

**Discussion of the Presentation:  
“Transmission Planning and Pricing:  
Lessons from Elsewhere” by  
Benjamin F. Hobbs**

*Transmission Policies to Unlock America's Renewable  
Energy Resources*

*Sponsored by the  
Program on Energy and Sustainable Development*

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## Outline

- ▶ Key Points of the Ben Hobbs Presentation
- ▶ Impact of RES on Congestion
- ▶ Cost Allocation Issues
- ▶ TSO Incentives
- ▶ Electricity SupeGrid Highways
- ▶ Poland: LMP-Based Market Development
- ▶ Conclusions



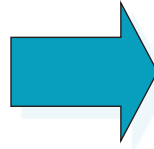
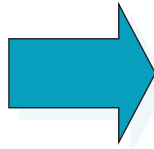
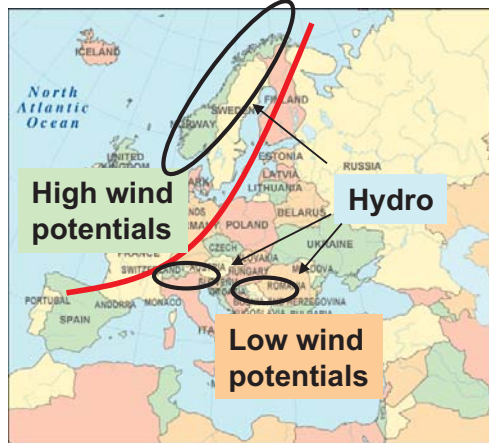
# Key Points

- ▶ EU jurisdictional friction between Internal Energy Market (IEM) Rules (EU-Wide) and RES implementation goals (country-by-country)
- ▶ Socialized short-term congestion management within the Bidding Zones (usually a country) and Physical Transmission Rights (PTRs) across borders
- ▶ “Path Based” Cross Border Trading vs Integrated Energy and Transmission Markets
  - Inefficient
  - Leads to unrealized gains from trade
- ▶ RES absolute scheduling priority does not make sense from economic and environmental viewpoint

# Key Points

- ▶ Despite current problems major EU stakeholders refuse to move to LMP-based markets (Some EU countries are pushing for more granularity)
- ▶ Most EU markets socialize transmission investment costs except shallow or super-shallow connection costs
- ▶ Blue print for future transmission investments
  - 10 year Development Network Plan
  - Development of the SuperGrid
- ▶ Transition to an LMP energy model is a necessity
- ▶ Management and investment in the cross-border transmission system remains a very serious issue

# How Increasing Wind Penetration Can Affect Grid Congestion

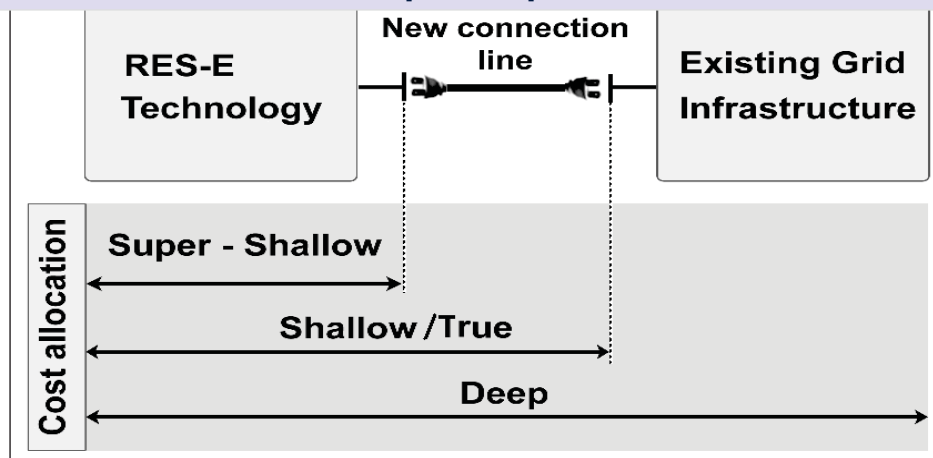


Congestion becomes a pan-European problem  
 Planning should be coordinated between the TSOs

Frequent flow changings heavily affect operation  
 and require a coordinated approach

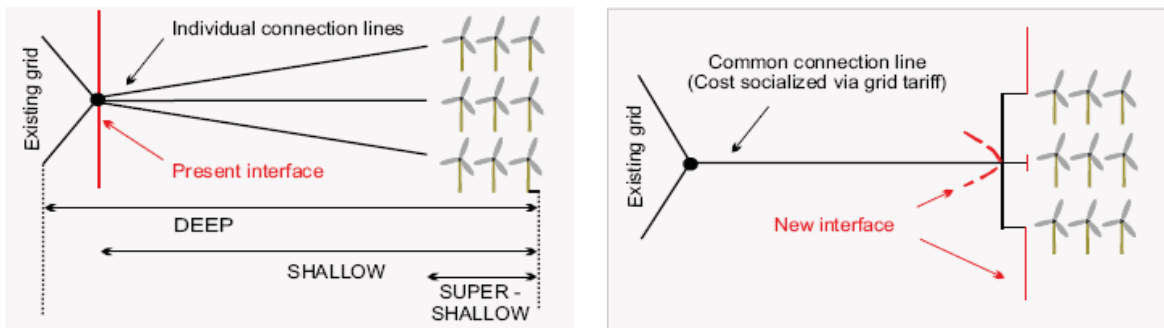
# RES and Grid Infrastructure

## RES connection cost allocations: from deep to super-shallow



**The Super-shallow** grid integration charging policy option has been recommended for large scale offshore-wind farms and other RES projects. The LMP based model is critical for supporting RES deployment location decisions

# Shallow vs. Deep Cost Allocation



$$C_{\text{transmission,common}} + \sum_{i=1}^n C_i < \sum_{i=1}^n C_{\text{Transmission},i}$$

## Cost Allocation Issues

- ▶ In different EU Member States there still exist a variety of different, non-transparent cost allocation and cost reimbursement principles for RES-E grid integration and system operation
- ▶ TSO have no incentives for large scale RES-E grid integration, since the corresponding grid related costs are hardly eligible in the grid regulation / grid tariff determination process
- ▶ Empirical case studies provide evidence that the “overall costs” of RES-E grid integration are below 10% of the long-run marginal costs of the RES-E generation technology itself
- ▶ The pattern of RES-E deployment depends to a large extent on the cost allocation method

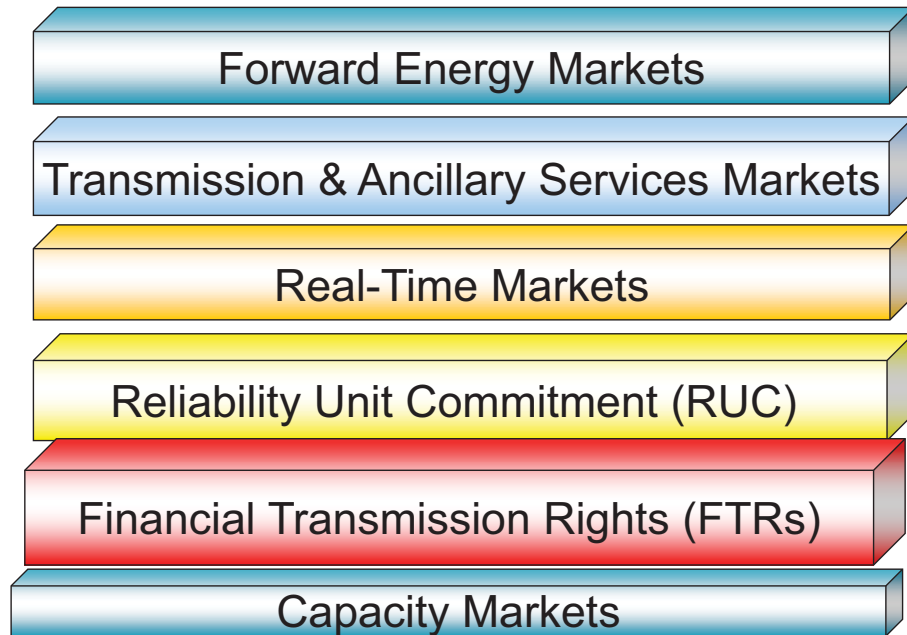
# TSO Incentives

- ▶ TSOs are not motivated to build new cross-border links when they operate in the exporting Zone or a transited Zone since local customers would see a reduction of their social welfare (**Regulators at this 'losing side' of the interconnector might oppose such an investment: National vs. European interests**)
- ▶ In an open market, transmission and generation investments are decoupled, thus coordination is more difficult especially between two countries
- ▶ Proposed Solution: Anticipate the transmission infrastructure construction for facilitating new generation development to minimize social costs
  - Need EU guidelines for maximum delays in national projects

# Electricity Highway

- ▶ Objective: Establish an EU coordinator and a long-term modular development plan by 2013/2014 which should feed into the short-term TYNDP (Commissioning of first highway planned by 2020)
- ▶ ENTSO-E presented the «Electricity Highways Roadmap» at the Florence Forum in May 2011
- ▶ North Sea Offshore Grid is considered as the «incubator» for the European Electricity Highway system
- ▶ The key for developing the pan-European grid architecture will be the guidelines for permits and cross-border cost allocation

# Poland: Energy Market Design



## Integration Models/Market Splitting

- ▶ **Model 1: Single Market Coupling (First Best Solution)**
  - ▶ One-step market clearing (Huge MIP Optimization problem)
  - ▶ Single market clearing algorithm which clears Zonal market simultaneously with Nodal (domestic) market (Nodal market is cleared for all nodes taking into account all resource and transmission constraints)
- ▶ **Model 2: Sequential Market Coupling (Second Best Solution)**
  - ▶ Two-step market clearing: EU Zonal → Polish Nodal
  - ▶ Simplified representation of Nodal market in Zonal market clearing (nodes aggregated into zones; only key resource and transmission constraints reflected)
  - ▶ Separate Nodal market clearing that includes results from Zonal market clearing (energy exchange between zones)

# Conclusions

- ▶ Security of Supply and RES EU policies call for massive investments of transmission grids both within and between the EU Member States
- ▶ ENTSO-E's first Ten-Year Network Development Plan has been a timely initiative that has enabled the policy debate
- ▶ Seamless integration of Electricity Highways with the 400 KN grids requires active participation of the TSOs with proper incentives
- ▶ Implementation of LMP-based energy markets is essential for managing increasing congestion within EU Member States and across borders in the presence of large penetration of RES