

The role of the service time extension of the Paks Nuclear Power Plant in the national economics, the main conclusions of the feasibility study, the state and social support

The title offers seemingly haphazard themes for the reader. Thus first we should start with an explanation. The electricity system and the different elements of it as the part of the strategic infrastructures can be evaluated according to economical, (provision) safety and environmental protective criteria. These are the criteria for the evaluation of the service time extension of the Paks Nuclear Power Plant. It is obvious that without the understanding and the consent of the society every value and evaluation is useless. The political support is bound to the social support, and the political judgment of the service time extension of the power plant reacts back to the public opinion in a very complex way; it can affect that with several ways. That is why we linked the introduction of the social and political support to the overview of the national economical role of the service time extension. The feasibility study also has to be here. The feasibility study and its conclusions give the arguments to the economical evaluation and also the technical-safety arguments of the feasibility. This later part had and has a major role in the convincing of the general public.

Let's go through the advantages and effects of the service time extension according to this set of aspects. It is obvious and with economical models understandable that the availability of electricity, its supply and its price affects the cost structure and thrift of every product and service, the competitiveness of the economy, the inflation and the standard of living. It is clear that the offer of energy sources, their availability and their world price are the outgrowth of world politics. They tend to be political and economical exigencies even to the most developed countries.

The service time extension has a squarely propitious effect on the energy supply of the national economy. This has technical reasons like the containability and stockpilability of the nuclear fuel. As we know the Paks Nuclear Power Plant maintains a two-year stock, which is ordered by law. The other cause is a geopolitical one: the nuclear fuel can be purchased from alternative sources, like in the case of the Paks Nuclear Power Plant, not only from crisis-regions of the world. This lessens the defenselessness and energy dependence of the country, which is a positive factor even if the nuclear fuel supply is currently without any problems.

Currently the Paks Nuclear Power Plant has a stabilizing effect to the electricity market and by the service time extension it will keep this for a long time, which is important to the national economy. A characteristic of nuclear energy is that its expenses of electricity producing are not affected by the price of the fuel (the doubling of the price of the uranium realizes less than 20% increasing in the expenses). With the help of this the Paks Nuclear Power Plant as one of the biggest companies has a calculable and stable price on the market. And on only the price what is stable but the product by the extraordinary availability of the Paks Nuclear Power Plant. This calculability besides the rationally low prices is necessary to the development of the national economy.

The fact that the Paks Nuclear Power Plant produces nearly 40% of the electricity in Hungary without the emission of carbon-monoxide and other harmful substances, which causes climactic changes.

There are consequences of the service time extension, which we can appreciate only if we think of what could happen if we would stop all the blocks in row from 2012. We premise that the change would be dramatic according to all of the three strategic goals.

To satisfy its yearly electricity demand Hungary has to build about 6000MW power plant capacity included the replacement of the run-down power plants. This dependence would increase because the short term developmental and investment interests favor the fossilized, mostly gas heated technologies even when the usage of renewable resources like wind power stations and biomass heated power plants have a not even fair advantage.

Without the service time extension they would have to set up the capacity equal to the capacity of the Paks Nuclear Power Plant, or they would increase the import of electricity.

The current capacity building tendencies suggest that they would try to compensate the lack arising in the industry with electricity import or with building gas heated power plants. This is a more than one billion Euro project provided that there is an investor in the industry. This would raise the actually high current natural gas import and would raise the import dependence of the country making it more defenseless which has a high risk to the national economy.

If we would try to substitute the production of the power plant from import, half of the country's consumption would be supplied from import. This would increase the defenselessness in the prices and the safety of the supply. This would risk the development of the country.

Substituting the power plant with electricity producing based on renewable resources is a nice looking but not a real alternative neither technologically nor economically. This would create enormous additional expenses to replace the yearly 14 billion kWh electricity produced in Paks with electricity produced from renewable resources. These power plants produce three times more expensive than a nuclear power plant, which would necessarily be paid by the customers in the form of extra price or tax, included the state support that is given to the growers or investors. On the other hand, to replace the production of Paks the wind farms would need 4-5% of the land in Hungary. The availability of the wind power plant is 16% and its distribution in time does not match our consuming customs. This rhapsodic availability would cause great problems on the level of the system. To be fit in a system the wind power plants require a reserve an equal capacity from a gas heated power plant.

Of course there can be other alternative conceptions to replace the nuclear power plant such as biomass heated power plants, which is indeed a supportable technology, or we could increase our energy efficiency, but we can economize only with that is already done produced.

Another serious problem the power plants intended to replace the nuclear power plant cannot be realized until 2012 the planned time of the service time extension or most likely until 2020.

It can be justified by calculations that the shutdown of the power plant between 2012 and 2017 would highly increase the expenses of electricity producing and also the price of electricity by up to 20%. Supposedly this would lead to the decrease of GDP and the devaluation of inland resources. This would affect the standard of living and also the return of investments. The increased import of energy sources would have to be compensated with surplus exports with declining exchange ratios.

And also the quality of the environment would worsen because by replacing the nuclear power plant even by the most modern gas heated power plant would increase the industry's CO₂ emission by 28%.

It is obvious that the service time extension has advantages not only on the level of the national economics but it has to yield profit for the owner.

The feasibility study of the service time extension was in 2000. It had to examine the safety and the technical state of the power plant, and they had to examine the changes in the state of the power plant, they had to make the forecast of the aging of the power plant. We examined the possibility of the extension of the service time over the planned 30 years. We also examined whether the state maintenance practice of the power plant is enough for the operation over the planned service time, and we examined the possible most important reconstructions. In the case of only some of the systems (in the degree of the service time extension) reconstruction will be necessary, because possibility of repair the effects of aging is limited or we would have to reckon with considerable moral depreciation. In the case of certain devices and systems (for example the drives of the regulatory and safety cassettes, the inner rods of them, etc) to extend the service time we need to change the whole stock, in other cases we need to increase the capacity (like in the case of the waste containers).

We have to mention separately (because of their special importance) two from the devices that limit the service period, the reactors and the steam generators. The material of the VVER/213 reactors in Paks is less sensitive to the neutron-irradiation and to the embrittlement caused by it than other similar reactors. Thus these reactors can operate longer without actions and expenses endangering the safety and economic of the service time extension. Reactor cores of reactor 3-4 don't require any intervention, modification thus any additional expenses even in the case of a 50 year service time extension. To extend the service time of reactor 2 requires only the heating of the *breakdown zone cooling containers*. There are tested and not too expensive solutions to this. Reactor 1 might need a heat treatment besides the heating of the *breakdown zone cooling containers*. Heat treatment is a successful and not expense critical method in the case of the VVER power plants (in Finland, Slovak Rep.). In the case of the steam generators we have to count with the stress corrosion of the heat exchangers. If we take into consideration the later introduced interventions on behalf of the safety of the secondary side of the steam generators (condenser exchange, copper removing, disabling the 100% condense cleaner) we have a great chance to avoid the exchange of the steam generators even if we consider a 50 year service time of the reactor. We have to note that these statements have been proven during the preparations of the service time extension or they will be proven later.

The conclusion is simple and clear: The service time extension has no technical or safety impediments. A 20year service time extension can be realized without the decrease of the safety reserves set in the laws. After stating this we have to analyze those aging and lifetime-economizing actions that are necessary to reserve the safety and producible state of the power plant. We have to analyze the required investments and incomes from a long-term market prognosis. This comes up with two possible conclusions: it is practical to extend the originally planned 30 year service time extension to 50 year, which requires no investment campaign but conscious lifetime-economizing and ageing treatment, state-dependant timing of required reconstructions. These reconstruction projects don't require the involving of neither outside

resources nor any proprietary capital or state guarantee. The investments can be financed from the arising operational cash flows, the dividend balance and from credits.

Till the end of the service time the issued capital forms and the dividend is going to be paid to the owner in flow price, which is ~4.4 times the capital.

Openly said, the service time extension is besides its indisputable profit to the national economy is very profitable to the owner too. This statement was re-confirmed by several acknowledged financial adviser companies (Ernst&Young, KPMG). The real surprising would have been the opposite; everyone in the world is sure about the profitability of the service time extension.

This does not mean that we don't have to do anything for the competitiveness of the nuclear power plant but besides the plans there are real opportunities in this area. Enhancing our performance is an important step in increasing our competitiveness. With this the performance of the nuclear power plant increases with about 150 MW. The effect of the performance enhancement is that the expenses are realized in a larger production volume. The investment returns in 3.5 years. On the whole the nuclear power plant is profitable and this profitability is maintainable for a long time.

The building and establishing of the nuclear power plant was done without asking the citizenship. This created a revulsion against the project even if it has not provoked any public protest or any acute problem during the years. There has never been any systematic survey, analysis on it. But we know that since years 75% of the asked accepts the fact that there is an operating nuclear power plant in the country. In this besides the acceptance of the interests and the routines the fact that between the citizens in the surroundings of the power plant there is a much higher amount of information than it was twenty years ago, and the opportunities for orientation (formally or informally) are given.

Preparations to the social acceptance of the service time extension was a hard work even if we managed to realize a harmonious and trustworthy relationship with the citizens of the surrounding towns. There are two ways to build relationship with the citizenship: open and honest informing and accepting the interest from the other side. Despite the beliefs a relationship based only on the financial support to the towns cannot be good and long. The range of financial support is limited, smaller than the demands of the towns, and indeed the fulfilled demands realize new ones, and there is no end of this course. This does not mean that the PNPP does not help the development of the surrounding town with every means.

It was an interesting experience that the public acceptance of the service time extension coincide the operational error in reactor 2 in 2003, which in spite of our fears didn't disturb the public acceptance of the case and did not even worsen significantly the acceptance of the power plant.

The tests of the social support of the service time extension were the environment protection procedure and the public hearing. The PNPP Co. did everything to win the people's confidence: it organized conferences, visits to every town concerned and was ready to answer any questions. We handed out 32 thousand brochures to approximately 130 thousand citizens. We felt that most of the people's opinion moved from the first negative or reserved state to a positive one as a result of our open communication. The public hearings proved that the service time extension became accepted on both sides of the river Tisza.

It was interesting that the most of the questions of the public hearing were economically or consumer oriented. The facts that we mentioned above moved the opinion for the behalf of the service time extension, because the advantages of the service time extension are obvious even on the ground of everyday economics.

2005. november 21-én 339 támogató és 4 ellenző szavazattal, 8 tartózkodás mellett elfogadta.

The social and the political acceptance of the service time extension are related to each other. In the Hungarian public life we could observe that surprisingly the political support of the service time extension is actually apolitical. Every people committed to the interests of the country. This led to the Parliament to officially accept the service time extension (along with the case of the intermediate level waste storage in Bábaapáti, which also has a full public support) in November 21, 2005 with 339 supporting, 4 objecting and 8 unresponsive votes.

To sum it up it can be pointed out that the shutdown and the substitution of the Paks Nuclear Power Plant with other solutions could lead to risks that are not acceptable on the level of social economy. The feasibility study proved that the service time extension can be realized according to technical and safety concerns. The necessary investments and the income during the extended service time result in a great rate of return for the owner. The advantages according to social economy and environmental protection and the arguments on the behalf of the service time extension were understood and accepted by the people, especially in the surroundings of the power plant. This was proved by the public opinion polls and the public hearing.

We should continue work for this trust and for the indisputable profit of the service time extension to the national economy.

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