

”Future trends in energy market design”
The future of (regional) energy market integration

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Outline

- Experiences and lessons of regional power market integration from the Nordic power market
- Some development trends of further regional market integration
- Prospects and challenges of the introduction of new, renewable generation technologies in the power system
- Need for network investment to facilitate market integration; financing issues; "missing money"; regulatory issues
- Wider policy implications of the new British power market reform?
- Concluding remarks

Some important steps and events in the Norwegian and Nordic liberalisation and market integration process

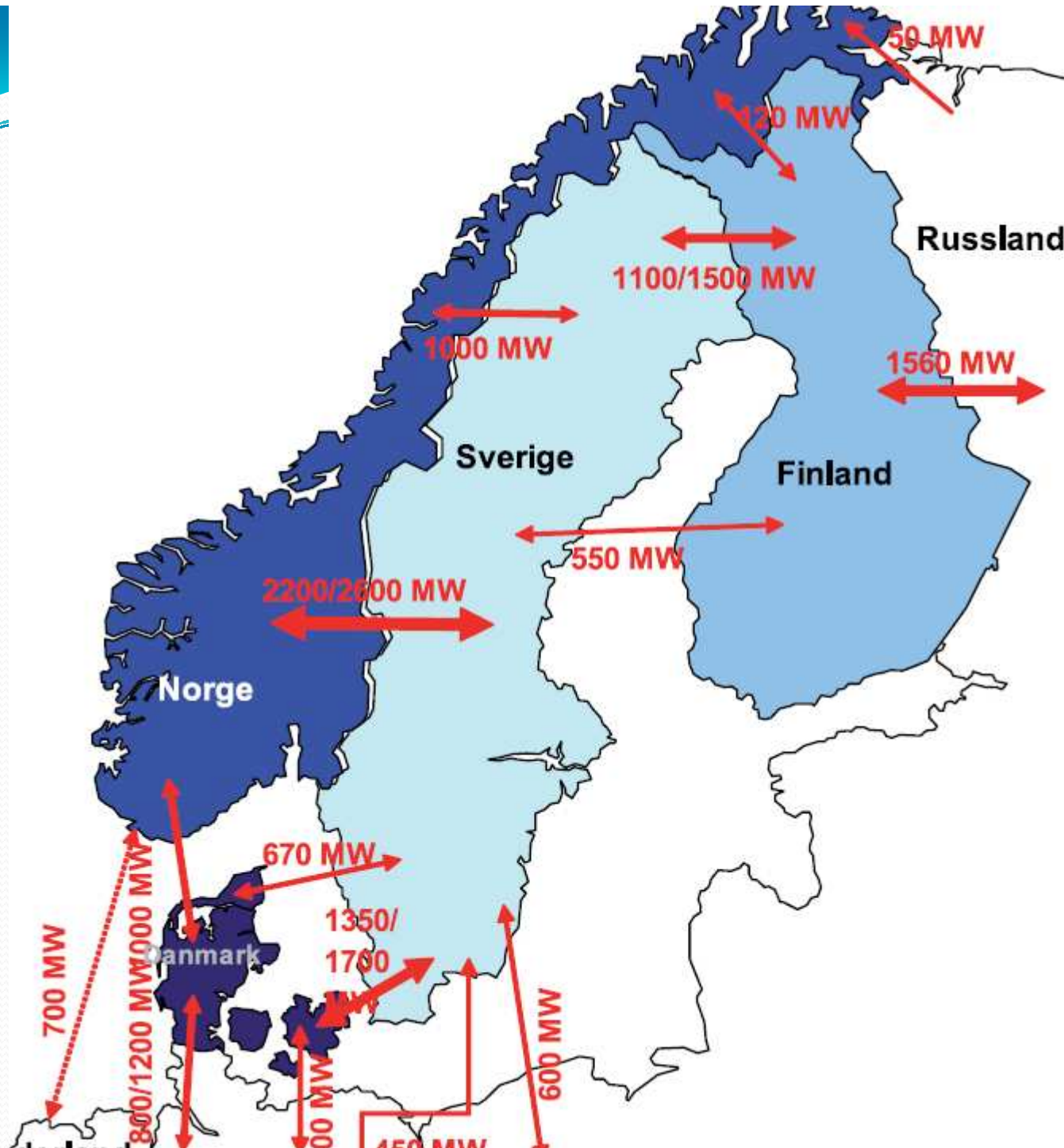
- **The Norwegian Energy Act 1990: Economic efficiency throughout the power system (generation, trade, transmission, distribution and end-use.**
- 1991: Rate of return regulation of grid entities
- 1992: Statnett Market in operation in Norway, transformed to NordPool in 1996. Regulation market operated by Statnett
- 1994: Financial trade in the weekly market
- **1996: A common Norwegian- Swedish power market**
- 1997: New regulatory mechanism for grid units: income frame regulation/revenue-cap regulation
- 1998: Price information system for end consumers by the Norwegian Competition Authority
- **2001-2003: Denmark and Finland integrated into a common Nordic market**

Some important events cont

- 1996, 1998 and 2001: European energy market integration. Directives for electricity, natural gas and renewable energy, respectively.
- 2002-03: The Nordic power market put to a test
- 2005-06: EUs Emission Trading System implemented. EUs Green Book for sustainable energy. Security of supply issues
- 2007: New regulatory mechanism for network regulation in Norway
- **2008-09: Futher Nordic market integration; integrating and harmonising the network and network operation. Towards a common system operator. Retail market integration?**
- 2010: Security of supply issues. Lack of capacity investments, particularly in networks. Market performance?

Organisation of the Nordic Power Market

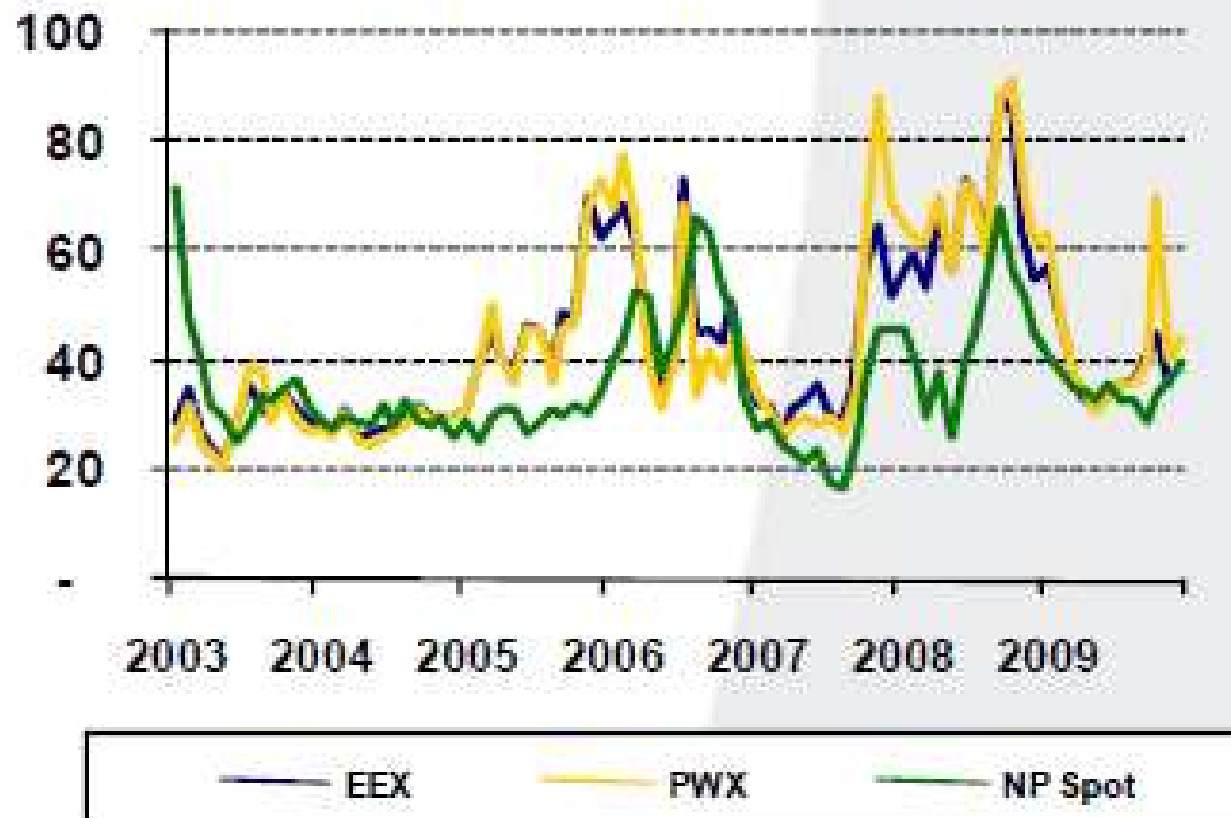
- A common power exchange, NordPool, for the whole market
- Spot market (day-ahead market; system price), balancing markets, financial/derivative markets, clearing functions, network management, etc.
- Also gas market trading and carbon dioxide emission market allowances (EUAs) and carbon contracts (CERs), through the Green Development Mechanism
- NordPool is a non-mandatory power exchange pool
- 420 members in 22 countries
- Full market integration of the wholesale market; towards full market integration also of retail markets
- A common Norwegian-Swedish green certificate market established in 2010



Nordic generation capacity (MW) by power source. 2007

	Denmark	Finland	Norway	Sweden	Nordic region
Installed capacity (total)	13 032	16 900	30 313	34 068	94 313
Nuclear power	-	2 651	-	9 074	11 725
Other thermal power	9 899	11 137	890	8 005	29 931
- Condensing power	928	2 988	-	2 298	6 214
- CHP, district heating	7 754	4 051	142	2 883	14 830
- CHP, industry	477	3 293	49	1 224	5 043
- Gas turbines etc.	741	805	699	1 600	3 845
Hydro power	9	3 031	29 043	16 209	48 292
Wind power	3 124	81	380	780	4 365

EUR/MWh Spot prices (NP, EEX, PWX)



Why has the Nordic power market performed so well ?

- The structure of the market; many players; composition of the production system
- Market design and reform; the "textbook" model; vertical and horizontal split of functions, etc.
- Economic efficiency and a focus on market power issues by competition and regulatory authorities. Strong political support for a market-based power system
- Self regulation, e.g. by stringent market rules by NordPool in terms of controlling for the exercise of market power in the bidding process and for making relevant market information available to all parties
- Voluntary informal commitment to public service by the power industry? Ownership issues; e.g. 85% public ownership of the electricity sector in Norway.

Lessons from the Nordic power market experience?

- Importance of choice of market design model and consistency over time in implementing the market reform
- Enlarging geographically the integrated (inter country) power market to fully tap the potential for economies of scale, and economies of scope through the composition of the system wrt to generation technologies. Also wrt to mitigation of the exercise of market power
- Recognising the importance of the transmission network as a facilitating device for market integration and competition
- Designing effective competition and regulatory policies for market monitoring and enforcement
- Strong and robust public support to the market-based system; avoiding the California experience



Some ongoing market integration developments

- Integrating the Nordic power market with the Baltic region (Estonia, Latvia and Lithuania)
 - Cooperation between NordPool and BaltPool – a common pool?
 - Investment in interconnections between the two regions/markets to facilitate market integration
- Market coupling between power exchanges – NordPool, European Energy Exchange (Germany), Powernext (France), etc. Price harmonisation?
- Integrating the Nordic market with the European power market. Market coupling and then need for massive investment in interconnections

New, renewable generation technologies: Wind

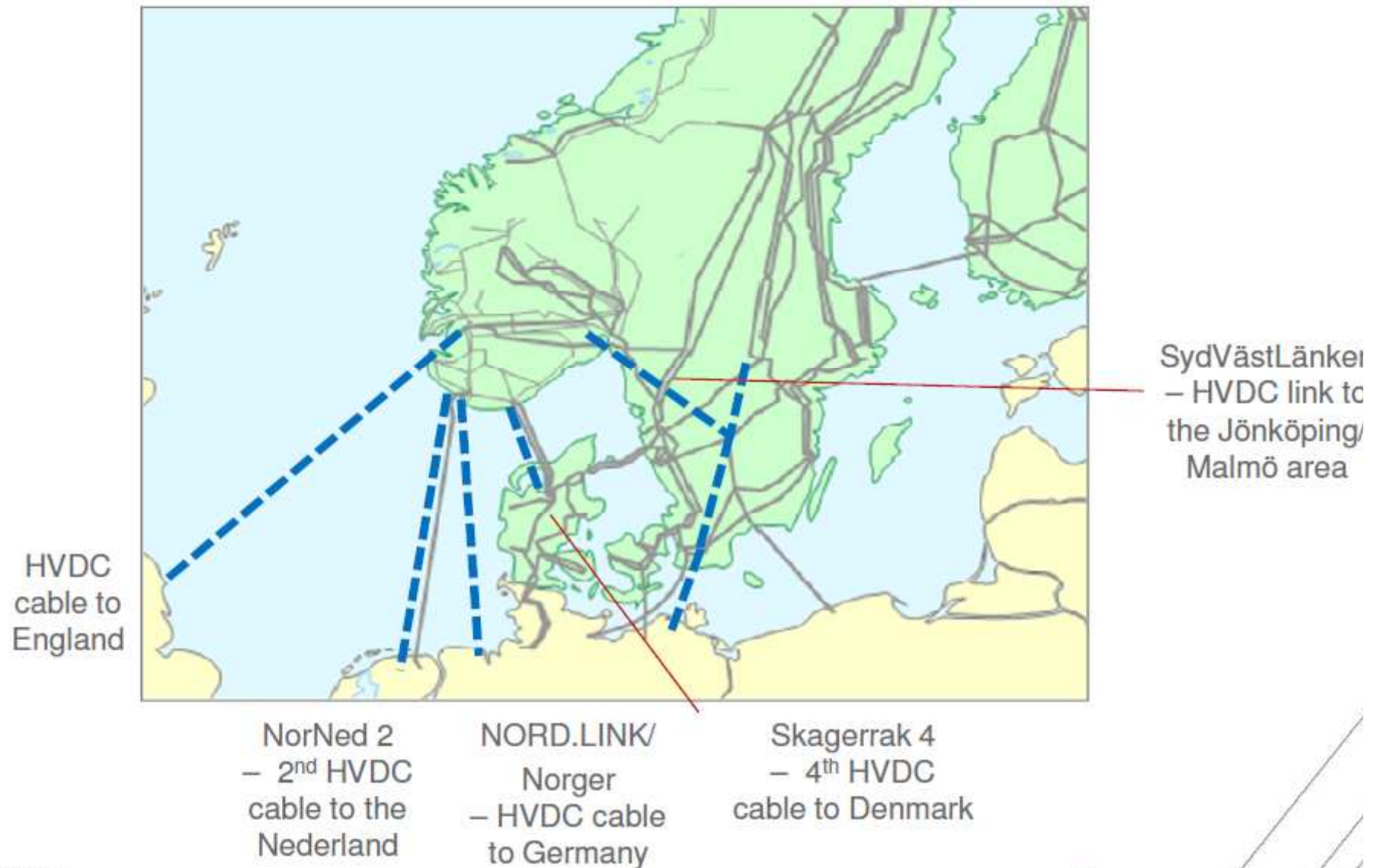
- Is the EU renewable policy target wrt to wind overambitious?
 - Profitability of wind power investment and implied subsidies
 - Total cost of wind power investment, including network transmission costs. Implications for grid user prices
 - Suboptimization with regard to location of wind power installations within the EU area in relation to wind resources
 - Policy instruments: feed-in tariffs versus direct subsidies. Priority to wind power in the total power system?
- Intermittency of wind power
 - Back-up facilities and incentives to operate and invest in such facilities in an integrated power system; optimal production mix
 - Incentives to disinvest in polluting power plants
 - Supply of base load, and capacity reserves for security of supply

Renewable technologies: Wind and hydro power

- Hydro power as a "swing" producer and a back-up technology for handling demand fluctuations?
- Norway's hydro resources and production system as a "battery" for Europe?
- Investment uncertainties and profitability
 - Investment in back-up facilities and reserve capacity in within "wind power countries", e.g. Germany and Denmark
 - Technologies for more flexible thermal power generation to accomodate demand variation
 - Needed investment in the transmission network for market integration and a "battery" function

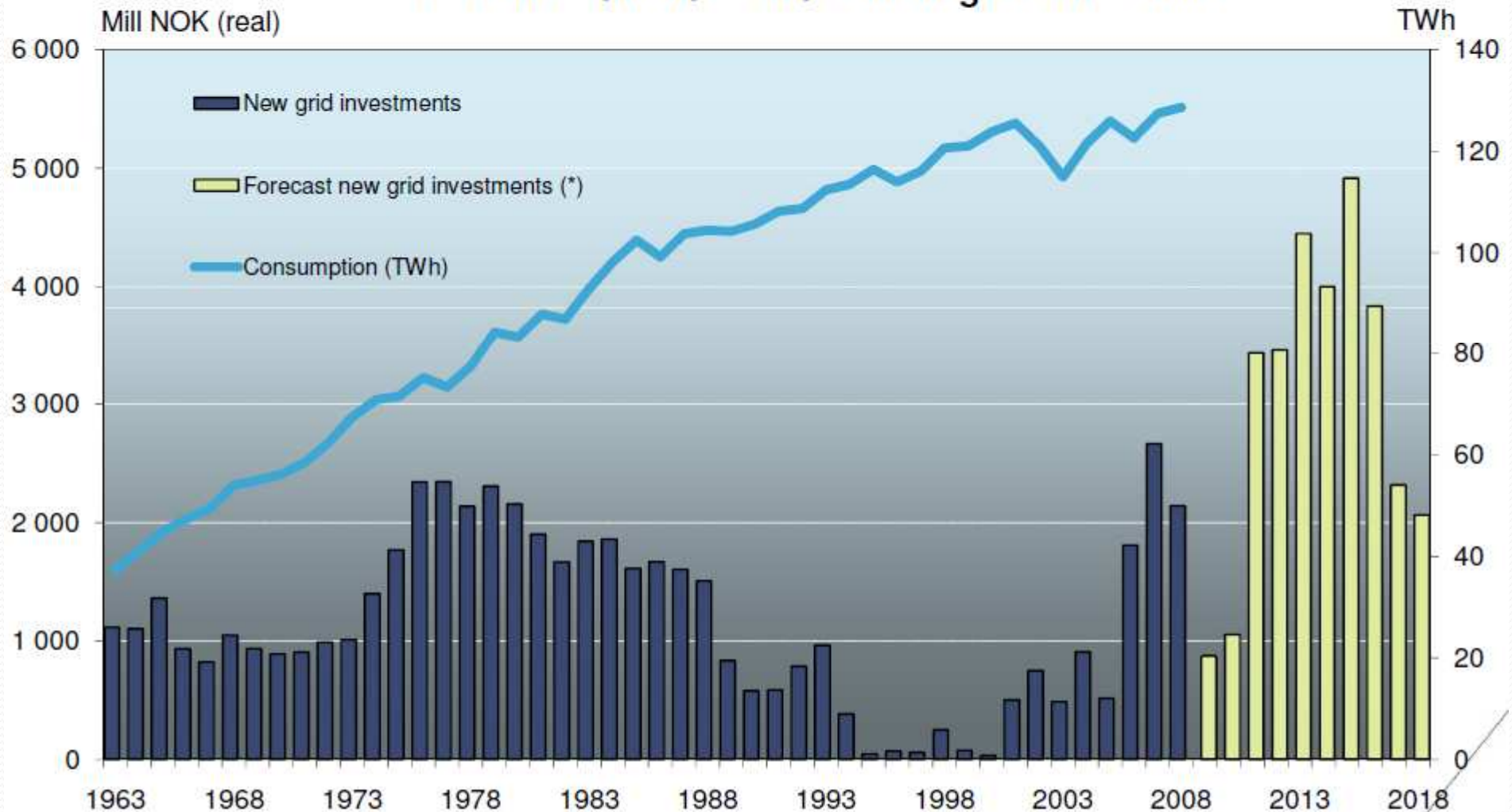
Potential new international interconnectors

- *ambitious plans*



Entering a new phase of major grid investments

New investments(*) in the main grid since 1963



(*): New grid investments only, excl. reinvestments, IT/Tele, and construction interest. Forecast dated summer 2009

The new UK market reform: Policy implications?

- Intended objectives and targets:
 - Decarbonisation of the power sector by 2030
 - 30% of electricity needs to come from renewable sources by 2020, largely wind, up from 7% today
 - New capacity investment and replacement investment to secure security of supply
 - Considerable energy efficiency improvements
 - Incentives and market arrangements for "affordable" energy
- Policy measures:
 - Carbon price support
 - Feed-in-tariffs
 - Capacity payments
 - Emissions performance standard

The UK market reform, cont.

- Estimated investment need in new generation and transmission assets of the reform: £ 110 billion
- ENTSO-E's estimate for network investment in and across member countries over a five year period: € 25 billion. In addition: huge investment in a European supergrid for long-distance transmission to facilitate market integration
- Issues of financing and implications for grid user prices

Some regional market integration and policy issues

- The need for coordinated transmission network investments across regions (Nordic-Baltic-European, etc).
Regulatory and financing issues
- The need for harmonising rules and regulations
- Market arrangements for new renewable energy and the optimal composition of the production mix
- Security of supply issues – national or regional solutions?
- Will there be a common European integrated power market, or rather regional submarkets within Europe?