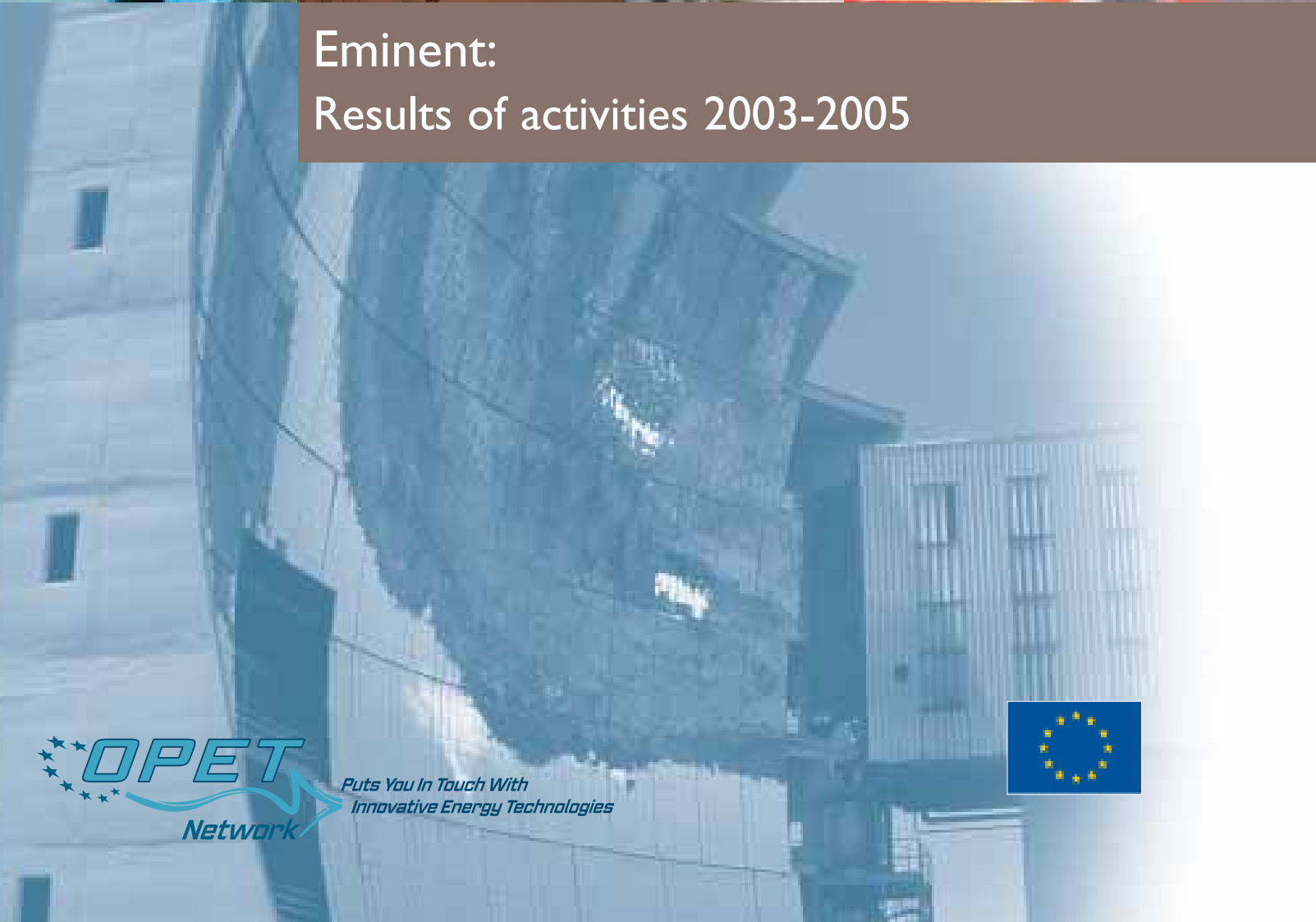


ORGANISATION FOR THE
PROMOTION OF ENERGY TECHNOLOGIES



Eminent:
Results of activities 2003-2005



Context 3

Two Reasons to promote Early Market Introduction of New ENergy Technologies 4

- 1 Environmental
- 2 Economic

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Further information: www.eminentproject.com

Ever-increasing energy consumption is one of the greatest challenges facing Europe and the world today. Most consumption is derived from fossil fuels - much of it imported from outside Europe, depleting natural resources and contributing to global climate change, through increased greenhouse gas emissions. When the EU signed the Kyoto Protocol, it promised to reduce these emissions by 2012, by 8% in comparison to 1990 levels. To meet this commitment, significant changes of behaviour are required now, both in terms of energy supply and demand management.

The Organisation for the Promotion of Energy Technologies (OPET) Network, established by the European Commission, seeks to enhance sustainable energy production, distribution and consumption (excluding nuclear energy) by promoting the use and exchange of information on new technology in the marketplace. The resulting efficient knowledge transfer benefits all European citizens, supporting and implementing European policy priorities at EU, Member State and regional levels, accelerating innovation of renewable energy sources (RES) and the rational use of energy (RUE).

The OPET Network was restructured in 2002 around a series of Thematic Consortia to provide an integrated and comprehensive view of on-going research and to further innovative technologies deployment. The CO-OPET partners in cooperation with each Thematic Consortium have issued a Consortium brochure, which provides a summary of the promotion and dissemination actions undertaken between 2003 and 2005 in emerging sustainable energy technologies, aimed at the valorisation and integration of R&D results, pointing the way towards more intelligent energy use in Europe.

The OPET Thematic Consortia:



- Buildings
- Electricity generation from renewable energy sources (RES-e)
- Combined heat and power / District Heating (CHP/DH)
- Clean fossil fuels (CFF)
- Energy issues in transport
- New energy technologies in the Mediterranean region (MEDNET)
- Modern and clean energy and transport technologies in Latin America and the Caribbean (OLA)
- Early market introduction of new energy technologies (EMINENT) and
- CO-OPET, support to the OPET Network

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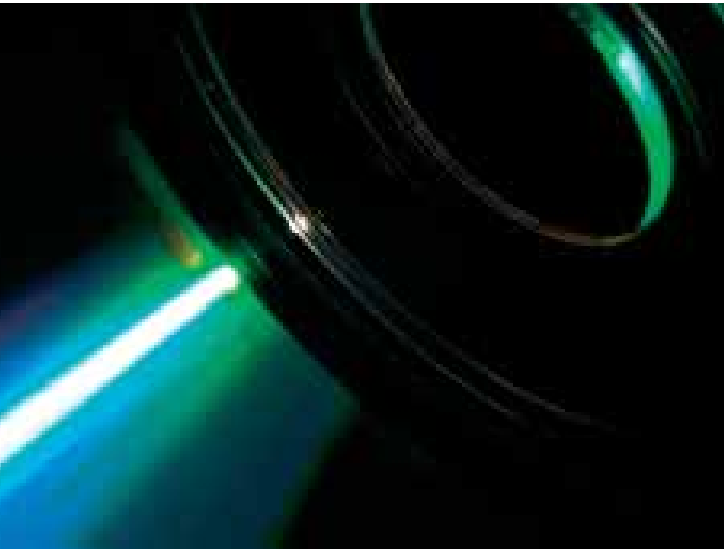
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1 Environmental

Global climate change has moved up the policy agenda in recent years. According to the US Environmental Protection Agency (2004), the Earth's surface temperature has risen by about 0.5°C in the past century, with accelerated warming during the past two decades. This problem is attributed to emission of greenhouse gases, which primarily are CO₂, CH₄ and N₂O. After the Industrial Revolution, atmospheric concentrations of CO₂ increased nearly 30%, methane concentrations more than doubled and nitrous oxide concentrations rose by about 15%. Scientists believe that the combustion of fossil fuels and other human activities are the primary reason for the increased concentration of CO₂.

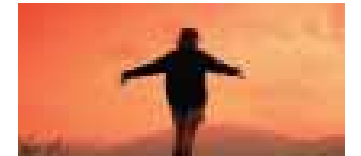
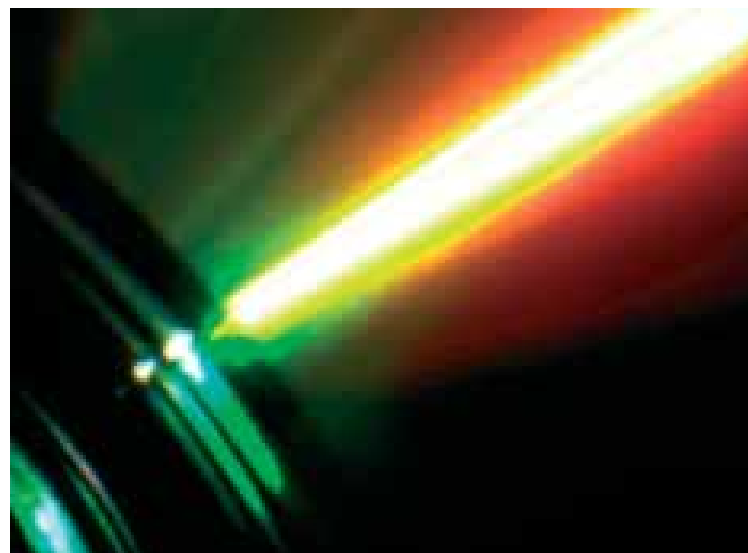
At the same time, increasing fuel consumption is combined with ever decreasing energy resources, such as oil and gas.

The early introduction of new energy technologies is an imperative in this situation.

2 Economic

Time to market is of great importance, as energy technology products, like all other products and services in the market place have a life cycle. The key to maximising company sales and profits over time is the successful launch of a new technology. And vital to this launch is early introduction through short and effectively targeted R&D. The sooner this occurs, the sooner research and development costs can be reimbursed and a profit shown. The earlier the market introduction, the higher the profit will be. Profit means that the product becomes self-sustaining and the greater the profit, the more likely that investment money is available for other projects. High technology products' early placement on the market enhances Europe's competitiveness in the global market place.

The lead-time for development of a new energy technology can take many years and may be influenced by several factors such as pinpointing the most attractive type of market application and geographical location. It may also be that potential investors and the manufacturing industry are not aware of the existence of a new technology concept, which hampers further development and delays market introduction.



The European Commission's Directorate General for Energy and Transport launched the EMINENT project, in collaboration with leading European research institutions as a new node in the OPET network, with the main purpose of identifying and accelerating the introduction and implementation of leading edge European energy and environmental technology into the worldwide market place and to accelerate implementation of promising Early Stage Technologies (ESTs) for energy conversion, storage and transportation. EMINENT provides the missing link between recent R&D developments on one hand, and the OPET network on the other by identifying recent technological innovations on energy and environment and disseminating such key information to the market through the OPET network.

As part of its work programme, EMINENT produced and demonstrated a systematic methodology that enables potential investors as well as developers of new energy technologies to identify current and future market opportunities throughout Europe. The score of a new technology in terms of potential market volume, environmental and financial performance can be essential when deciding how to proceed with the further development of technologies that are yet immature. EMINENT absorbs and evaluates data on the performance of ESTs both directly from R&D organisations as well as DG Research supported initiatives (shared cost RTD projects, Marie Curie fellowships, Thematic Networks, etc.) By evaluating these EST on their potential merits and fields of application before offering them to the OPET network, EMINENT lead to increased awareness and reduced lead-time in the transfer of results from pure research to viable social or industrial solutions. The results also provided insight on:

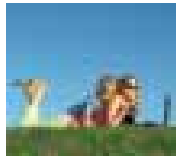
- How to optimally arrange information flow from R&D projects to market implementation
- Better knowledge of the renewable energy sector allowing research money to be spent more efficiently.

Within EMINENT a software tool has been developed. It is capable of identifying and assessing the potential of ESTs. This was followed by a series of workshops, media initiatives and a website to provide public awareness of the technologies. EMINENT acts as an interface of technology with EU policy, suggesting measures to enhance implementation.

EMINENT partners

The OPET is coordinated by TNO Science and Industry, Netherlands and the Project Consortium consists of:

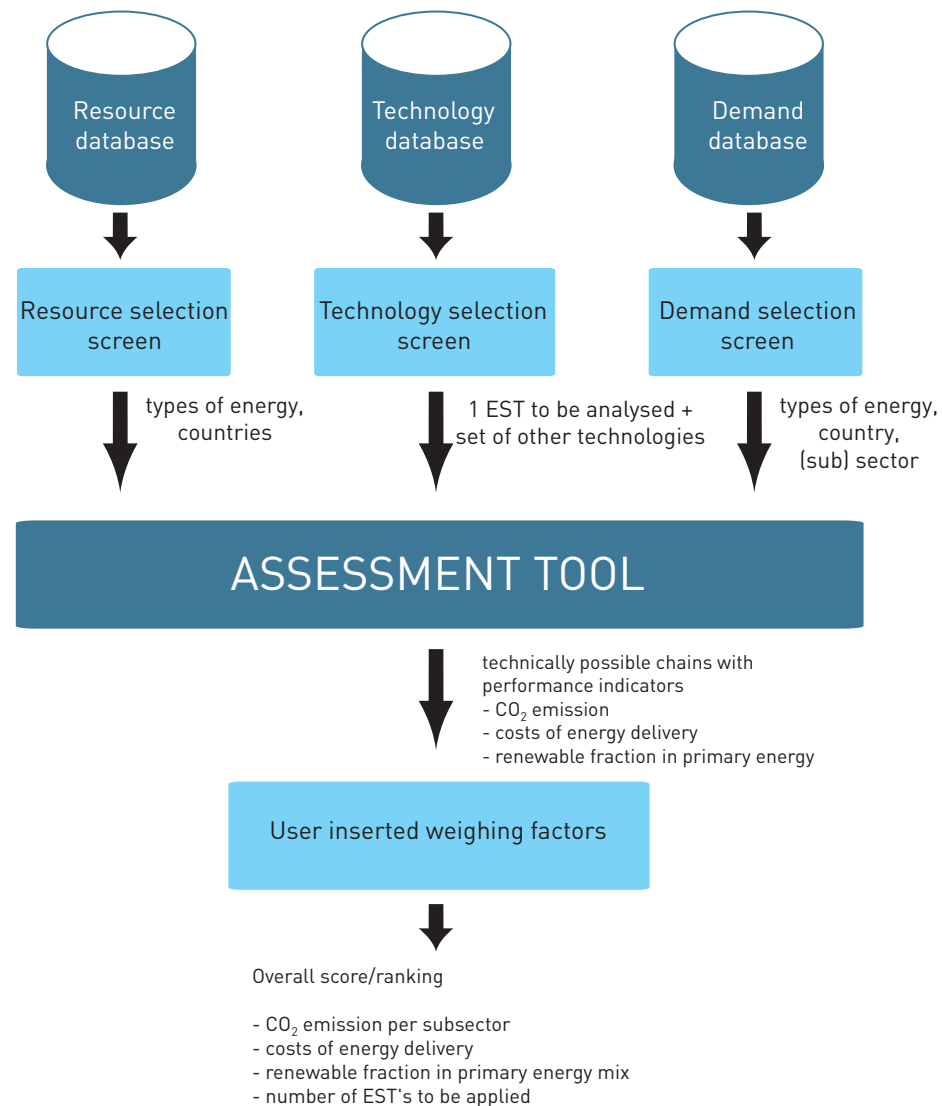
- SINTEF Energy Research, Norway
- The University of Manchester UK
- PTJ-Forschungszentrum Jülich, Germany
- VTT Processes, Finland
- Riga Technical University, Latvia
- UPEI-Institute of Process and Environmental Engineering, Czech Republic
- Risø National Laboratory, Denmark
- Instituto Superior Tecnico, Portugal
- Moscow State University, Russian Federation.



The EMINENT Assessment Tool (version 3.0) is now available through the internet. It has been produced by TNO to identify markets for Early Stage Technologies (EST's). It is fully functional and also contains a database of energy technologies.

Brief Description of the EMINENT Software Tool

The software tool developed within the EMINENT project has the aim of designing possible energy supply chains and to evaluate each of them based on weighing factors given by the user. It consists of an integrated resource manager, demand manager, EST manager, databases on resources, demand and EST as well as the analysis tool.



1 Resource Manager

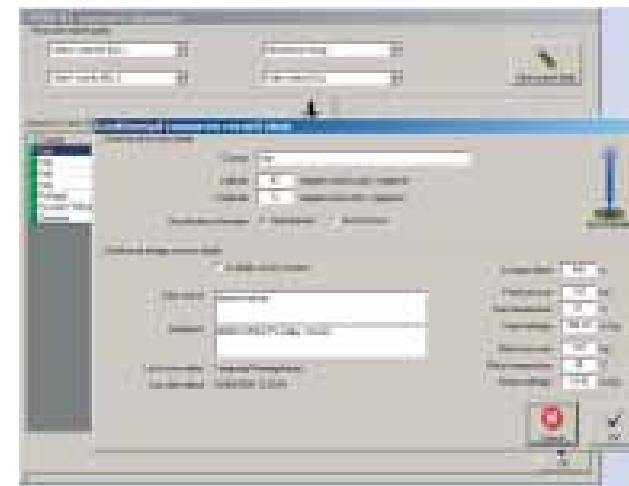
The analysis tool is the central part of the software package. It provides the evaluation of the market assessment and suggests full energy supply chains with their attractiveness in terms of cost of delivery, CO₂ emission and renewability of the energy produced.

The resource manager describes details of resources available in the country, and allows for modification, addition and deletion of resource data. It is also used to select the resource data for which a technology assessment should be done.

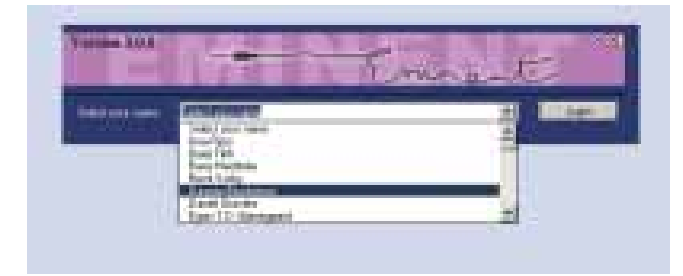
The resource manager provides seven energy resource options:

- Electricity
- Fuels
- Geothermal
- Hydro energy
- Ocean tidal energy
- Wave energy
- Wind energy

The user can search for the energy resource by selecting the continent, country, resource type, source, and editor name. From the energy resource list, the user can edit, delete selected records and add new resources by using right-click on the name list.



EMINENT geothermal resource screen



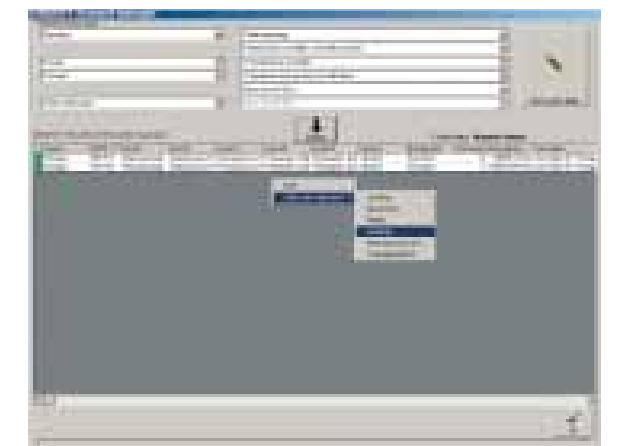
EMINENT tool login screen

2 Demand manager

Similarly, the demand manager describes details of energy demands per subsector in a given country, and allows for modification, addition and deletion of demand data. It is also used to select the demand data for which a technology assessment should be done.

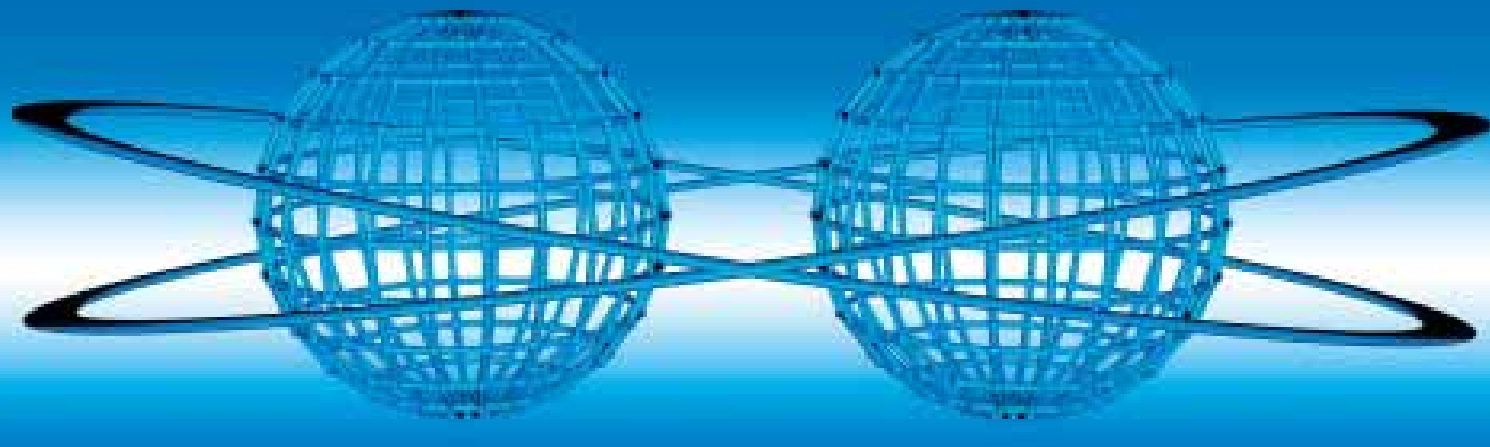
There are five demand types:

- Electricity
- Fuels
- Heating
- Mechanical work
- Transportation



The user can search for the energy demand by selecting the continent, country, main sector, sector, sub sector, demand type, source, or editor name. Moreover, the user can edit, delete selected demand and add new demand by using right-click. The main unit contains the different types of demand such as agricultural, building, household, commercial service, industry, etc.





3 EST Manager

The EST manager is the most important part of the EMINENT Assessment Tool. The Early Stage Technology (EST) manager operates the technology database, which contains key data on a number of energy technologies that are either commercially available or in their early stages of development. It is also used to select the key technologies that should be evaluated, eventually in combination with other, peripheral technologies.

The EST manager is used to store the information on how a technology works, inputs into the technology and output from the technology. Each technology can have a maximum of three inputs, three outputs and four operating modes. The list of inputs and outputs are shown below.

Inputs

Heating
Cooling
Fuels
Electricity
Mechanical work
Solar
Wind
Hydropower
Ocean tidal energy
Ocean wave energy
Geothermal energy

Outputs

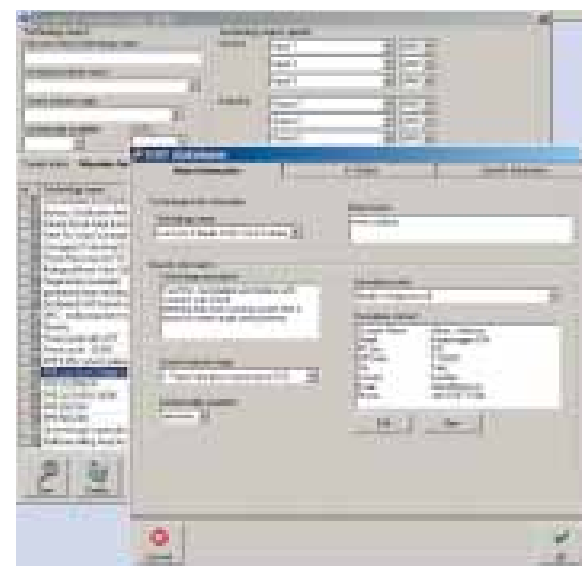
Heating
Cooling
Fuels
Electricity
Mechanical work

4 Main information

The main information screen provides the information about technology name, data source, technology description, current maturity stage, commercially available year, developer name and developer contact.



This screen allows the user to search for the technologies by using keyword search on technology name or selecting developer institute name, current maturity stage, commercial available year, input(s) or output(s). The user can select a technology for an assessment or, if authorised, add, delete or modify technology data.

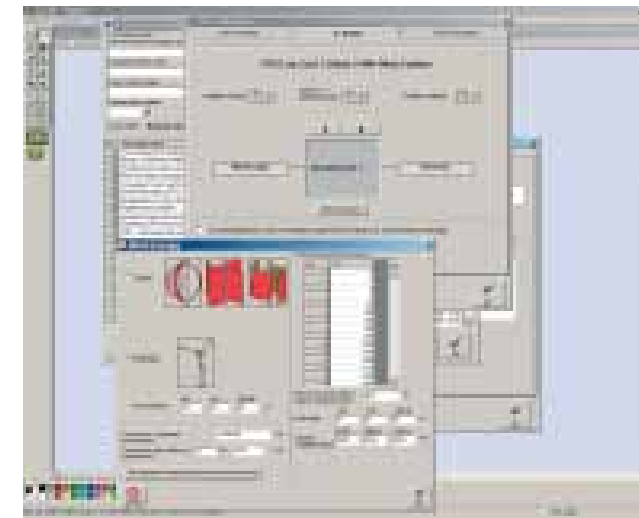


The EMINENT select technology main information screen

5 Summary report

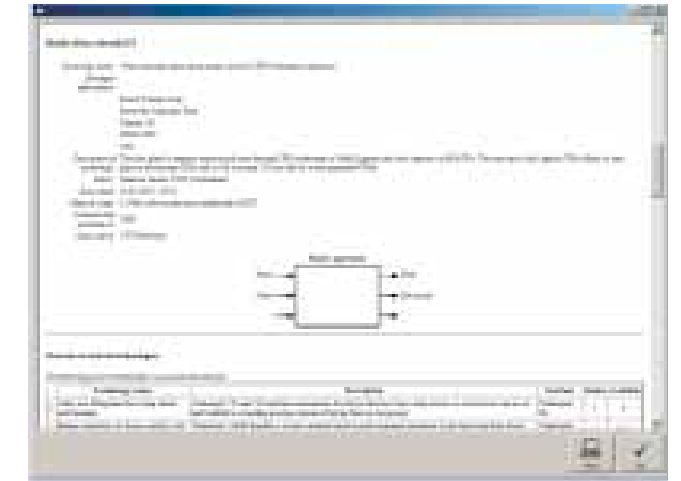
The EMINENT Summary Report screen shows three main results:

- Problem definition,
- Most promising options summary,
- Best chain per (sub)sector.



EMINENT input-output screen

The input-output page provides the information about the technology. If authorised, the user can edit, add, and delete specifications of the energy inputs and outputs. The input and output properties screens contain more specific details for each input and output.

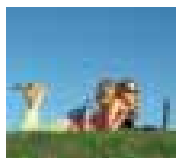


EMINENT Summary Report

Conclusions



The aim of the EMINENT Assessment Tool is to collect the EST data from the information sources. These immature technologies are still developing or in the early stages of commercial development. By opening up access to information on Early Stage Technologies, the lead times from science and research to the market should be cut. The project partners are keen for the scientific and research community to be involved in the continued development and exploitation of the tool.



The potential impact of new, yet underdeveloped ESTs in different sectors of society in different countries can be analysed and enables the project partners to proceed to case study analysis.

Case Studies

Analysis of case studies provided quantified performance data, resources and demand for the relevant chains, emissions, costs and savings. Results showed the benefits of the technologies considered and areas of their application. Several biomass processing technologies show high performance and wide range of applications. Geothermal energy applications using compact and enhanced heat exchangers are another innovative and promising field. Power recovery technology in Fluid Catalytic Cracking (FCC), efficient in converting waste heat into electricity, also shows a very short payback period which makes it attractive to the industry.

<http://www.cpi.umist.ac.uk/eminent/References.asp>

Biomass gasification methanol synthesis system



The technology enables varying feed; it allows the gasifier to operate in a steady-state mode critical to efficient, economic gasifier performance. Stored methanol can be used as back-up fuel for the combined-cycle power block used for peaking power in on-site or off-site gas turbines, or sold on the market as a fuel/chemical feedstock. Biorefinery application will contribute to new use for agricultural and forest waste materials; preserve natural resources through an environmentally friendly process design and near zero discharge. It can produce cleaner-burning transportation fuel from closed-loop carbon cycle sources. Diversion of materials from landfills will conserve finite spaces and avoid greenhouse gas emissions from anaerobic digestion.



Biomass gasification methanol synthesis system (II)



The biomass energy has three beneficial characteristics: zero CO₂ emission, contribution to energy security and permanent energy. A synthesis methanol process from biomass has been reported by Mitsubishi Heavy Industries (2004):

- (i) Biomass is dried under the sun and pulverised to 1 mm
- (ii) Biomass is burnt with steam and oxygen in the gasifier, temperature about 800 - 1100 °C
- (iii) The synthesis gas, which consists of H₂ and CO, is cooled and sent to gas clean up
- (iv) In gas clean up, ash and surplus steam are removed and the gas is pressurised to 3-8 MPa;
- (v) The copper-zinc catalyst is used at 180- 300 °C to synthesise methanol.

The efficiency is approx 45%. Cost data are 246 euro/kW fuel input for specific, 2 euro/kW for variable investment and 158 euro/kW for fixed annual cost; the technical lifetime is 10 years.



Simplified diagram of biomass gasification methanol synthesis system



Comparative analysis of photovoltaic cell application in domestic sector



Solar film photovoltaic cell potential applications in the UK have been tested. At present they show a rather low efficiency, the first and second generation cells are not economically efficient and are not a sustainable option for mass scale application in the household sector. The analysis also shows that the application of third generation solar cells in the household sector can become economically viable and contribute to reduction of CO₂ emissions. If economic incentives are applied at the national and local levels to stimulate the use of the solar technology, it can become commercially viable in the household sector in the UK.

Dissemination activities within the EMINENT project include development of Technology Assessment Reports, organisation of thematic workshops, an interactive internet site and other kinds of technology transfer. The EST assessment results will be used as part of the ongoing EU consultation process on the potential of EST applications in different countries, covering technology, knowledge, education, market aspects, economics, incentives and partnership arrangements. The development of the project allowed greater focus on these activities.

The OPET Thematic Brochures: Results of activities 2003-2005

The collection comprises 8 brochures and covers the following technological topics:

- **Energy Technologies in the Building Sector**
- **Energy Technologies for the Generation of Electricity from Renewable Energy Sources**
- **Combined Heat and Power Generation (CHP) and DHC (District Heating and Cooling) Technologies**
- **Clean Fossil Technologies Within the Energy Market**
- **New energy technologies and efficiency measures in transport**
- **Mediterranean Cooperation for New Energy Technologies**
- **Modern and Clean Energy and Transport technologies in Latin America and the Caribbean**
- **Accelerating Market Introduction of Promising Early Stage Technologies for Transport and Energy**

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