

自然エネルギー財団 RENEWABLE ENERGY INSTITUTE Status, Concept and Way Forward for Nordic Electricity System

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Nordic production system



Source: ENTSO-E preliminary data 2015

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

Nordic solution

Nordic cooperation – A long history

- Nordel from the beginning of the 60's to 2009
- > Many Areas
 - Planning, Market, Operation, R&D, Maintenance etc
- > Coordinated Planning
 - > Common dimensioning criterias
 - > Requirements for generators



Baltic region included

> 2007 - 2009 a Multi-regional study was performed including Nordel, the Baltic states (Baltso) and Poland (PSE Operator)

Identifying three major interconnections:

Lithuania - Poland Estonia - Finland Lithuania - Sweden

> The Baltic states Estonia, Latvia and Lithuania part of NordPool

Three studied cross-sections



Benefits of interconnections



- Security of supply
- ✓ Value creation
- Promoting renewables

Benefits of interconnections

Security of supply



Benefits of interconnections

Price difference between Germany and Norway



Development of interconnection capacity



Nordic electricity market

	12 day b	:00 1 hour efore deli	before De very	elivery time
Forwards / Futures	Day-ahead	Intra-day / Balancing	Regulating	
 Hedge against price risk Several years or months ahead 	 Hourly schedule for next day Needed by slow plants 	 Allows schedulte changes Important for variable renewables 	 Ensures real-time supply/ demand balance Important for compensating demand calculation errors 	g

Crossborder electricity trading increasing



Positive development of prices



Typical operation of the Nordic System



•	Nuclear	7370 MW
•	Heat 14	27 MW
•	Wind 42	03 MW
•	Hydro	11331 MW
•	Unspec	591 MW
•	Tot Prod	24922 MW
•	Tot Cons	20736 MW
•	Export	4186 MW

Interconnections reduce consumer prices, NordBalt

~ € 90 million can be saved in the first
 year with minimum risk

Daivis Virbickas, Litgrid CEO:



 Nasdaq OMX and Platts Forward Assessments indicate positive impact on consumer prices already today

Interconnections are good investments, NorNed



Payback 6 years, life > 40 years

Going forward, new interconnection capacity



Source: JRC 2015

Going forward towards 100 % renewable production

Nordic Countries 600 Solar Electricity production (TWh/yr) Wind 500 Bio+waste 400 NG Oil 300 Coal 200 Nuclear Hydro 100 Gross demand 0 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050

How much wind can you have in the system ? 2016-08-09





Going forward, Integration of national wind resouces



Going forward, increase in interconnection capacity





Going forward, net export of clean electricty



Electricity trade



An interconnected renewable electricity system ensures low and stable prices



Summary

- The Nordic Electricity System is based on physical and market integration that ensures:
 - High penetration of renewable energy
 - Efficient use of the collected production resources
 - Positive development of prices and reduced price volatility
- The interconnections are characterized by:
 - High capacity
 - Good return on investments
- Future electricity system characteristics:
 - Close to 100% renewable
 - Increased interconnection capacity
 - Low prices



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Status and concept of Nordic Grid

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