INSTITUTE OF TECHNOLOGY ASSESSMENT

Transition pathways to a sustainable energy future in Austria

Socio-technical scenarios and structural challenges

Ornetzeder, Wächter, Rohracher

15 March 2013

ÖAW Austrian Academy of Sciences

Michael Ornetzeder

Overview

- Transformation of the energy system as Great Transition
- National scenario project E-Trans 2050
- Discussion and outlook

INSTITUTE OF TECHNOLOGY ASSESSMENT

ÖAW Austrian Academy of Sciences

The challenge: Transition to a sustainable energy system

- IPCC: Reducing greenhouse gases by 80-90%
- SET-Plan: „reinvention of the energy system in the form of a low carbon model“
- EU Energy Roadmap 2050: “Energy 2020 goals ... are insufficient”
  - All forms of low carbon technologies
  - Renewables from 10 to 55 percent
  - Prime focus on energy efficiency (reduction by 40%)
- Transformative change of the energy system: system innovation

Characteristics of system innovation

- Develop in a ‚co-evolutionary' way > covering demand and supply side, technologies and values and practices
- Architectural innovations > involving changes of elements and structure
- Multi-actor processes > wide range of societal groups involved
- Unfold within a long timescale > several decades

Source: (Geels, Elzen, Green 2004)

INSTITUTE OF TECHNOLOGY ASSESSMENT

Austrian Academy of Sciences

Project E-Trans 2050

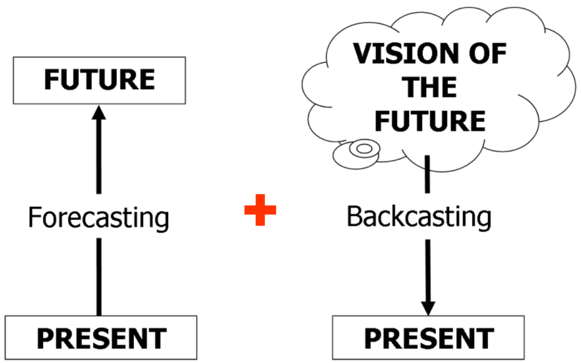
- Scenario building project commissioned by the Austrian Climate and Energy Funds (2009 - 2011)
- Project Team:
  - Inter-University Research Centre for Technology, Work and Culture, Graz (IFZ)
  - Austrian Institute of Technology, Vienna (AIT)
  - Institute of Technology Assessment, Austrian Academy of Sciences, Vienna (ITA)

Aim of E-Trans 2050

- Development of qualitative long-term scenarios for the Austrian energy system
  - Pathways under different external conditions and actor strategies
  - No prognosis – better understanding of interrelations, identification of uncertainties and inconsistencies
  - As a complement to output oriented, quantitative energy models, scenarios and roadmaps
- Identification of key fields of action and policy options

Research strategy and design

- Combination of Foresight and Backcasting
  - Foresight: Scenarios for the whole energy system
  - Backcasting: Specific fields (spatial organisation, smart grids)
- Explorative and normative scenarios
- Methods
  - Literature research
  - Interactive workshops
  - Interviews with experts



Framework scenarios: Austrian energy system in 2050

- Socio-technical storylines covering
  - Policy (e.g. international and national regulation)
  - Society (e.g. demographic trends, changes in lifestyle)
  - Economy (e.g. energy prices, stability of economy)
  - Environment (e.g. climate change, availability of resources)
  - Technology (e.g. mix of energy technologies, introduction of new technologies)
- Unfolding development paths under different conditions

INSTITUTE OF TECHNOLOGY ASSESSMENT

ÖAW Austrian Academy of Sciences

Three framework scenarios

- ‘Ecological modernisation’
  - Incremental system optimization, focus on new technology
- ‘Radical change towards sustainability’
  - New infrastructure, technology, institutions, rules and regulations, norms and values, social practices
- ‘Break-down scenario’
  - Financial and ecological crises, energy shortage (oil and gas)

INSTITUTE OF TECHNOLOGY ASSESSMENT

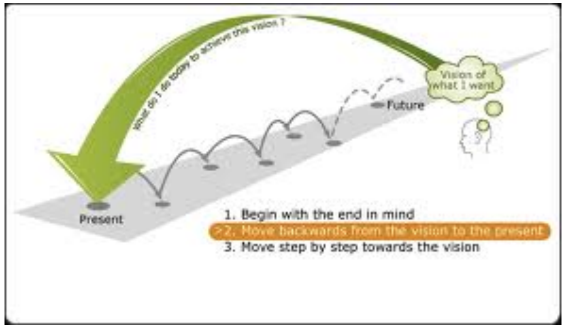
Austrian Academy of Sciences

Backcasting: Spatial development and energy

- Starting point: Normative, radical sustainable, long-term vision based on framework scenario (Austria in 2050)
- Main points of sustainability scenario

Reduction of gross energy consumption by 45%
High share of renewables (90%)
Large share of distributed generation (heat & electicity)
50% of building stock passive house standard
Energy efficient settlement structures
Improved and new transport infrastructure
New commuting and mobility practices

Results of Backcasting



- Discussion of policy strategies
- Short-term with a long-term perspective
- Key outcomes
  - Better coordination of energy policy, spatial planning and land use regulation
  - Improved knowledge-base (e.g. regional resource plans)
  - Reorganisation of regional structures to match local resources and local demand (‘energy regions’)
  - Niche experiments: integrated settlement showcases to enable socio-technical learning (focus on daily mobility patterns)

Discussion

- Benefits of socio-technical scenarios
  - Make interdependencies between social, economic and technical elements visible and ‘discussible’
  - Raise awareness that energy transition will involve fundamental social changes
  - Enable reflection on (hidden) assumptions of quantitative models
- Benefits of backcasting from normative visions
  - Reflection on currently dominant policy instruments
  - Demand for novel strategies
  - Focus on cross-cutting fields (e.g. energy & settlement structures)

Outlook

- Project level
  - Participation of new groups of actors (e.g. high level decision-makers, general public)
  - Further backcasting exercises
  - Stronger integration of qualitative and quantitative approaches
- Energy policy level
  - Development of a ‘foresight culture’
  - Coordination of different levels (municipal, regional, national, European) and sector strategies (‘roadmap integration’)
  - Introduction of broad and open system understanding (socio-technical perspective)

Thank you

Contact:
PD Dr Michael Ornetzeder
A-1030 Vienna, Strohgasse 45/5
Tel: +43 (1) 51581 6589
Fax: +43 (1) 7109883
Email: ornetz@oeaw.ac.at
WWW: www.oeaw.ac.at/ita