Organizational Forms, Competences and Industrial Strategies: the Relations between Manufacturers and Operators in the European Wind Energy Sector

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Aim of the presentation

• Try to answer to some questions:
  ✓ How evolved the wind industry until today?
  ✓ What was the role of the various wind technological systems?
  ✓ What are the main actors and their strategic positions?
In which conditions technological knowledge was created in the wind energy industry?

We can identify two salient phases in the evolution of the organization of the wind industry (Johnson, Jacobsson [2002]):

- **The phase of experimentation**: from the 1970’s to late 1980’s
- **The phase of growth and maturity**: since the 1990’s
The phase of experimentation : 1970 - 80’s

• Technological variety and uncertainty with various competing design for wind turbines
• Two types of policies were implemented to foster wind energy after the oil crisis:
  ✓ ’Technology push’ policies (R&D) in many IEA countries with the will to make multi MW turbines by using existing technologies (‘top down’ strategy)
  ✓ In Denmark an evolutionary model based on ‘technology push’ and ‘demand pull’ policies to develop a specific technological trajectory from small designs (‘bottom up’ strategy)
• Different actors were involved in the development of national wind industries (Dk, Germ., Neth., Swed.)

✓ Public institutions (R&D laboratories, agencies, universities)

✓ Some large firms (aeronautical, electrical, mechanical) with no specific competences to develop MW turbines

✓ Electric utilities in some demonstration projects (Ex: Elsam in Denmark)
✓ Many smaller manufacturers with a variety of competences and a fragmented knowledge base (shipbuilding, electrical agriculture machinery)

✓ Local private owners of turbines, mostly cooperatives, individuals and farmers which played a crucial role in Denmark and Germany
• Characteristics of the early wind technological systems (Dk, Germ, Neth, Swed)

✔ On the manufacturing side

. No scale economies, low degree of assets specificity, non-high tech components and many (potential) suppliers

. According to Transaction costs theory (Williamson [1975, 1985]) no vertical integration between suppliers, manufacturers and operators
On the technology side

In the 1980’s MW size projects never left the prototype stage due to a lack of experience regarding the technology.

The small ‘danish horizontal-axis three bladed’ design was selected in part due to the learning effects created by the ‘Californian wind energy boom’ (1000 MW installed in 1987).
The phase of growth: since the 1990’s

- Wind energy received an institutional backing in Europe:
  - Several countries set up their first wind energy programmes: Germany, Spain (fixed feed-in tariffs)
  - The Electricity Directive (1996) introduced provisions which can be used for RES: public service obligations, fair access to the grid, etc...
  - The RES Directive (2001) fixed the target to double the total share of RES from 6 to 12% by 2010
• From a mechanical and electrical engineering knowledge base the wind energy sector became an international high tech industry with specific components (aerodynamics engineering, software).

• The average size of commercial turbines increased (50 kW in 1985, 1 MW in 2000) and costs dropped: - 50% between 1991 and 1998 in Germany.

• The offshore technology (turbines ≥ 2MW) is now available and secure for large wind parks.
Stakeholders and value chain of wind energy

Components manufacturers

Turbines manufacturers

Turbines owners
- Individuals/Cooperatives
- Electricity utilities
- Petro-gas groups and Independent start-ups

Components manufacturing

Turbines manufacturing

Project management

Wind parks operation

Green electricity trading and distribution
Competitive positions and industrial strategies

- **Wind turbines manufacturers**
  - Oligopolistic sector with strong positions of the danish « historical » incumbents
  - In 2001 the market shares of the first seven manufacturers represented 87%: Vestas (Dk): 23.3%, Enercon (Germ): 14.1%, Neg Micon (Dk): 12.5% GE Wind Energy (USA): 12.3%
  - From their core competences in manufacturing many are integrated in upstream for the crucial components and in downstream through wholly owned local subsidiaries to protect their technology
• **Wind parks projects managers and operators**

  ✓ **Competitive sector**: individuals, a lot of new entrants often by mergers, to acquire new competences from their core business in consulting and operating

  ✓ **From a strong national base some firms developed international subsidiaries with global competences**: EHN, RES Ltd, IVPC

  ✓ **Growing presence of electric utilities and petro-gas groups** (Iberdrola, ENEL Green Power, BP Renewables, Shell Renewables): they try to develop distinctive competences in green electricity production and trading following market’s transformations