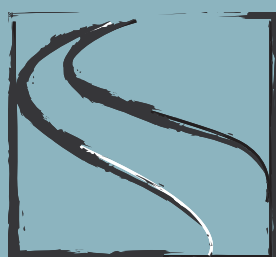


# **Pathways to Sustainable European Energy Systems 2006-2010**



**pathways**

# A new project for Pathways to Sustainable European Energy Systems

*This new international project has the overall aim of evaluating and proposing robust pathways, or bridging systems, towards a sustainable energy system in Europe. The focus is on the stationary energy system. The Pathways project is an important part of an international cooperation, the Alliance for Global Sustainability (AGS), where companies such as Ford, Du Pont and Vattenfall are involved together with MIT, ETH, Tokyo University and Chalmers. Together we work on a long-term basis, and in international projects, to be able to draw a map showing the pathways to a sustainable future.*

## A five-year project

The European pathways project is a five year project with the overall aim to evaluate and propose robust pathways towards a sustainable energy system with respect to environmental, technical, economic and social issues. The focus is on the stationary energy system (power and heat) in the European setting. Evaluations will be based on a detailed description of the present energy system and will focus on how the present system can be developed into the future under a range of environmental, economic and infrastructural constraints.

*"We are prepared to commit ourselves on a long-term basis so that we, together with Chalmers, AGS and others, will be able to draw a map showing the pathways to a sustainable future."*

Lars G. Josefsson, CEO,  
Vattenfall



## Independent results to support decision makers

The Pathways project is a response to the need for a large and long-term research project on European energy pathways, which can produce independent results to support decision makers in industry and in governmental organizations. Stakeholders for this project are: the European utility industry and other energy related industries, the European Commission, EU-Member State governments and their energy related boards and oil and gas companies.

## The research questions

The overall question to be answered by the project is:

*How can pathways to a sustainable energy system be characterized and visualized and what are the consequences of these pathways with respect to the characteristics of the energy system as such (types of technologies, technical and economic barriers) and for society in general (security of supply, competitiveness and required policies)?*

This question is addressed on three levels; by means of energy systems analysis (technology assessment and technical-economic analysis), a multi-disciplinary analysis and an extended multi-disciplinary policy analysis. The overall question has been divided into sub-questions such as:

- What are "key" technologies and systems for the identified "pathways" - including identification of uncertainties and risk?
- Are the deregulated energy markets suitable to facilitate a development towards a sustainable energy system?
- What is the critical timing for decisions to ensure that a pathway to a sustainable energy system can be followed?
- What kind of political action is necessary? What can and should the EU and/or the Member States do politically?
- What are the consequences of a strong increase in the use of natural gas and/or renewables?
- What if efforts to develop CO<sub>2</sub> capture and storage fail?



*"This project will show what pathways to a sustainable energy future means in practice."*  
Jan-Eric Sundgren, President,  
Chalmers University of Technology.

**During 2006 we start the initial phase of the project. This initial phase will:**

- Provide a professional and detailed description of the European energy system.
- Establish a solid and transparent modelling methodology and toolbox.
- Analyse and investigate effects from policies on energy futures.
- Make the first initial analysis of pathways to sustainable systems.

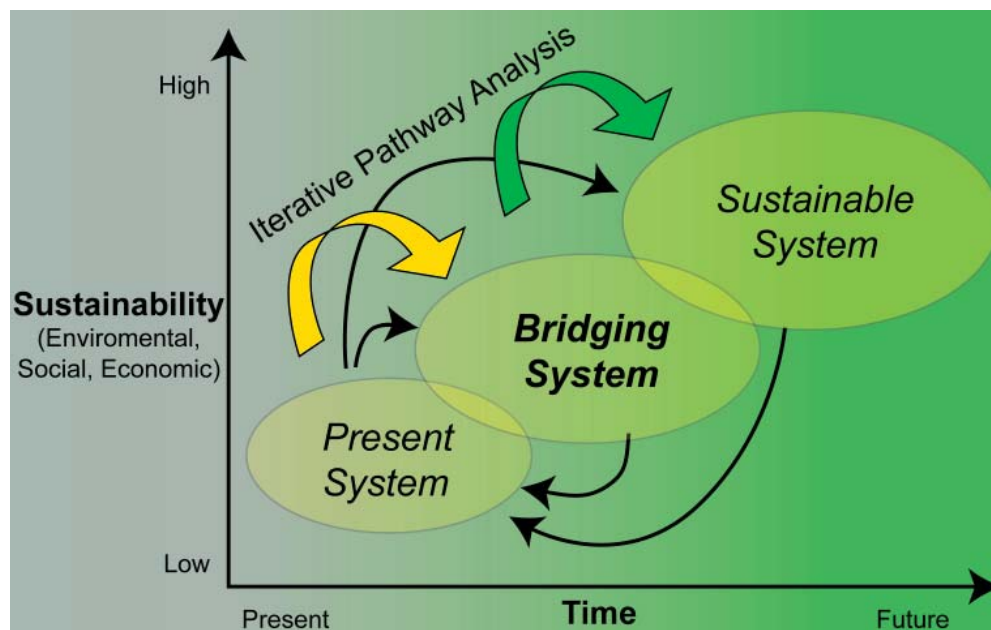
# Bridging Systems



The aim of the project is to identify ways of making the transition from our present energy systems, based upon today's technologies, infrastructures and markets, towards sustainable systems which should become possible when new technologies have been developed and implemented. The figure illustrates the problem in finding such pathways: Starting from the present system the desirable (sustainable) future is not known and "bridging technologies" are necessary to implement on the large scale before the sustainable future can be reached.

## Iterative pathway analysis

The pathway analysis takes its basis in a detailed description and it is analyzed how the system can be developed over time, considering technical, economic and infrastructural constraints. Naturally the pathway analysis has to be done in several steps, refining the analysis as the analysis tools are developed over the course of the project. Thus, for a system obtained from a first analysis it can be necessary to investigate that this system is feasible from an operational point of view. In all, the method employed can be seen as an iterative pathway analysis.



*Conceptual presentation of the move from a non-sustainable energy system (e.g. carbon intensive) to a sustainable energy system (which ultimately will be decarbonised). The project will study options and pathways leading through the bridging system.*

# Ten Work Packages



In order to address the sub-questions in an efficient and focussed way the project is structured into 10 work packages (WP1-10) addressing topics such as description of the energy infrastructure, energy systems modelling, technology assessment of best available and future technologies and international fuel markets. Each WP should have the aim to form a research group of sufficient momentum to reach a critical mass while keeping within the focus of the overall project.

## Both research and communication

In planning of the project significant efforts have been put into ensuring that the project should not only be strong in research but also in management, and communication. Both research and communication have been initiated and are progressing well.

WP1. Description of European energy structure

WP2. Energy systems modelling - model development, model analysis as well as other analyses work

WP3. Technology assessment of Best Available Technology - production

WP4. Technology assessment of Best Available Technology - demand side

WP5. Technology assessment for innovative and intermitten technologies

WP6. Land use and infrastructure modelling

WP7. International fuel markets and resource basis

WP8. Social and political implications of energy futures

WP9. Management and Fundraising

WP10. Communication

Bringing leading technical universities together with industry and government to tackle some of the world's greatest challenges

The Alliance for Global Sustainability (AGS) brings together four of the world's leading technical universities—the Massachusetts Institute of Technology, The University of Tokyo, Chalmers University of Technology, and the Swiss Federal Institute of Technology—to conduct research in collaboration with government and industry on some of society's greatest challenges.

The AGS represents a new synthesis of multidisciplinary and multi-geographical research that draws on the diverse and complementary skills of the AGS partners. In addition to academic collaborations, each of the universities has extensive experience in working with stakeholders, particularly a growing number of visionary leaders from industry who recognise their fundamental role in achieving sustainable development.

More information on Pathways:

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