

Maintaining electricity security across the Nord Pool market

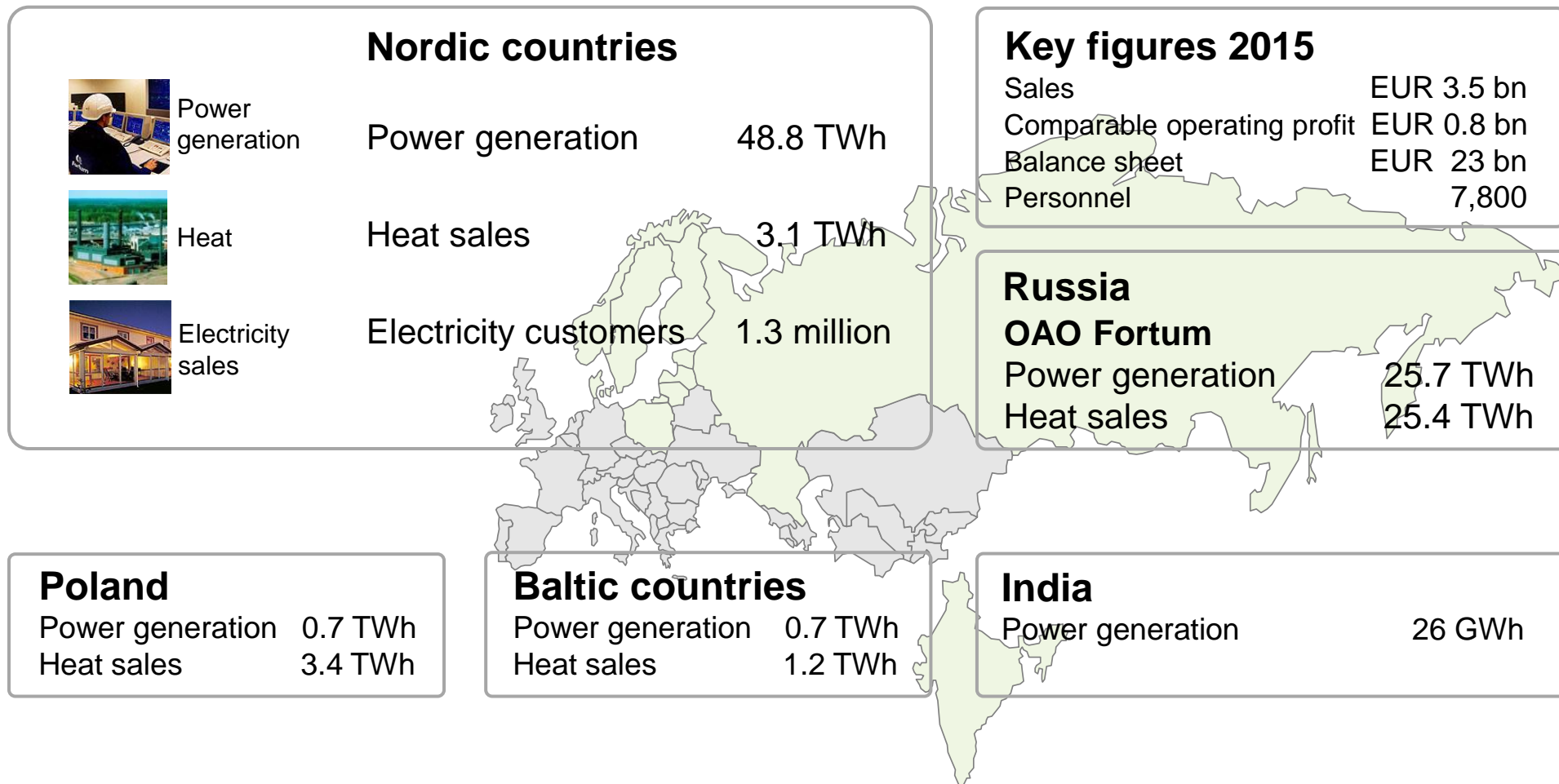
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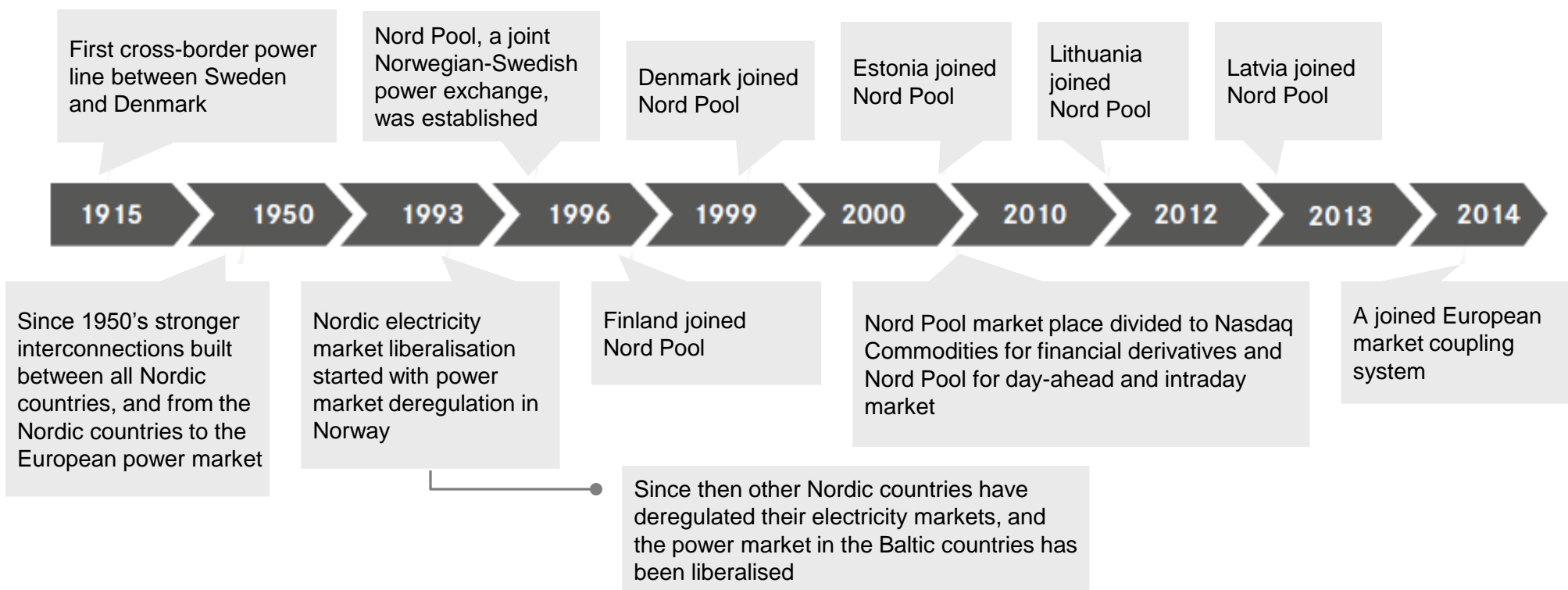
Fortum is a power utility operating mainly in the Nordics, Russia, Poland, Baltics and India



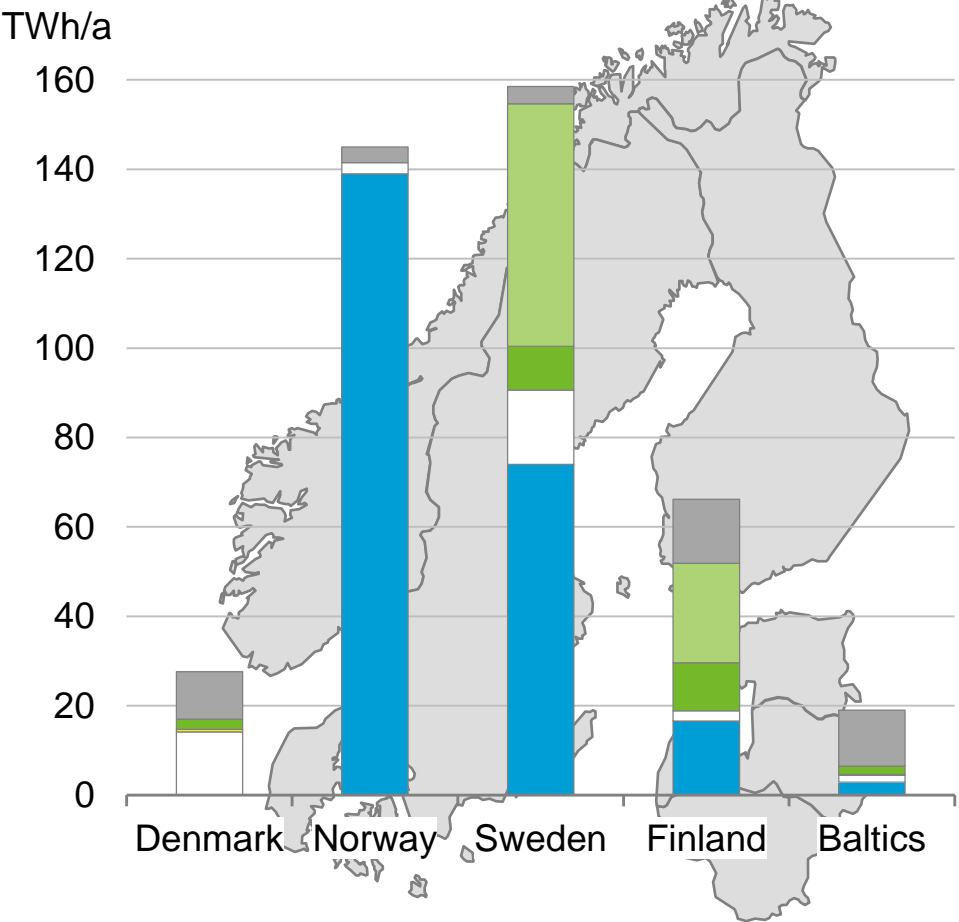
Outcome of far-sighted and persistent development

Nord Pool market was created in 1993

- Nordic electricity market is the outcome of far-sighted and determined cooperation
- Today the market covers seven countries (SE, NO, FI, DK, EE, LV, LT)



Over half of power generation is hydropower. Rising energy surplus due to investments in wind generation



Total generation in 2015

Nordic 397 TWh

Baltics 19 TWh

- Fossil fuels
- Nuclear
- Biomass
- Solar
- Wind
- Hydro *

Nordic		Baltics	
TWh	%	TWh	%
32	8	12	66
77	19	-	-
23	6	2	10
1	0.2	0.1	0.5
35	9	2	8
229	58	3	15

Nordic net export 16 TWh
 Baltic net import 8 TWh

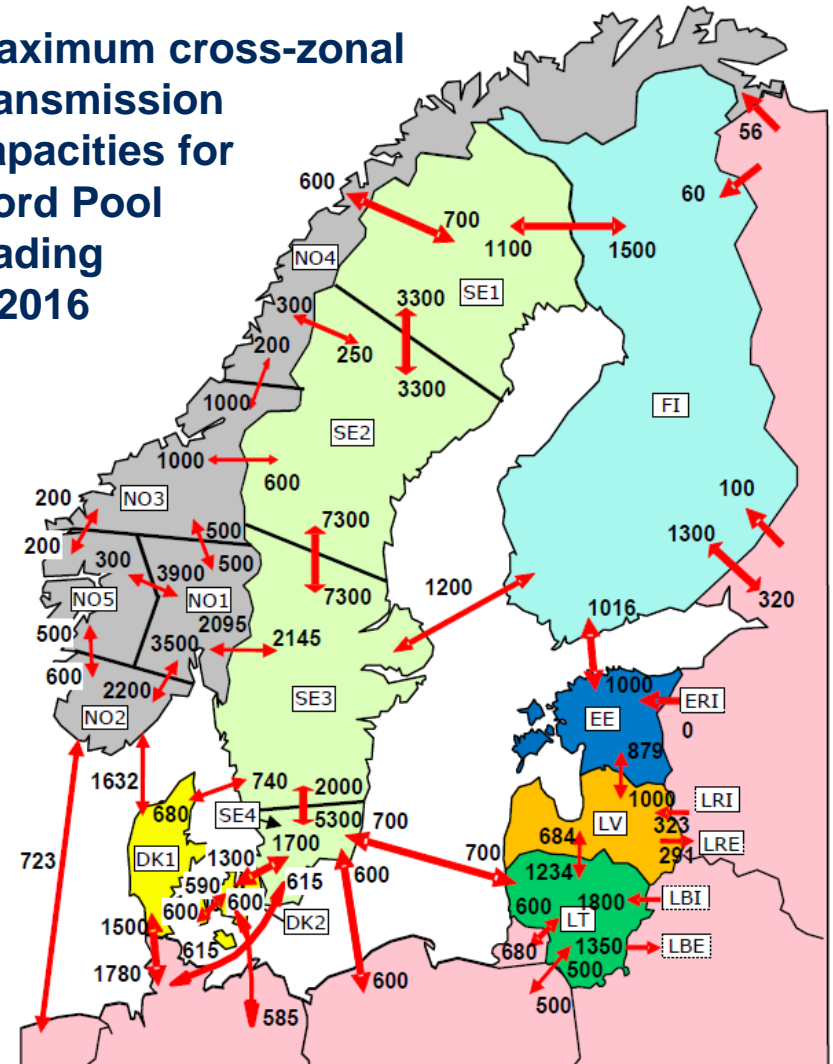
Source: ENTSO-E preliminary data 2015

*) Normal annual Nordic hydro generation 208 TWh, variation +/- 40 TWh.

Strong grid interconnections enable efficient use of all resources from generation, demand response and pan-European trade

- Strong transmission grid enables
 - optimized power generation
 - mutual support during failures and peak load situations
- Extensive investments in transmission capacity between the Nordics and other countries continue
 - Nordic export capacity will double to over 12 GW by 2023
- Export of surplus power enables maintaining power plants that serve the Nordic market during dry years and winter cold spells

Maximum cross-zonal transmission capacities for Nord Pool trading 3/2016

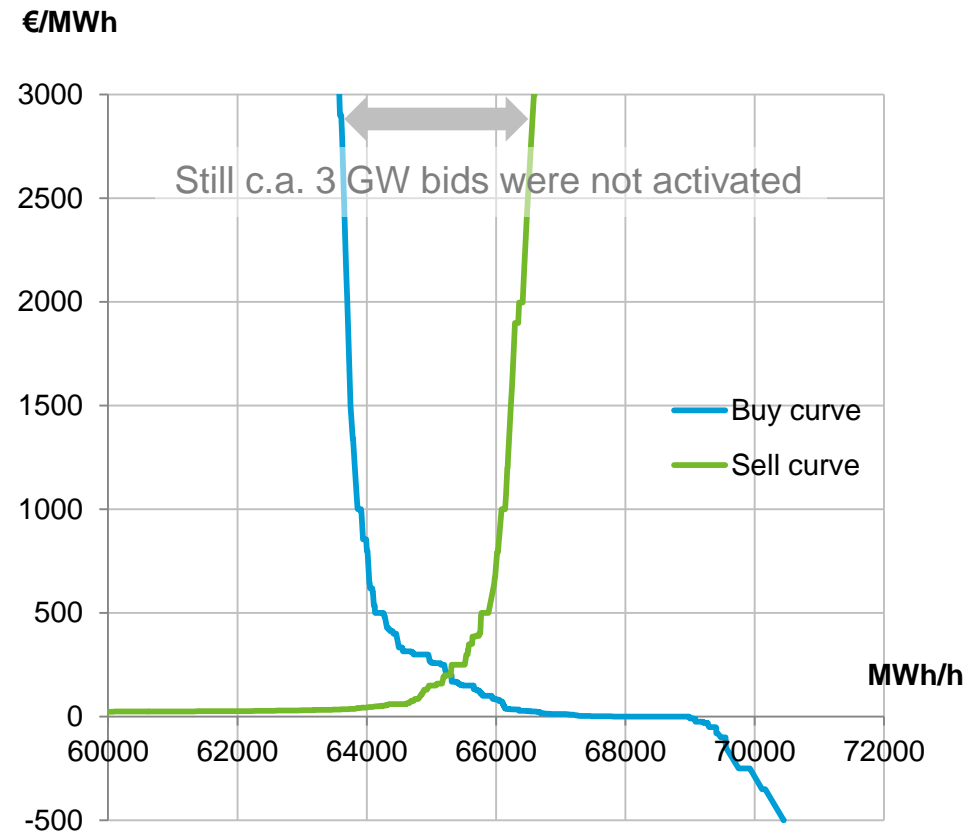


Sources: Nord Pool, Fortum

Day-ahead, intraday and balancing markets to provide clear price signals, guaranteeing security of supply with adequate reserves

- **Day-ahead market**
 - Coupled with European day-ahead market; price limits -500/+3000 €/MWh
- **Intra-day market**
 - Common Nordic+Baltic with marginal pricing
- **Balancing market**
 - Regional Nordic with marginal pricing
- **Imbalance settlement**
 - Different rules for generation and consumption
- **Reserves**
 - Regional Nordic market for procurement of primary regulation reserves - min 2/3 maintained nationally
 - Frequency Restoration Reserves: first balancing market. If no bids there, TSOs activate own or nationally contracted reserves
- **Strategic reserves in SE & FI**

Spot bid curves for the winter peak price (200 €/MWh) hour 8-9 on 21.01.2016



Strategic reserves in FI & SE, activated under same rules only to avoid curtailments of purchase bids

- Key principle for strategic reserves: **do not impact electricity supply or price formation in the markets**
- Activation only after all the commercial resources have been activated in SE or/and FI
- When reserve activation is needed, **SE and FI TSOs together decide** what sources to use
- **Generation reserve**
 - Obligated to be bid in spot market in winter¹
 - When reserve activated, spot price = price of highest commercial bid + €0.1/MWh²
 - Reserve plants get a capacity payment and variable cost compensation
- **Demand response**
 - Obligated to be bid in balancing market in winter³
 - Gets fixed payment for winter

Strategic reserves in SE & FI

- Capacities determined nationally
- **Common activation rules**



¹ The bid is not given any price. If the reserve is activated, it is also obliged to place up-regulation bids in the balancing market for the amount of available free capacity

² But not less than the variable cost of the activated reserve plant

³ But not activated before all commercial bids are used

National energy policies require more coordination

Development suggestions for the Nordic market

- Common Nordic (and European) grid planning
- Regional capacity adequacy assessment
- Balancing market to include Baltics and European integration
- Real-time publishing of balancing prices and one-price imbalance pricing; sharper price signals when TSOs reserves used
- Common Nordic retail market
- Regional RES support mechanisms

European-level improvements to enhance security of supply in the Nordics, too

- Implementation of the European cross-border intraday market as planned in H2/2017 and integration of regional balancing markets
- Increase of the day-ahead market price ceilings



Nordic TSOs are improving collaboration and actively developing Nordic power market 2.0

Main Nordic market initiatives

1. Regional Security Cooperation Initiative
2. Nordic Coordinated Balancing Area
3. Finer time resolution (15 min products)
4. Getting balancing prices right
5. Empowering consumers to support the adequacy
6. Assessment of Flow Based market coupling in the Nordics

Report "Challenges and opportunities for the Nordic Power System" to be ready June 2016

