Workshop « Wind Power and Market design »

Issues in Economic Analysis of Wind Projects

Paris

Friday 6th of June

Introduction

To present to the participants of the seminar an overview of some of the key risks and uncertainties we face in economic evaluation of wind investments, which are related to market design issues.

- **Corporate strategy department advises Suez Energy Europe's Investment Committee by providing:**
  - Electricity market analysis as a recurrent service to support planning and decision – making processes
  - Specific economic and risk analysis for (typically) power generation investments
- **Our "core" business is market and risk analysis**
- **We need to be able to understand, and challenge, the economic assumptions that are made on balancing markets, system adequacy, and green certificate markets (amongst others)**

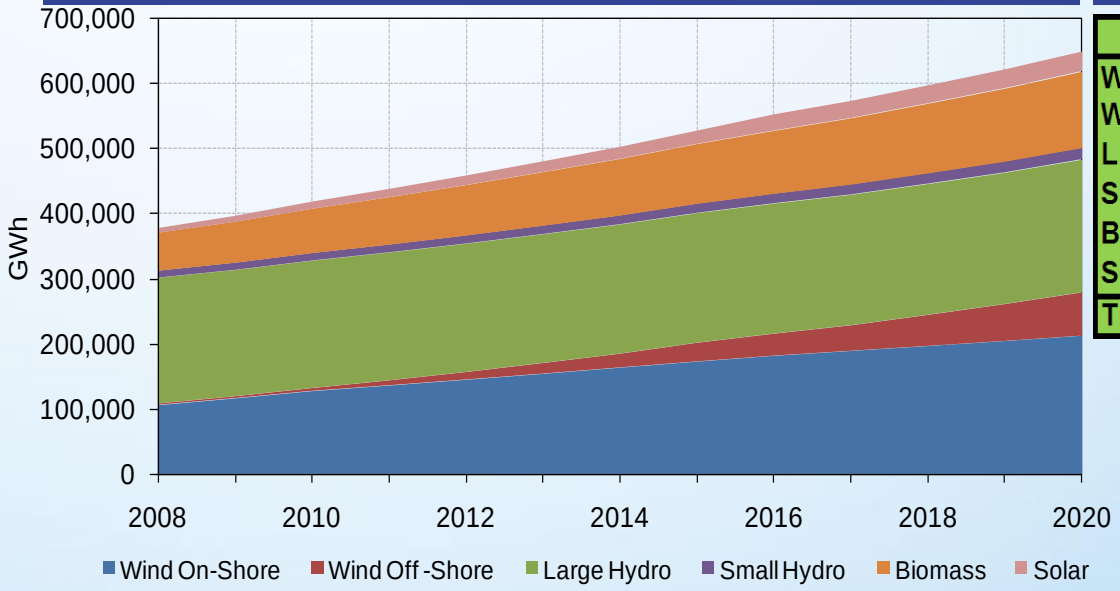
Growing importance of RES-E and wind

1) Today, the “EU Electrabel” RES-E market represents close to 400 TWh, roughly the demand of the UK and approximately 15% of gross generation.

2) In a reference scenario, the sector is expected to grow close to 5% per year, reaching 650 TWh by 2020.

3) Onshore and offshore wind are expected to grow at rates of over 35% and 6% per year respectively, and will play a major role in RES-E deployment.

Development of RES-E production in EU EBL – Reference Scenario



GWh and Growth Rates

Technology	2008	2020	CAGR
Wind On-Shore	105,335	212,163	6.0%
Wind Off-Shore	1,897	66,610	34.5%
Large Hydro	193,908	204,212	0.4%
Small Hydro	10,613	17,658	4.3%
Biomass	58,636	117,571	6.0%
Solar	7,375	29,748	12.3%
Total	377,765	647,962	4.6%

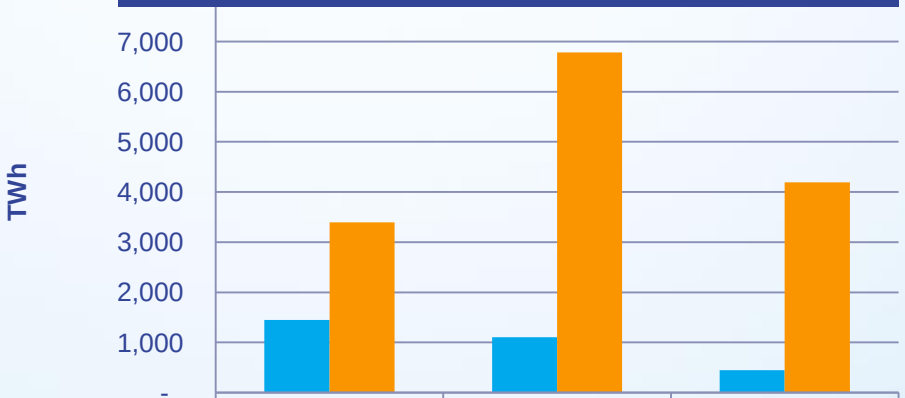
EU 20% RES objective: burden on electricity

1) Not clear if it is achievable…

2) RES target would depend heavily on electricity sector, with contributions from heat & transport sectors

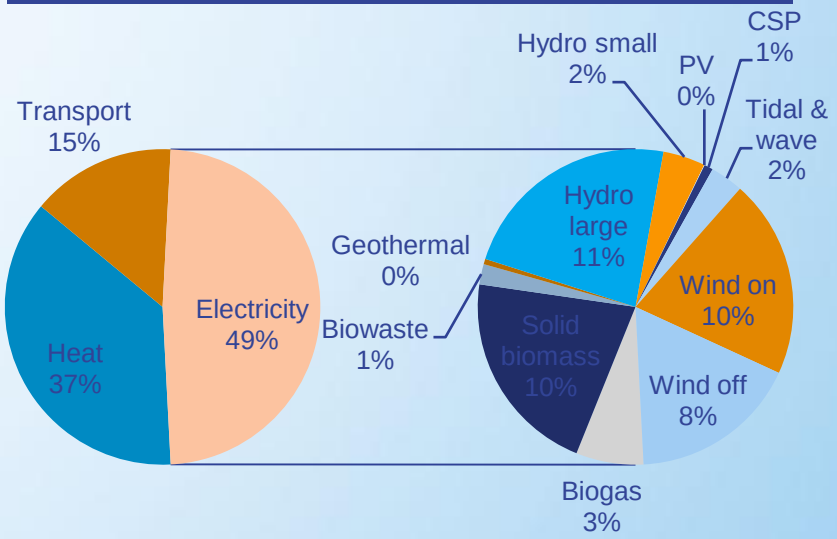
2) Wind would be key contributor: **550 TWh or roughly 200 GW** (major doubts on biomass)

RES breakdown: E, H & T



	Electricity	Heat	Transport
RES share	1,451	1,105	445
Total Demand	3,391	6,780	4,194

RES-E breakdown by technology



Source: Economic analysis of reaching a 20% share of renewable energy sources in 2020 (commissioned by European Commission DG Environment, August 2006)

Evaluating balancing costs of wind installations

1) Since wind is a natural phenomenon, forecasting wind power production is a different task than forecasting other generation forms or forecasting the load

2) The forecast error (RMSE) for a single wind farm is between 10% and 20% of the installed wind power capacity for a forecast horizon of 36 hours

3) The forecast accuracy can be substantially reduced by reducing the time interval between the last forecast and actual delivery (gate-closure time): intra-day forecasts reduce error to about 5%

4) Evaluating balancing costs depends on many factors and is a challenging easy task

Case Study: Offshore wind farm DE

- Proposed EEG system has option for wind farm to sell energy on market after 12+ years
- Conservative assumption was made of day-ahead forecast error
- Assumption was made of symmetric split between overfeeding / underfeeding
- Historic average TSO prices for under- and over-feeding were determined
- Balancing cost €/MWh = FcError x (50% x Punder €/MWh - 50% x Pover €/MWh)

→ **Are there more sophisticated evaluations of balancing costs?**

System adequacy: “capacity credit” of wind

1) System adequacy analyzed by TSOs: compares reliably available capacity with peak load to ensure system can cover peak load (with a reserve margin)

2) Non-usable power fraction of wind typically 80 – 90%, not clear if there is a standard amongst the TSOs for the determination of this fraction

3) We perform Reserve Margin Analysis in our department, to determine for the coming years in different markets, need for additional capacity or on the contrary, excess capacity

4) Numerous factors affect positively and negatively the value of the capacity credit of a certain amount of wind power in the system (penetration, load factor, geography, season). In the range of 15 – 20% (winter, 10% – 20% wind penetration vs. peak load)

Case Study: Wind project in RO

- Proposed new regulatory framework requires back up capacity (fast tertiary reserve) of 60% – 80% for each MW of wind installed (as a condition to get approved)
- Basically means building a GT next to wind park, with the risk on this unit being actually dispatched

→ **Definitely not a very “wind-friendly” system, but could this happen in EU at some point in the future, when high wind penetration begins to affect system adequacy?**

Green certificate markets

1) One of the two main systems to support RES-E development in EU (market based)
2) Obliges suppliers of electricity to provide an increasing quota of green electricity to consumers, which must be demonstrated with green certificates either bought on secondary market or self-produced
3) Value of green certificates evolves with S/D situation, and provides revenues for producers to compensate otherwise unprofitable cost structures of RES-E
4) Regulator controls "market" by periodically increasing quota and adapting profitability of different technologies through "banding" (i.e. 5x for PV, 0.6x for co-combustion of biomass)
5) Inherently riskier than feed-in system, S/D analysis gives insights but high regulatory risk

Case Study: Green certificate market(s) in BE

- Two incompatible regional markets, makes portfolio management difficult
- Numerous actors and lack of transparence leads to a structurally erratic market, which makes investment decisions difficult
- No long-term view on quotas, rules change frequently, fine sets the price…
- We model GC price on basis of LT equilibrium (best we can do…)

→ **Is this really the most effective way to support RES-E?**

Thank you.