

## Nuclear Power Plants and their Potential Significance for Croatia

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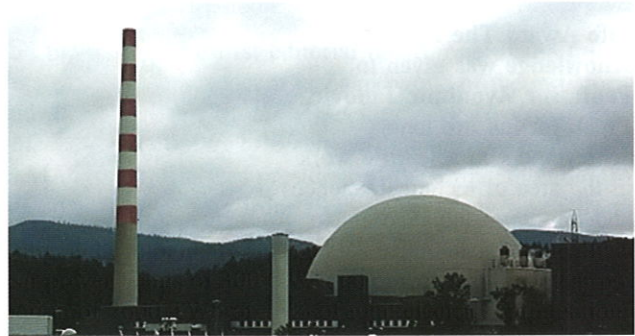
During the last 30 years nuclear power plants have become economically and ecologically acceptable. Today there are 440 nuclear power plants of 300 GW total power, with energy production of 2600 TWh or 16% of total electrical energy consumption in the world. For years now, many European countries have been meeting significant share of their energy production by nuclear power plants (i.e. current share of nuclear power plants in total energy production in France, Belgium, Sweden, Switzerland and Germany amount to 78%, 55%, 52%, 50% and 32%, respectively).

A number of countries today show interest in building nuclear power plants, especially countries at the Far East (China, India), USA and Russia. This interest is motivated by the fact that nuclear power plants are not only the most economical solution for electricity production, but are at the same time the most efficient power plants for greenhouse gasses emission reduction as well.

Nuclear power plants that are in operation nowadays belong to the second generation of nuclear reactors. In the last decade the third generation of nuclear reactors has been developed, and few years ago the development of the fourth generation has been announced. While the third generation projects have mostly been focused towards safety improvements of second generation of reactors, the fourth generation projects (which are expected to be implemented after 2030) are focused on resolving the essential questions regarding applying fission energetics in long term (total utilization of nuclear fuel energy potential, minimization of nuclear waste and hydrogen production).

According to the middle scenarios, long-term development projections of nuclear energetics in the world predict the increase of electricity production in nuclear power plants at about 12000 TWh by the year 2050, which would be sufficient for one third of estimated electricity consumption.

The existing analysis of Croatian electricity production predicts that by 2020 electricity consumption, with the modest consumption growth rate, could reach 21-23 TWh.



This would mean that during the following 13-14 years there would be demand for additional 6 TWh of electrical energy (which equals to production about one of 1000 MW power plant). Additionally, during the same timeline it would be necessary to replace the production from outdated liquid fuels and coal thermal power plants (locations in Sisak, Rijeka, Zagreb and Plomin), with total power of more than 1000 MW, which in total results in approximately 2000 MW of new power plants needed.

At this moment it is very hard to answer the question by which power plant type could electricity demand be reliably and economically met before the end of next decade, and even harder if the longer term is considered. Various technologies are available. There is natural gas the availability of which and especially reasonable price are very questionable. Then there is coal the application of which has become more difficult due to unacceptable emissions, in particular greenhouse gasses, and there are also renewable energy sources (particularly wind), the application of which is complicated by the stochastic nature of energy production (which limits the share of renewables in electricity production to few percent only) and by the high prices. In order to meet the aforementioned level of power from new power plants in Croatia, the vision of possible solution exists for only about one half of the requirements, while the rest is without the proposed solution. For that reason, during the next decade it would be opportune to consider the possibility of building a nuclear power plant. Analyses have shown that this option could also offer attractive solution for electricity production from the economical point of view.