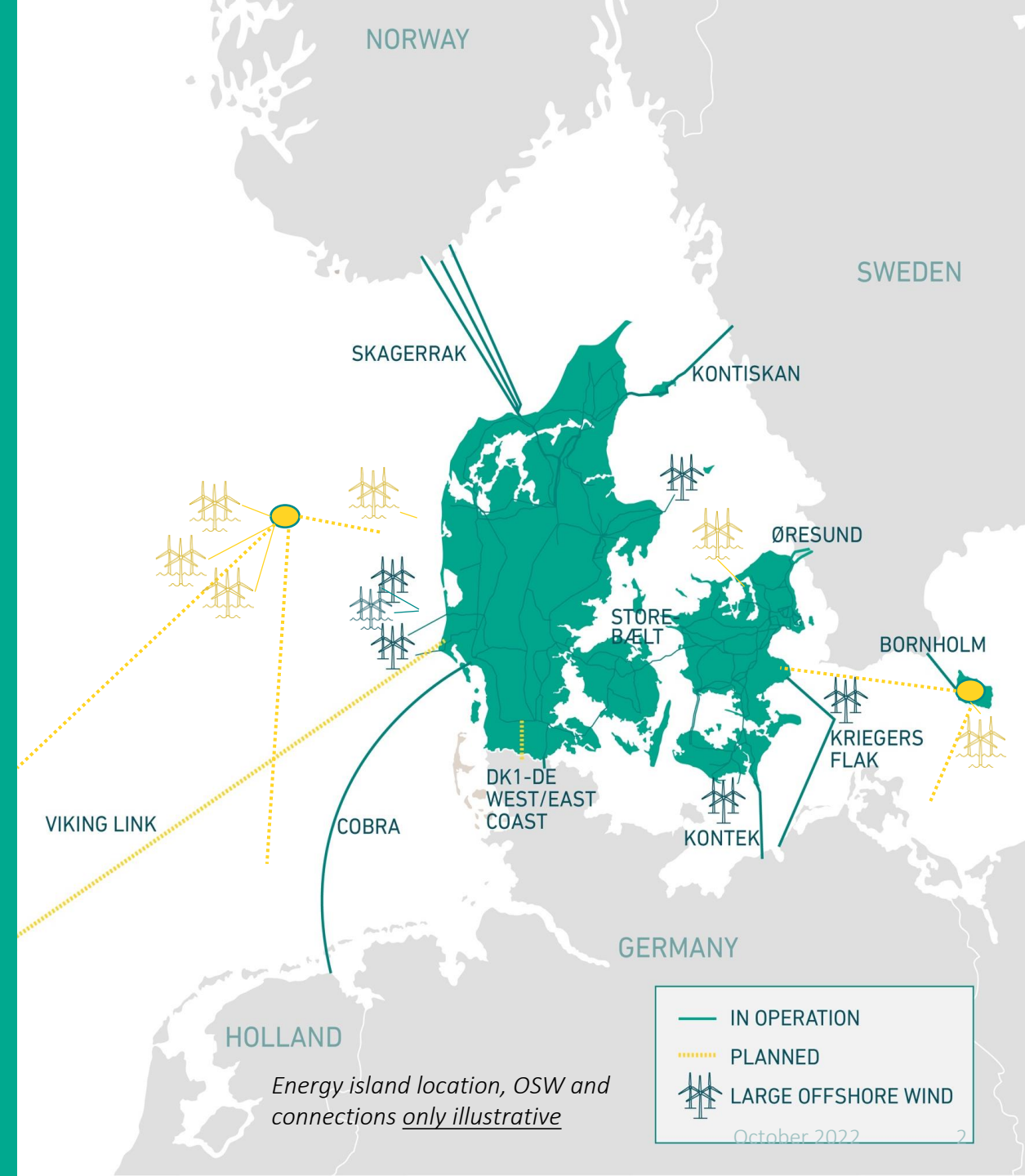
We operate and develop the transmission grids and gas pipelines in Denmark.

ENSURE BALANCE

We have the day-to-day and long-term responsibility for the overall electricity and gas system in Denmark.

WORKING FOR THE SOCIETY

Owned by the Danish Ministry of Climate, Energy and Utilities we safeguard society's interests as we move to a 100% green energy system.



WHY IS IT IMPORTANT?

ACCELERATED GREEN TRANSITION

Reduced curtailment and CO2 emissions

HIGH SECURITY OF SUPPLY

Lower risks for energy not served

Increased access to balancing resources

Reduced dependency on imported fossil fuels

AFFORDABLE ENERGY

Annual 5-9 bill Euro reduced production costs

HOW TO MAKE IT HAPPEN?

EUROPEAN LEVEL: Framework grid codes

Short and long term planning to support national decisions

Common European electricity market

NATIONAL LEVEL: implementation and approval of interregional transmission capacity

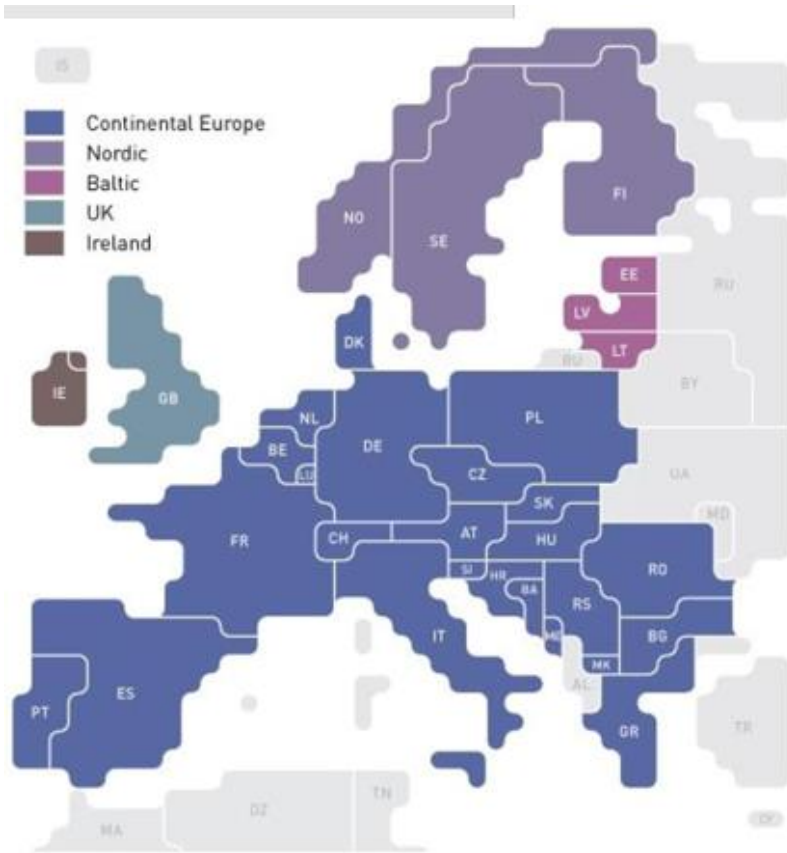
TSO LEVEL: Unbundled sector and clear roles and responsibilities of system operators

Financial incentive for cross border transmission

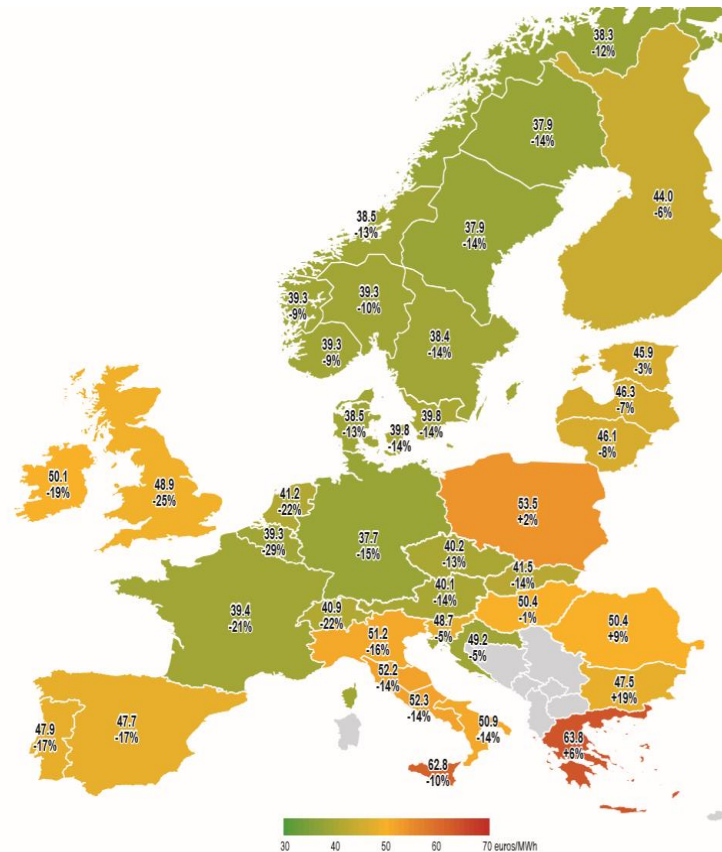
EUROPE IS DIVIDED IN MORE SYNCHRONOUS AREAS AND LOAD FREQUENCY CONTROL AREAS (LFC)

General rule: LFC area = country = TSO = market price area

Synchronous areas



Market price areas



Source: ACER calculations based on data by the European Network of Transmission System Operators for Electricity (ENTSO-E).

European grid codes (framework regulation)

- Connection
- Electricity Market
- System operation

ACER

- Monitoring implementation (and ensure benefits are materialized)

Entso-E

- Development and adaption of of grid codes
- Long term grid planning coordination
- R&D coordination

Country:

- Level of security of supply
- Subsidies for renewables and tariffs approvals
- Agreements and approvals new interconnectors

TSO

- System Operation and balancing (N-1)
- Ownership and development of grid
- Tariff financed (congestion rents)

Regional Coordination Centers

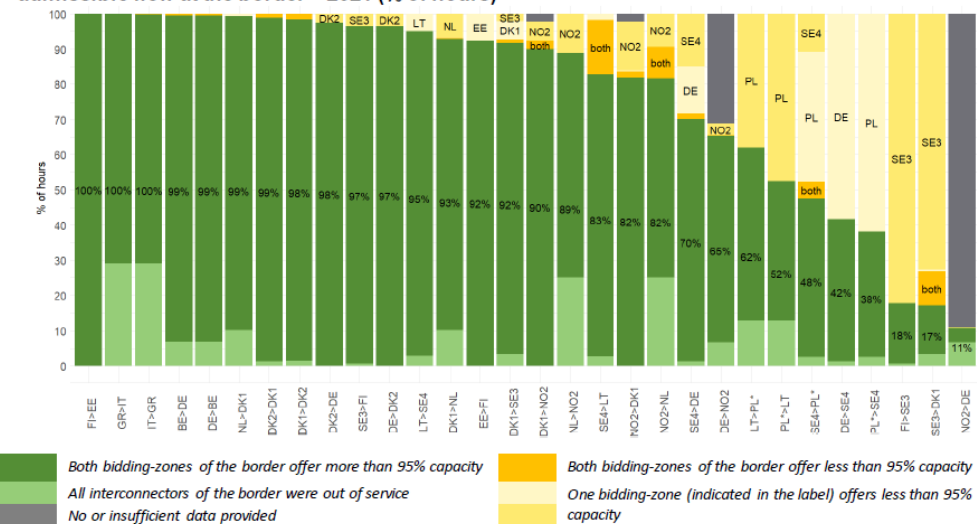
- Support cross border system operation

INTERREGIONAL PLANNING – TEN YEAR NETWORK DEVELOPMENT PLAN



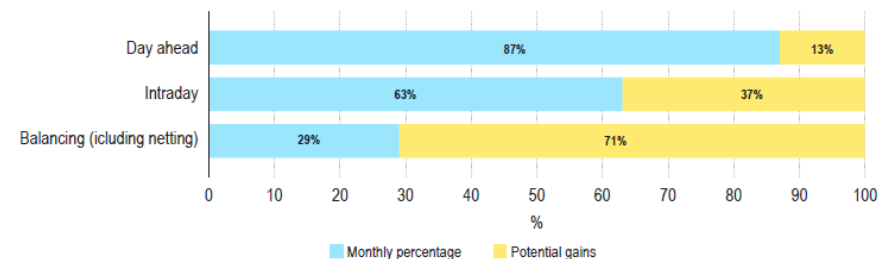
INCREASING THE COMMON BENEFITS – EUROPEAN MARKET COUPLING

Figure 3: Percentage of the time when the margin made available is below 95% of the maximum admissible flow at the border – 2021 (% of hours)



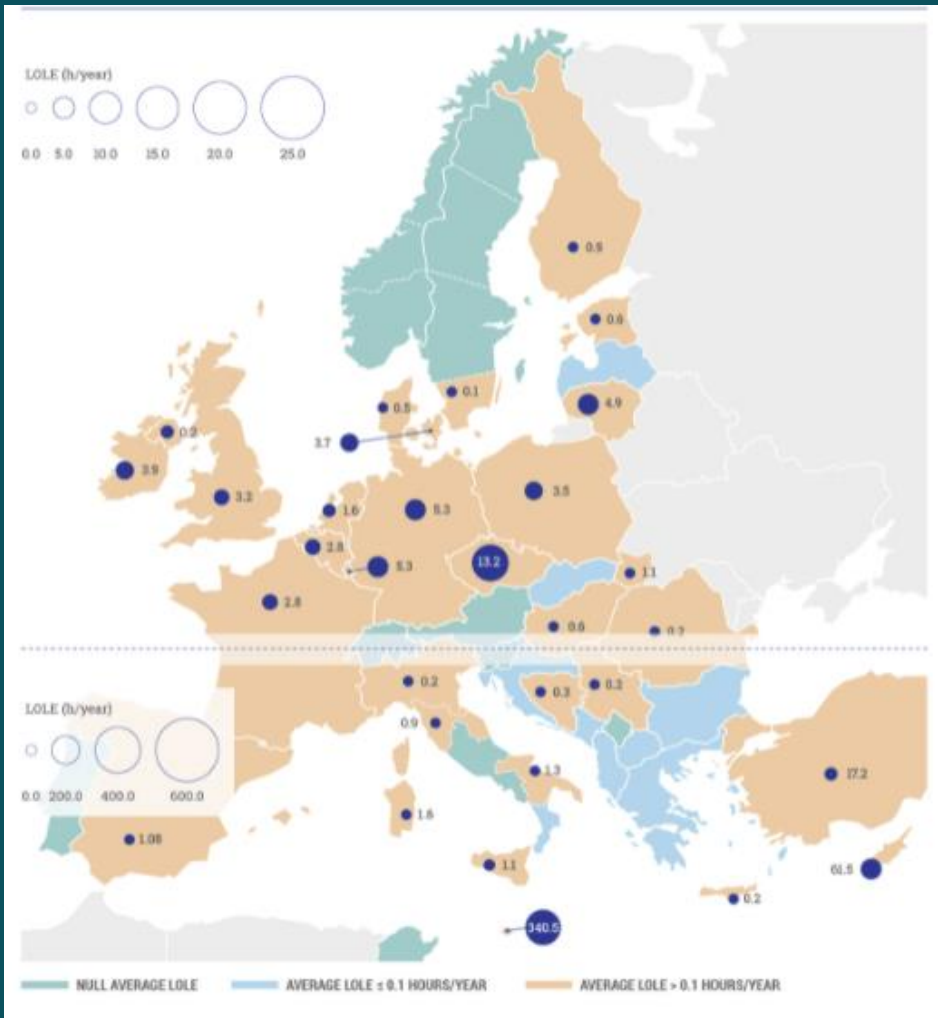
Source: ACER calculation based on TSO data.

Figure ii: Level of efficiency in the use of interconnectors in Europe in the different timeframes – 2020 (% use of available commercial capacity in the 'right economic direction')



Source: calculations based on national regulatory authorities, ENTSO-E and Vulcanus data.

SECURITY OF SUPPLY – EUROPEAN RESSOURCE ADEQUACY ASSESMENT



FUTURE COORDINATION OF GAS, ELECTRICITY AND HYDROGEN INFRASTRUCTURE

European hydrogen backbone

