ENERGY RENOVATION OF EXISTING BUILDINGS

Danish Case Study

Niels I. Meyer

Technical University of Denmark

nim@byg.du.dk

INTERNATIONAL BACKGROUND

Grim picture

- Failing international negotiations on mitigation of global warming and climate change (COP 15,16,17, Rio + 20).
- US and China refuse binding commitments.
- Increase in global temperature on the path towards 4 degrees centigrade or more – not towards 2 degrees.
- All new empirical results point in the wrong direction.
- Greenland is melting faster than anticipated.
- More extreme dry and hot periods related to global warming – e.g. James Hansen (Proc. Natl. Acad. Sci., USA, 2012).
- Bonanza in shale gas – delaying renewables + pollution risk.

Niels I. Meyer

DANISH BACKGROUND

Examples of targets in national energy agreement 2012

- Wind power to cover 50 % of Danish electricity consumption by 2020 – a doubling compared to 2012 *(ambitious)*.
- Renewable energy covering 35 % of total energy by 2020.
- CO2 emission reduced by 34 % by 2020 compared to 1990.
- Coal plants phased out by 2030.
- Oil heaters phased out by 2030.
- Electricity and heat covered completely by RES by 2035.
- Total Danish energy consumption covered by RES by 2050, including transportation.

Niels I. Meyer
Salzburg, August 29, 2012/3

CEESA PROJECT – www.ceesa.dk/publications

Sponsored by Danish Stratecical Research Council

- **Overall goal**: Develop detailed scenarios for outphasing of fossil fuels in all sectors of the Danish energy supply system (including transport) before 2050.
- **Scenario road map***:* years 2015, 2020, 2030 and 2050.
- **Framework:** Goal to be reached, in principle, by national resources, i.e. as little energy import and export as possible.
- **Policy instruments:** Focus on new and efficient policy means, securing desired goal with balanced societal consequences.
- **Secondary criteria:** Low cost solutions, positive employment and export effects.

Niels I. Meyer
Salzburg, August 29, 2012/4

ENERGY FOR BUILDINGS

- About 40 % of energy consumption in industrial countries related to buildings (heating, cooling, electricity).
- New low energy houses with drastic reduction of yearly energy consumption. More attention needed for energy involved in building materials (life cycle analysis).
- Main problem is *existing houses* with lifetimes of 50 to 100 years compared to urgent need for energy reduction.
- Danish building stock in 2050 will consist of 70% to 80% of todays buildings.
- This paper will focus on barriers and solutions for *energy renovation of exisisting houses* (mostly Danish data).

HISTORICAL DEVELOPMENT OF ENERGY INTENSITY IN DANISH HOUSES

- Energy *intensity* (heat and electricity per m2 per year) has been reduced over the last 25 years from 195 kWh to 165 kWh (25 kWh related to electricity).
- Mainly due to extra insulation in old buildings (promoted by subsidies) and less energy intensity in new buildings.
- Total energy *consumption* has been increasing - mainly due to increasing living area per person *(rebound effect)*.
- This development requires new policy strategies in order to fulfil the official targets of energy conservation – with focus on renovation of existing houses.

BARRIERS FOR EFFICIENT RENOVATION

Negative investor considerations and lock-in to old systems

- Too long pay-back times.
- Preference for investment in modern kitchen, larger panorama windows, new organisation of rooms etc.
- Better wait until a major renovation is necessary.
- Private comfort is disturbed during renovation.
- Major renovations may harm the original architecture.
- Lack of detailed knowledge concerning economy and comfort advantages in spite of campaigns.
- Lock-in to old tariff systems.
- *Policy means have to overcome these barriers.*

Niels I. Meyer
Salzburg, August 29. 2012/7

POLICY MEANS FOR RENOVATION OF HOUSES (1)

Reform of district heating tariffs

- About 60% of heat demand in Danish households is supplied by cogeneration plants and district heating systems.
- The fixed share of the tariff varies with location but goes up to 60 % in some cases.
- Societal economy supports investments leading to reductions of heat intensity of about 50%. Present tariffs prevent that.
- Proposed solution: *abolish fixed part of heat tariff* – possibly combined with an economic compensation for young district heating systems.

Niels I. Meyer
Salzburg, August 29, 2012/8

POLICY MEANS FOR RENOVATION OF HOUSES (2)

Green building taxes and subsidies

- *Green building tax graduated with energy intensity.* This scheme requires *labelling of energy intensity of all houses*.
- *Tax reductions and other forms of subsidies in relation to strong renovations and installation of RES.*
- A number of old houses can not be economically renovated: *the government may pay the owner to dismantle the house and replace it by a passive house.*

Niels I. Meyer
Salzburg, August 29, 2012/9

POLICY MEANS FOR RENOVATION OF HOUSES (3)

New societal systems

- Green taxes are hitting low-income groups relatively strongest. This problem may be reduced by *introducing an energy cap per person below which the tax is low or zero and above which the tax is progressively rising.*
- A supplementary scheme is called *Personal Carbon Allowances (PCAs) where all citizens have the same CO2 allowance for private heat and electricity, private car driving and private air travel*. The money credit card would have to be supplemented by a CO2 credit card.
- The PCA system has been discussed in the UK parliament.

Niels I. Meyer
Salzburg, August 29, 2012/10

POTENTIAL FOR ENERGY SAVINGS BY RENOVATION

- The Danish SBI institute finds a potential reduction of about 30 % of present energy consumption in buildings (private houses and commercial buildings) by renovation.
- In absolute numbers improved insulation provides 37 PJ/y and renovation of installations 24 PJ/y out of 203 PJ/y total.
- This is a conservative estimate, and more efficient policy means will lead to potential reductions of about 43 %. This is without new societal systems like Personal Carbon Allowances etc.

Niels I. Meyer
Salzburg, August 29, 2012/11

CONCLUSIONS 1

- There is a large potential for energy conservation by renovation of existing building.
- This potential will not be realised without new systems for tariffs, taxes and institutional organisations.
- The new Danish government is presently investigating new policies to harnish the potential energy reductions by renovation of existing buildings.
- Unfortunate late news (August 27): Danish government proposes reductions in subsidies for house renovations!

Niels I. Meyer
Salzburg, August 29, 2012/12

CONCLUSIONS (2)

Personal reflections on international solutions

- A new club of international fore-runners should be created.
- New economic paradigm with less attention to GDP and more attention to sustainability, ecological economy - and *"limits to growth", equity* and *global solidarity (re Ross Jackson).*
- Changes needed in present employment policies including lower working hours, sharing of paid work, more free time.
- Rich countries can afford a general *citizens salary.*
- New institutional frameworks and taxation systems.
- Precautionary Principle - No new coal plants without CCS.
- 50 % of known coal and oil reserves to remain underground in order to keep global temperature increase below 2 degrees.

Niels I. Meyer
Salzburg, August 29, 2012/13

THANK YOU FOR YOUR ATTENTION

nim@byg.dtu.dk

www.ceesa.dk/publications

REFERENCES

- Tina Fawcett, Frede Hvelplund and Niels I. Meyer: “Personal Carbon Allowances”, Conference paper for “Energizing Markets”, October 31, 2008 at Copenhagen Business School, Denmark. *nim@byg.dtu.dk*
- Ross Jackson: ”Occupy World Street”, Chelsea Green Publishing, Vermont, USA, 2012.
- Niels I. Meyer, Frede Hvelplund and Jørgen S. Nørgård: “Equity, Economic Growth and Lifestyle”, chapter 4 in “Energy, Sustainability and the Environment”, Elsevier publishers, the Netherlands, 2011.
- Niels I. Meyer: “New Systems Thinking and Policy Means for Sustainable Energy Development”, chapter 16 in “Paths to Sustainable Energy”, Intech Open Access Publisher, Austria, 2011, www.intechopen.com
- Herman Daly: ” Ecological Economics and Sustainable Development”, in Advances in Ecological Economics, Edward Elgar Publishers, Northhampton, MA, USA, 2007.