NEP 2010
Nordic Energy Perspectives

The Nordic role in a European and global energy

Tiina Koljonen

Nordic Energy Perspectives
Stockholm, 27 April 2010

Future scenarios on energy and climate change mitigation

Definition of the future scenario by Kaapo, 11 years:

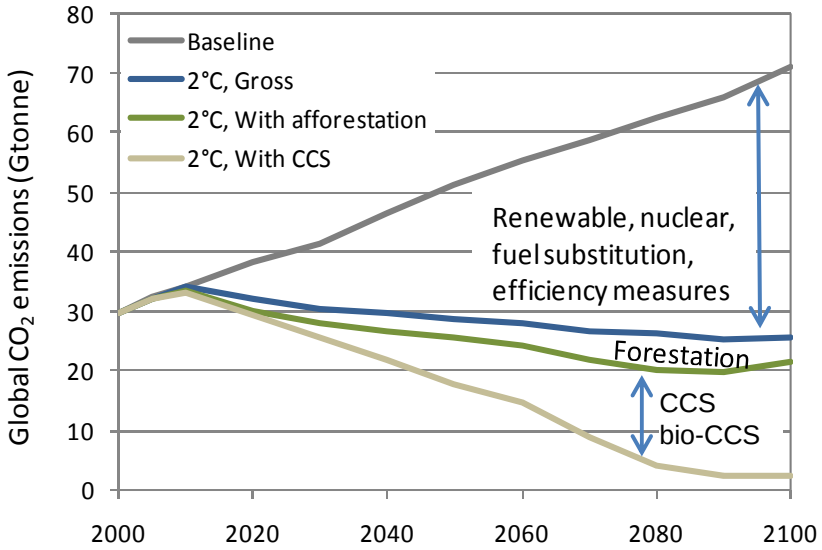
Future scenario means that research scientist, who is sticking diagrams and tables together, continues the temperature graph towards the future:

- at first based on argumentation
- then by largely exaggerating
- finally by purely guessing
- and after that the researcher makes a picture of the future with a computer based on this guessing.

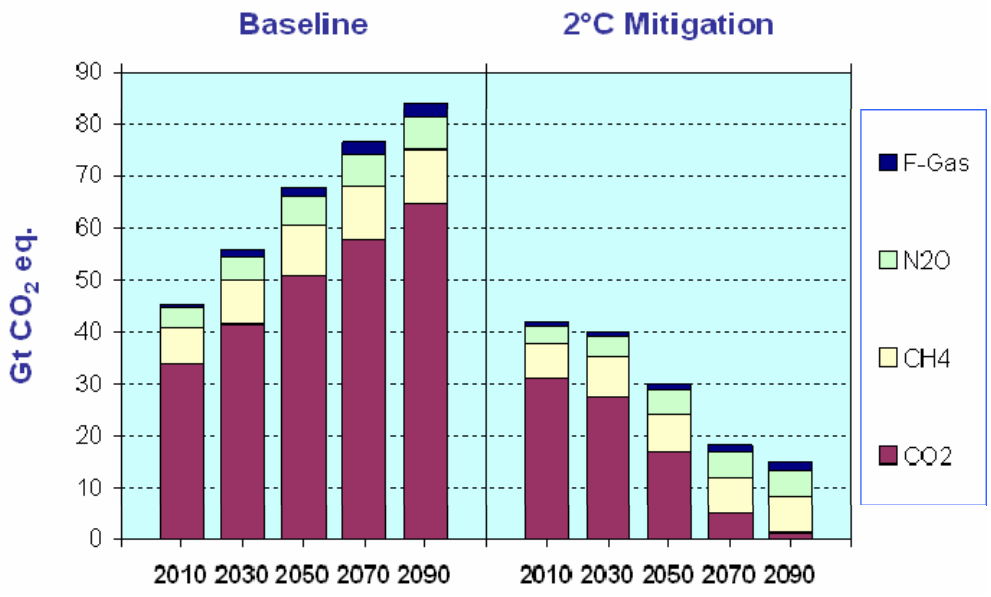
Source: Spring buzzer, April 2010, 51st edition (In Finnish)

The global climate challenge to achieve 2 ° C mitigation target – Carbon neutral society to be achieved

Global CO_2 emission paths



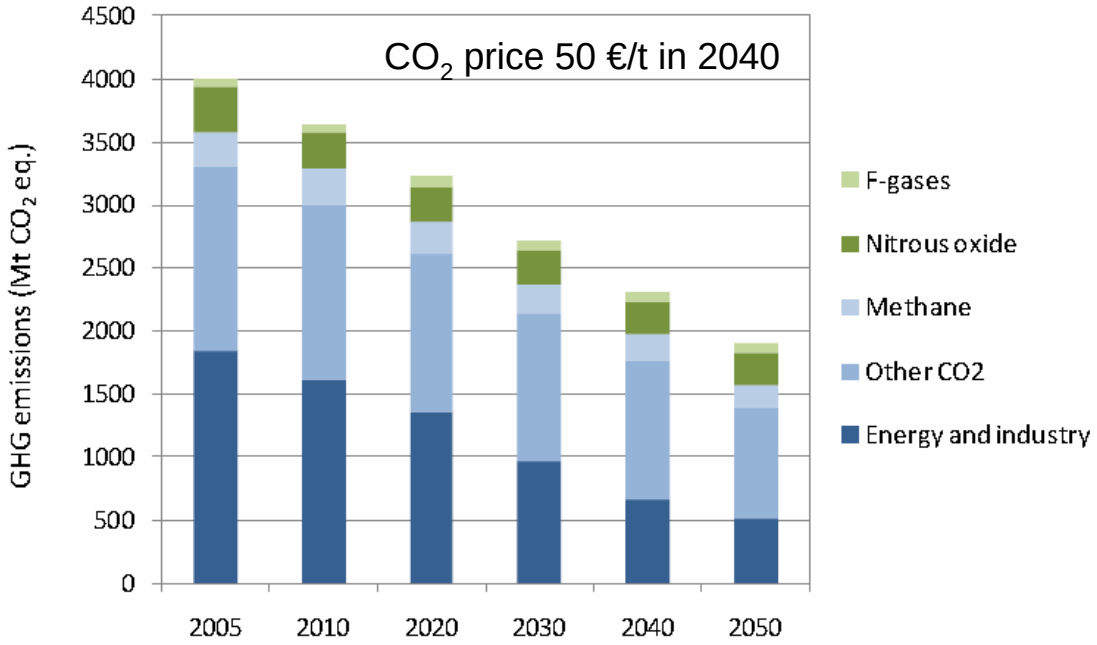
Global greenhouse gas emission paths



Carbon neutral energy system in the Western Europe and Nordic area by 2050

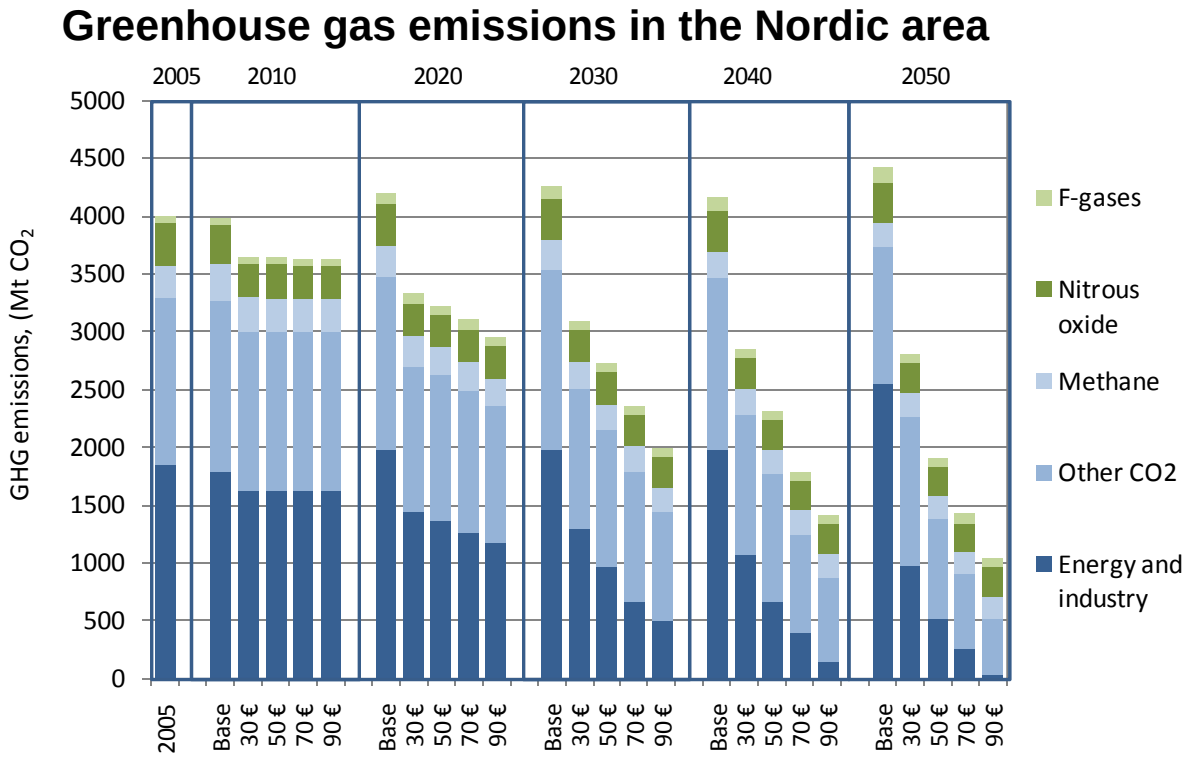
- ✓ **Western Europe together with Nordic countries have better opportunities to move towards carbon neutrality than the other world regions, especially with high CO_2 prices**

Greenhouse gas emissions in the Western Europe



Carbon neutral energy system in the and Nordic area by 2050

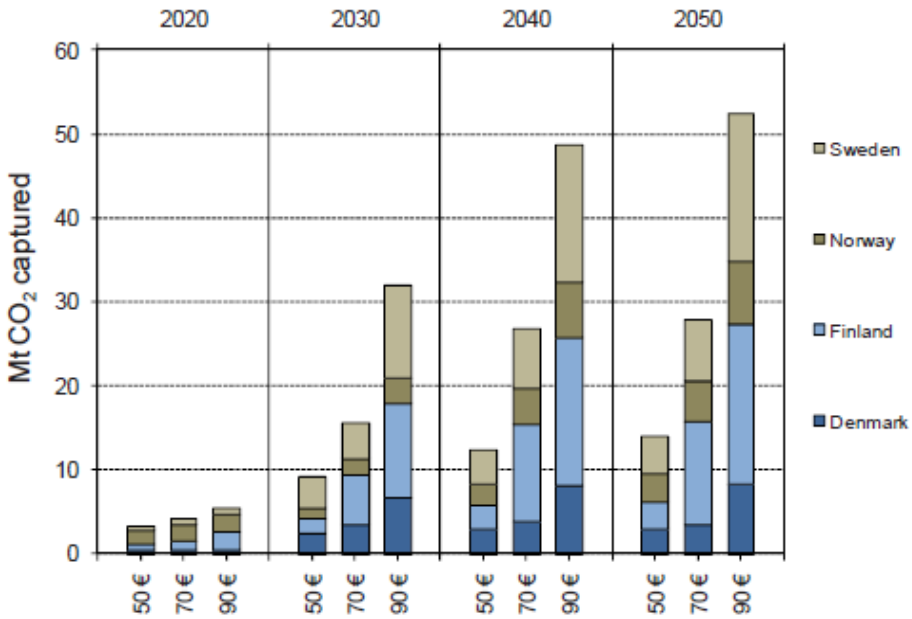
- ✓ **In the Nordic area both energy and industrial sectors could be carbon free with higher CO_2 prices**



Carbon free technology options in the Nordic area

1. Short term
   - Hydro power
   - Biomass
   - Wind
   - Nuclear
   - Heat pumps
2. Long term
   - Fossil energy with CCS
   - Small scale hydro
   - Solar
   - Ocean
   - Bio-CCS with “negative net emissions”

The potential of CCS in each Nordic country with different CO_2 price levels

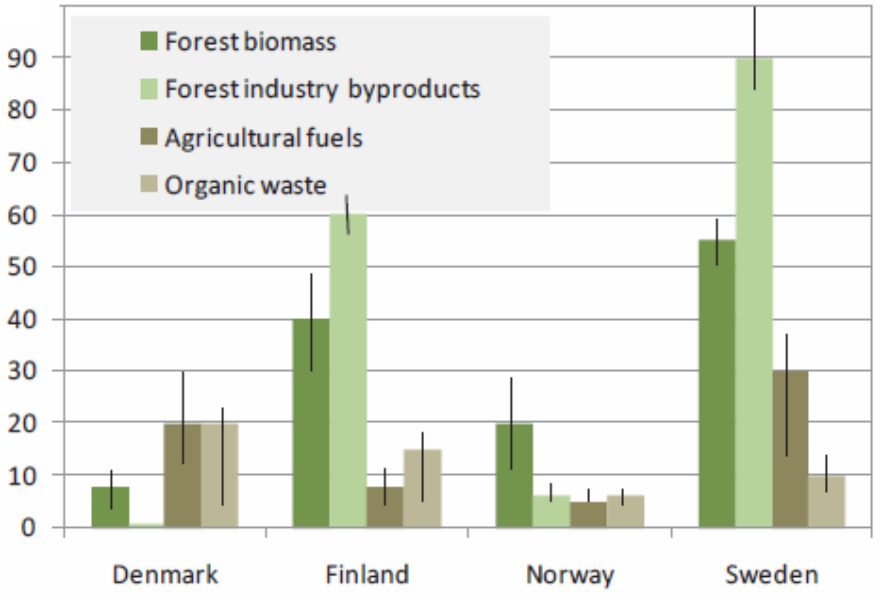


Large renewable resources in the Nordics

… But the extent to which the use of these resources can be increased varies significantly from country to country

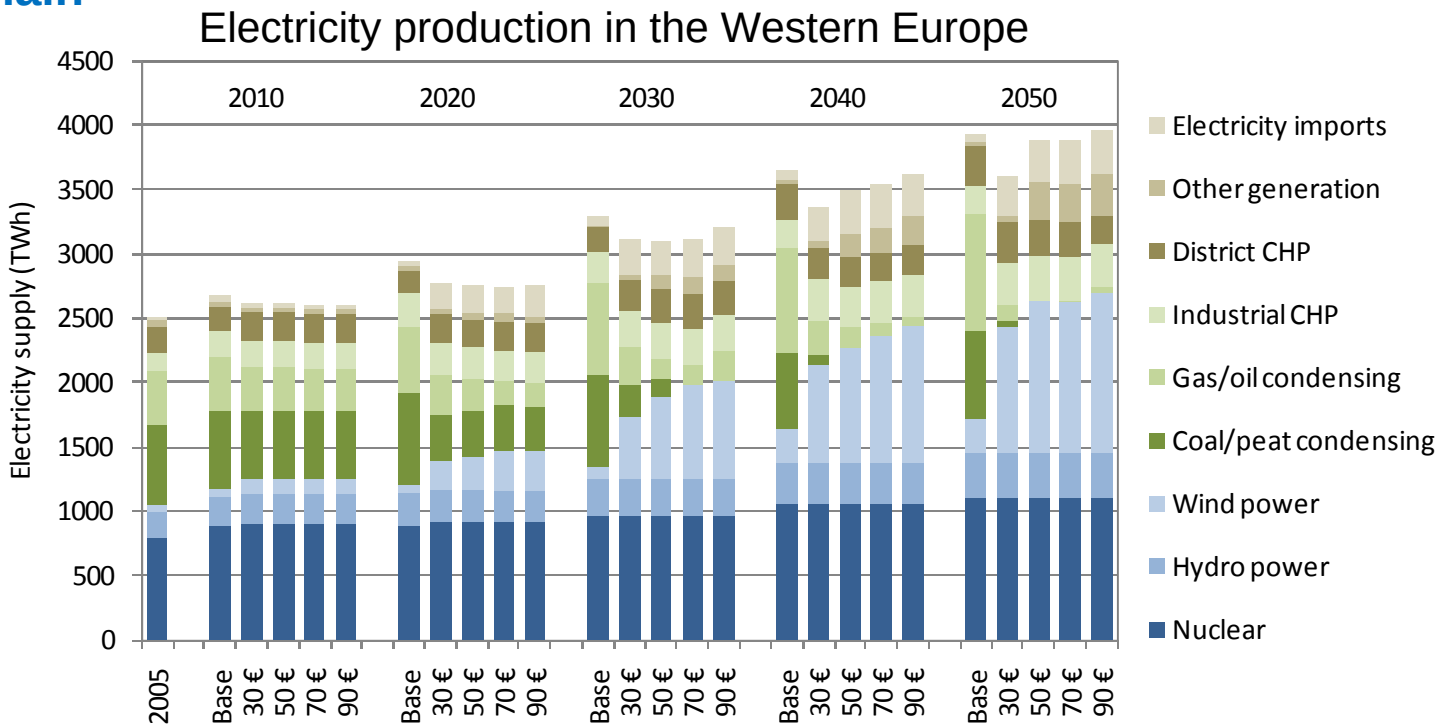
- Ambitious plans for new wind power in each country
  … but also concerns for lack of public acceptance and conflicts over criteria for land use
- Theoretical potential of biomass is large but economic potentials have large uncertainties
- National environmental legislation limits the investments in new hydropower production

Reported biomass potential estimates in TWh



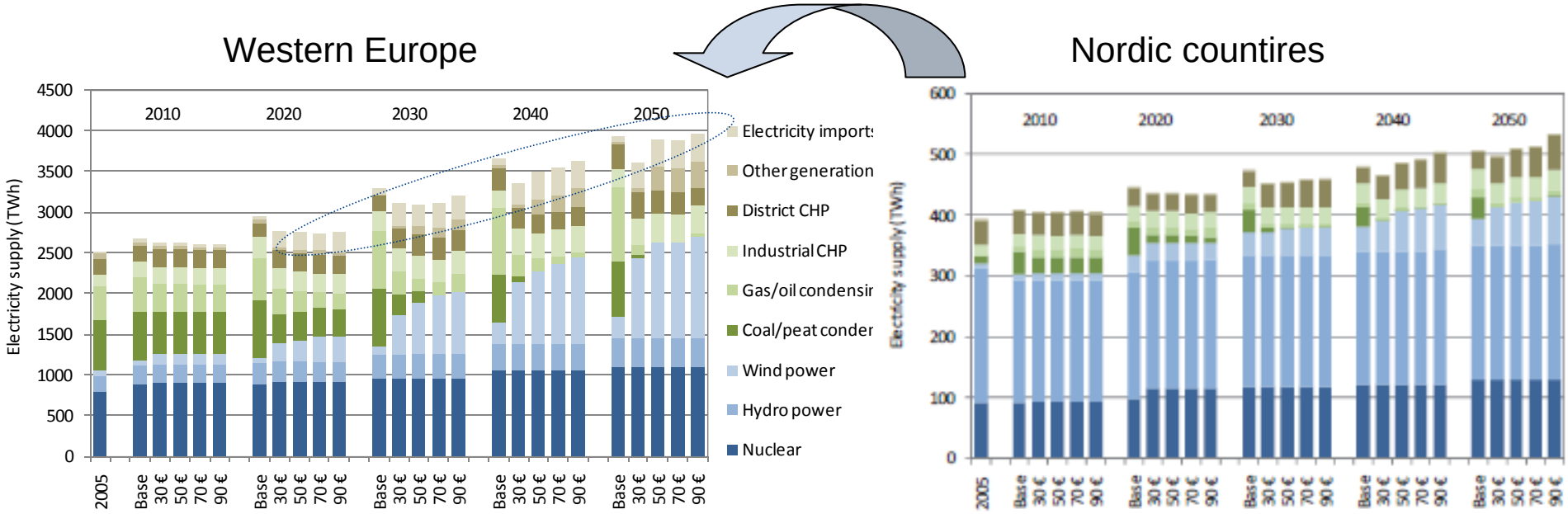
Electrification of the energy system with tightening climate targets – also an important option

- ✓ **Electricity demand increases as CO_2 price increases even though energy efficiency is highly increased through the whole energy chain**



Electrification of the energy system with tightening climate targets

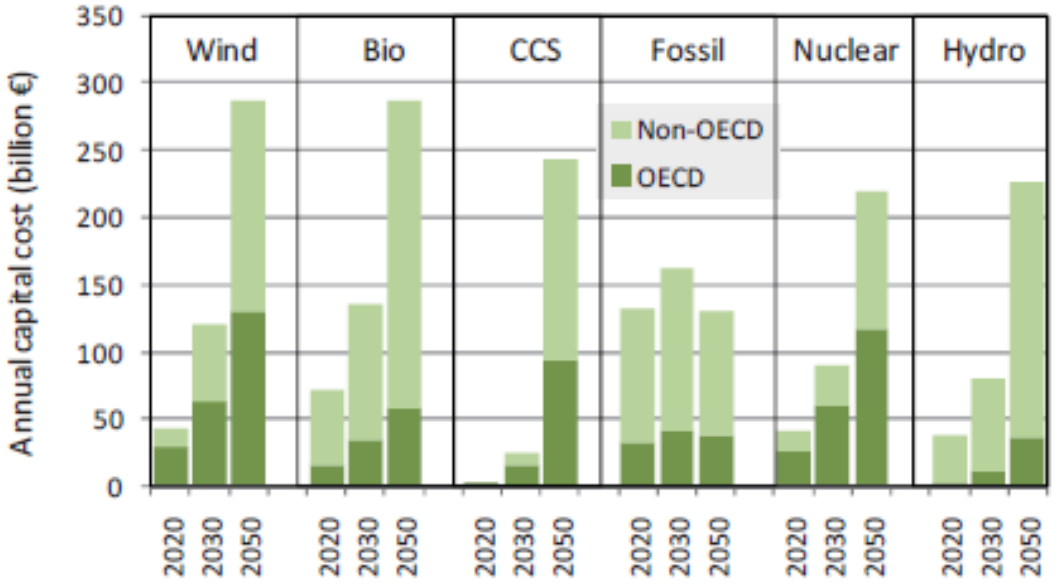
- ✓ **Export of carbon free electricity from the Nordic area is a cost efficient measure to reduce emissions in the Central Europe**



Global demand of clean energy technologies expand rapidly, especially in the non-OECD countries

- ✓ **Nordic countries have excellent opportunities to export clean energy technologies and services**

Annual capital expenditures on new power and heat generation capacity in 2020-50 with a 2 C mitigation scenario



Global climate challenge – a stimulant for a new Nordic business?

- Greater global competitiveness of Nordic industry with international climate agreement
- Increased welfare by
  - New business with increased clean energy technologies and services
  - Increased electricity export to the Central Europe
- By Nordic collaboration, better opportunities to tackle climate change with minimum costs