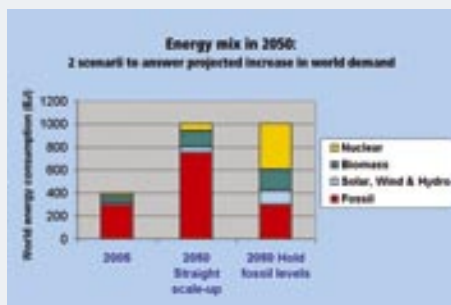


Nuclear Energy Meeting the Challenge of Global Warming



In 2005, more than **80%** of the world's energy is produced through fossil fuel burning that **aggravates the greenhouse effect** by causing an increase in CO₂ emission.



Although efforts are necessary for controlling energy consumption, the world demand is most likely to increase in next decades, for **electricity, heat, and transport** – whether for domestic or industrial uses. Electricity offers possibilities to use various primary energy sources, but as it accounts only for about 16% of the total consumption, any real **solution for oil depletion and global warming issues** must encompass the three sectors, with carbon-free energy sources.

Concerned by these issues, MEPs of 11 countries signed on October 19th, 2005 a declaration claiming that **“nuclear energy should play an increasingly central role in the global fight against climate change...”**

In addition to renewable energies, **advanced nuclear systems** can indeed bring a major contribution to future needs, especially for all forms of massive energy demands: with **Very High Temperature Reactors (VHTR)**, one of the promising technologies for the **next generation**,

industrial heat applications up to 1000°C can be addressed, beyond mere electricity generation. Moreover, this reactor can provide energy for **massive hydrogen production** from water splitting, without CO₂ emission. Hydrogen is already widely used in refineries and chemical industry and is considered in the longer term as a sustainable substitute for oil in transport applications.

Furthermore, VHTR technology presents considerable potential in terms of **nuclear safety, radioactive waste minimisation, proliferation risk reduction, and cost effectiveness**. Finally, it is a step towards developing a further system “GCFR” (Gas Cooled Fast Reactor) that would make it possible to further secure fissile resources supply, and drastically reduce existing radioactive waste.

The EU has been involved in this lead since 1998, by supporting R&D on high temperature reactors. The first projects have exploited past experience and assessed technical feasibility, and FP6 Integrated Project **RAPHAEL (ReActor for Process heat, Hydrogen And Electricity)**



Fuel cell bus in Madrid

now explores ways to achieve the best performance – with already encouraging results. A consortium of 34 partners from 10 countries – mainly industrials,

research centres and universities – expects challenging technological innovations. The project already associates potential users (hydrogen producers, oil and chemical industries, electricity providers) to the R&D strategic agenda.

European industries also contribute with their own engineering and R&D effort, for instance in the French AREVA's ANTARES programme, or British BNFL-supported PBMR project.

Other VHTR programmes are thriving, in particular in the US and Asia (Japan, China, Korea), but **European leadership** in such a strategic field as nuclear energy must be maintained, which requires **strong R&D effort in the next decade**.

The next step is a European demonstrator. This implies a **change in scale of the development effort**; industry is working on it, but this cannot be achieved without a major synergetic approach supported by the EU. The **7th Euratom Framework Programme** could thus support the beginning of design of this demonstrator, in the perspective of commercialisation of first VHTRs around 2025.

Contact:
Dominique HITTNER,
 Coordinator of RAPHAEL
 (dhittner@raphael-project.org)
Sylvie CASALTA, EC Project Officer
 (Sylvie.casalta@cec.eu.int)
Vincent CHAUVET,
 Project Management
 Advisor of RAPHAEL
 (vchauvet@raphael-project.org)
Website: www.raphael-project.org