Maintaining a balanced electricity supply favours increased nuclear capacity in Finland

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Finland's electricity supply is based on a balanced mix of energy sources to maximise the security of supply and to keep the volatility of electricity price at a minimum. One third of electricity is obtained from domestic sources hydro, wood and peat. Nuclear power provides one quarter and fossil fuels slightly over one fifth. Electricity imports from neighbour countries cover the rest of the consumption. It is important to maintain this balanced structure also when electricity supply is being increased. Domestic renewable sources are not enough to cover the predicted future needs, and increasing imports would risk the security of supply. Increasing the proportion of fossil fuels is not a generally desired option. Therefore, balanced increase of nuclear capacity has to be included among the choices of future electricity generation.

Electricity consumption

During the last decade the average yearly growth of electricity consumption was 2,2 per cent, and a recent report by the Finnish Energy Industries' Federation, Finergy, concludes that the total electricity demand will continue to grow at a rate of 1,0-1,5% a year until 2015. The estimate takes into account strong actions for enhanced energy efficiency.

According to the growth estimate the electricity use in Finland will be 97 TWh in 2015 as compared to the current level of 80 TWh. Prompt decisions are needed to meet the increasing demand while at the same time looking into the future to a time when older power plants begin to reach retirement. Account taken to both factors mean that 3800 MW of new generating capacity is needed by 2015.

Electricity supply

According to the Finnish Government programme for the future electricity production the priority will be put on methods, which help in reducing the greenhouse gas emissions. A national programme to further intensify the use of renewable energies is in place. Several new power plants using biomass fuel are currently under construction, and environmental impacts are being investigated for large offshore wind farms.

To cope with the growing electricity consumption other sources are needed, however, for base-load production in large scale. Large increases in use of natural gas with simultaneous ban of coal or, alternatively, additional nuclear power are the methods presented in the Government's climate programme for securing a sufficient capacity for base-load production without increasing carbon dioxide emissions.

Security of supply

Imported energy covers 72% of the total energy use in Finland with a considerable part of imports originating from Russia. The dependence of natural gas, now 10% of primary supply, continues to grow. The imports of electricity have in the recent years risen to about 15 per cent of the country's needs. In the long term, however, the electricity imports cannot be increased without risking the security of supply by becoming too dependent on one energy supplier.

Nuclear power

The operating record of Finland's four nuclear power plant units is good, and the electricity has been produced at a competitive price. The long-term stability of the price of nuclear electricity due to low fuel cost is seen as a vital advantage.

Based on considerations of growing consumption and the long-term electricity price the power company TVO applied for approval by the Finnish Government for a new nuclear plant unit in November 2000. According to the Nuclear Energy Act, a company considering a nuclear plant project must get approval, the "decision in principle", from the Government on beforehand. The

- by progressing in our understanding of the biological effects of low-doses and of chemical compounds produced by the nuclear industry,
- by improving our understanding and tightening our control over the environmental impact of nuclear activities,

– to design, evaluate and develop a new generation of reactor and fuel cycle systems based on the following criteria:
  - improved economic competitiveness (reduction of the capital costs),
  - still improved safety and reliability (fuels and materials offering better resistance in the event of an accident, etc.),
  - environmental protection: in addition to the absence of CO_2 and toxic gas emissions,
    * a considerable reduction in long-life radioactive waste,
    * optimum use of the fuel and natural resources,
    * capability for uses other than electricity generation (hydrogen, desalination of water, etc.).

Conclusion and outlook

Globally, the processing of spent fuels, the consumption of the plutonium in light water reactors, then the transmutation of long-life radio toxic wastes (minor actinides) in the new generation reactors, could help to divide the long-life radio toxicity of the waste by 100, with a radioactivity that would then be comparable to that of the initial natural uranium after several hundred years (instead of several hundred thousand years, in the case of the direct storage of spent fuels).

The development, in an extended international perspective, of a new generation of nuclear power production systems, with gas coolant, offers attractive opportunities for meeting the challenges for the development of sustainable energy sources.
The characteristics of the GCR technology range are promising (cost, safety, environmental protection) and offer the possibility of implementing several configurations, suited to the economic and technical context in question, thereby enabling a gradual deployment on the international market.

The fast neutron configuration of the future nuclear energy systems, integrating into their design the objective of transmutation and the minimising of wastes, aim at enabling a virtually 100 times better use of the natural fuel, and give humankind a sustainable energy source for several thousand years.