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## **SECURITY OF SUPPLY UNDER THE ASPECTS OF RESOURCES, SYSTEM DEVELOPMENT, EMISSIONS AND COSTS UNTIL 2030**

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### **Objective**

The energy supply industry suffers in future under increasing pressure because of the fact that demand is still significantly growing and the transmission system and the generation capacities are ageing. The problem of adequacy of infrastructures, this means an adequate investment in relation to the growing demand will necessitate large investments in future.

The security of supply under the aspect of supply security with resources in adequate quantity, to a stable price and with secure transportation routes forms a further criterion for the development of the energy systems.

The renovation of the energy systems forms a chance in many dimensions. First by replacing existing power stations by newest technology significant reductions in fuel demand and emissions are possible (fig. 1). Second by replacing of coal by natural gas the carbon dioxide emissions can further be reduced. Third regenerative energy resources can be integrated in the energy systems. Together with fossil fired backup systems a secure supply is possible.

### **Methodical Approach**

The general approach is a simulation model integrating the areas of investment cost, fuel costs, emissions limitation according to national Kyoto Agreement and security of supply.

From this the following strategic approaches are compared: future fossil generation strategy for short and mid term renovation of power stations and their influence on demand of fossil resources, emissions and costs; combined heat and power strategies and influence on passive house technology on future district heating demand and future role of regenerative energy and possibility for integration in existing energy systems.

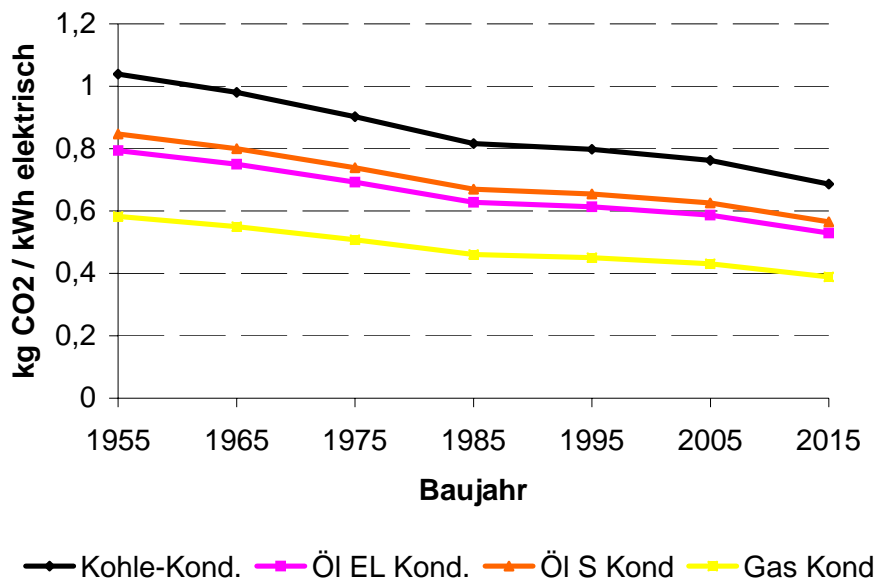


Figure 1 Emission reduction by new power station technology

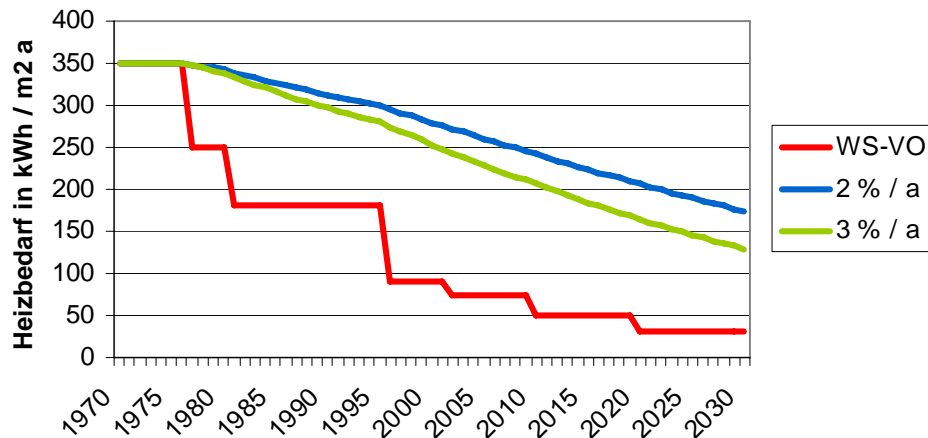


Figure 2 Specific heating demand of buildings in dependence of annual renovation rate

### Results and Conclusions

The following strategies for the power industry are in future most promising to improve security of supply and reduce emissions.

Old thermal power stations should be replaced by newest technology. This brings a significant reduction in fossil resources needed and in emissions. Combined heat and power versus pure electricity generation only brings further advantages but is limited to bulk areas. As a result by replacing an old coal fired thermal power plant by a new of combined cycle type the CO<sub>2</sub>-emissions can be reduced to 40% and the fuel demand to 60% in condensing operation mode. In combination with district heating a further reduction is possible. In the short term range the replacement of power stations against newest technology forms the most economic and environmental relevant measure.

In future an increasing of regenerative resources is of greatest importance. Wind, biomass and solar energy will have a higher portion on electricity and thermal demand. Solar architecture and passive technology in buildings are very important. But today the renovation rate of buildings is only about 2% per year. It is too low to have significant effect in short term range on the fossil energy demand (fig. 2). Legal and financial incentives for higher innovation rate should be given in future.

Additional higher efficiency in electricity and heat demand in the private sector and in industry is and energy saving is important. The annual increase in electricity demand is increasing by 2 until 3 %. In future a demand reduction to about minus 30 % forms a precondition for a new regenerative generating scheme. In the area of buildings this will probably be possible in the near future. In the area of private and industrial electricity consumption this will need much effort.