

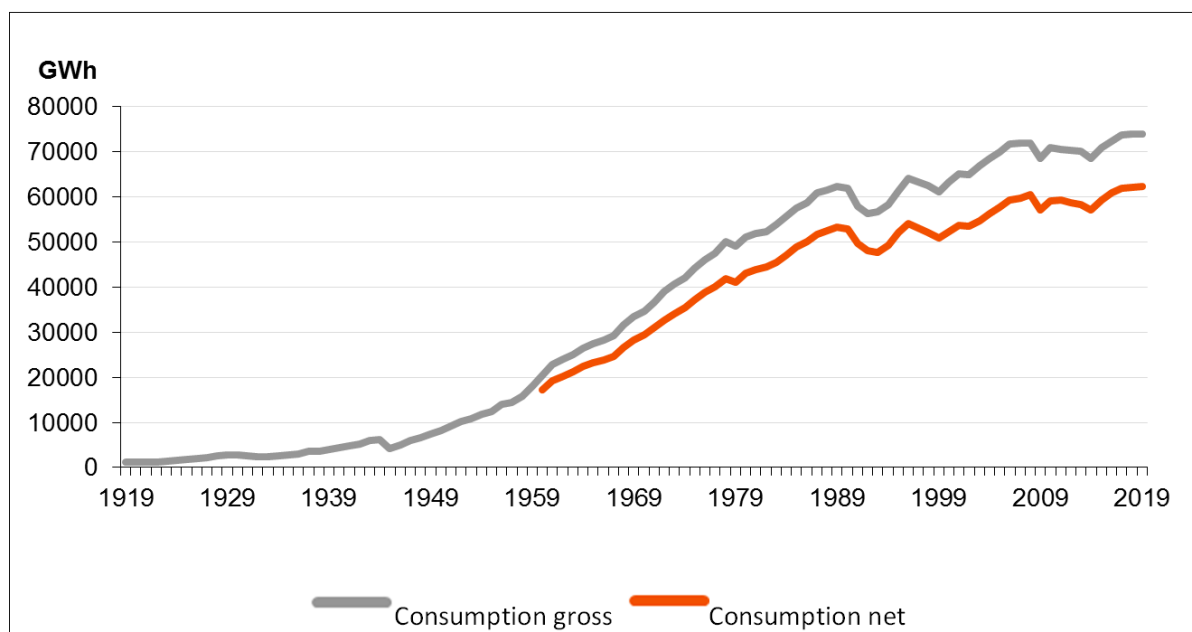
Development of nuclear energy in the Czech Republic and construction of a new block of the Dukovany power plant.

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State of Issue

There are currently four hundred nuclear units in the world. Unlike several developed European countries that have decided to end nuclear energy or those that do not operate any nuclear power plant (NPP) and refuse nuclear energy, the Czech Republic (the CR), like France, is one of the countries that sees nuclear energy as an important part of its energy sector mix for the future. The CR currently operates two NPPs - Dukovany and Temelín. The main subject of the government's interest is now the construction of a new block of the NPP Dukovany. Long-term development of electric energy consumption is depicted in the Graph 1.

Graph 1: Long-term development of electricity consumption in the Czech Republic (1919-2018)



Source: ČEZ (2021)

The Dukovany NPP (abbreviation EDU) is a nuclear power plant in the CR. In 1970, the then Czechoslovakia and the Soviet Union ratified the treaty for the construction of two NPPs. Work on the EDU project began four years later and the construction itself in 1978. Between 1985 and 1987, four power units with pressurized water reactors were put into operation and are still in operation. EDU is an important source of the Czech energy system. In 2020, it produced 14.30 TWh of electricity and thus covers about one-fifth of the total electricity consumption in the country. As part of increasing efficiency, the plant was modernized during operation and the installed capacity was increased from the original 4x440 MW to the current 4x510 MW. The total installed capacity of the power plant is

therefore 2040 MW. The expected operation of the existing units is until 2045-2047. The planned new block (NPP EDU II) should have an output of 2400 MW (2×1200 MW).

The choice of a strategic partner will affect the energy security of the CR for the next eight decades which equals the service life of a NPP. The construction of the new NPP EDU II is a long-term project. According to the schedule of *the Ministry of Industry and Trade of the CR (MIT CR)*, the construction of a new NPP Dukovany II should begin in 2029 at the latest, and in 2036, according to Prime Minister A. Babiš, it should be completed. It is therefore an investment project that has a long-term impact.

Causes and Analysis

Despite the coronavirus pandemic, ČEZ is working with the government on a plan to complete the fifth unit of EDU. At the end of April 2020, the government approved two agreements with ČEZ on the construction of the new EDU block. It is decided how the energy mix will be set several decades ahead. The government cannot hamper the project because it must meet the country's commitments to the European Union. Gradually, ten thousand megawatt fossil fuel power plants will be shut down in the CR, and this outage must be replaced. Otherwise the country would be dependent on electricity imports. Nuclear energy is to ensure important self-sufficiency of the CR in the energy sector. The energy mix is based on nuclear energy and renewable sources.

Financing model: According to estimates, the construction of new block in EDU should cost 160 bn CZK. The financing model will represent a mix of resources for ČEZ. The company will use part of its own resources and part of external ones. There are various options - bonds, loans from commercial sources, loans from the state, or a mix. The state will play a role in external sources. A balance will be sought so that state intervention is not considered as illegal aid by the European Commission. The most probable is a variant of financial guarantees from the state, thanks to which ČEZ would receive more favorable interest rates from banks.

Purchase price guarantee: For a long time the government defended itself against guaranteed purchase prices for the future investor in the new nuclear block. In the end, the situation has changed significantly for ČEZ. The government plans to guarantee the purchase prices of electricity produced at the new EDU block for ČEZ. Without guaranteed prices, the investor would probably give up the construction. So in addition to loan guarantees, the right to sell the project and reimbursement of construction costs, ČEZ should also have secured the so-called realization price, which it will receive for each MWh of electricity produced in the new nuclear source. The state will buy energy from ČEZ at a predetermined price and then sell it on the market at the current market price. Thus, support in the form of the purchase of electricity at the realization price was chosen as the most suitable. This price should take into account the economically justified costs of ensuring the production of electricity from a nuclear source, including a reasonable profit, as well as the costs associated with the decommissioning of a nuclear unit.

Supplier selection: By 2024, ČEZ should select a company to build a new EDU II block. Several companies from all over the world have previously expressed interest in the construction. They will go through a complex selection process. Initially, there were five companies from the US, France, Russia, the Republic of Korea and China that showed preliminary interest. However, strategic, technological, economic and security factors as well as references will play an important role. The government

adopted security rules under the secret regime for the selection of a supplier of a nuclear unit in EDU. In addition to safety, electricity prices and self-sufficiency are also strategic items. Even for security reasons, the government has the insurance that it does not have to approve the choice of ČEZ. In April 2021, a security assessment of three potential applicants - from France, the Republic of Korea and the US - is being considered. After the competition, the government will eventually approve the selection of the supplier.

The government's approach is based on the assumption that from a net exporter position, the CR should gradually become a net importer of electricity. The reason for this turnaround is the gradual shutdown of coal resources. Despite the European Union's measures in the field of energy savings, the government expects a gradual increase in electricity consumption from the current 67 TWh to 77.5 TWh in 2040. In selection of possible ways to replace existing sources the following options had been evaluated: (1) *renewable energy sources*, (2) *natural gas fired power plants*, (3) *increased electricity imports from abroad*, (4) *the development of accumulation and strengthening the involvement of the consumption side*, and (5) *the development of NPPs*. Both point (1) and point (4) are not considered by the government to be sufficient compensation for decommissioned resources. Renewable sources do not have sufficiently suitable conditions here and in the case of energy accumulation its real potential in 2030 is estimated at only 1200 MW. Similarly, according to the government, point (3) does not have sufficient potential to ensure sufficient and reliable performance in the energy system. Sufficient cross-border transmission capacity would also not be available.

Future Expectations and Implication

The construction of the new NPP EDU II is important for the Czech economy and its ecological orientation. This is in line with *the Updated State Energy Concept*, which, in connection with the gradual reduction of production in coal-fired power plants, envisages an increase in production from renewable and nuclear sources. The new block should replace part of the current output of the NPP, the operation of which should slowly end after 2035 (the life of the old reactor units should end in 2037; possibly they will be in operation until 2047). The construction of the new block is supported by the government and other stakeholders. The new block will be financed by ČEZ Group through its subsidiary, and the state will guarantee the stability of the legislative and regulatory environment.

Although it is estimated that the CR will be a net importer of electricity in the near future, one of the impacts of the construction of NPP Dukovany II will be securing of energy security and self-sufficiency. The current energy concept provides for self-sufficiency of at least ninety percent. Another positive fact will be that coal burning in NPPs will end in 2038 or even earlier. *The Coal Commission* recommended to the government to end the use of coal for electricity production in the CR in 2038. The date has not yet been approved. By the end of 2021, the Coal Commission is to analyze in detail the conditions, tools and impacts of the earlier cessation of coal use in the Czech energy sector. Renewable sources of energy now account for just over ten percent (12.1 % in 2020).

The ecological dimension of this change is obvious, although a strategic reserve in the form of coal resources is still envisaged. However, structural changes in the area of the energy mix will take place not only as a result of the construction of NPP EDU II, but also due to the orientation of the Czech energy sector towards other renewable energy sources. Although the NPPs Dukovany and Temelín have the largest installed capacity (4×510 MW and 2×1055 MW), there are more coal-fired power plants together exceeding the NPPs' capacity. The ČEZ Group wants to reduce the share of electricity

produced from coal in less than decade to less than a third of today's production. New investments should go predominantly to the construction of photovoltaic power plants. The Group plans to build 6,000 MW renewable energy sources by 2030. The construction of the new NPP Dukovany's unit and the support of other renewable energy sources should be reflected in a decrease in the ČEZ Group's production of energy from coal from the current approx. 40 % to 25 % in 2025 and to 12.5 % in 2030. Until 2025, the Group plans to build 1,500 MW of renewable sources. The Group now has in the CR the capacity 1,000 MW of renewable sources.

Since, despite all efforts to save on electricity consumption, it is expected its further increase in the future, the completion of NPP EDU II will help to solve the issue of replacing obsolete power plants and also to ensure the functioning of domestic industry. It is industry that is an energy-intensive segment of the economy. Nuclear energy represents more stable energy source due to its output stability than, for example, solar sources. As a result of the financial model used, the effects on the price of energy for the population should also be less pronounced than for some other model and source alternatives. Stabilization or strengthening of the nuclear power generation component will also help to cope with the fact that banks operating in the country are coming under "ecologic" pressure from their parent foreign banks. They try to reduce the financing of coal mining and prefer ecologically "cleaner" energy sources.

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This format of the Graph 1 is intended for translation into Korean language

