



Nord Pool

Increased Security of Supply through
market coupling

Profile Hans-Arild Bredesen

Hans-Arild has 25+ years of experience from international projects in the energy sector based on his work with the Nord Pool model

Consultant

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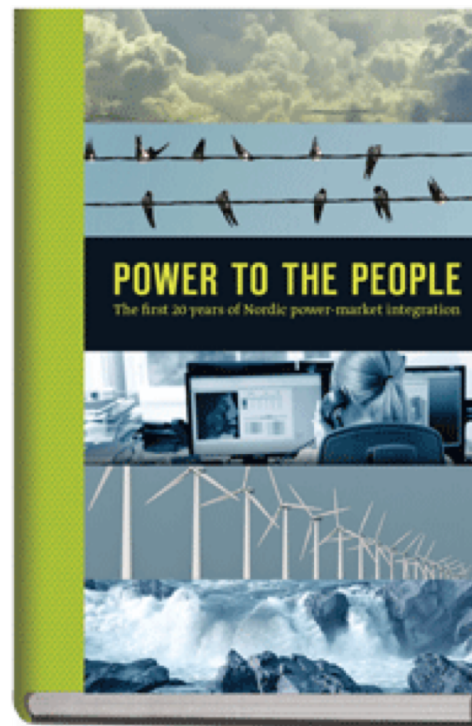


Education and Experience

- BSc in Computer Science from Høgskolen i Østfold, Norway
- Involved in the electricity deregulation process since 1992.
- Technical project manager for the market systems at Nord Pool (incl DAM and BM)
- Product manager for wholesale energy market participant systems for the Nordic market.
- Wide international experience from key roles in the development of strategies for trading, scheduling and settlement systems for PXs and TSOs in California, Ireland, India, Romania, Turkey, Ukraine, Southern Africa and South-east Europe.

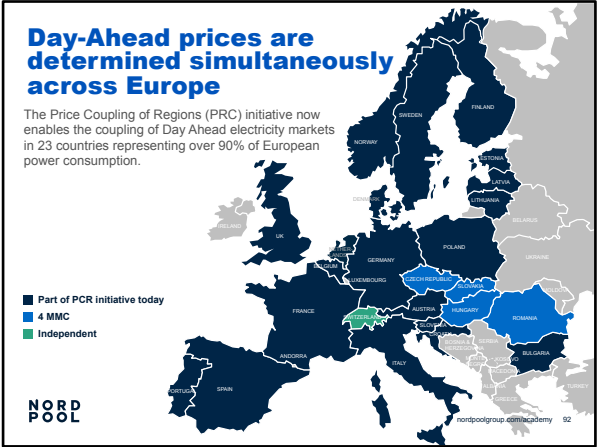
Selected Project References

- Electricity market reforms in > 20 countries/regions
- Author of “Power to the People”



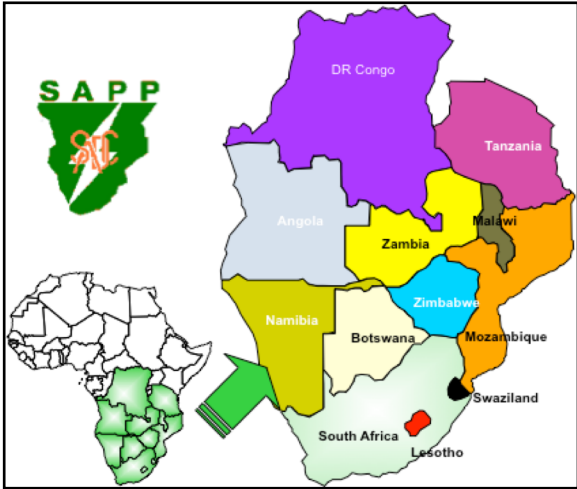
Some examples of Nord Pool's experiences from International Power Markets

European target model



NORD POOL

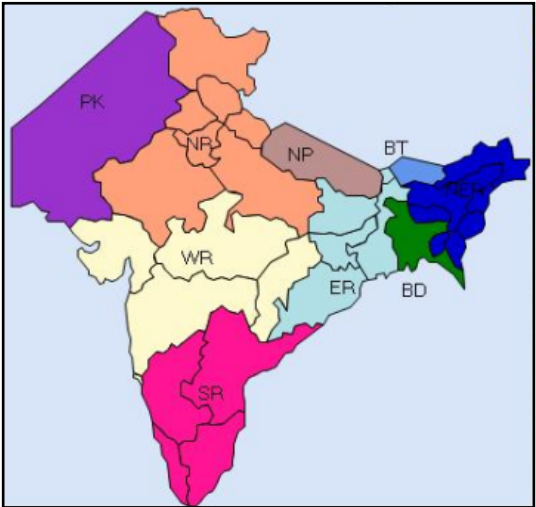
Southern African Power Pool



South-east Europe



India

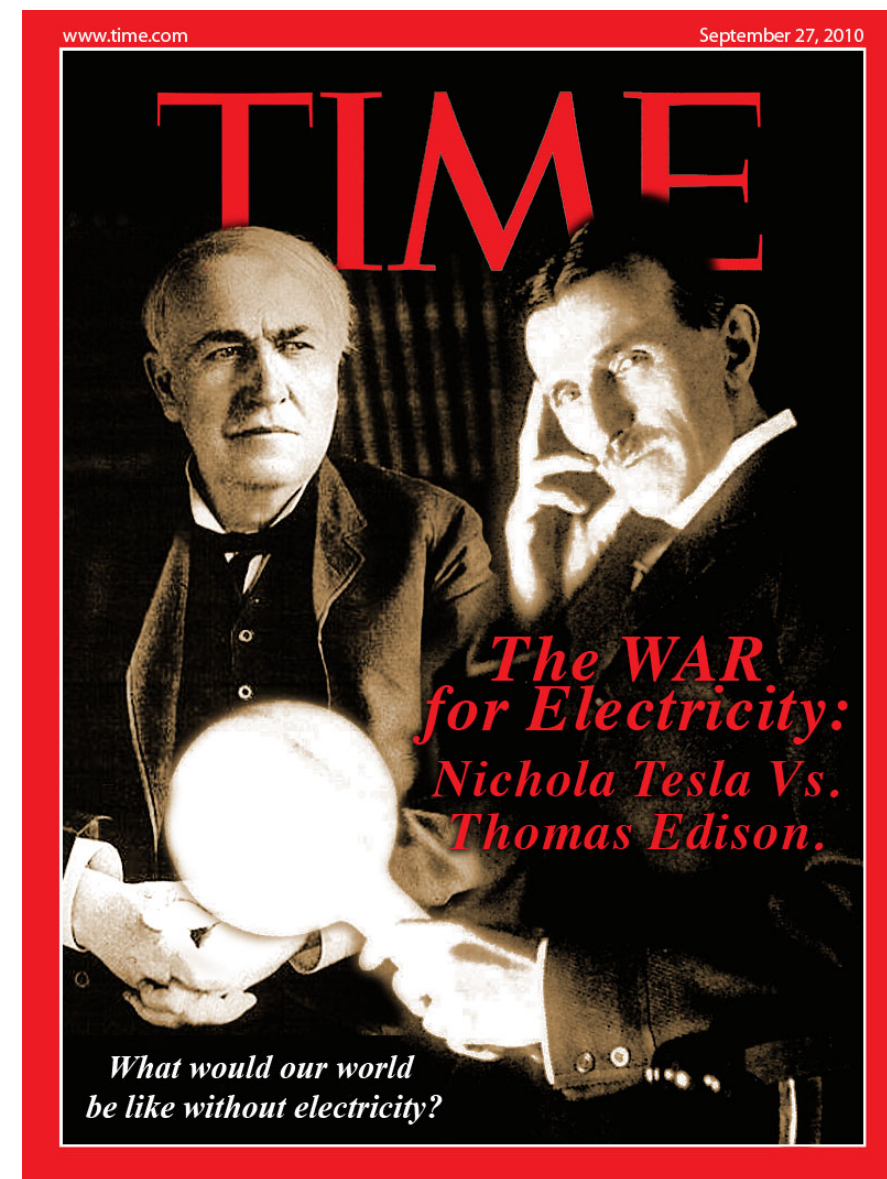
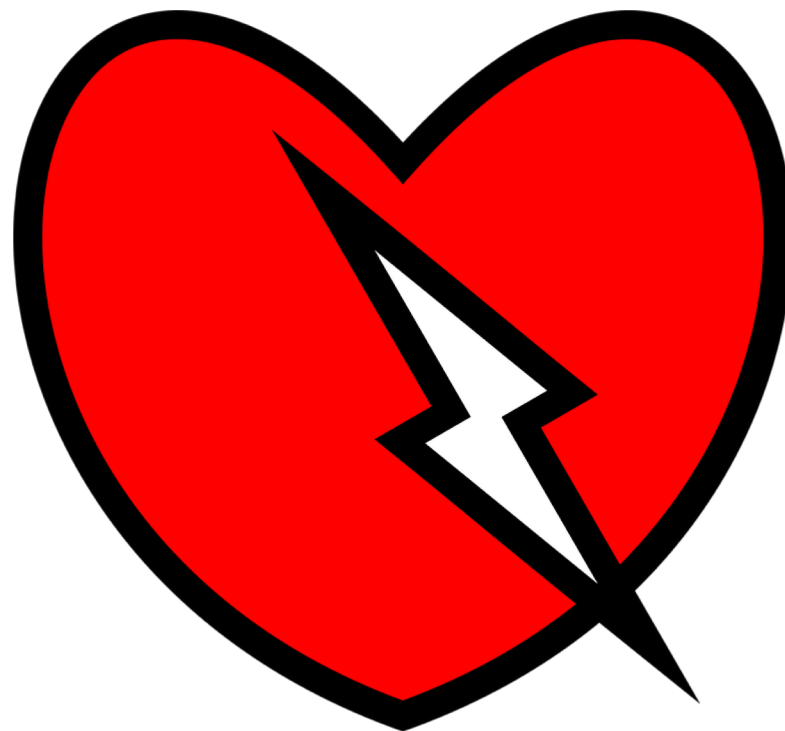
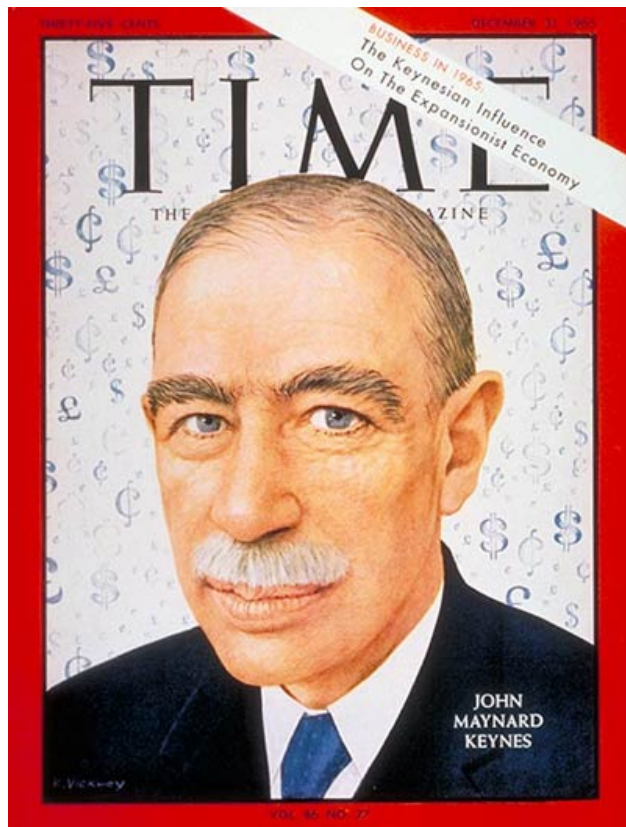


ASEAN



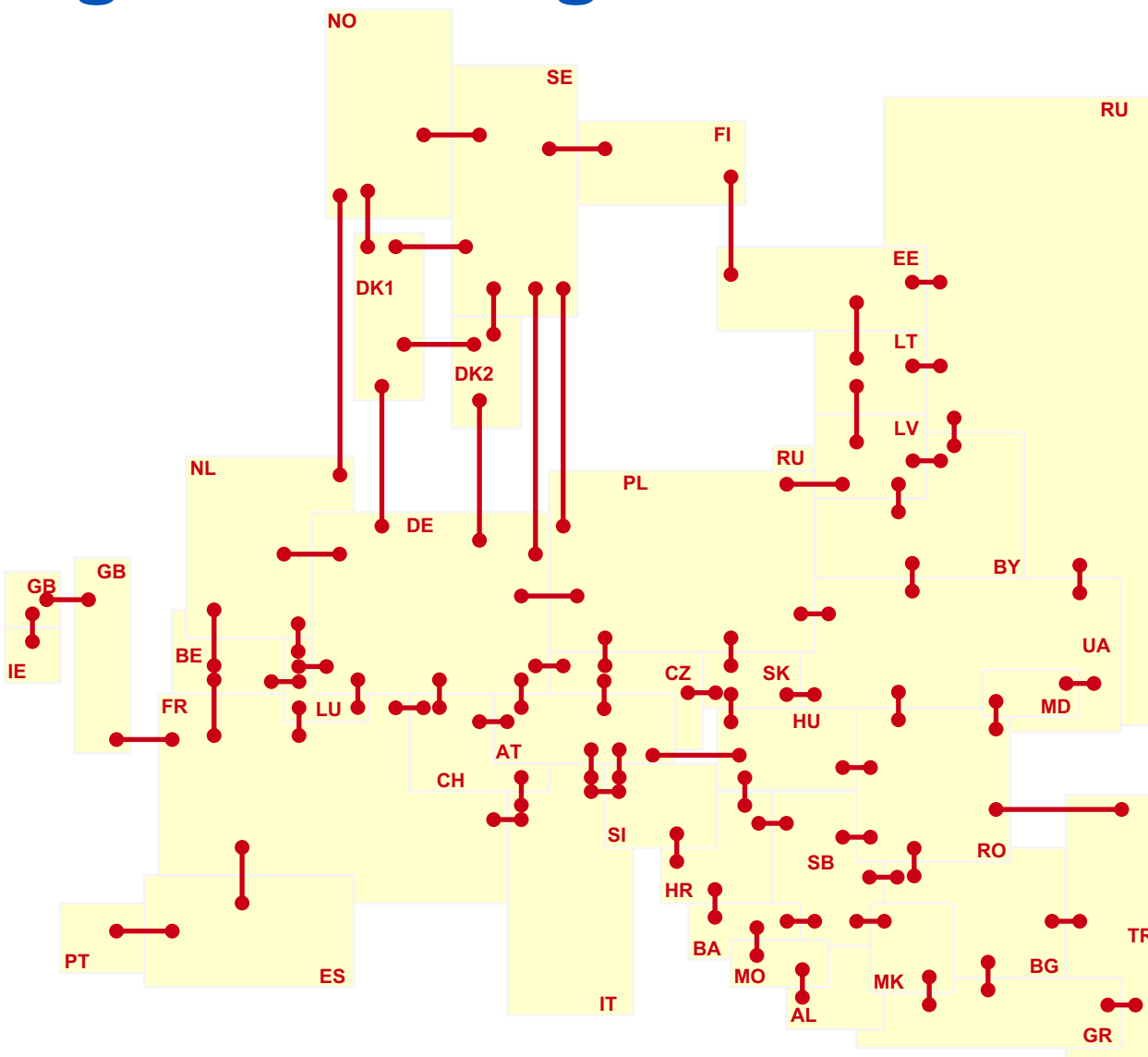
The Integrated European Power Market as a catalyst for SoS

A happy marriage between engineers and economists

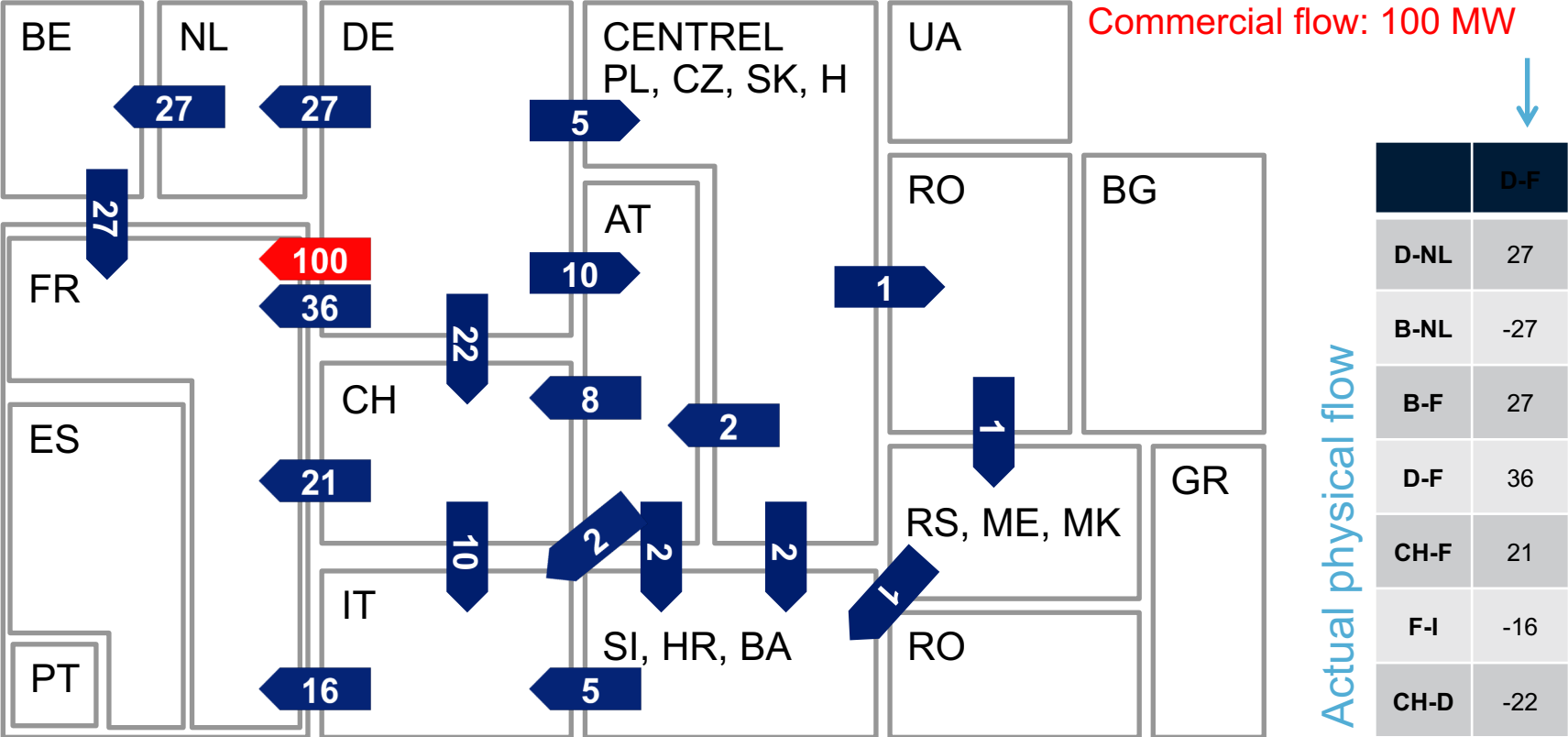


The European Challenge – Pre Target Model

- Europe has many interconnections, where different regimes are used to handle the exchange
 - implicit (Nordic)
 - explicit
 - market coupling
- How can we characterize the handling of interconnections in Europe when we today have to state that explicit handling of interconnections “produce” wrong flows in up to 25% of the operational hours (2008)?



An Example



Based on a study from UCTE (ENTSO-E)

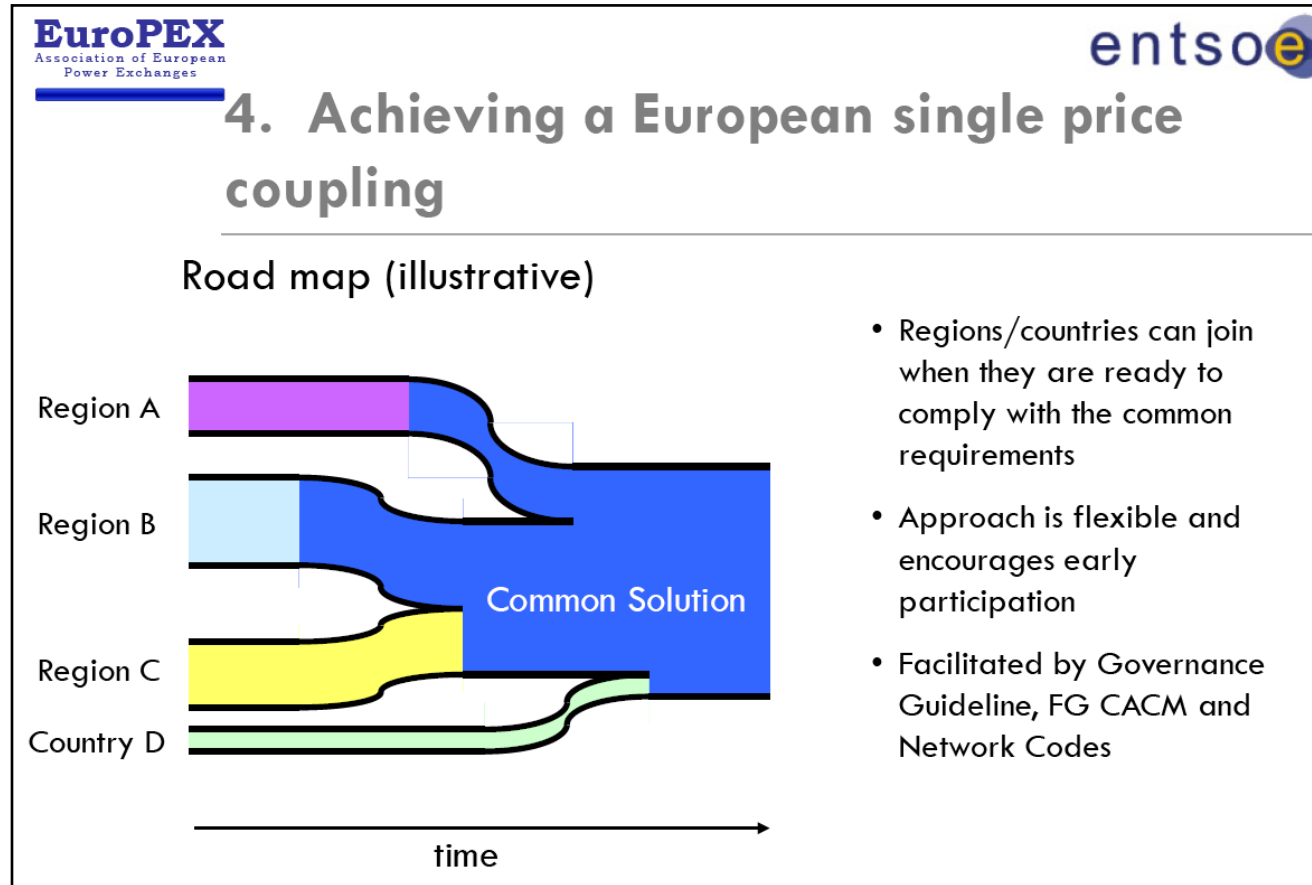
A common European power market

- ▶ The European Commission has a stated goal of **harmonising European power markets**. The aim is to create a pan-European market with closer connecting of power markets to improve the **efficient use** of energy across national borders, the European Target Model for electricity market integration.
- ▶ The concept of market coupling and cross border trading was originally developed by Nord Pool and we are a driver in the European market coupling initiatives
- ▶ Requires close **co-operation** between TSOs, Power Exchanges and National Regulators across Europe
ENTSO-E (European Network of Transmission System Operators – Electricity)
ACER (Agency for the Co-operation of Energy Regulators)

Why?

- ▶ Efficient use of transmission capacity by trading energy across borders
- ▶ A coordinated market development
- ▶ Level out electricity prices

Choice of market model for the Regional Market Design



Common European market

- The concept of market coupling was originally developed by Nord Pool and has been successfully implemented in the Nordic market over the last 20 years
- Efficient use of transmission capacity by trading energy across borders
- ▶ Close cooperation between TSOs, Power Exchanges and National Regulators across Europe



European target model

The European target model shall ensure the completion of the **EU Internal Energy Market for electricity**. Guidance and standards for each timeframe: Day Ahead (DA), Intra-Day (ID), Balancing and Forward Market.

A fair and transparent day-ahead power price is an key factor for the models success.

Price Coupling of Regions (PCR)

- The initiative of 7 Power Exchanges to develop a single price coupling solution, launched Feb 2014
- EUPHEMIA algorithm

Multi-Regional Coupling (MRC)

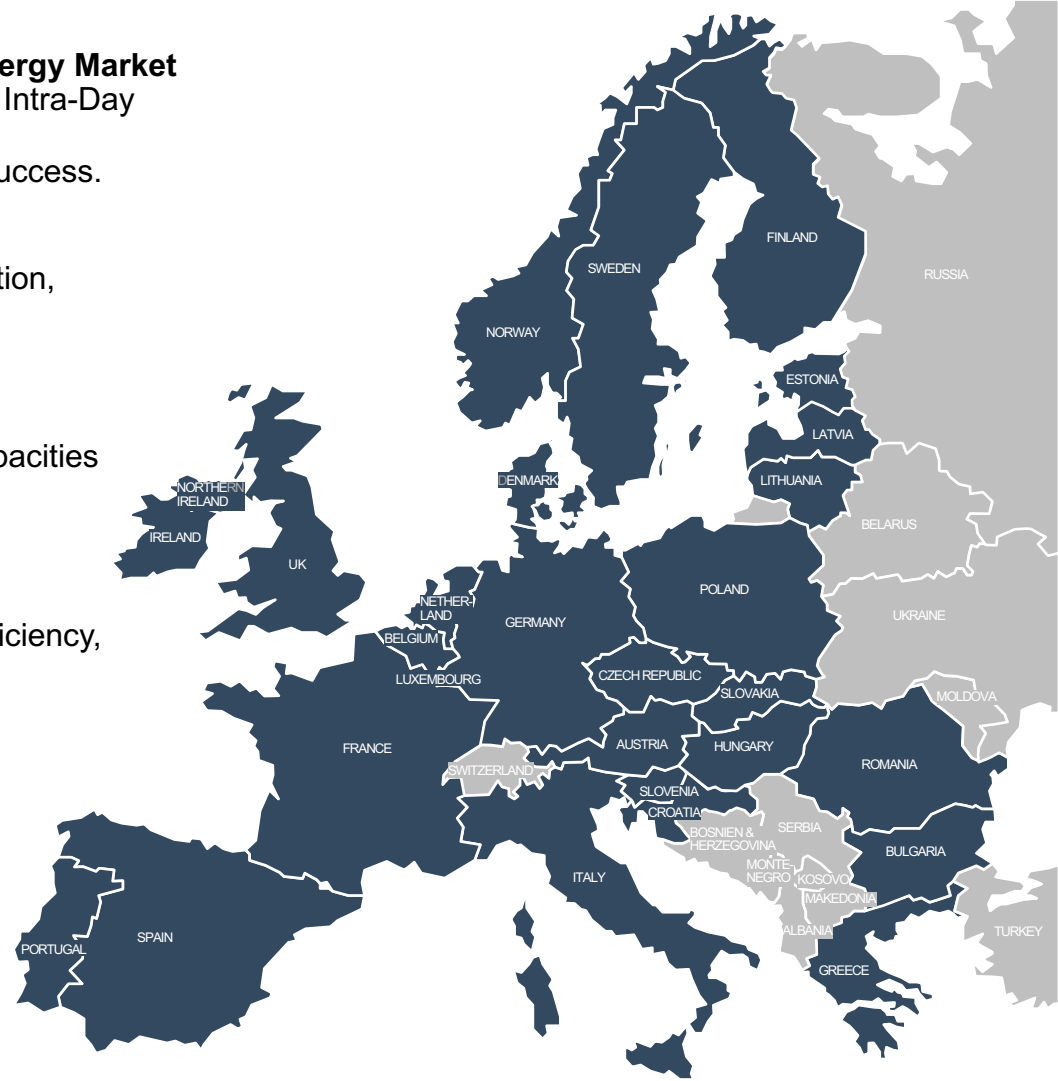
- Coupling of regions and efficient management of available transmission capacities between areas and countries
- Implicit capacity allocation

Cross Border Intraday Trading (XBID)

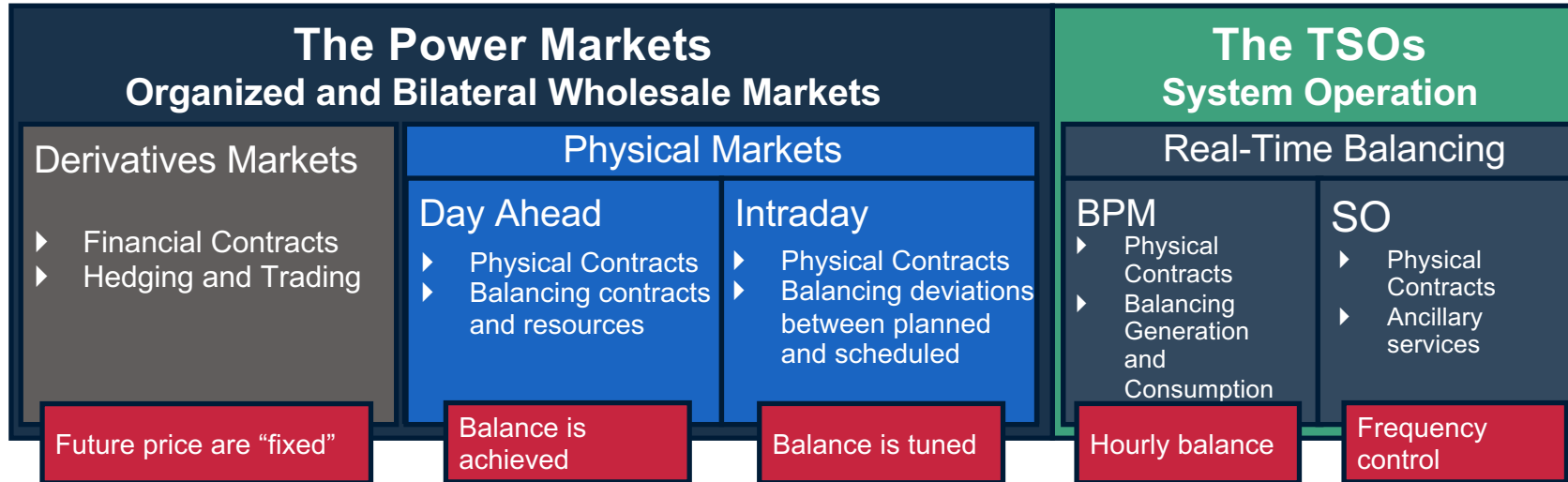
The integrated European electricity market is expected to increase liquidity, efficiency, social welfare and transparency of prices and flows.

Several new projects on Balancing and AS products:

- Not as far advanced



The Integrated Markets



Stakeholders – TSOs are important owners

- ▶ Owned by Nordic and Baltic transmission system operators
- ▶ Regulated in Norway by Norwegian Water Resources and Energy Directorate (NVE)
- ▶ Nominated NEMO in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Great Britain, Ireland, Poland, Latvia, Lithuania, Luxembourg, the Netherlands and Sweden

**NORD
POOL**

Statnett SF – Norway – 28.2%

Elering AS – Estonia – 2%

Svenska kraftnät – Sweden –
28.2%

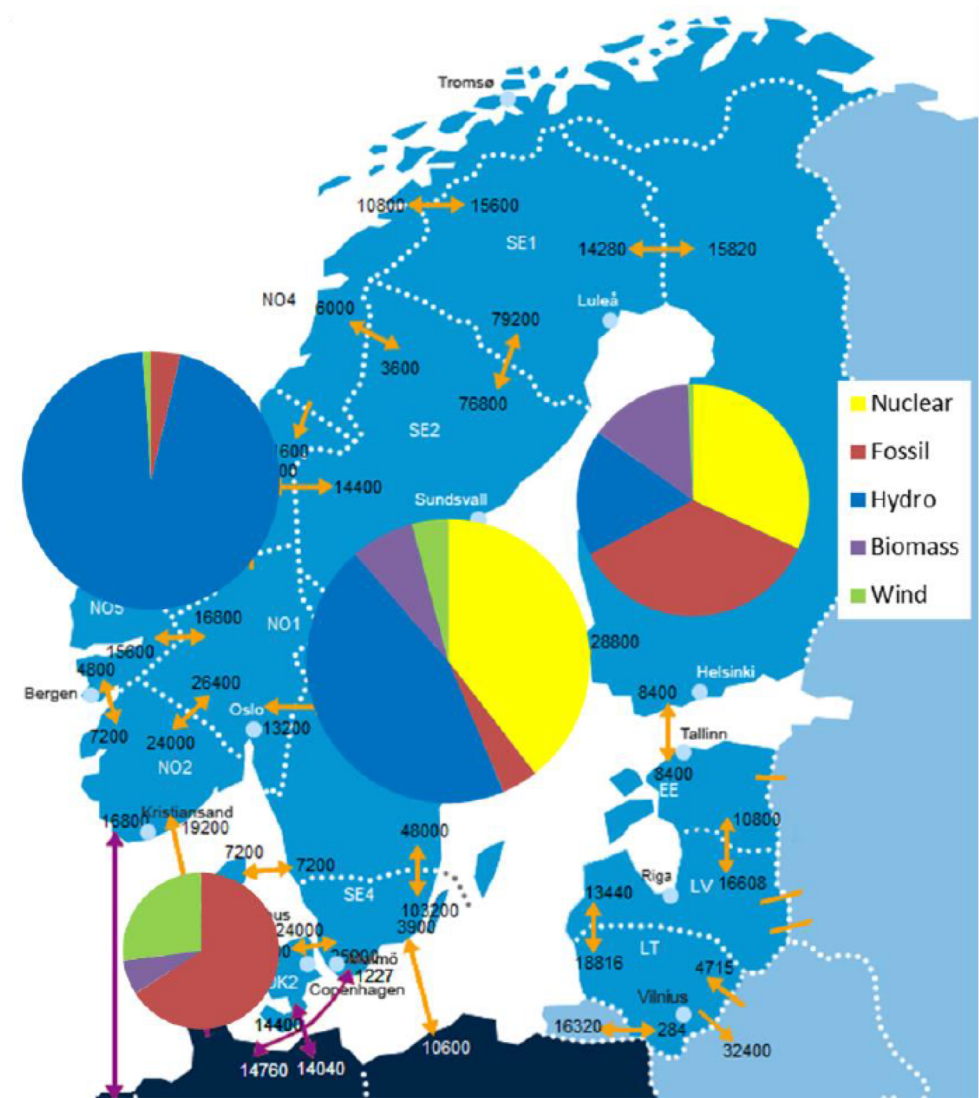
Litgrid AB – Lithuania – 2%

Energinet.dk – Denmark – 18.8%

Augstsprieguma tīkls AS – Latvia –
2%

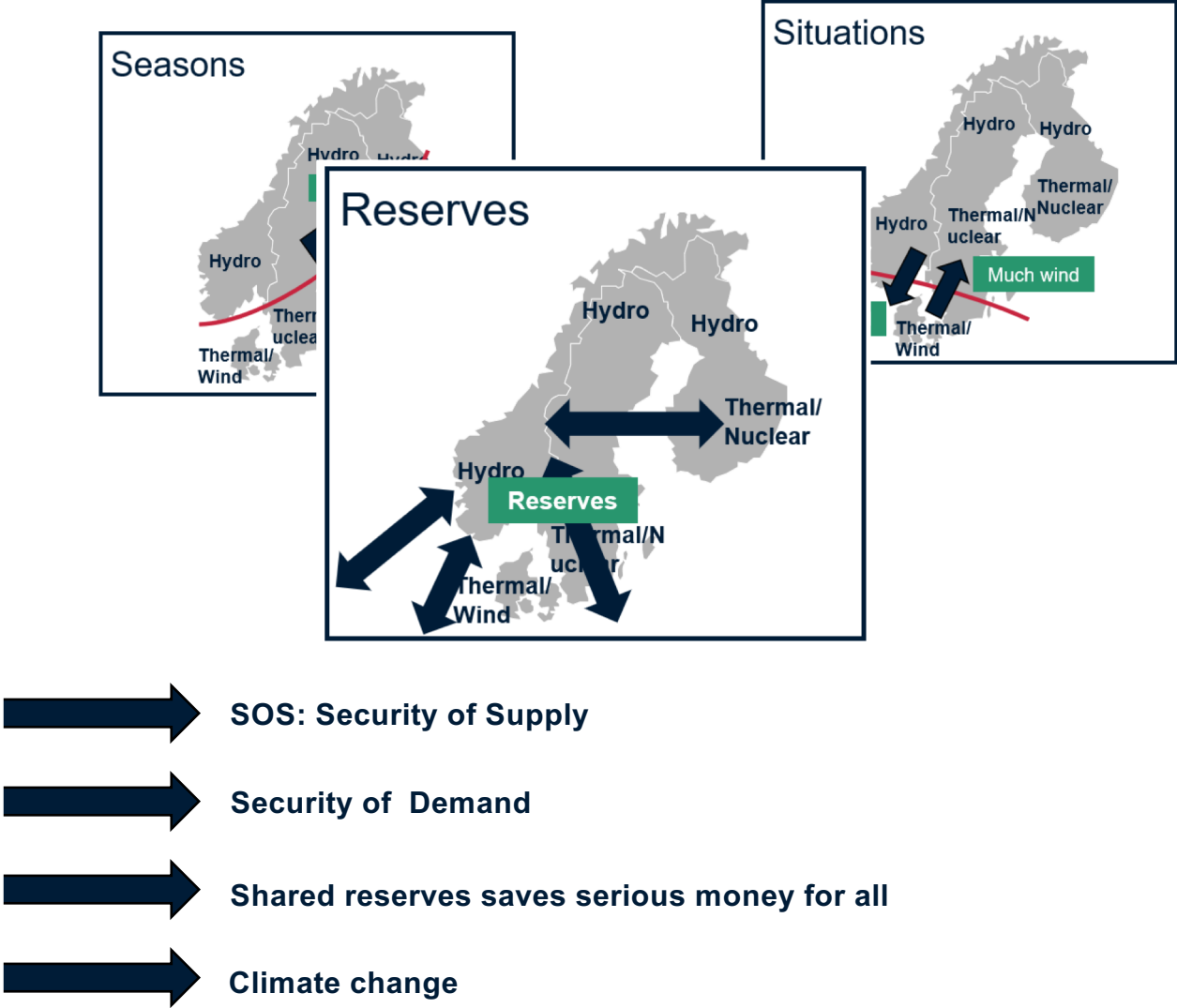
Fingrid Oyj – Finland – 18.8%

Why do we cooperate?



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Nordic energy mix 2013. YTD much more wind, solar and interconnectors. Less thermal production.



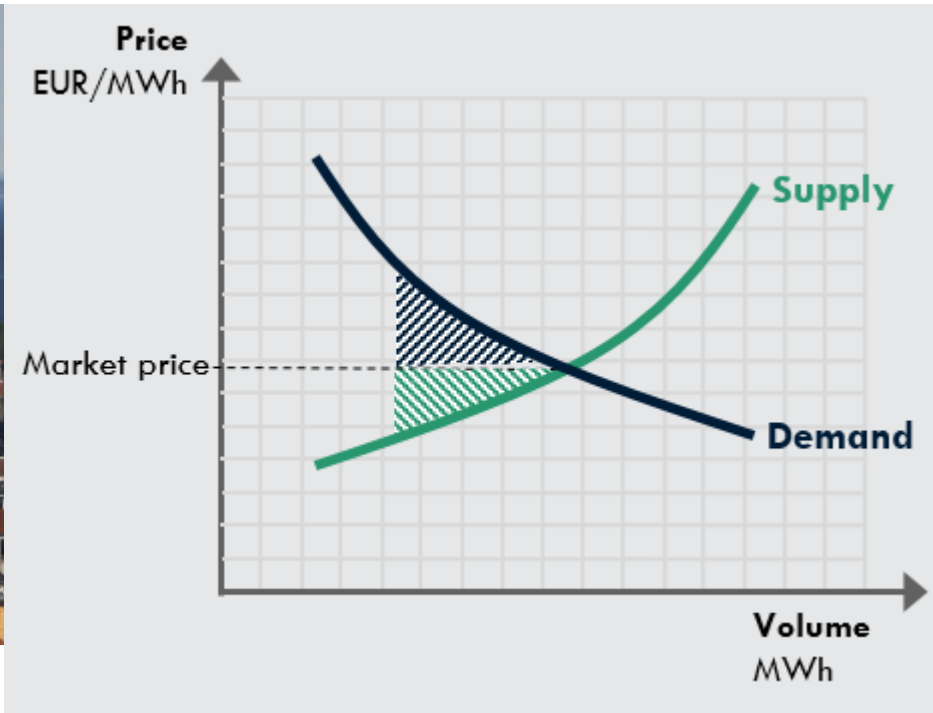
Market Principles of the Power Market

The Day-Ahead Market is balancing production and consumption every hour of the year: Ensuring that the cheapest energy is produced/sold and consumed/bought first.

Transmission capacity between areas are very important and SOS for all.

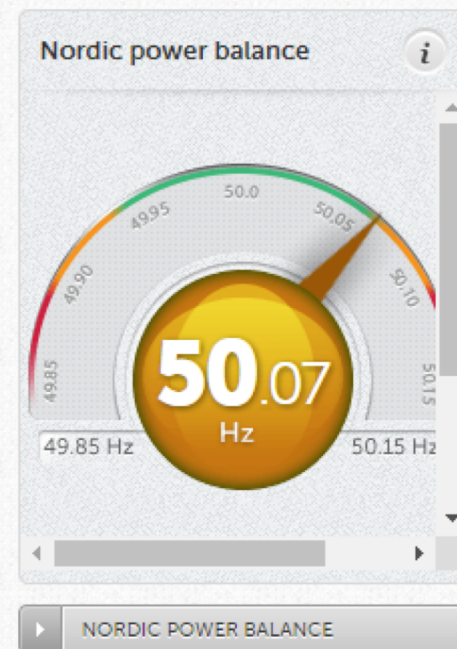
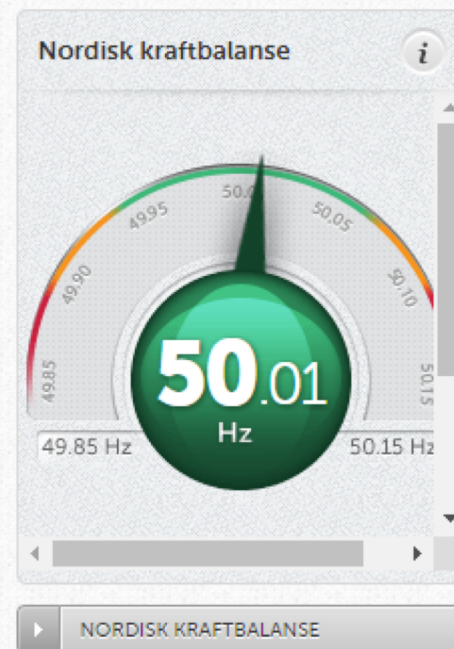
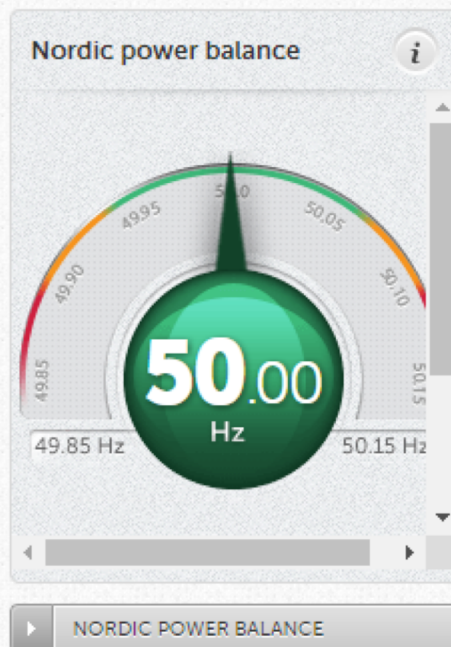


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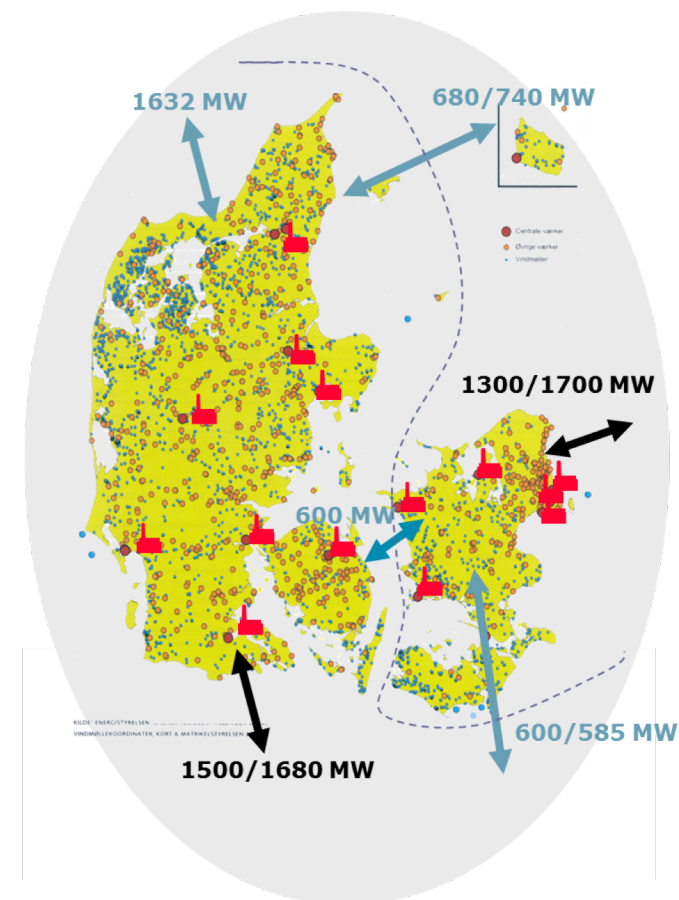
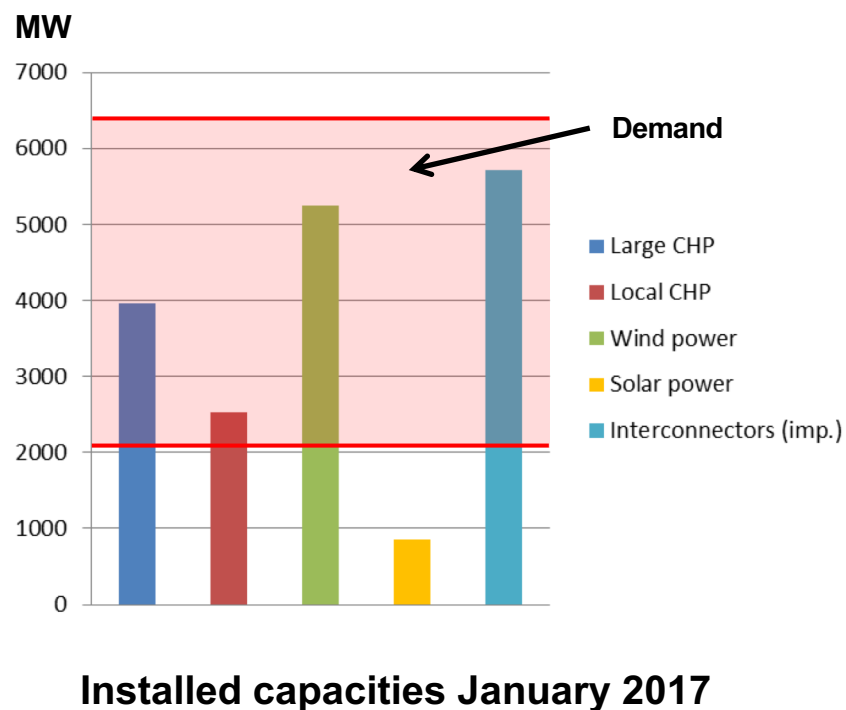


The power system **right now**

Statnett is responsible for maintaining the balance in the Norwegian power system, and has the overall supervision responsibility and physical control as regards Norway's power system. You can monitor the power system in real time here.



The Danish electricity system – capacity balance



ber 2017

8

Proof of concept

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MARKET DATA

TRADING

SERVICES

MEDIA

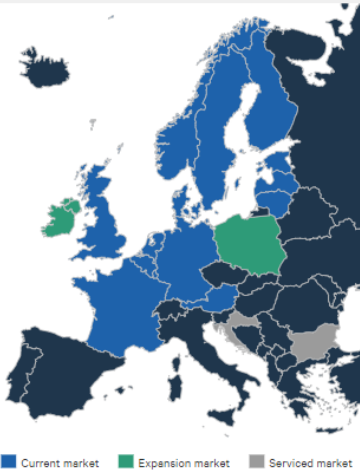


MARKET
UPDATES

See what Nord Pool can offer you

Trade power in 13 markets as well as adding specific related services such as compliance, data or courses.

Use the map to find what we offer in our markets or click on the country you are interested in.



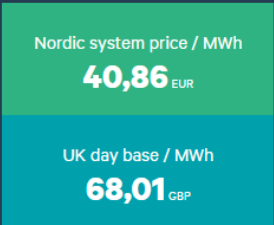
Simple, efficient & secure

Nord Pool runs the leading power market in Europe, and we offer day-ahead and intraday markets to our customers. The day-ahead market is the main arena for trading power, and the intraday market supplements the day-ahead market and helps secure balance between supply and demand.

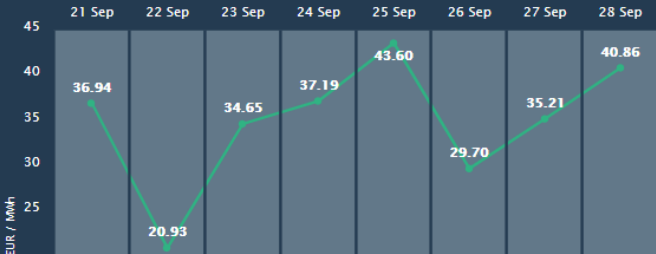
Delivering products and services that are simple, efficient and secure is at the centre of what we do.

- INTRADAY
- DAYAHEAD
- SEE SERVICES

Price Development



Delivery date 28 September 2018



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WORLD
ENERGY
COUNCIL

Energy Index

Country profile

Regional profile

Pathway calculator

Maps

Energy Trilemma Index

Full Report

The World Energy Council's Energy Trilemma Index tool, produced in partnership with Oliver Wyman, ranks countries on their ability to provide sustainable energy through 3 dimensions: Energy security, Energy equity (accessibility and affordability), Environmental sustainability. The ranking measures overall performance in achieving a sustainable mix of policies and the balance score highlights how well a country manages the trade-offs of the Trilemma with "A" being the best. Use this interactive Index to assess the sustainability of national energy policies.

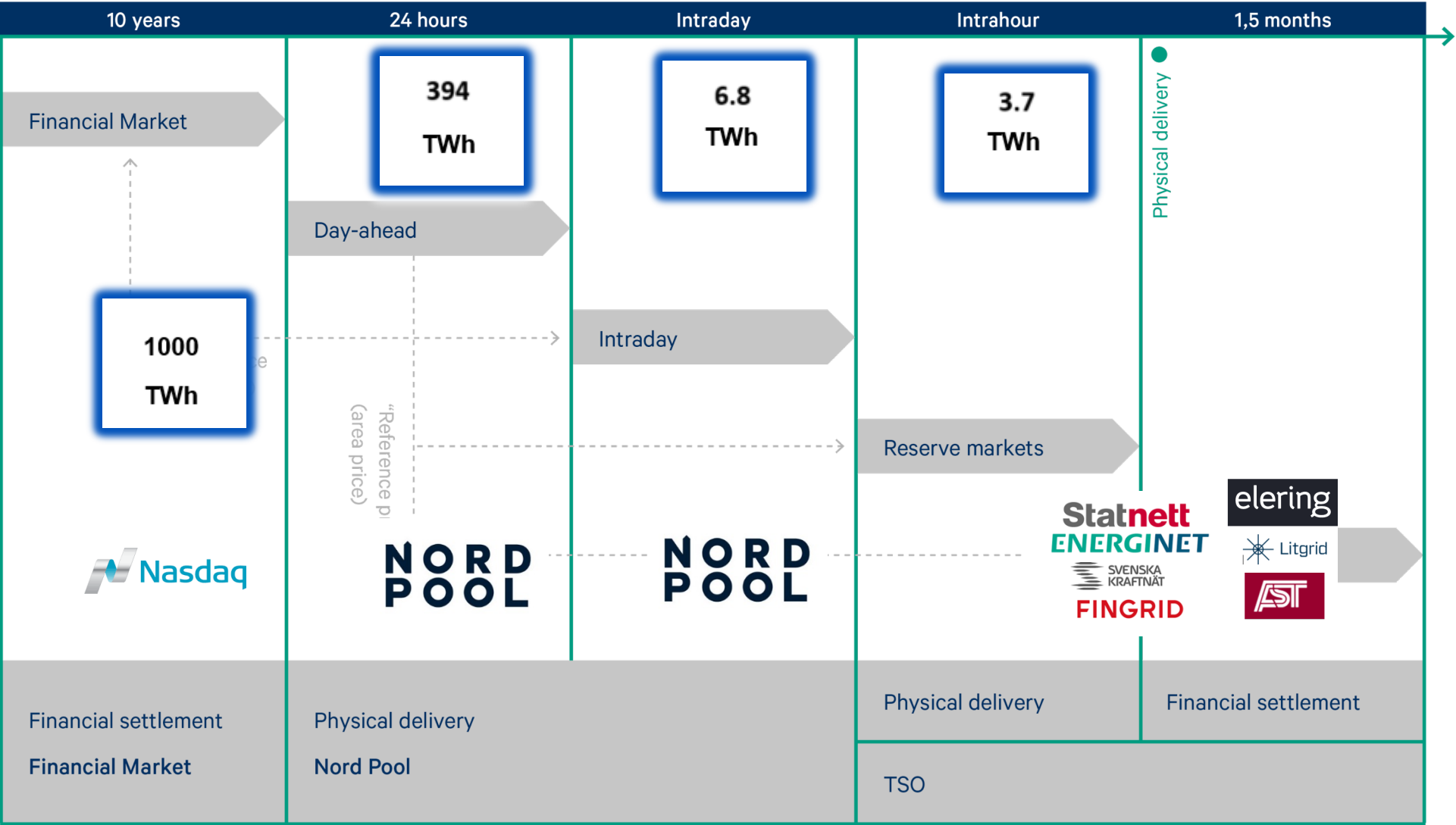
Explore the Pathway Calculator to determine what it takes to improve your ranking and understand the impact of policymaking in achieving a sustainable energy future.

Country rankings

2017

| Index rank | Country | Balance score | Energy security | Energy equity | Enviromental sustainability |
|------------|----------------|---------------|-----------------|---------------|-----------------------------|
| 1 | Denmark | AAA | 1 | 12 | 4 |
| 2 | Sweden | AAA | 9 | 21 | 5 |
| 3 | Switzerland | AAA | 16 | 4 | 3 |
| 4 | Netherlands | AAB | 10 | 3 | 38 |
| 5 | United Kingdom | AAA | 26 | 15 | 9 |
| 6 | Germany | AAB | 12 | 17 | 32 |
| 7 | Norway | BAA | 32 | 23 | 8 |
| 8 | France | AAA | 25 | 13 | 6 |
| 9 | New Zealand | AAB | 15 | 19 | 42 |
| 10 | Slovenia | AAB | 2 | 31 | 43 |
| 11 | Finland | AAB | 3 | 27 | 67 |

The proof of success is in the TWh/year 2017



European market coupling is a success

DAY-AHEAD

Statnett

EUROPEISK MARKEDSKOBLING ER EN SUKSESS

1

Algorithm

85%


Of European
consumption
covered

1500

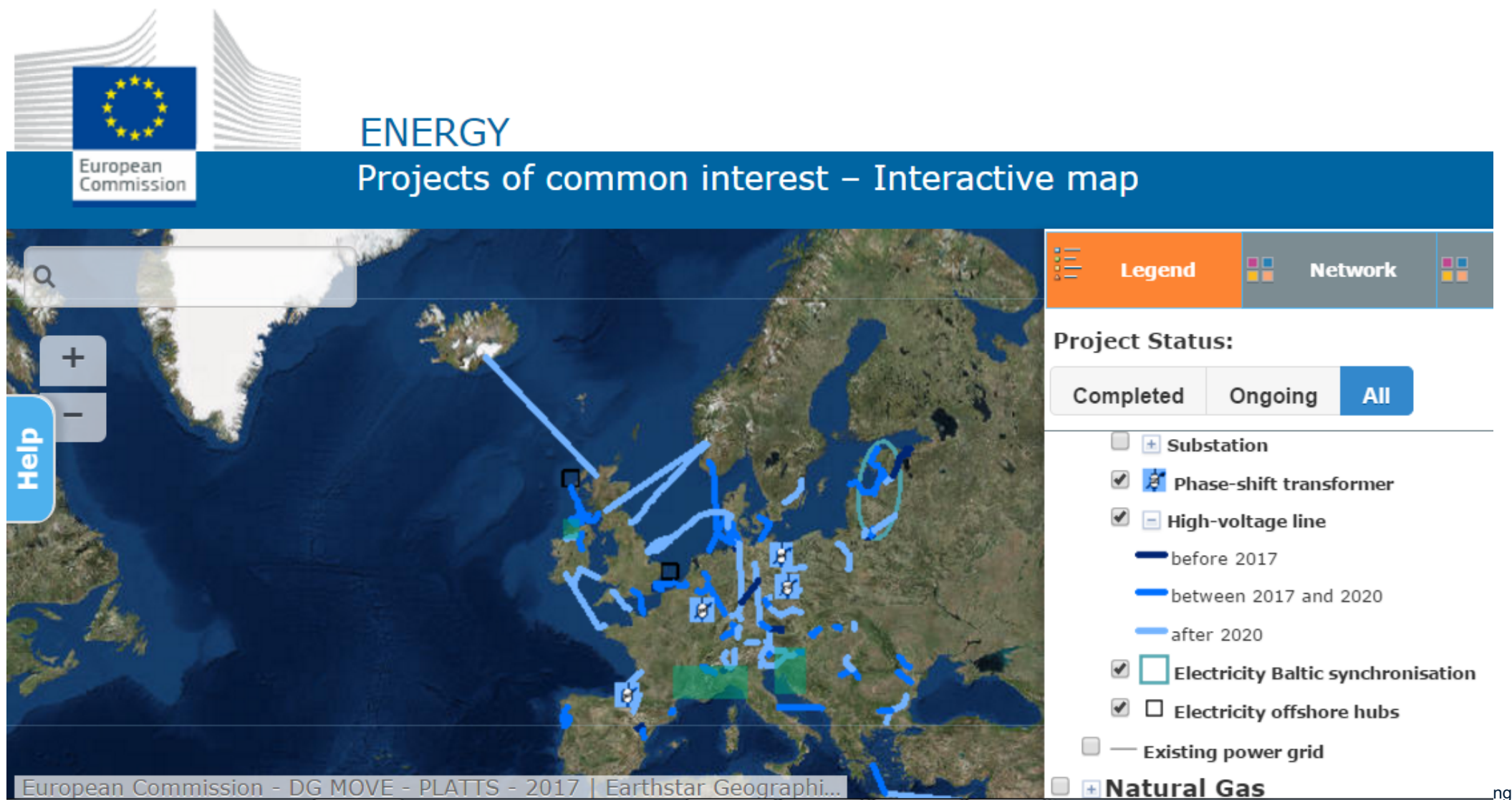
1500 TWh i one
market solution

1B€

In annual earnings
for Europe

- 
- ✓ Less CO2 emissions
 - ✓ Better competition
 - ✓ Saved costs
 - ✓ Higher security of supply

Europe's future electrical energy supply infrastructure: Increase SOS



What's in it for our customers

There are three key benefits of market coupling single market:

An **integrated European market** will help to secure our supply of power

It will create a system that is more **transparent and efficient** than ever

It will help businesses to **better manage** regulatory issues

And of course, there is serious money to be saved by cooperation and ensure optimal use of resources and infrastructure



Future for ERRA countries

- ▶ The PCR/MRC opens for cost-efficient national markets participating in a bigger market coupling through «Serviced PX» concept
- ▶ Target from WB6 market coupling:

All of Western Balkan integrated in the Single European Coupling

- ▶ This should also include the «wider» Europe
- ▶ EnC a promoter for EC countries
- ▶ Also similar activities in:
 - GCCIA,
 - Central Asia,
 - South Asia,
 - EAPP
- ▶ NPC is promoting and supporting this!





Thank you for the attention!

Hans-Arild Bredesen

CEO, Nord Pool Consulting

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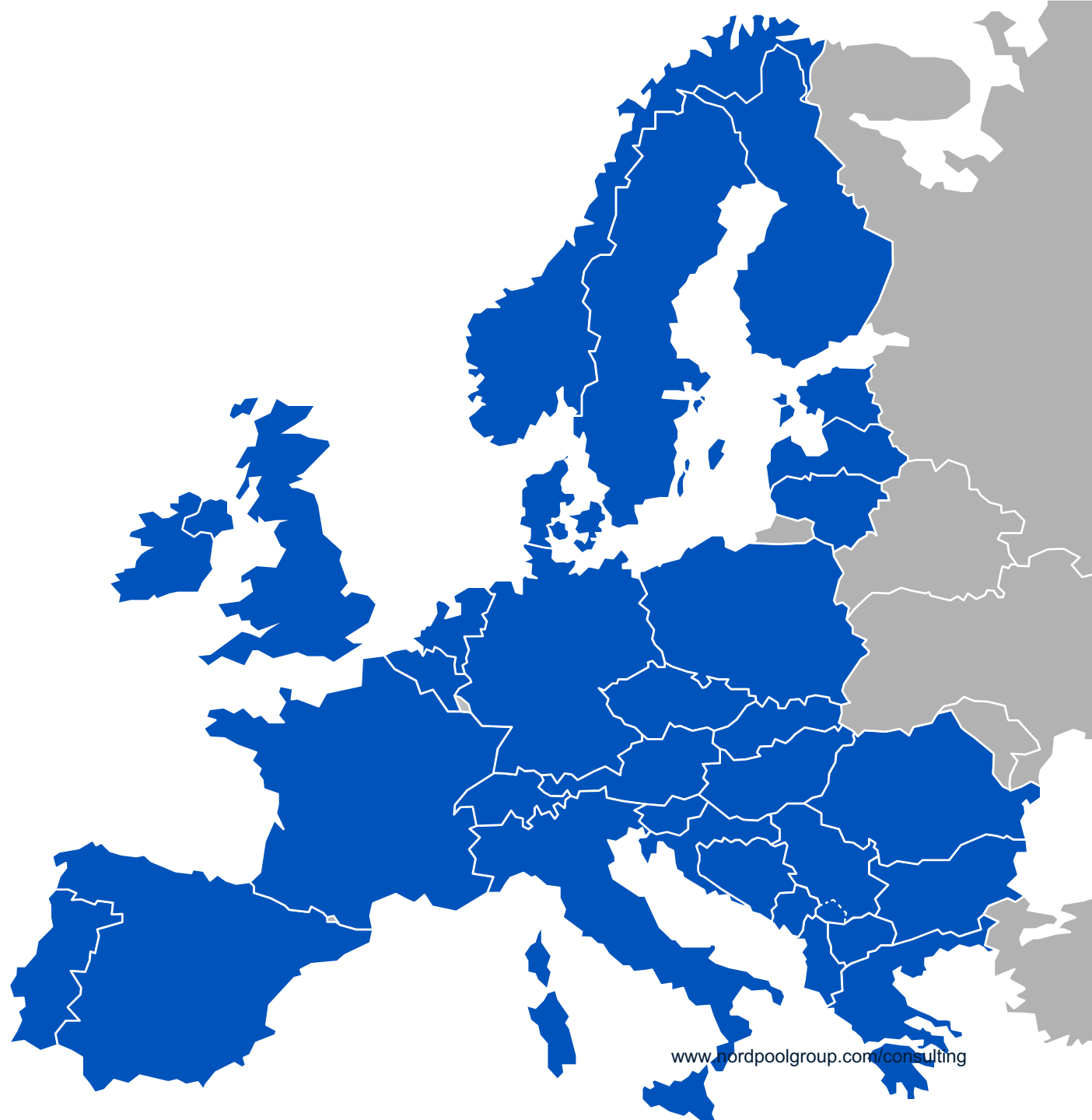
Company and market information

Ambition

We want to be recognised as the **industry frontrunner** across Europe.

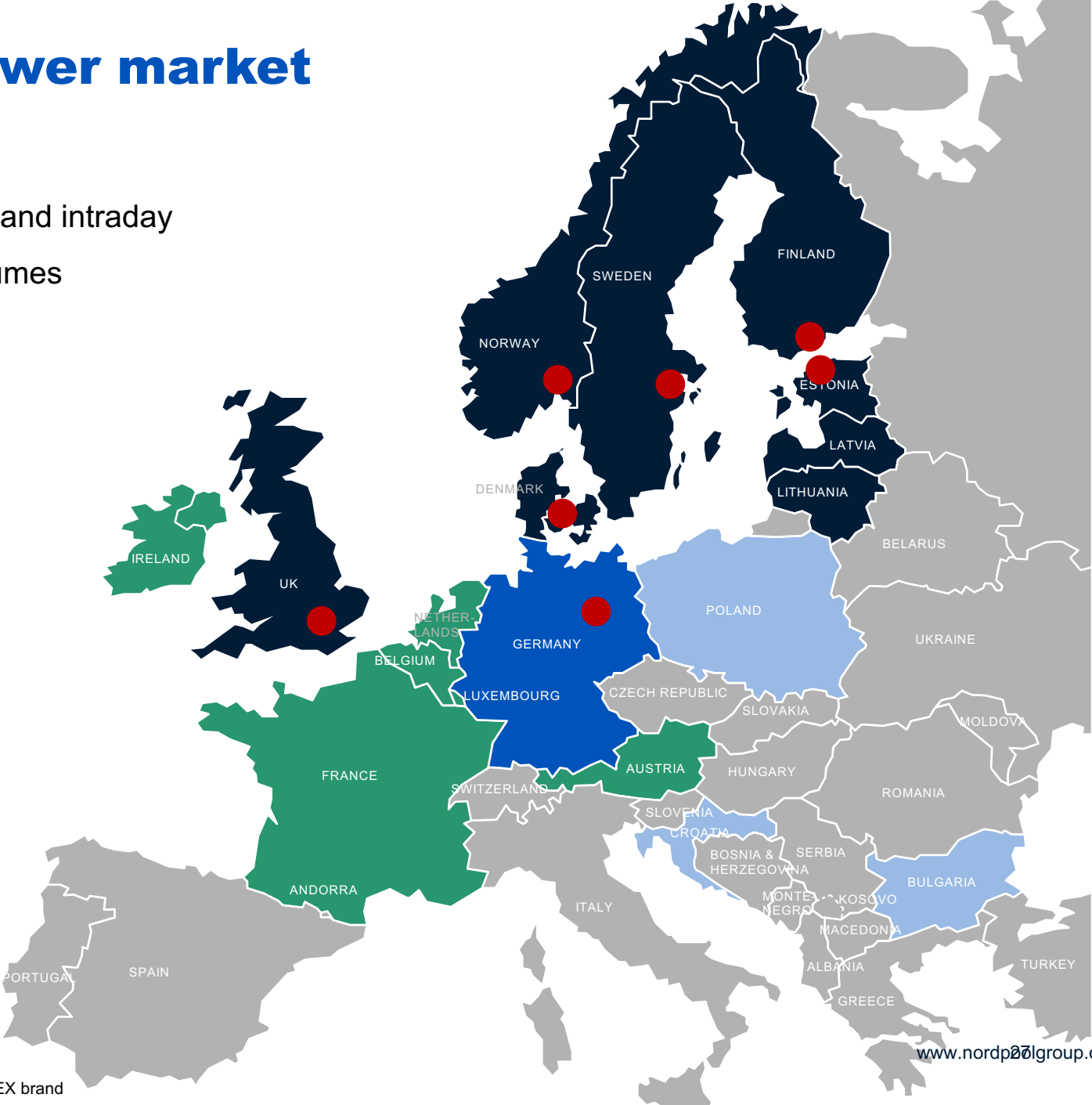
Trading – Clearing – Data - Compliance

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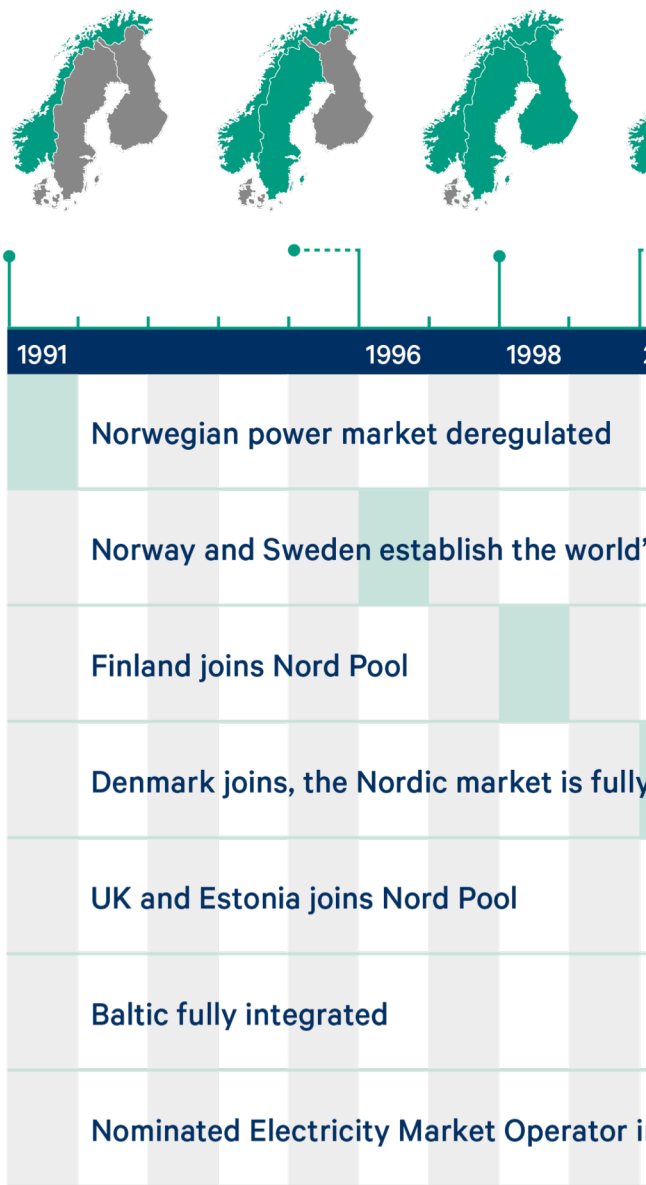
Europe's leading power market

- Nord Pool offices
- Nordic/Baltic and UK – day-ahead and intraday
- Intraday with access to Nordic volumes
- Serviced markets YTD
- ■ ■ ■ NEMO status approved

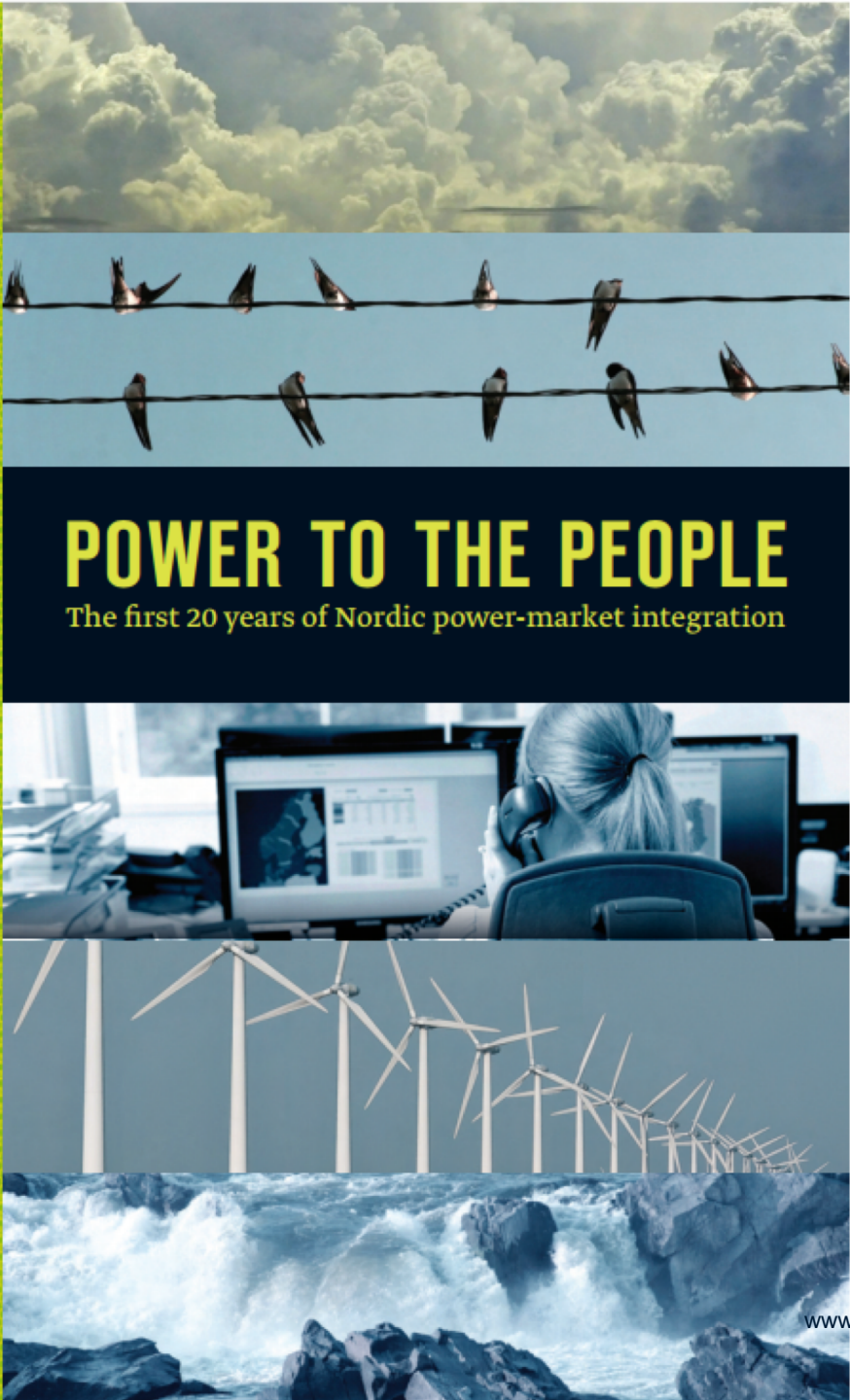


*) In the UK, Nord Pool operates under the N2EX brand

Development since the



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2017

Total traded volume in 2017 at Nord Pool: Security of Supply

512 TWh

European intraday:

7 TWh

UK day-ahead:

111 TWh

Nordic Baltic day-ahead:

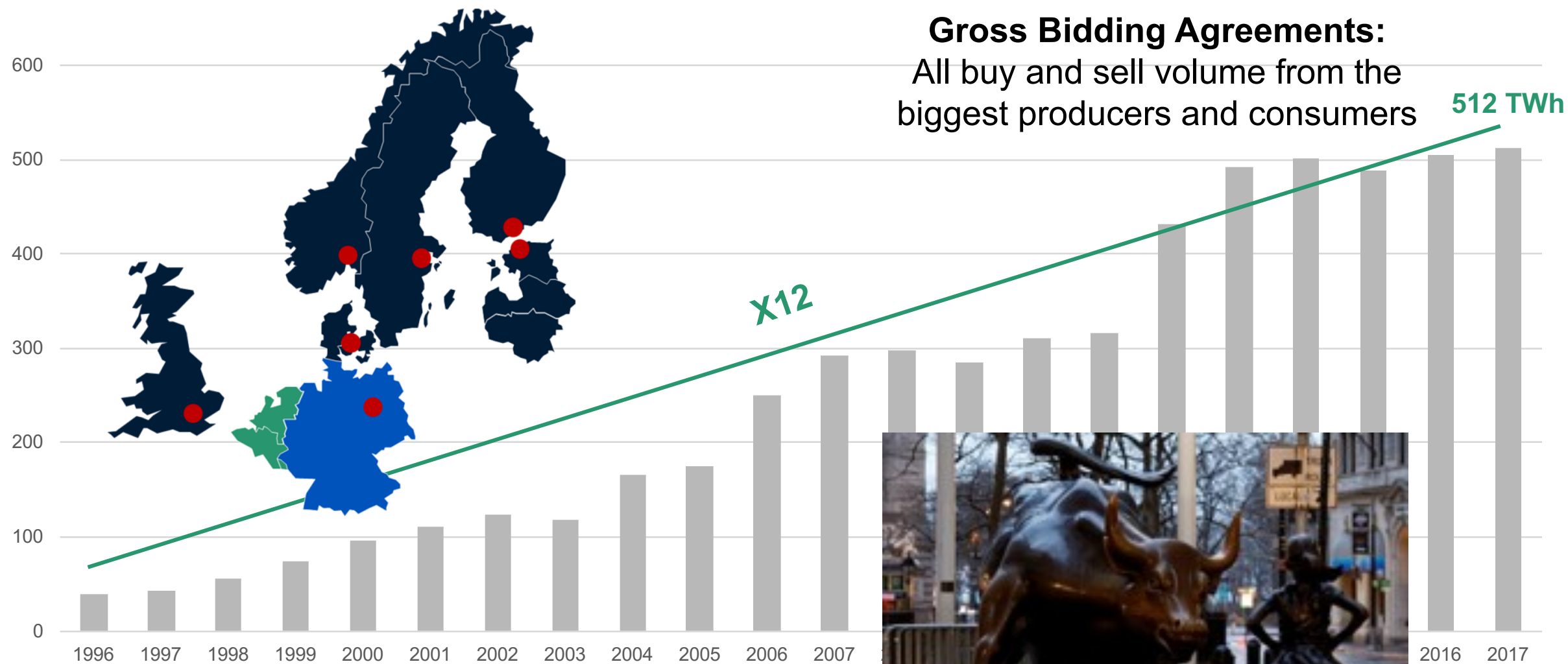
394 TWh 93% market share

Daily value traded and cleared over Nord Pool: Security of Settlement

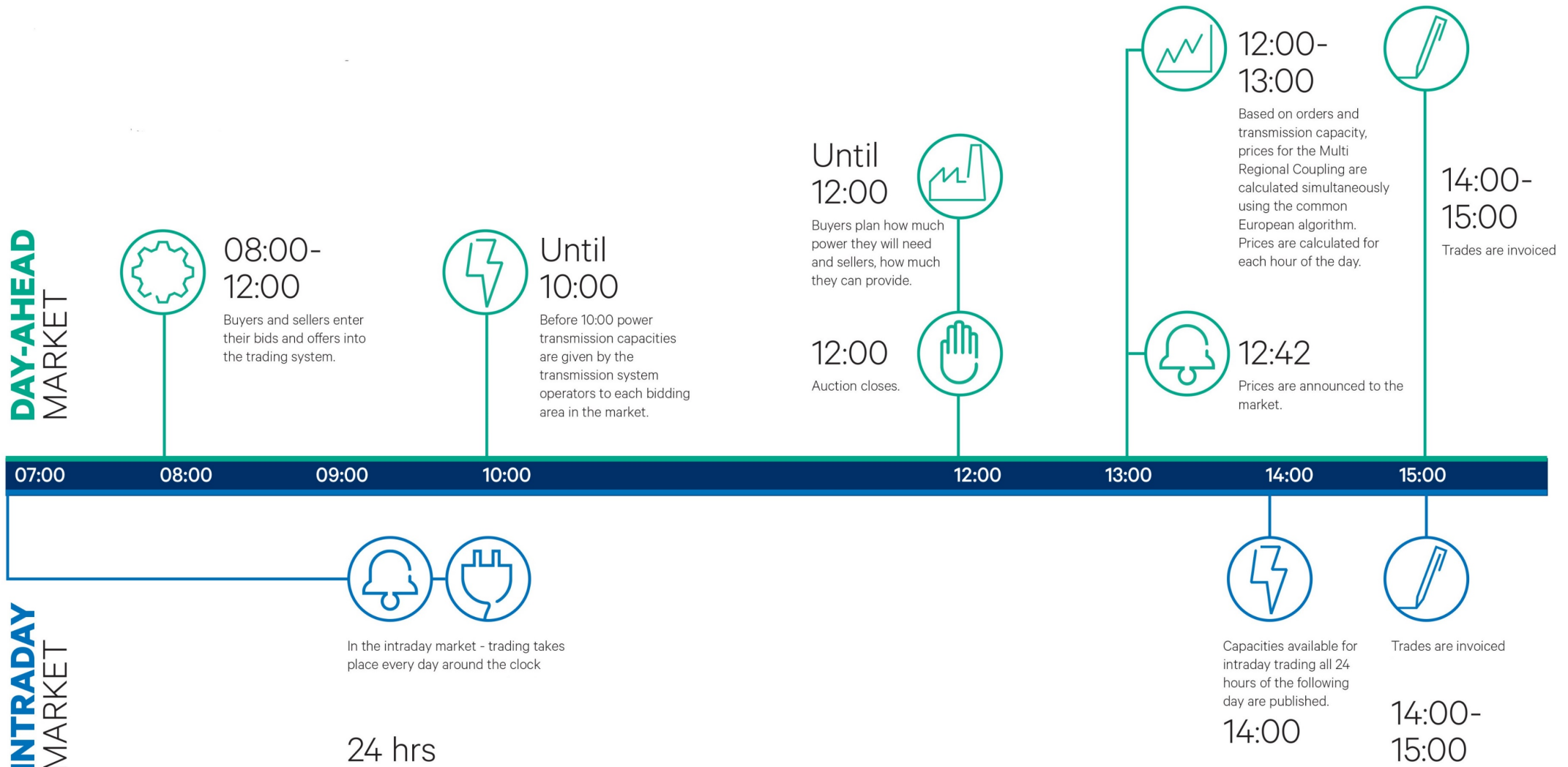
EUR 80.000.000,-

- ❑ Since 1993 Nord Pool has cleared approx.. 20 million trades over the Day-ahead market with 100 % success rate of delivery of electricity and settlement
- ❑ Nord Pool clears approx. EUR 30.000.000.000 per year

We continue to see steady growth



The day-ahead and intraday markets



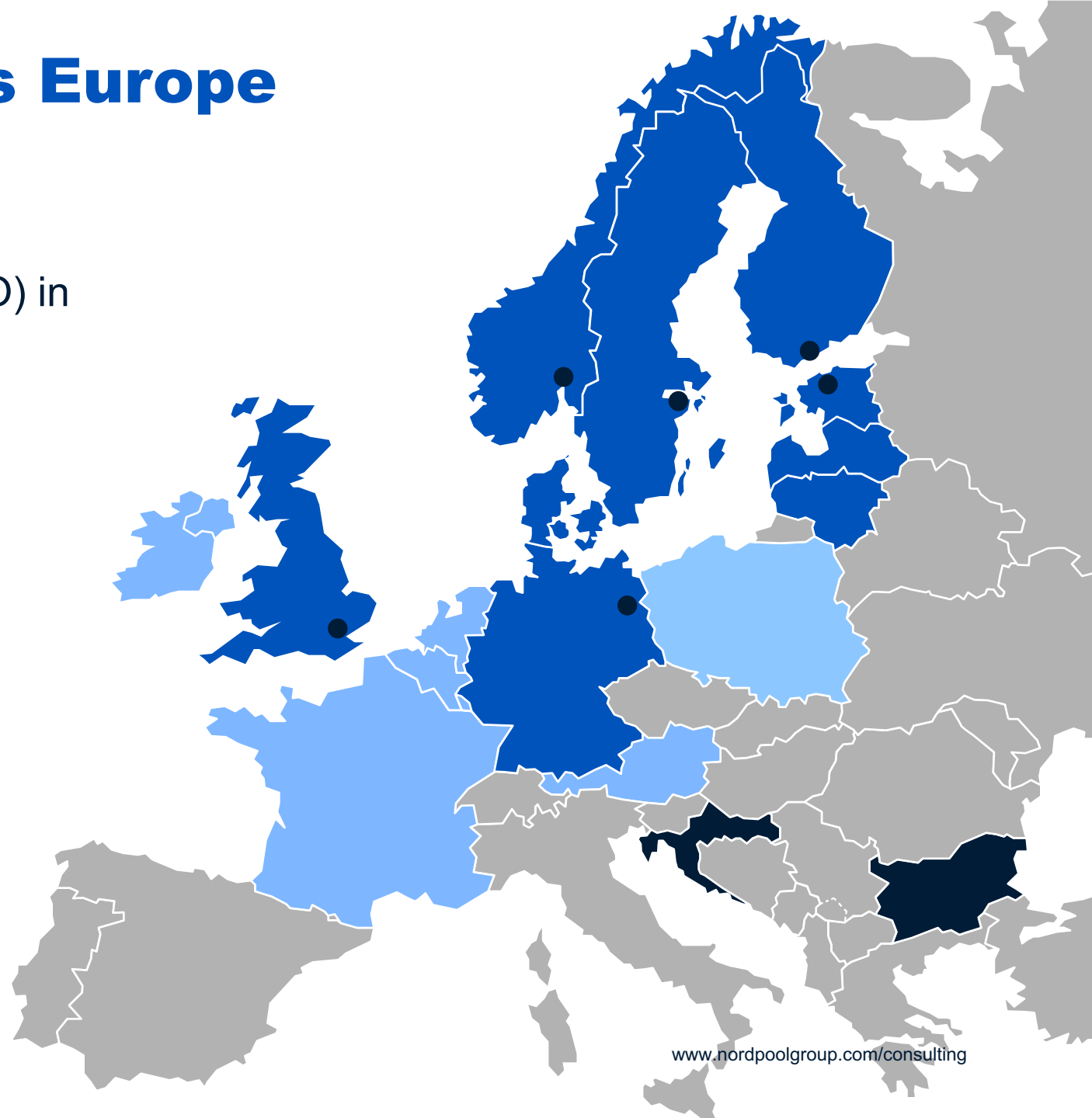
We are expanding across Europe

Nominated Electricity Market Operator (NEMO) in
15 European countries

Delivering systems and operations to Power
Exchanges – Bulgaria and Croatia

Tailored services to TSOs

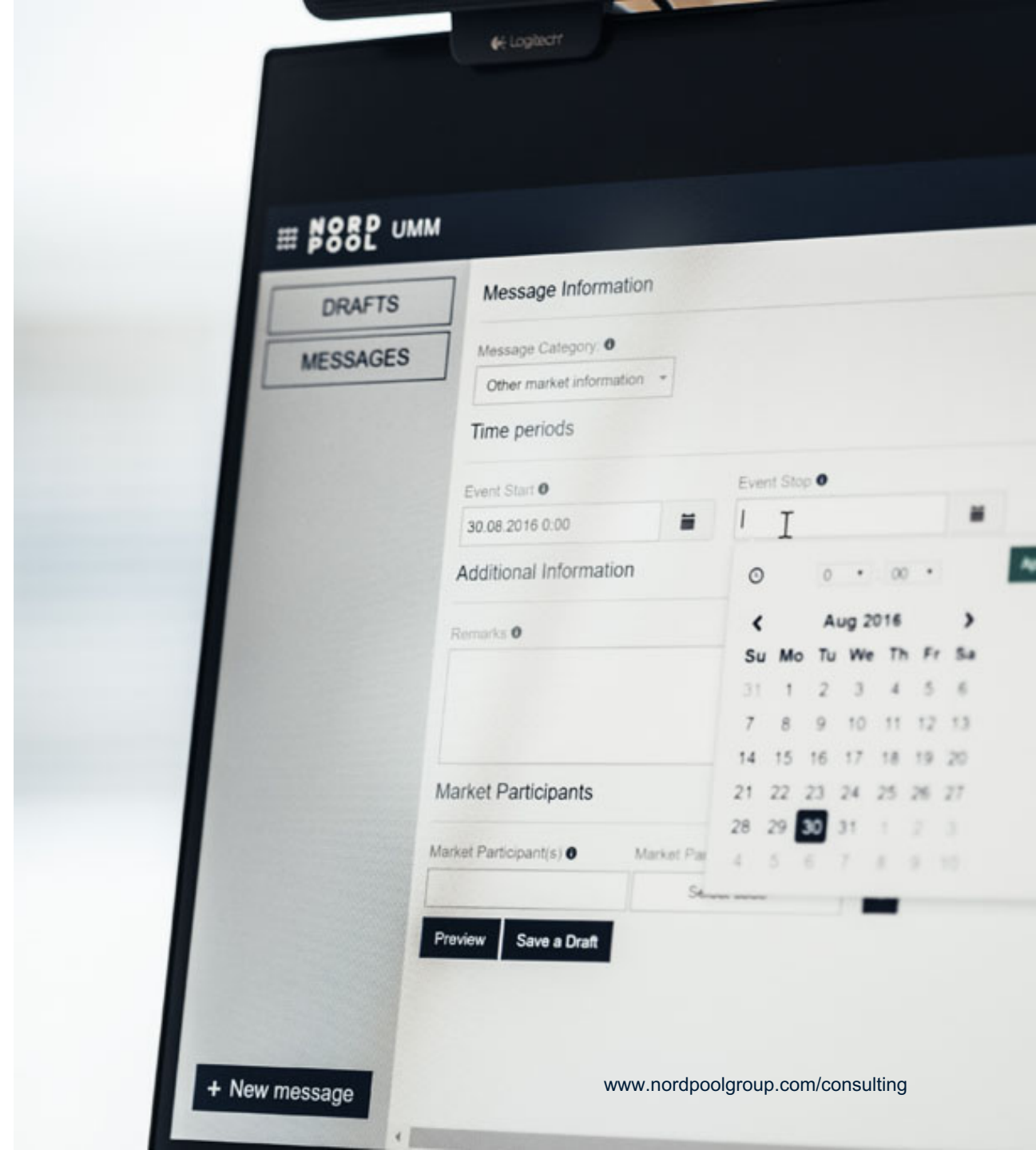
Offices in Oslo, Helsinki, Stockholm, Tallinn,
London and Berlin



Compliance

REMIT Urgent Market Messages

- ▶ Notify the market about planned or unexpected changes to generation, consumption and transmission
- ▶ Comply with European energy market regulations on information disclosure with automatic forwarding of data direct to the ACER REMIT platform and optional reporting to ENTSO-E Transparency Platform
- ▶ Connected API integrates your systems with UMM, enabling seamless information transfers between you and the market
- ▶ View real time notifications of events, disturbances and price impacts on short and long term markets
- ▶ Available in European markets and accessible alongside all Nord Pool applications via a single, web-based interface



The Nord Pool app is FREE

- ▶ Access to day-ahead prices with optimal push notifications when prices are published
- ▶ Graphs – information at a glance with highlighted max, min and average prices
- ▶ Drill down in hourly price table
- ▶ Check prices in the currency of your choice

Free in App Store & Google Play NOW



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