Modeling issues in Norway-ongoing projects

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Ongoing projects related to MARKAL

- TRANSES
  - Sustainable development, Multi-Attribute Trade-Off
- NORWAYS
  - Hydrogen, biofuels, linking Markal to infrastructure models/GIS
  - Low emission scenarios for Norway
    - Linking top down and bottom up analysis
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Electricity production and use in the Nordic region

The Nordic MARKAL model

- Four national models linked by electricity grid (Nordpool)
- Covers energy supply and demand in stationary sector (electricity and heat)
- Common fossil fuel market
- Harmonized large power plants assumptions
TRANSES scenarios (2005)

- Business as usual (BAU)
- Low Carbon (LC)
- Green business (GB)
- Reduced Consumption (RC)

Example of preliminary results - scenario indicators
Example of preliminary results—electricity production

New scenario approach

- Technological options → energy policies
- Investigate a large number of technological strategies for energy supply and end use
- Including more options than minimizing costs
- Future uncertainties taken into account by doing sensitivity runs
Strategies and Uncertainties

- Example of strategies energy supply and uncertainties
  - Electricity supply
    - Wind power
    - Hydro
    - Thermal
    - Import/export
  - Heat and CHP
    - Biomass
    - Waste
  - Uncertainties
    - Energy demand growth
    - Fuel prices
    - CO2 cost
    - European electricity prices

Post-processing and trade off analysis

- Example handling uncertainties etc

![Costs vs Emissions Graph]
Norways – introduction of Hydrogen

- Follow up of HyWays to identify regions and market segments for H2 in Norway

- Modeling issues:
  - Regional modeling - link to infrastructure models/GIS
  - LP vs MIP

Thank you for your attention!