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In Light of the Future: Innovation, Institutions and Governance

LCS-Rnet 7th Annual Meeting 15-17 June, Paris

LARS J. NILSSON - ENVIRONMENTAL AND ENERGY SYSTEM STUDIES





LC-society transition challenges

- Bioenergy and land-use governance
- The power system: the Nordic countries as a power island, exporter or green battery?
 - Integration, T&D planning and investment, grid codes, storage technologies, hydro conflicts, etc...
- Transport sector
 - Technical fix versus travel patterns, biofuels, electric, or electrofuels (power-to-gas or liquids)
- Energy intensive basic materials industry
 - Relatively unexplored, subject to international competition and carbon leakage risk



Energy intensive basic materials

- Metals (e.g., copper and steel), minerals (e.g., lime and silicon) and various organic compounds (e.g., cellulose fibers and plastics) in a circular economy
- Mitigation options:
 - Carbon Capture and Storage
 - Biofuels
 - Electricity and hydrogen/electrofuels
- Few, if any, co-benefits.
- Only more expensive (from 30 % for steel to 300 % for plastics)
- Potentially large electricity user (e.g., +1500 TWh in EU)

Four simple observations on LCS transitions and innovation

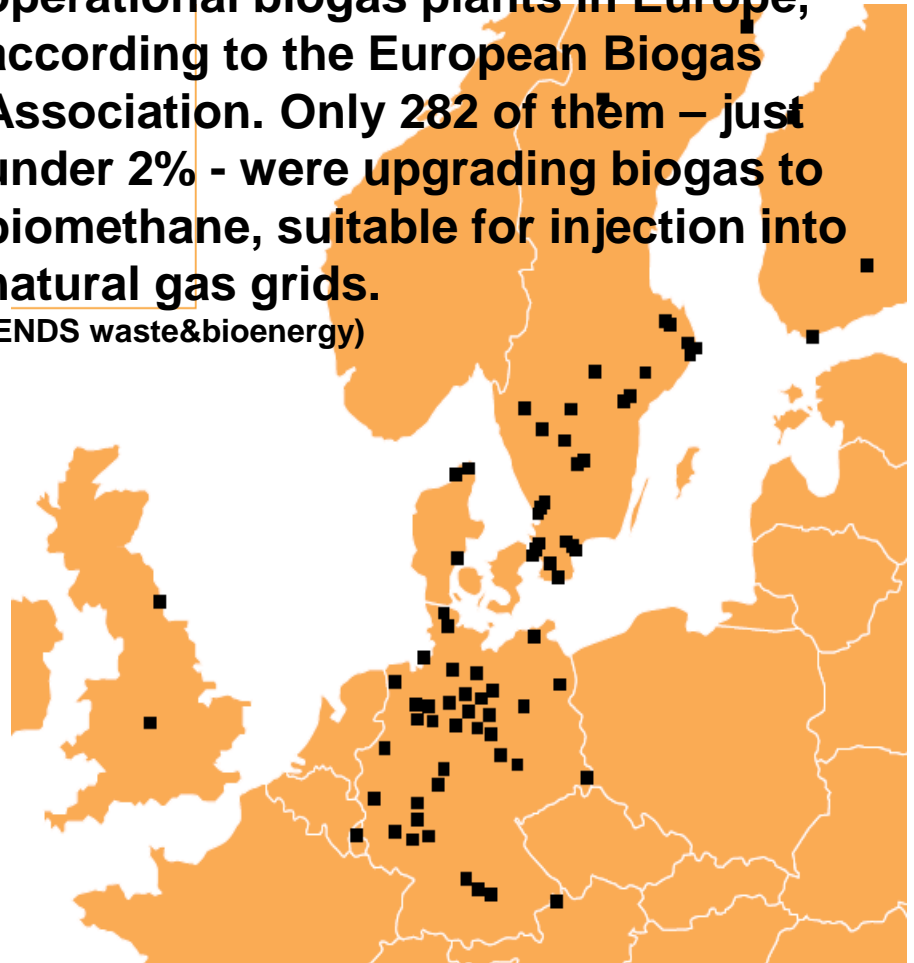
- Develop integrated and coherent innovation policy across policy domains; push (RD&D) and pull (market demand, public procurement)
- Understand the complexity of technologies, systems, contexts, logics, transition pathways, markets, actors, social norms, timing, etc.
- Winners can be picked (i.e., question the 'truthiness' that governments should not pick)
- Consider the role of incumbents versus new actors (not all changes are 'Kodak-moments')



The example of Malmberg Water biogas upgrading technology



At the end of 2013 there were 14,500 operational biogas plants in Europe, according to the European Biogas Association. Only 282 of them – just under 2% - were upgrading biogas to biomethane, suitable for injection into natural gas grids.
(ENDS waste&bioenergy)

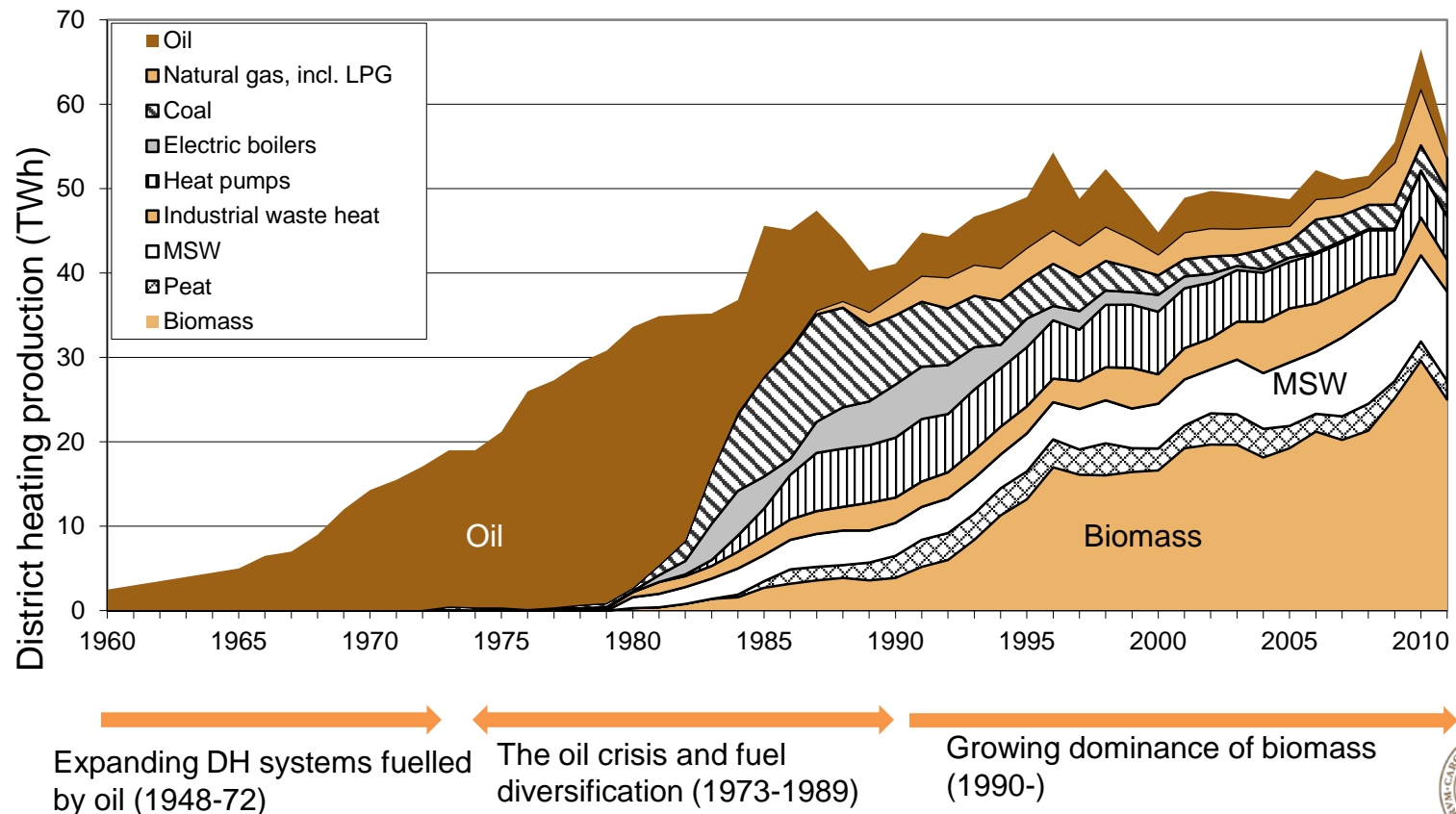


Complexity, context and path dependence

- Contexts and pathways matter (Swedish examples):
 - High Voltage DC och mobile telephones (geography)
 - New internet businesses, e.g., Minecraft, Battlefield, Skype and Spotify (broadband infrastructure)
 - TCO-labelling and water based paints (workers safety)
 - Bioenergy technologies (heat demand, district heating and the forest industry)
- General purpose technologies and spill-over (e.g., semiconductors, batteries and electric motors) versus 'single use' (e.g., CCS)
- Leadtimes, scales and markets/actors (LED-lamps vs blast furnaces and biorefineries)



A historic case: Two major transitions in space heating during 50 years



Executive Order 13221—Energy Efficient Standby Power Devices

July 31, 2001

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the National Energy Conservation Policy Act (Public Law 95–619, 92 Stat. 3206, 42 U.S.C. 8252 *et seq.*), as amended by the Energy Policy Act of 1992 (EPACT) (Public Law 102–486, 106 Stat. 2776), and section 301 of title 3, United States Code, and in order to further encourage energy conservation by the Federal Government, it is hereby ordered as follows:

Section 1. Energy Efficient Standby Power Devices. Each agency, when it purchases commercially available, off-the-shelf products that use external standby power devices, or that contain an internal standby power function, shall purchase products that use no more than one watt in their standby power consuming mode. If such products are

sis



For the purpose of this order, military departments, as defined in 5 U.S.C. 102, are covered by the Department of Defense.

George W. Bush

The White House,
July 31, 2001.

9, promoted by Alan Meier at LBL

To pick a winner: The development of heat pumps in SE

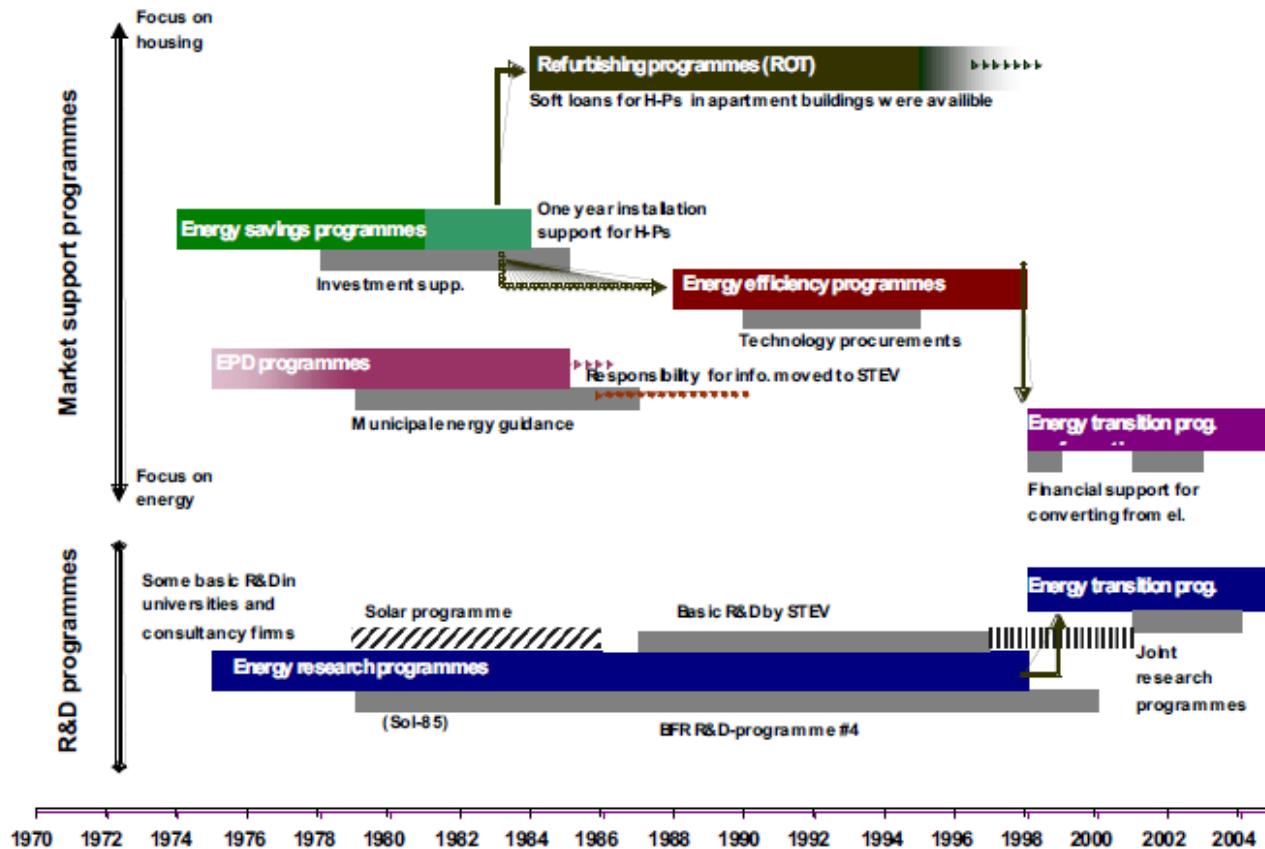
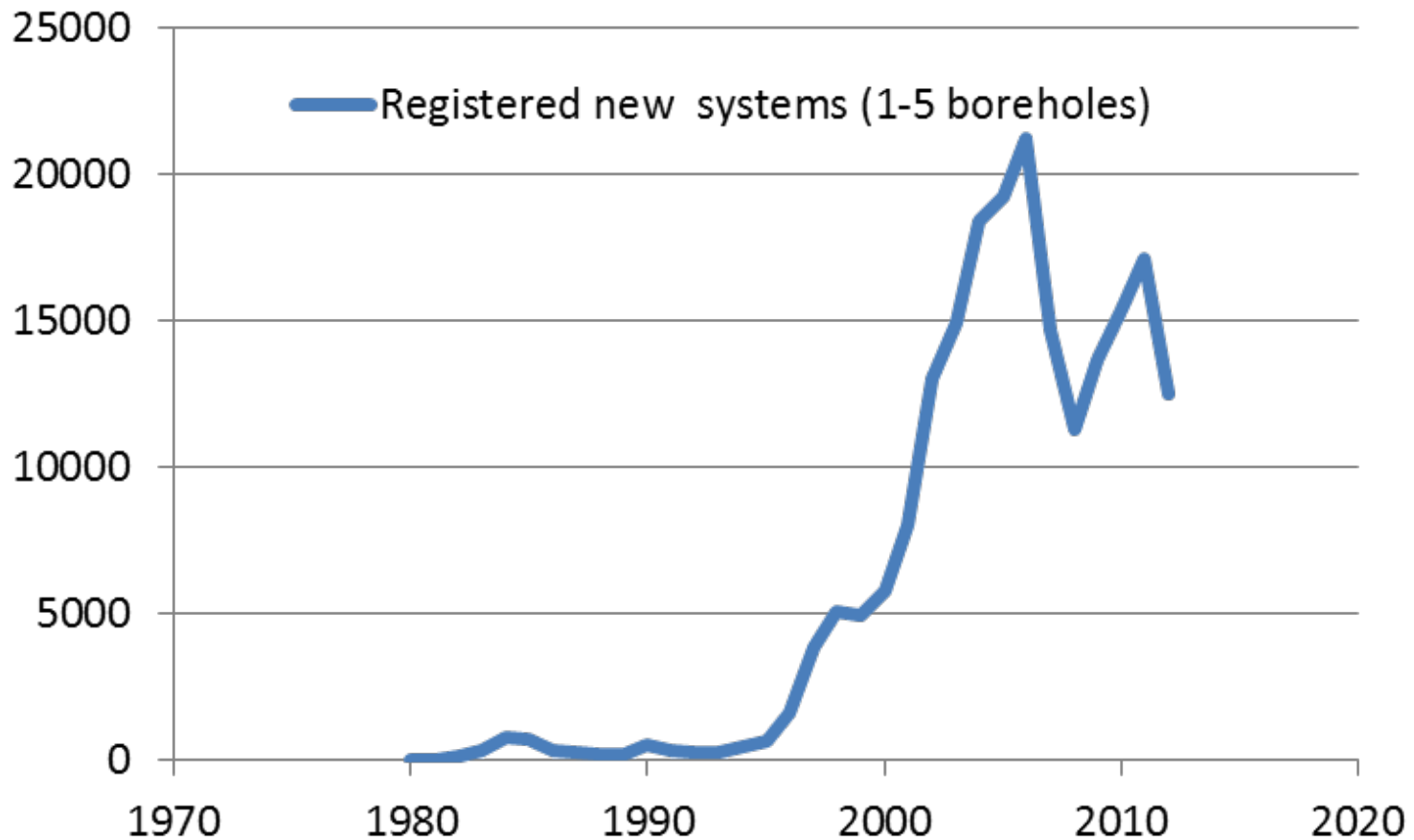


Figure 3. Major Swedish public support programmes of relevance to heat pumps between 1974 and 2004. (Based on several official sources.)

Source: Nilsson, Åhman and Nordquist, 2005, Cygnet or ugly duckling – what makes the difference? A tale of heat-pump market developments in Sweden, ECEEE



The development of borehole ground source heat pumps in Sweden



Transition governance; conflicting ideas

- **One perspective:** The state should only intervene if there is a market failure (e.g. environmental costs, lack of R&D and information) to correct and improve the market to make it more efficient.
 - Economy-wide market based technology neutral policy instruments for CO₂ are efficient.
- **Another perspective:** The state has an important role in governing and driving the transition to sustainable energy and transport systems and the long-term restructuring of society.
 - Multi-objective long term sequential policy strategies for sustainable cities/transport/industry.

Governance approaches

Provide clear and stable direction



- Develop long term innovation and industrial development policies aimed at preparing for deep emission reductions post 2020 and 2030. Selected areas can be targeted, winners picked.
- Explore and develop mechanisms for greater transparency, participation and monitoring/evaluation of policy in a LCS transition context.
- Reconsider whether existing administrative structures, organisations and jurisdictions in government are well suited to govern the transition. Mechanisms for coordination between levels, sectors and different policy domains. Scenarios as mechanisms for learning and strategizing about policy, as well as for policy integration.
- Create new pathways and long term lock-in situations that are consistent with low carbon transitions. Stable investment conditions. Some countries have/consider climate legislation.



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The road to Paris?