**Working Group 3**

## Technological Challenges and Options for Future Energy Supply

*Dr. Wolfgang Eichhammer, Deputy Head, Department of Energy Techniques and Energy Policies, Fraunhofer-ISI, Karlsruhe, Germany: Potentials for energy savings, technical efficiency*

**Improving energy efficiency is still largely part of Sunday policy speeches and not yet enough reality despite growing efforts: without suitable large-scale policy initiatives and frames to enhance the demand for energy efficient products and to get energy efficient technologies becoming part of the economic growth processes in both developed and developing countries, progress will be too slow as compared to our increased demand for comfort and living standard.**

Improving energy efficiency in the various demand sectors of the economy has been shown in many studies to have tremendous technical and economic potentials:

- The building sector can evolve at little or no additional costs from a net energy consumer to the "power house" of the economy by integrating low- and zero-energy buildings with decentral energy supply options
- Electric appliances have halved their energy consumption over the past 10 years in Europe and another 33% reduction is possible for a variety of them
- Stand-by consumption of electric appliances can in principle be reduced to zero while saving costs
- Industrial processes are factors of 4-20 away from their theoretical performance
- Cars can half energy consumption at no additional costs

In parallel to these more "classical" energy efficiency potentials that could reduce current energy consumption by at least 25 % in an economic manner, there are further potentials which are less well explored, to be realised by material and product efficiency, by nanotechnology applications, by bio-technologies and by information/communication technologies. The potential for such applications is difficult to estimate today, but there are indications that in the next 50 years energy consumption could be halved in an economic manner and probably be reduced by 60-70% with relatively modest costs. Considerable R&D in these fields focussed on energy will be necessary and raises the question of how to better link the results of basic research with energy efficiency advances.

However, these potentials are not easily realised. There are several strong "enemies" to energy efficiency:

- The complexity of energy consumption with a large number of heterogeneous consumers. This makes policy makers shy to enter the field
- The lack of "sex-appeal" of energy efficiency: while politicians and other stakeholders like to be taken in picture in front of renewable energy sources, an energy efficient building looks in general quite common. Energy efficiency does not look "high-tech" enough. This also leads to the fact that energy efficient products have a highly dispersed industrial lobby.
- The fact that consumer habits lead to an every increasing demand for energy (larger and more powerful cars, larger homes, larger appliances…).

There are recent changes in energy policy aiming more strongly at the improvement of energy efficiency (e.g. the European Directive for Energy Efficiency and Energy Services), however these developments still have to show that they can have a strong impact. The key to an efficient uptake of energy efficiency technology is to trigger demand for the products while at the same time preparing the way for further improvement of performance through future R&D. This holds in particular for the uptake of energy efficient technologies in the developing world: without suitable large-scale policy initiatives and frames and those countries to enhance the demand for energy efficient products these countries will take them up at the market path which is too slow to cope with the challenges of climate change and security of supply. Particularly important is to find ways of how to get energy efficient technologies becoming part of the economic growth processes in developed and developing countries and not be seen as expensive add-ons.