



Ten opportunities and challenges for Nordic Energy – a short summary of the NEP findings

Berit Tennbakk, Bo Rydén

Nordic Energy Perspectives
Stockholm, 27 April 2010

The challenges of implementing the EU Energy and Climate Package

- **The EU policy goals affect each other:**
- **All targets reduce CO₂, but sometimes goals counteract**
 - CO₂ target increases electricity price, increase energy efficiency
 - Renewable target reduce NordPool price, may reduce energy efficiency
- **Both CO₂ and renewable targets increase renewables**
 - But the energy efficiency target reduces the renewable energy use
- **Consistent measures throughout the energy system**
 - All energy resources, all parts of the value chain, all countries, all goals

The challenges of implementing the EU Energy and Climate Package

- Identifying synergies is key to cost-efficient solutions
 - Renewables and energy efficiency the most important CO₂ measures
- New technologies present new opportunities
- A large share of the CO₂ reduction taken by the trading sector
 - Important measures in focus are measures that:
 - Transfer the responsibility from the non-trading sector to the trading sector
 - Reduce more than one greenhouse gas at the same time

Millions of electric vehicles ...

... would have a manageable impact on the power system and should contribute to reaching the EU targets.



The Nordic renewable energy resources provide opportunities

- but also challenges

- Bioenergy and wind power: EU targets lead to a large increase
- Opportunities for Nordic co-operation
 - Effective utilization of renewable sources
- The national mix of renewable energy – let it be flexible
 - A proper balance between different demands for biomass
 - Public acceptance and permitting procedures
- Increased renewable electricity production – and export



Nordic renewable resources are valuable also for other EU countries

Three energy efficiency challenges

- when the EU makes its 20 % target binding

- **A policy that gives equivalent efficiency incentives**

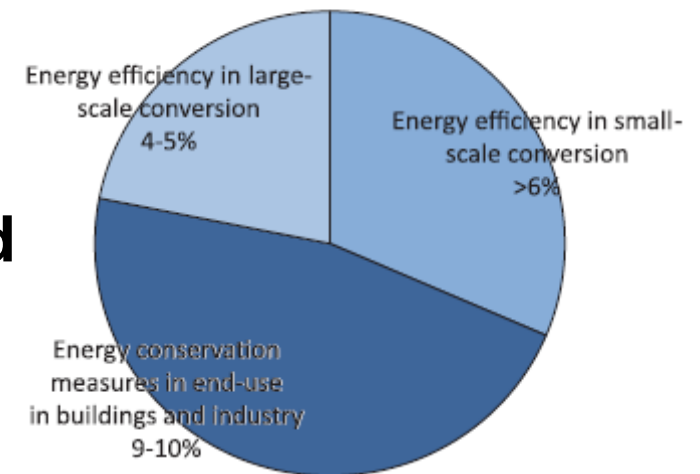
- in the entire energy system
 - measures in energy conversion, >50% in the NEP cost-effective package

- **A balanced choice of policy instruments**

- in order to support all EU targets
 - also energy efficiency

- **Strong incentives might be required**

- to reach the 20% efficiency target
 - if the EU focus on end-use measures
 - Potentials in end-use hard to release



The "NEP package" of measures to achieve 20% improved energy efficiency in the Nordic countries

Finding the balance between politics and markets

- a recurring theme in the NEP project

- **Nordic energy markets increasingly policy-driven**
 - The market plays a role, within limits set by policies and regulation
 - Can the market still provide the proper price signals?
- **Successful deregulation requires adequate reregulation**
 - Regulation and power market design must be constantly developed
 - New fundamentals require new market design and regulations
- **The market cannot always be blamed**
 - When policies override the market, e.g. RES support
 - When regulations are not adequate, e.g. locational price signals

Making Nordic power CO₂ free

- a challenge which opens for new opportunities

- Almost CO₂ free generation is a more rational ambition
 - More renewables and nuclear replace most gas and coal by 2020
- Managing intermittent electricity generation may require some fossil generation
- Nordic consumption becomes practically CO₂ free
 - Substantial increase in exports: Renewables generation in line with Nordic consumption
- RES and fossil exports from the Nordic area reduce the cost of reaching the emission cap



Further integration of the power markets in Northern Europe

- **The Nordic renewable energy resources**

- Are abundant and competitive in a European perspective
- Joint implementation may boost Nordic RES

- **Necessitates investments in cross-border and domestic transmission grids**

- **Challenges**

- Increased intermittency and price volatility
- Public acceptance in a situation with large exports



Opportunities in district heating

- but challenging to remain competitive when/if demand declines

- **An important part of a sustainable energy system**

- Facilitates the utilization of waste heat and renewable fuels
- Provides flexibility and improves efficiency through CHP
- Opens for bioenergy combines and bioenergy refineries

- **Challenge: Energy efficiency and competition**

- Energy efficiency reduces heat demand
- Increased competition from heat pumps
 - both for existing and potential customers
- Limited growth potential in existing and new markets
 - mature business



Industrial development and export opportunities

- for Nordic industry

- **Global climate policies** more favourable for Nordic industry
 - than national or regional European policies
- **World economies grow, emissions grow and leak**
 - emission reductions in some areas partly offset by increases in others
- **Structural threats & challenges for Nordic forest industry**
 - but a sustainable global development also provide opportunities
- Clean Tech study: **Manufacturers of biomass combustion plants**
 - time consuming physical presence in local markets is often necessary

Security of supply challenges in the Nordic countries

- SoS is mainly a geopolitical issue, not technical or economical
 - Mixed views on what the SoS issues are for the Nordic region
- SoS in the Nordic region differs from the rest of Europe
 - Europe worries about gas import dependency
 - Nordics may worry about nuclear and biomass dependency
 - ... in addition to traditional effect capacity concerns accentuated by increased shares of wind power
 - And generally reduced flexibility in the energy system



Success factors for energy systems modelling in multidisciplinary projects

Modelling process

Define research questions and let them govern model limitations shall not decide the contents of

Early involvement of stakeholders (feedback on in

Initiate model runs as early as possible, prior to synchronization. Such early model activities are v the learning process and for achieving a general model package available to the project for modell

Identify an appropriate balance between the run sensitivity analyses) and the effort put into the an Not all model runs need to be reported unless knowledge.

Establish a well-organized clearing-house where are gathered with a shared and agreed view on and a shared model "language". Keep these gathe

Ensure that model input and output becomes scientific methods such as deep interviews, ques analyses.

Model synchronization

Synchronize important input data – within reason

Use output from model A as input to model B whe

Model validation

Models should be well validated (and documente

Put effort in tracking down human errors (by e.g. c

Differences in model approaches

Choose models with different methods aiming at plinary approach. Models should be compleme

...but recognize model overlaps and use it to highl more than one (in this case similar) model appro assurance for the models used and adds value to

Identify similarities in model output among the mo

Identify differences in model output among the m explain the differences! Highlight differences e: ssumptions rather than differences explained by shortcomings

Identify system-boundary differences between the

Identify differences in geographical scope – How w described

Use each model for what it is aimed for ...

...but also identify areas or issues where a specif

Identify the "cultural" differences in the models (when working with different approaches, e.g. diffi kets are described

Identify "national" differences between models for This may be due to national differences in existi

Coordinated use of Energy system models

in Energy and Climate Policy Analysis



Lessons learned from the NEP project

Models help quantify effects and clarify interaction, synergies and counteracting effects in complex systems.

But models are simplifications – using several models with different features increase understanding of the crucial issues and assumptions

NEP 2010
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