EnergyVille

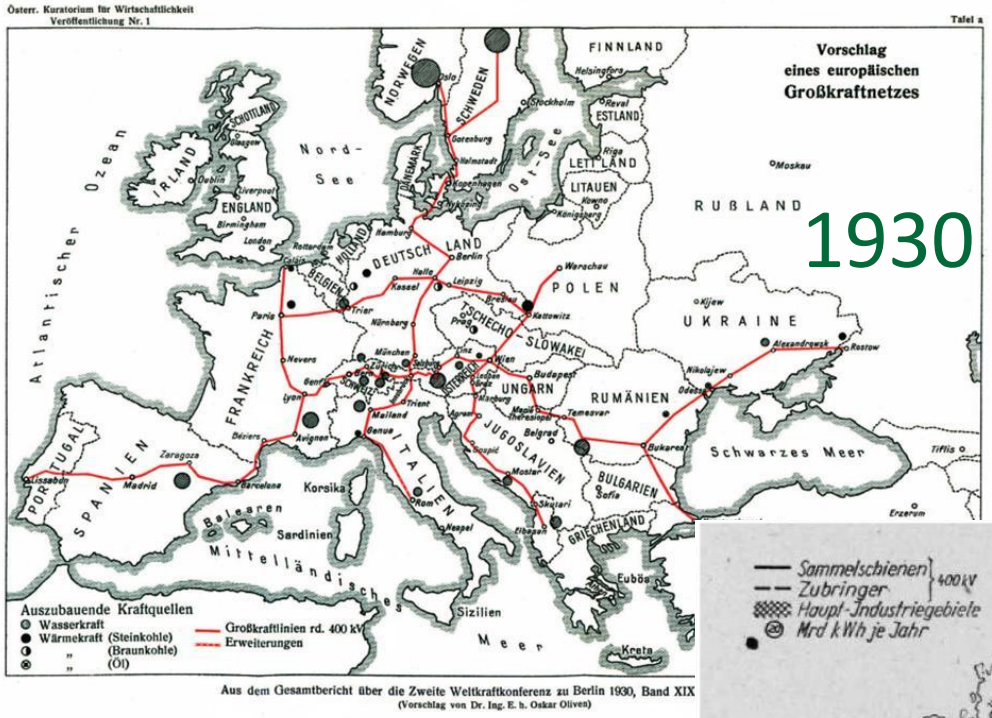
DESIGN GRID

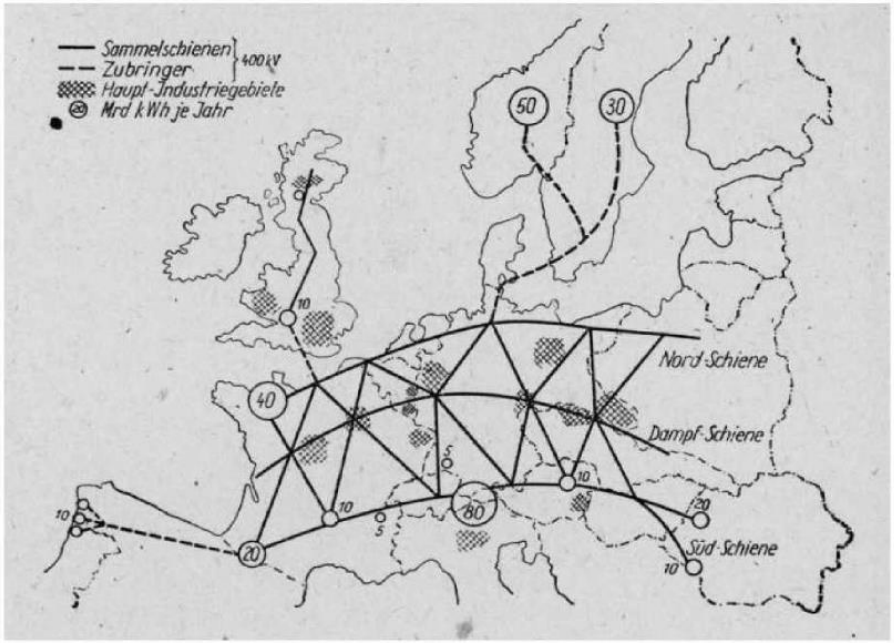
Structure, Financing and Regulation

Ronnie Belmans

28 May 2015

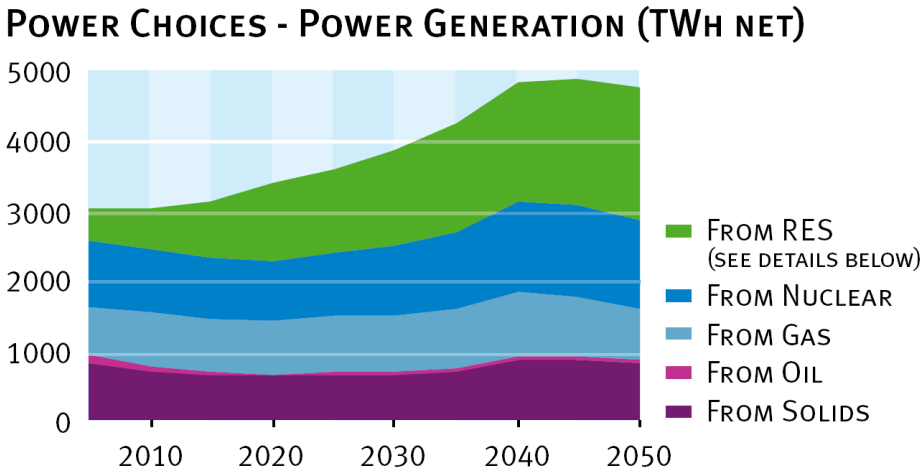
The Supergrid Vision in not new!

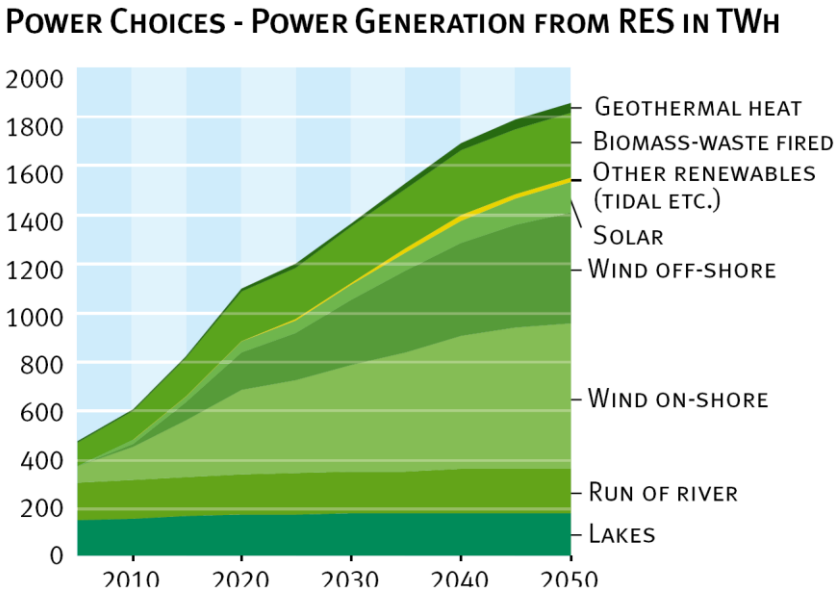




Coping with the challenges

European electricity generation mix by 2020 … 2030 … 2050

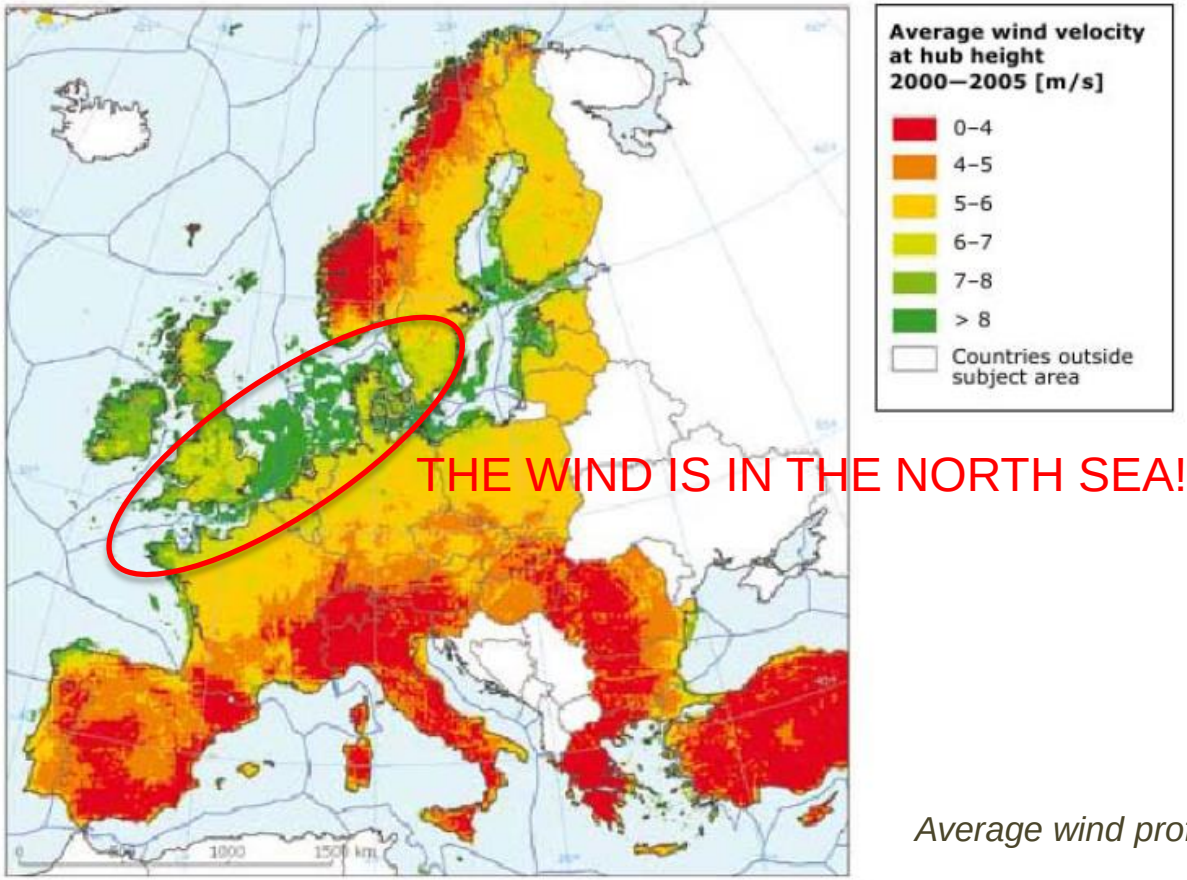




Source: EURELECTRIC, "Power Choices – Pathways to Carbon-Neutral Electricity in Europe by 2050," Full report, 2011.

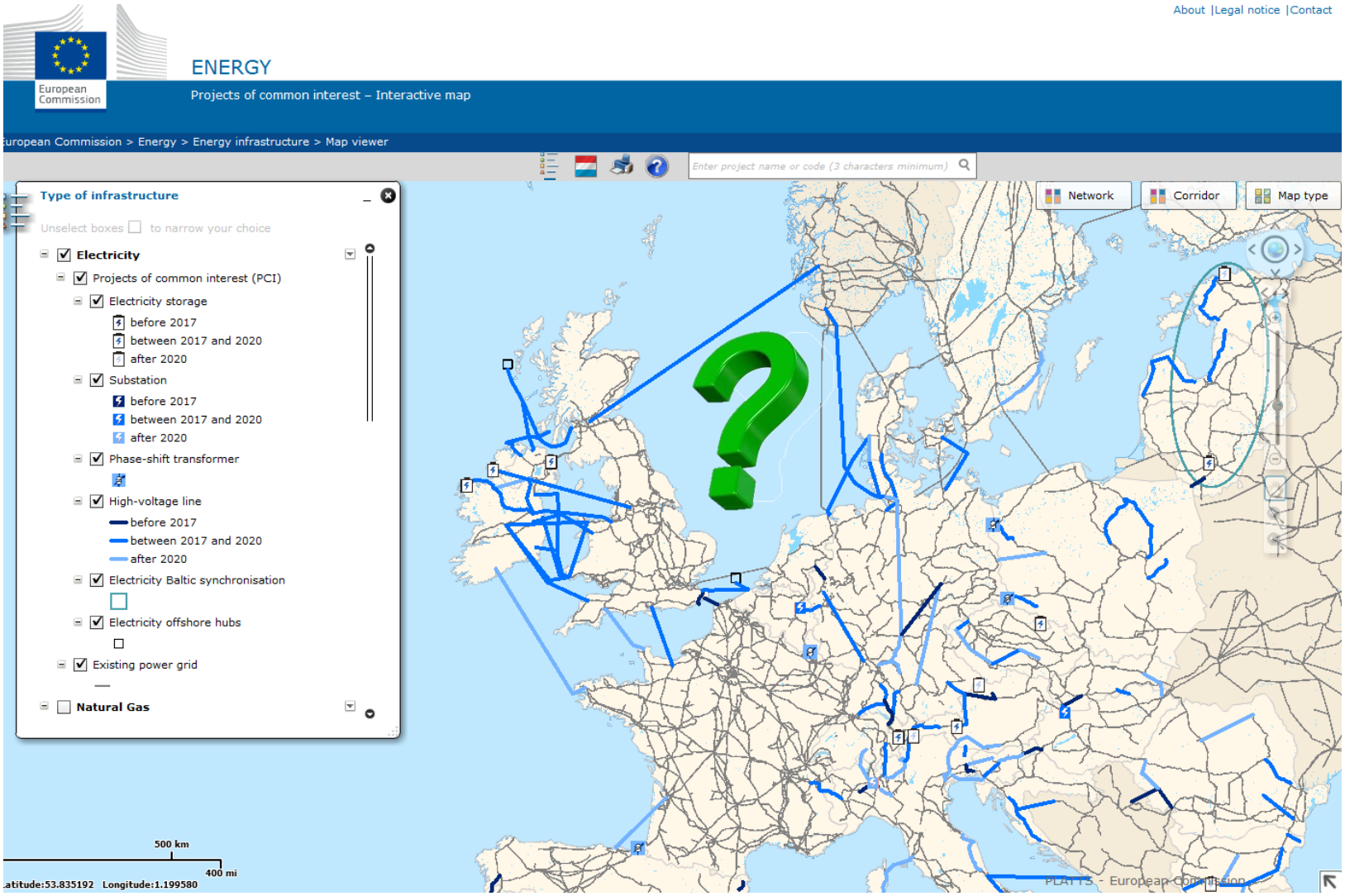
Coping with the challenges

How to harvest more wind power?



Average wind profile in Europe (source: EEA)

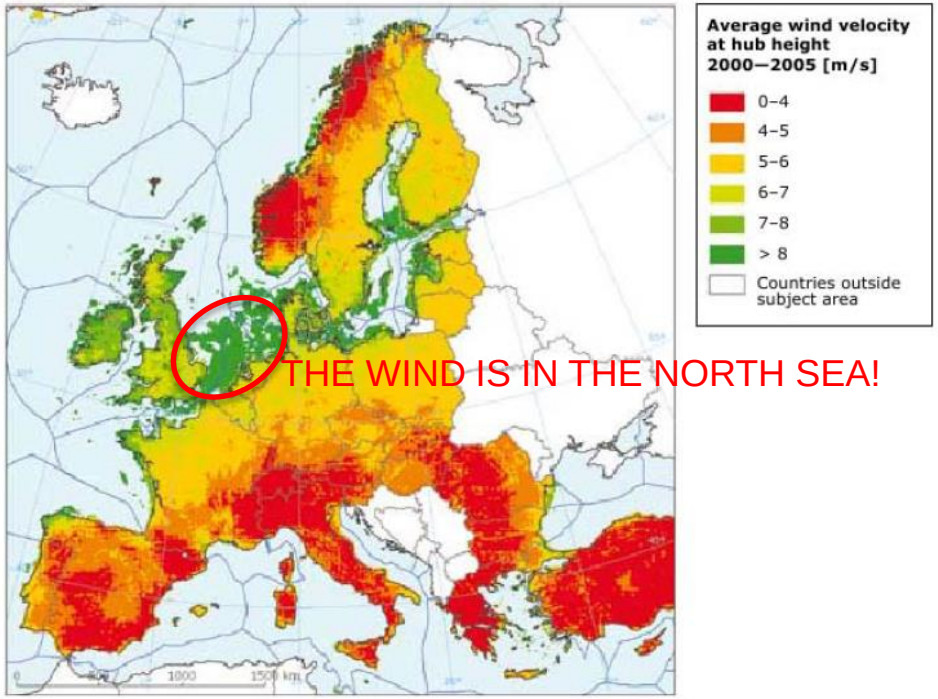
But, where is the grid?



Source: http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/

The North Sea challenge

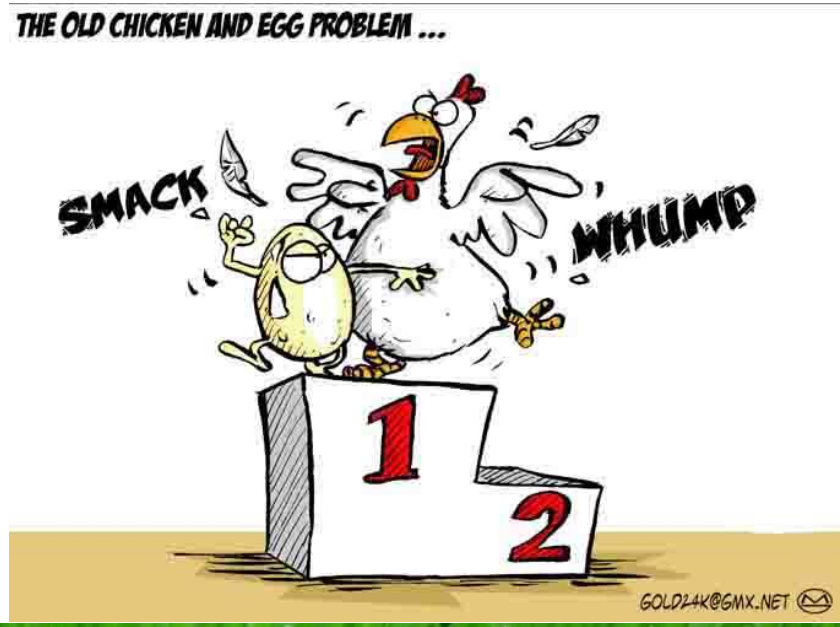
- Near shore wind
  - Abundant resources for foreseeable future.
  - Connection to single energy systems, possibly integrated
- Grid as facilitator
  - Value of flexible generation and energy services
  - Energy trade is key



Average wind profile in Europe (source: EEA)

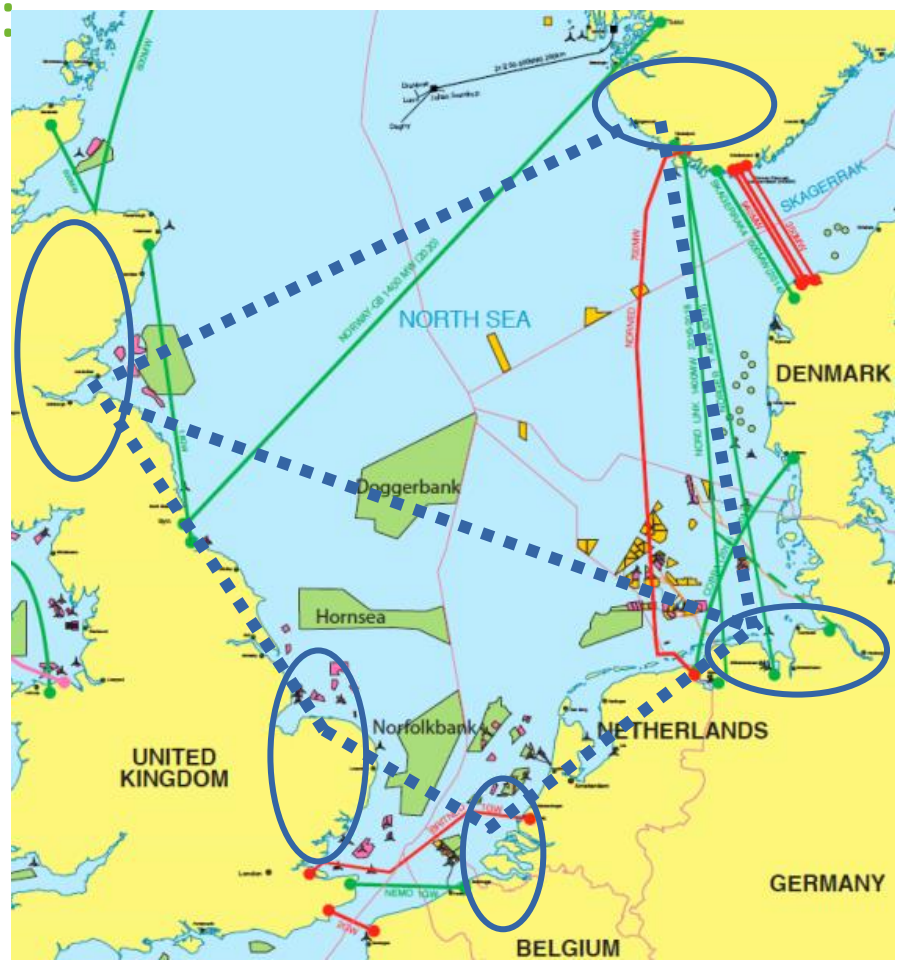
Why are investments stalling?

- TSOs are hesitant to invest in a multinational offshore grid as long as there is not a harmonized regulation
- Regulators have no means to harmonize and improve regulation as long as there is no multinational offshore grid



An Answer: DESIGN GRID

- A five line grid connecting:
  - Denmark
  - Belgium
  - Netherlands
  - Germany
  - Sweden
  - Iceland
  - UK
  - Norway



- Allowing integration North Sea offshore wind farms

An Answer: DESIGN grid

- **DESIGN Grid** will allow trade between
  - Denmark — **DKK**
  - Belgium
  - Netherlands — **Euro**
  - Germany
  - Sweden — **SKK**
  - Iceland — **ISK**
  - UK — **GBP**
  - Norway — **NOK**

DESIGN grid

- This way, TSOs will develop new products and services, based on the possibilities offered by **DESIGN grid**

How to get there?

- 1st STEP: Feasibility study
  - Identify technical and regulatory show stoppers and provide solutions
  - Risk level: low
  - Time horizon: 1-3 years
- 2nd STEP: Detailed engineering study
  - Subsea surveys, technical studies, legal advise, permits, etc….
  - Set up as a Newco -> **DESIGN grid**
  - Acts as commissioning agent for construction
  - Risk level: Medium
  - Time horizon: ~ 3 years

How to get there?

- 3rd STEP: Stepwise Construction and Operation
  - Different companies can build parts of the grid
    - TSOs, insurance companies, pension funds, manufacturers, asset holders, ….
  - The operation is transferred to a commercial system operator -> "**DESIGN operate**" (Newco)
  - Revenues are passed to **DESIGN grid** determined in a specific regulatory scheme
  - Risk level: Medium
  - Time horizon: 2020 - 2030

Building Blocks of a Regulatory Framework

Planning and Design	• Coordination of national and regional transmission expansions
Ownership	• Ownership by New Third Party Companies (Newco) • Impact monopoly of local TSO (parallel path)
Cost Allocation	• Distribution of the costs amongst regions: new cost allocation methods • New tariff schemes (cfr. national regulators)
Operation	• Network Codes to ensure compatibility local TSO and Newco • Redesign of Ancillary Services • Coordination maintenance, scheduling and dispatch of transmission assets owned by Newco

Operation and Regulation

- Operation and maintenance in the hands of **DESIGN operate**
  - Collecting grid fees
  - Maintenance
  - Scheduling and real time operation (ISO approach, e.g. CORESO)
  - Payment of concession holders
- Interaction with national grids is important
  - Although power transfer managed by **DESIGN operate**, reactive power control can be given to national TSOs
- Fundamental rewrite of grid codes is required to coordinate interactions

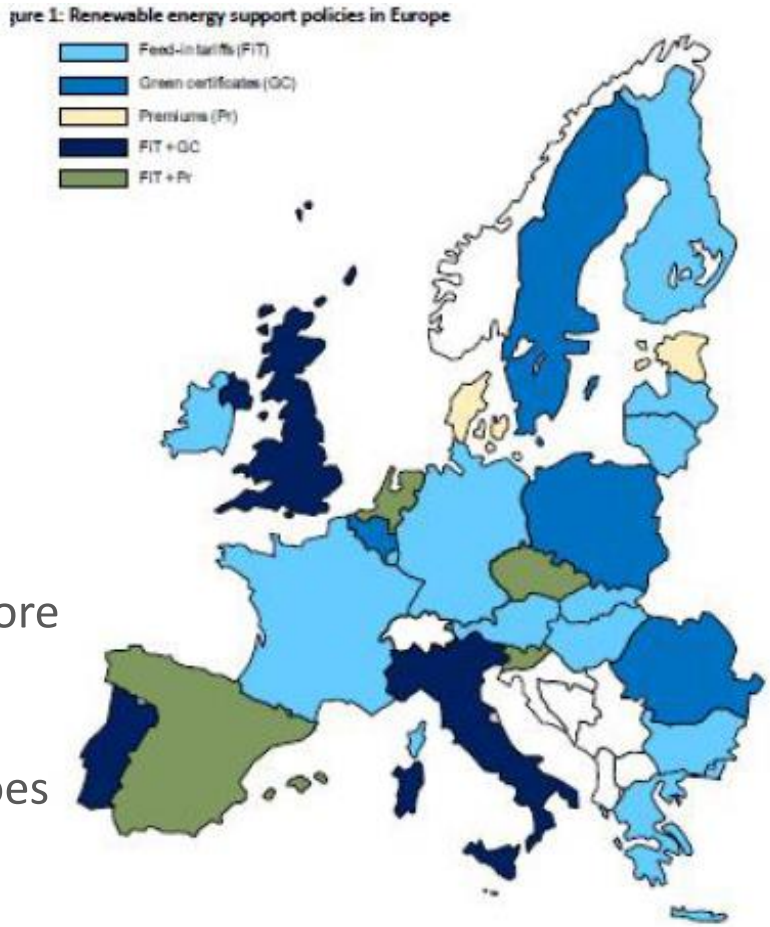
Financing and Regulation

- Regulatory Framework determines feasibility of North Sea Grid Developments
- How to match national operational standards, regulatory and legal framework?
- How to handle inland connections?
- Is landing in more than one country feasible (technical, regulatory)
- Further away countries benefit, but how do they contribute

Challenges for coordinated planning

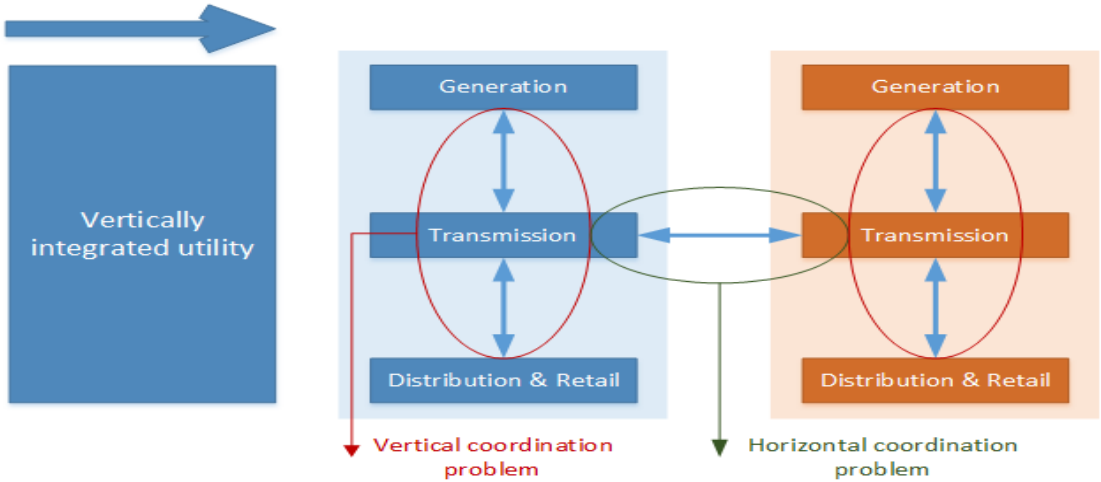
Regulatory challenges for coordinated planning

- Not aligned national frames
  - Swedish TSO is not responsible for connection of offshore wind farms
  - German TSO obligation makes cooperation difficult
- Not aligned renewable support schemes
  - Integrating three national solutions where each country imports the offshore wind produced in its water is not necessarily the best design
  - In case of an interconnector, where does the wind go?
- Capacity Remuneration Mechanisms



Cost allocation and Regulation (1)

- New developments
  - Restructuring => Vertical coordination (VC)
  - EU energy policy objectives => Horizontal coordination (HC)



- Efficient cost allocation solutions required both at national and European level
  - Transmission tariff design
  - Cross-border cost allocation

Cost allocation and Regulation (2)

- Existing cross-border cost allocation solution in Europe
  - Relative to asset hosted
    - Does not reflect the welfare distribution effect
  - 50-50 rule
    - Does not reflect the welfare distribution effect
    - Limited application
  - Inter TSO Compensation (ICT)
    - Limited scope and precision
    - Welfare distribution effects ignored
  - Summarizing

Not suitable for PCI type projects

Other mechanisms based on Peak Demand – Installed Generation Capacity – RES Installed – TSO involvement – Distance – …

Source: PLATTS, GISCO, European Commission

Source: PLATTS, GISCO, European Commission

Summary

- There is a need for a North Sea offshore grid
- **DESIGN grid** shows how it can be built by reducing investment risk
- Nevertheless, support from the European Union is needed to tackle challenges
  - Regulation
  - Interoperability
  - Financing

DESIGN GRID

Structure, Financing and Regulation

Dr. Ronnie Belmans
KU Leuven, EnergyVille, Belgium
ronnie.belmans@energyville.be

28 May 2015

Thank you for your attention!