Low Carbon Societies Network

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GERMANWATCH

INFORSE-EUROPE
International Network for Sustainable Energy

PIK

C.I.R.E.D.

100% Renewables and Low-Carbon Scenarios in Europe - a Comparison

EU Sustainable Energy Week

EUSEW
Brussels 14/04/2011

Gunnar Boye Olesen,
International Network for Sustainable Energy
(INFORSE-Europe)

100% Renewables and Low-Carbon Scenarios in Europe - a Comparison

Gunnar Boye Olesen, International Network for Sustainable Energy (INFORSE-Europe)

100 % Renewables and Low-Carbon Scenarios in Europe by 2050. EU Sustainable Energy Week, April 14, 2011, Brussels

Lowcarbon Socities Network Project, supported by EU FP7 program

INFORSE-Europe in Lowcarbon Societies Network

- INFORSE-Europe is network of 80 NGOs
- Collecting Lowcarbon scenarios: 80% greenhouse gas reductions in EU / allowing climate stabilising at or below 2'C global temperature increase
- Produce newsletter
- Maintain website, www.lowcarbon-societies.eu
- Mailing lists, sign up at website

INFORSE-EUROPE
International Network for Sustainable Energy - Europe

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100% Renewables and Low-Carbon Scenarios:

- 4 Global scenarios: Greenpeace/DLR, INFORSE/Roskilde University, WWF/Ecofys, PIK with REMIND-R, CIRED with IMACLIM
- 5 EU level scenarios: EU roadmap2050, Eur. Climate Foundation, Greenpeace+EREF, Greenpeace En.Evolution, INFORSE
- 23 scenarios of EU countries (of which 13 in France, Germany & Denmark)
- 5 scenarios of countries outside EU (USA, Australia, Belarus, Ukraine, Russia)

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Scenarios are Very Different

- Technical/engineering: no economy
- Micro economic/bottom-up
- Macro-economic/top-down
- Hybrid (linked bottom up and top-down models)

- Annual or hourly balances
- One electricity pool/market or more load centers linked with physical constraints
- Single (future) year or evolution scenarios
- Economic optimisation or purely input based

"Comparing apples to oranges"

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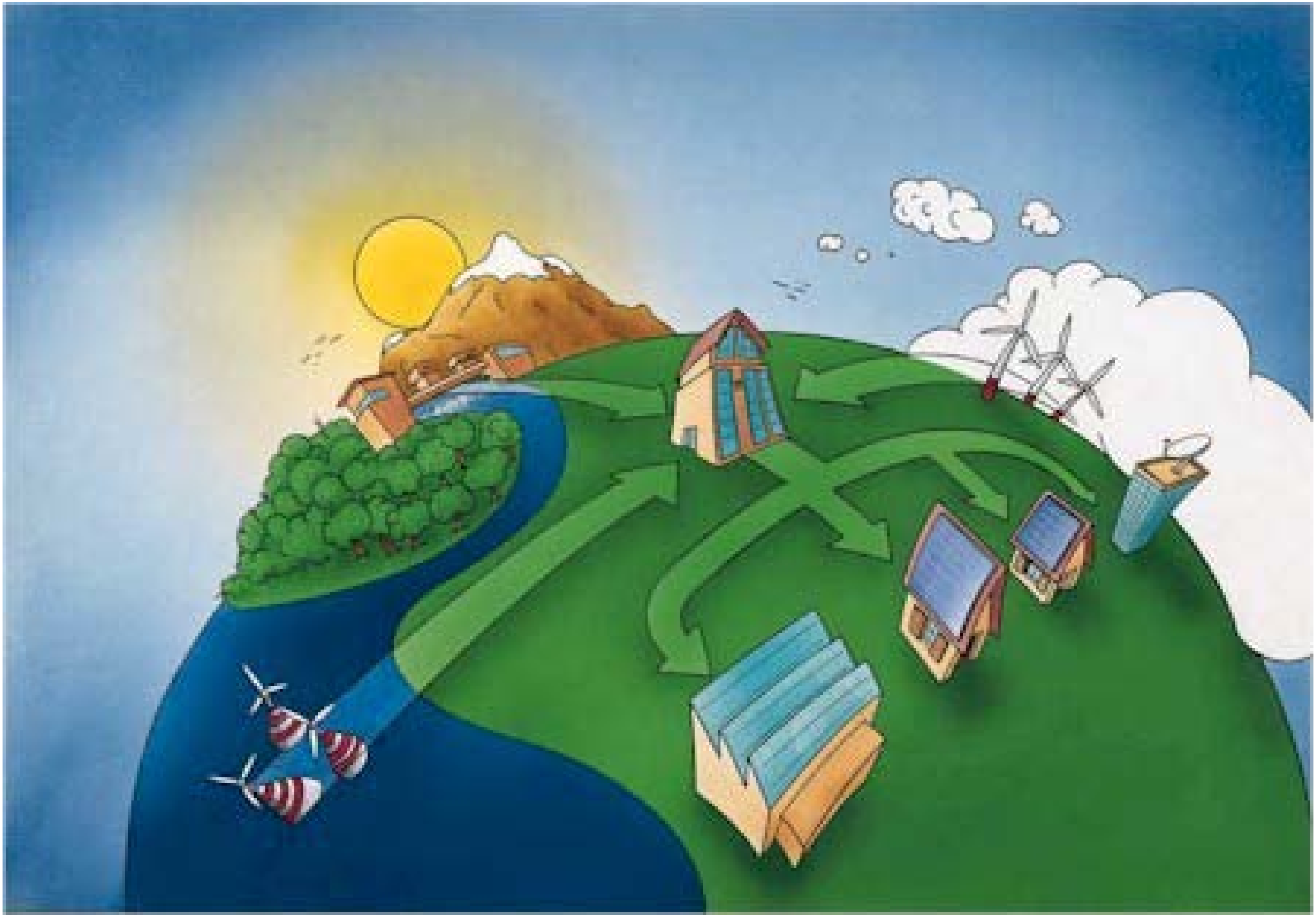

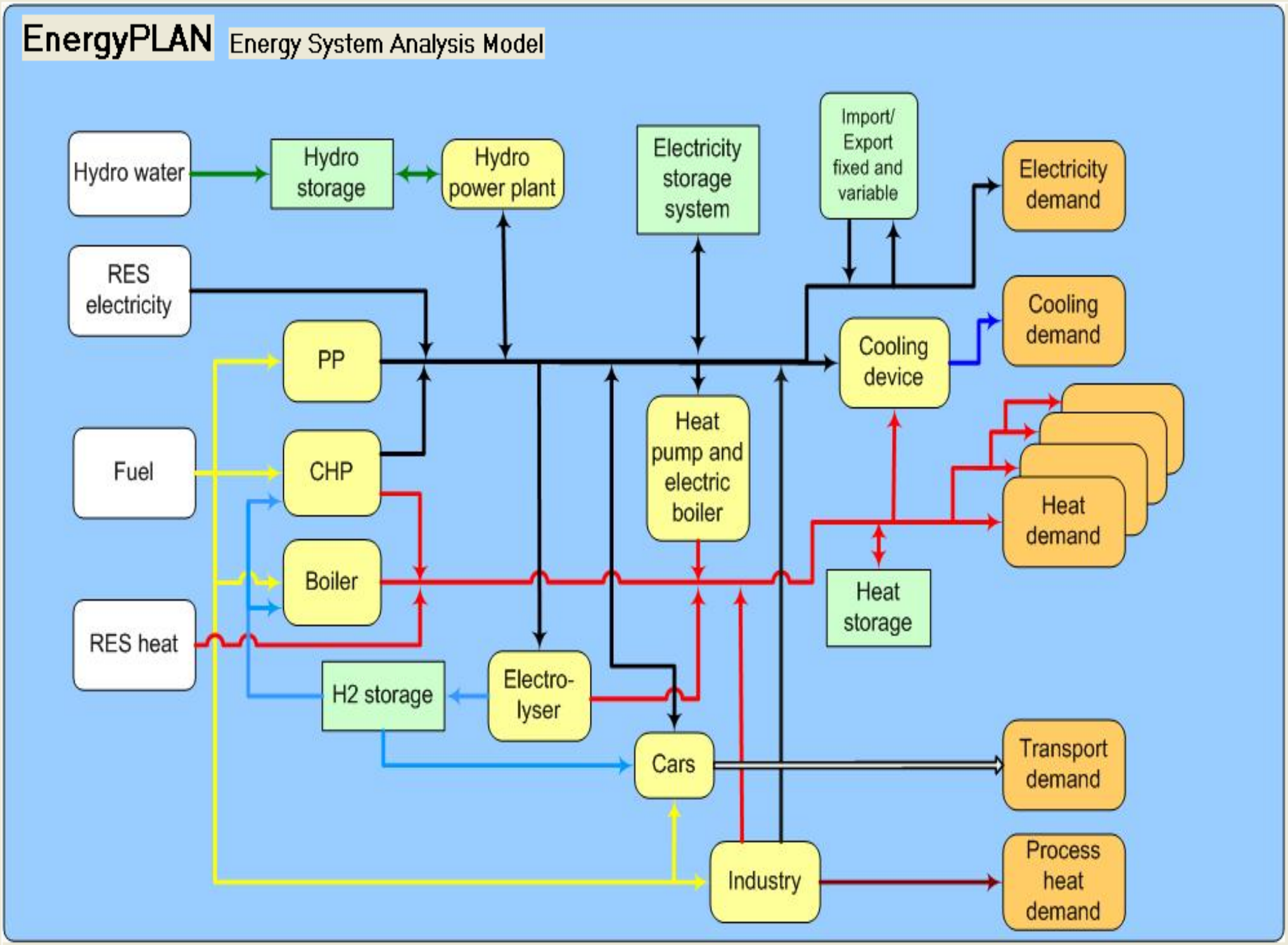
EnergyPLAN
Energy System Analysis Model
Hydro water
Hydro storage
Hydro power plant
Electricity storage system
Import/ Export fixed and variable
Electricity demand
RES electricity
PP
Cooling device
Cooling demand
Fuel
CHP
Heat pump and electric boiler
Heat demand
Boiler
Heat storage
RES heat
H2 storage
Electro-lyser
Cars
Transport demand
Industry
Process heat demand

Global Scenarios

Technically we can supply energy services for 9 billion people and better standards than today in 2050 with renewable energy - if we use energy efficiently
(INFORSE/Roskilde University, WWF/Ecofys, Greenpeace/DLR)

Costs for lowcarbon transition around 1.5% af GDP
(PIK with REMIND-R, Aug 2009, multi-regional economic hybrid model) for global Lowcarbon scenarios for the period 2000 - 2050,

Costs less than 1% in annual average of GDP for 100% renewable energy scenario
(WWF/Ecofys2010, Greenpeace/DLR 2010, multi-regional bottom-up)

Some macro-economic studies have shown very high costs of CO_2 reductions (Neo-classical models by Nordhaus et.al.)

“Costs of business as usual is biggest uncertainty”

EU

EU can reach 100% renewable energy in 2050 with moderate growth or stable use of energy services (economic growth is somewhat different from growth in energy services)

(INFORSE2010, Greenpeace+EREC2010, Greenpeace/Energynautics2010, Eur. Climate Foundation2010, FoE/Stockholm Env. Institute 70% greenhouse gas reductions by 2030. Eur.)

One scenario with 100% RE by 2040 (INFORSE)

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EU – Scenario Costs

European Climate Foundation(ECF):

- up to 0.07%/year increase in GDP (positive contrib.),

EU Roadmap2050 :

- 1 bill €/year savings - 2 bill €/year extra costs in average, depending on fossil fuel prices.

(EU Commission/PRIMES, 80% greenhouse total greenhouse gases, 85-90% fossil fuel)

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EU- Other Effects:

Employment:

- large employment increase, 1.5 million jobs (EU Roadmap 2050/different model)

Energy import reductions: 50-100% reduct.

Electricity Networks:

- ECF: Massive investments in networks, mainly Southern Europe & Central Europe.
- Greenpeace/Energynautics: Massive inv. In networks: about 4 bill. € /year until 2050

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National Scenarios

- Technically we can have 100% renewable energy for all countries studied, a few with some electricity imports, (but we have no Lowcarbon scenarios from some difficult countries like Belgium, Netherlands)
- 100% RE can be done until 2050, 2040 or even 2030 according to different scenarios.
- Some economic models concluded it was difficult to reach 100% renewable energy (and made no 100% RE scenario)

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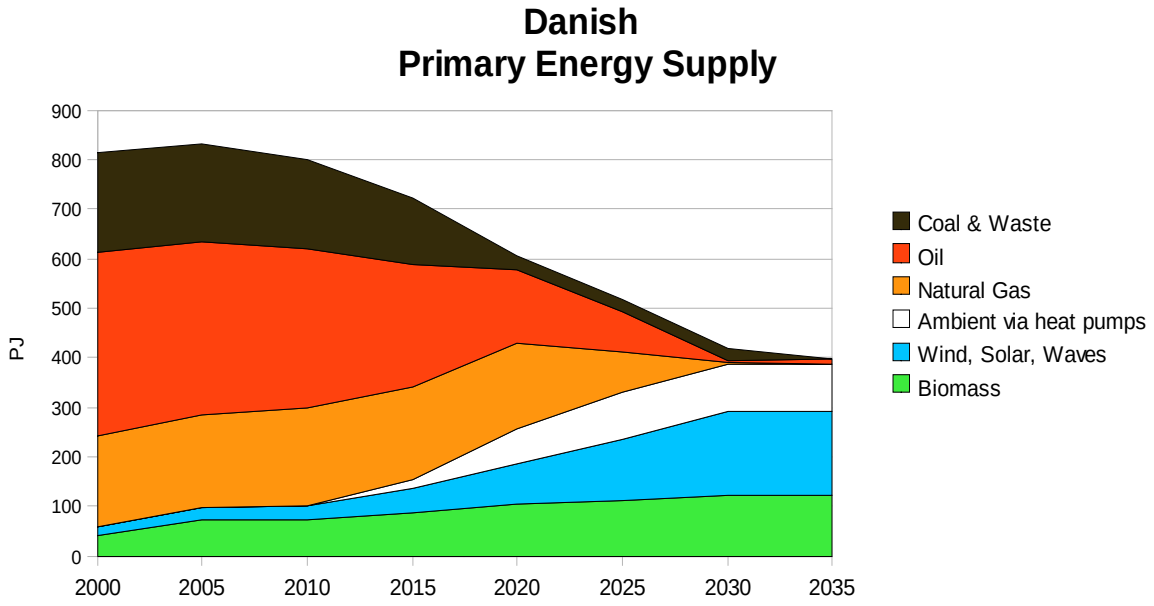
Two scenarios has 100% Renewable by 2030

RenewableEnergy & INFORSE 2009-2010



Both are engineering/micro-economic scenarios, one show good economy in 2030 as a point in time

Analysing National Scenarios

Costs:

- Micro-economic models: lower or higher costs than baseline,
- Macro-economic models: higher costs than baseline, but not radically higher,

Employment: positive, because of more local energy production, small extra costs

Energy import reductions, increase security of supply

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Other effects

- Additional investment required in first two decades
- Increased electricity use for transport & heat pumps for heating
- Electricity grid important, but expansion differ, from larger increases than in EU-scenarios to no increases needed for international lines
- Gas grid proposed for storage and back-up for power supply
- Reduced primary energy demand (30% - 60%) from efficiency + less condensing power plants

Renewable vs. Nuclear vs. CCS

- There is a choice (we do not need all)
- With optimistic assumptions for nuclear, nuclear shows economic benefits
- Nuclear scenarios do not include realistic external costs (those analysed)
- With optimistic assumption CCS show economic benefits, realistically after 2030
- A diverse renewable mix seems most economic for RE-scenarios, as each source is limited, so last part is more expensive

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Thank you

See:

http://www.lowcarbon-societies.eu