

# Stimulating emerging sustainable energy technologies through policy learning - a comparative study of the Danish wind energy and solar cells

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DIME workshop: “Eco-innovation: Policy Perspectives”  
Cardiff, March 17th 2011

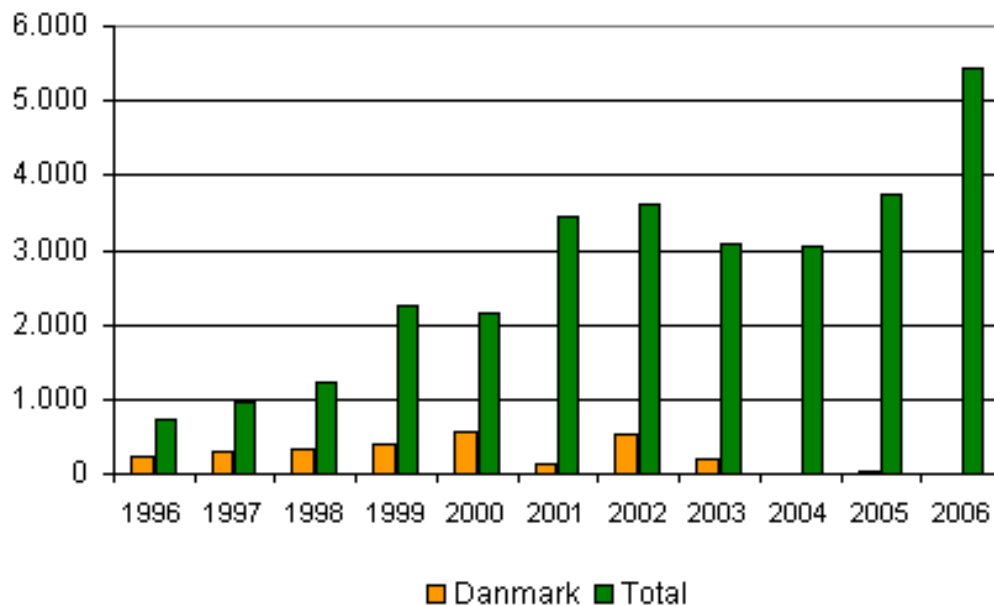
## Main questions

- What policy lessons can be learned from the Danish wind energy case?
- To what extent are these lessons relevant for stimulating other renewable energy technologies in the current Danish and international context (PV as an example)?

Point of departure:

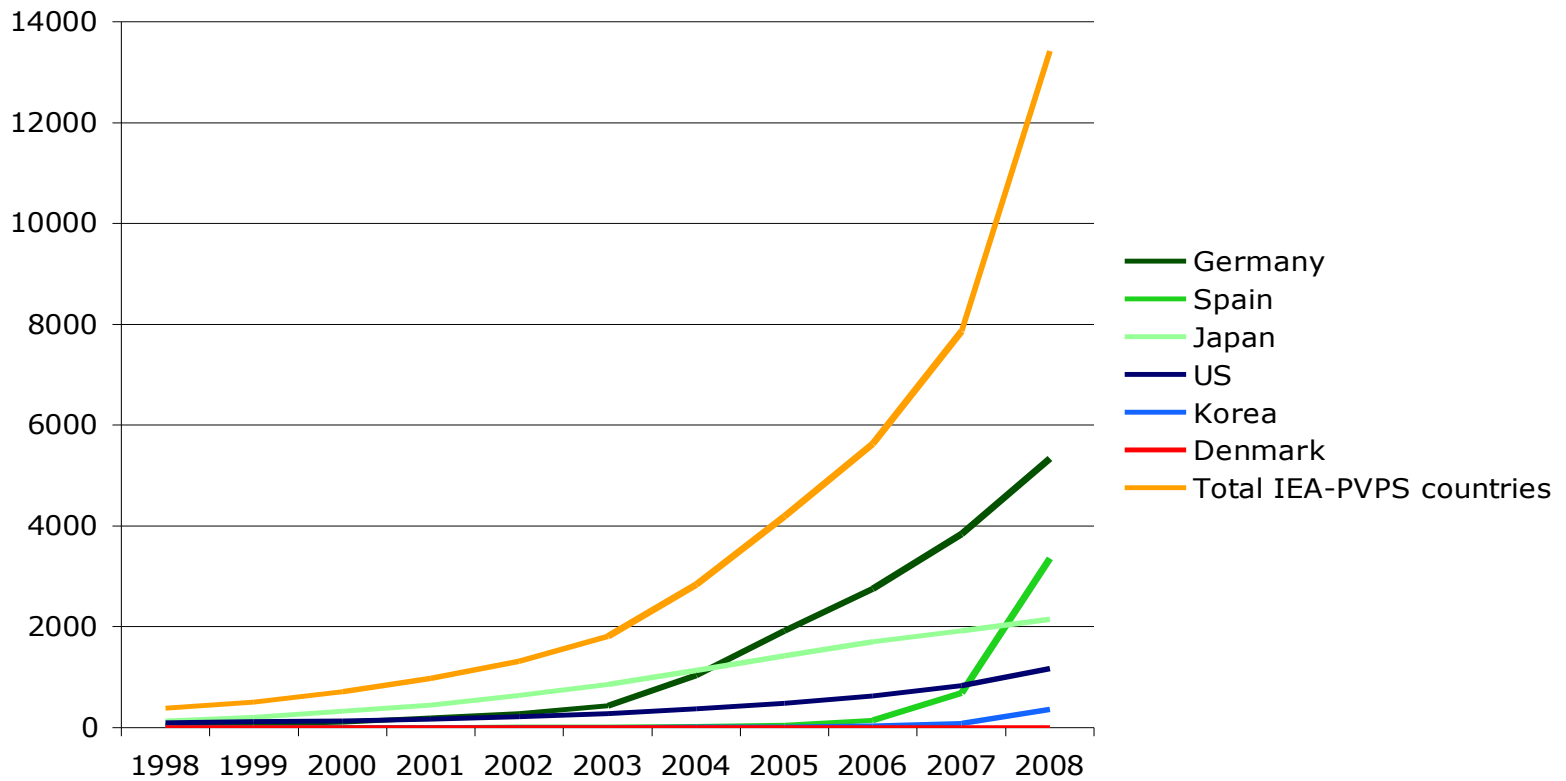
A Policy learning approach may improve policy making in order to stimulate sustainable energy technologies

Figure 1: Wind turbine sales (Danish manufactures) - MW (1996-2006)  
 [Source: Danish Wind Industry Association 2008]



- The wind power industry in Denmark was born in the 1970s.
- In 2008 about 20% of Danish electricity production is from wind power.
- In 2006 Danish wind power producers covered 33% of the global market.

Figure 2: Accumulated installed PV in selected IEA-PVPS countries 1998-2008. Source: IEA-PVPS (2009)



## Learning from hindsight - solar energy (PV) as an example

New context:

- Liberalisation and internationalisation of the energy sector
- Increasing competition
- Internationalisation of knowledge creation and technology development
- Changed institutional setting - for instance IPR
- Increasing role of international policies (for instance EU)

But still relevant to draw lessons from the wind power case

## Policy learning in short

Traditional view (in economics) is to look at policy making as a rational process:

You need:

well-defined goals and instruments, a good model, institutional capability, knowledgeable and well-connected policy-makers.

Policy learning implies a shift in perception of policy as a precondition for change in praxis.

It implies that policy-making itself is a process of learning and that this process more and more takes learning and competence building in many parts of the economy into account.

The goals, the instruments, the models, the data, the competence of the bureaucracy, the organisations and the institutions develop over time in interaction with each other.

Policy learning – direct and indirect

## Policy learning

Policy learning includes the following elements:

- (a) *Forming visions* about the learning economy as an environment for innovation and sustainable development and forming the value premises of innovation policy.
- (b) *Developing a system of innovation approach* including development of new concepts, data, and theories of innovation and systems of innovation.
- (c) *Establishing new practices and routines in the conduct of policy stimulating learning and innovation* including gradually trying, testing, and evaluating new practices and routines.

## Policy learning, continued...

- (d) *Stimulating regional and local experiments* in policy areas in need for reform and developing new methods to evaluate the outcomes of such experiments that take into account learning effects.
- (e) *Institution building* that supports the production and reproduction of human and social capital and diffusing international, regional and local 'good practices' in this field.
- (f) *Analyzing and comparing systemic features* and critically important indicators in a form for benchmarking across regions, organizations and nations.
- (g) *Stimulating democratic participation in the design and implementation of innovation strategies* including forms of ongoing dialogues between employees, unions, researchers and governments.



## Policy learning - lessons learnt

	Wind power	Solar cells (PV)
<p>Forming visions: Included in the national energy plans with ambitious and concrete minimum goals</p>	xxx	-
<p>Developing a system of innovation approach: Coordination of energy policy, innovation policy and industrial policy</p>	xxx	-
<p>Establishing new practices and routines in the conduct of policy stimulating learning and innovation: Combination of different policy instruments (market and non-market), Public technological procurement, full-scale demonstration projects.</p>	xxx	x
<p>Stimulating regional and local experiments: Public programs opening up for local experiments with different solutions combined with knowledge sharing between users, producers and researchers.</p>	xxx	x

## Policy learning - lessons learnt, continued

	Wind power	Solar cells (PV)
Institution building: Supporting networks, partnerships. Strengthen education (on all levels)	xxx	x
Analyzing and comparing systemic features: Systematic monitoring and benchmarking of different performance indicators, ....	xxx	-
Stimulating democratic participation in the design and implementation of innovation: Broad social accept, participation, economic incentives.	xxx	-

## Summing up policy implications

1. The high degree of diversity between different energy technologies implies that an effectual innovation and energy policy has to take into account these differences. Policy initiatives have to be technology specific (technology sensitive innovation policy depending on for instance degree of technology and market maturity)
2. New emerging energy technologies and energy systems as for instance solar energy requires public support stimulating both supply and demand side in order to be competitive with established fossil fuel technologies (for instance Public Innovative Procurement as a direct policy tool).
3. A broad mix of demand-pull and technology-push policies is necessary, if new renewable energy technologies as for instance solar energy should develop into a 'serious' contributor to Danish energy production and at the same time generate future opportunities for Danish companies. (R&D is not enough, renewable energy technologies requires market support; coordination and long term strategies/policies, avoid Stop-Go policy)

## Policy implications, continued..

4. Continued innovation requires variety with room for experimentation and evaluation of alternative solutions to technological, organizational and institutional problems.
5. Maintaining a long-term, pro-active policy with specific and ambitious targets for implementing renewable energy systems is essential. Especially domestic competence building and interaction + international collaboration
6. [Difficult to apply the lessons from the Danish cases to other contexts (sectors, technologies, countries), but a policy learning approach may be a helpful tool.]

Thank you for your attention

