FEASIBILITY OF REPLACEMENT OF NUCLEAR POWER WITH OTHER ENERGY SOURCES IN THE CZECH REPUBLIC

by

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The feasibility and consequences of replacing nuclear power plants (NPP) in the Czech Republic with other energy sources are discussed. The NPP produced about one-third of electricity in the Czech Republic in 2017. Renewable energy sources such as hydropower, wind and solar power plants and biomass/biogas burning power plants produced about 11% of electricity in 2017. Due to the geographical and other constraints (intermittency, land footprint, and public acceptance), the renewables do not have the potential to entirely replace the capacity of the NPP. The only feasible technologies that could replace NPP in the Czech Republic in the near future are the power plants using fossil fuels. The combined cycle power plants running on natural gas (NGCC) are technically and environmentally feasible alternative for NPP at the moment. However, the natural gas imports would increase by two-thirds and the total greenhouse gas emissions would go up by about 10% if the power production of the NPP was entirely replaced by NGCC in the Czech Republic.

Keywords: *nuclear power, combined cycles, renewable energy, greenhouse emissions*

Introduction

Nuclear power has a relatively short history with the first nuclear power plants (NPP) starting supplying electricity to the power grid in the mid-1950's. After a 30-year-long boom of the NPP construction, nuclear power began to be viewed with more caution when the Chernobyl disaster affected many countries in Europe in 1986. The 30-year time period since the Chernobyl disaster was characterised by a slow increase in the total capacity of NPP. A decline of the NPP total capacity occurred after the Fukushima disaster in 2011 when several NPP were shut down permanently and Germany announced stopping nuclear energy development. It is fair to mention that there was no electricity shortage in the three decades following the Chernobyl disaster and the slow pace of new NPP construction was to some extent given by reduced demand for new significant power sources.

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The Nuclear Energy Agency (NEA) report [1] states that 348 nuclear reactors were connected to the power grid in the NEA countries as of January 1, 2018, and 25 reactors were under construction (3 of them temporarily halted). The NPP in the NEA countries produced 1856.8 TWh of electricity in 2017. Besides the safety concerns, other issues about nuclear power have been raised in the last decades; from the life-cycle cost to sustainability to carbon footprint mitigation. Pravalie and Bandoc [2] point out the complexity of the three dimensions of nuclear power – economic, climatic and environmental. The nuclear power may economically remain an important option in the countries with NPP in the next several decades as the operating lifespan of the existing NPP is going likely to be extended. The existing (already built) NPP have a GHG footprint similar to RES, and as such, they mitigate the climatic impact of power production. On the downside, the environmental impacts of nuclear disasters can be enormous. There are also issues of cost and footprints in nuclear waste disposal.

Several analyses of the impact of the retirement or voluntary decommissioning of NPP can already be found in the literature. Blumsack [3] analysed the possible impact of the Beaver Valley and Three Mile Island NPP retirement on energy prices in Pennsylvania. The modelled scenario assumed that two units of Beaver Valley NPP with the total capacity of 1834 MW and one remaining unit of the Three Mile Island NPP (803MW) would be retired. The considered units represented 27% of the nuclear generation capacity and 6% of total electric generation capacity in Pennsylvania. The paper analysed scenarios without the replacement of the retired unit and with the replacement of the nuclear units with gas-fired plants. The conclusion was that the impact of the retirement of the three nuclear units would have a marginal impact on energy prices.

The largest shift from nuclear power to RES has been seen in Germany. Renn and Marshall [4] analysed the energy policies in Germany from the 1950's to the second decade of the 21st century. Their work highlights the changing perception of various energy sources in Germany from enthusiasm about coal and nuclear to scepticism. The production of electricity by NPP decreased from 169.6 TWh in 2000 to 91.8 TWh in 2015. In the same time period, the production of electricity from RES increased from 37.9 TWh to 195.9 TWh. However, the production of electricity from lignite coal remained almost the same in that time period; 148.3 TWh in 2000 and 155.0 TWh in 2015. The authors point out some unintended consequences of the energy transition, *e.g.* a significant increase in the average electricity prices for households. The authors also express doubts about the feasibility of the planned reduction of fossil fuel use to 20% of current consumption by 2050.

Power generation in the Czech Republic

The Czech Republic is a landlocked country located in the centre of Europe. The population of the Czech Republic is 10.6 million inhabitants, the area is 78866 km^2, and the population density is about 135 inhabitants per km^2. Until 1993 the Czech Republic was part of Czechoslovakia. Former Czechoslovakia started building its first NPP near the village of Jaslovske Bohunice (now Slovakia) in 1958. The first nuclear reactor in Jaslovske Bohunice NPP was a heavy water type cooled with CO_2. Nuclear power has played an essential role in the prospective and actual energy mix; first in Czechoslovakia, and after the dissolution of Czechoslovakia, in both the Czech Republic (currently 33% of electricity produced in NPP) and Slovakia (currently about 60% of electricity produced in NPP). As will be shown further, the Czech Republic is almost entirely dependent on the import of oil and natural gas, which are difficult to stockpile. While the stockpiles of oil and natural gas would last only several months, it is rather easy to keep a stockpile of nuclear fuel for years of operation of NPP.

Resources in the Czech Republic

Except for coal, the Czech Republic has rather limited resources of fossil fuels [5]. The total reserves of brown coal were estimated at 8.7 Gt in 2017 (682 Mt recoverable). The production of brown coal was 39.3 Mt in 2017. The reserves of black coal were estimated at 16.3 Gt (about 22.5 Mt recoverable). The production of black coal was 4.87 Mt in 2017. The reserves of oil were estimated at 30.5 Mt (1.4 Mt recoverable). The production of oil was 0.107 Mt in 2017. The import of oil was 7.8 Mt in 2017, significantly exceeding both the domestic production and the recoverable oil reserves. The reserves of natural gas were estimated at $30.5 \cdot 10^9$ m^3 in 2017. The recoverable reserves were $4.8 \cdot 10^9$ m^3, and the production of natural gas was $0.171 \cdot 10^9$ m^3 in 2017. The total import of natural gas in 2017 was $8.9 \cdot 10^9$ m^3. Both the recoverable domestic reserves and the production are very small in comparison to the demand for natural gas. A better situation is in case of uranium ore [6]. Uranium was mined in the Czech Republic since the 19th century with utilisation in the glass industry (coloured glass). Only after WW2, uranium mining reached an industrial scale. Almost 111000 tones of uranium ore was produced between 1946 and 2009. The last uranium mine was closed in 2017. The uranium ore reserves were estimated at 134948 tones in 2017. However, the Czech Republic does not have the processing plants for preparation of nuclear fuel from uranium ore. The fuel for nuclear plants needs to be imported from abroad.

Energy mix

The energy mix in the Czech Republic in the year 2017 is shown in fig. 1. The NPP represent about 20% of the total installed capacity, but they produce one-third of electricity.

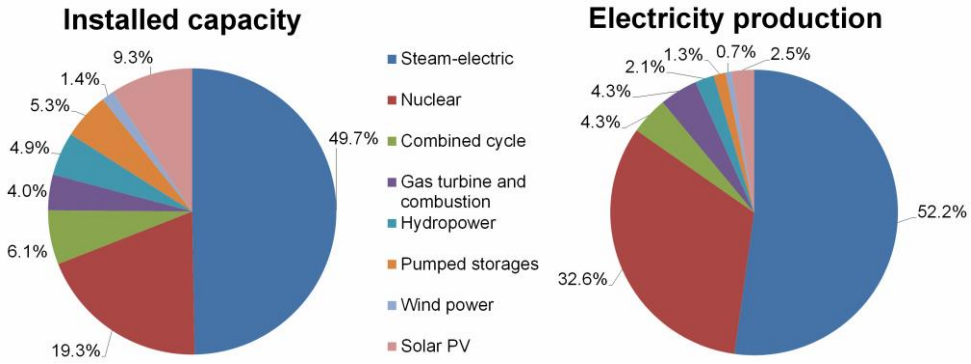

Figure 1. Energy mix in the Czech Republic [7]

The total production of electricity in 2017 was 87 TWh, from which 9.7 TWh was produced from RES (including biomass/biogas burning power plants). The total electricity consumption was 73.8 TWh, and thus the Czech Republic was a net exporter of electricity. The maximum load of the power system was reached at noon on January 24, 2017 (11768 MW) and the minimum load was reached on July 30, 2017, at 5 a. m. (4885 MW). That demonstrates high seasonal differences in the demand for power.

The production of electricity from various fuels in 2017 is shown in fig. 2. As can be seen, most electricity was produced from brown coal. Nuclear fuel is the second largest source of produced electricity, and its share is going to increase as some power plants running on brown coal should be shut down in the near future. The RES (including biogas and biomass) accounted for about 9% of power production.

The chart in fig. 2 demonstrates the difficulty of replacing nuclear power in the Czech Republic. The brown-coal-burning power plants are the most polluting sources of electricity in the Czech Republic. They are planned to be replaced with greener electricity power sources. Since the NPP and the power plants running on brown coal currently produce about 75% of electricity in the Czech Republic, it would be quite challenging to replace both the NPP and brown-coal-fired power plants with other sources in one or two decades.

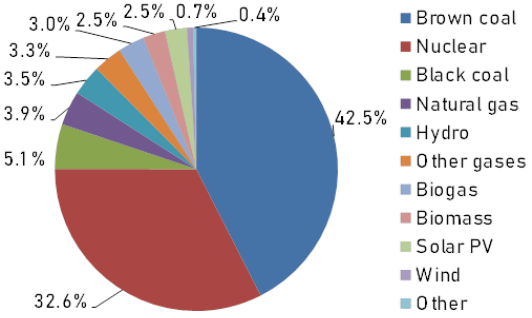

Figure 2. Production of power by fuels [7]

Table 1 shows the installed capacity, the power production and the average capacity factors of the power sources in 2017. As can be seen, the NPP exhibit the highest average capacity factor. The capacity factors of RES are inherently low.

Table 1. Installed capacity, electricity power production and capacity factors in 2017 [7]

Power plants	Installed capacity [MW]	Power production [GWh]	Average capacity factor [–]
Steam-electric	11075.4	45431.7	0.468
Nuclear	4290	28339.6	0.754
Combined cycle	1363.5	3722.4	0.312
Gas turbine and combustion	895.9	3719.6	0.474
Hydropower	1092.7	1869.5	0.195
Pumped storages	1171.5	1170.5	0.114
Wind power	308.2	591.0	0.219
Solar photovoltaic	2069.5	2193.4	0.121
Total	**22266.7**	**87037.6**	N/A

Nuclear power plants in the Czech Republic

There have been two NPP in the Czech Republic; the Dukovany Nuclear Power Plant (DNPP) and the Temelin Nuclear Power Plant (TNPP). The DNPP (location 49.08°N, 16.15°E) consists of four units commissioned between 1985 and 1987. Each unit includes one nuclear reactor, two steam turbines, and two cooling towers. All units use the same type of pressurised water reactor. The gross power generation capacity of one unit is 510 MWe, giving the DNPP the total capacity of 2040 MWe. The TNPP (location 49.18°N, 14.38°E) consists of two units commissioned in 2002 and 2003. Each unit consists of one pressurised water nuclear reactor, one steam turbine and two cooling towers. Each unit has the gross power generation capacity of 1125 MWe, giving the TNPP the total gross capacity of 2250 MWe. In 2017 the TNPP operated at the unit capacity of 1082 MWe (2164 MW total). The power production of the nuclear plants from 2009 to 2017 is shown in tab. 2.

The DNPP and the TNPP are used as the base load power plants. Since the thermal output of the nuclear reactors cannot be controlled to match the current demand for power generation, pumped storages are currently used to balance the supply and demand of electricity. With the increasing share of RES, the current energy storage capacity of the pumped storages is becoming insufficient. New energy storage options will be needed in the future to solve this problem [8].

Table 2. Power production of NPP [TWh]

	2009	2010	2011	2012	2013	2014	2015	2016	2017
DNPP	13995	14176	14369	15022	15680	15371	12608	11954	11860
TNPP	13253	13823	13914	15302	15065	14953	14232	12149	16479

Alternatives to nuclear power

The potential of different energy sources for the replacement, but also an extension, of the existing NPP in the Czech Republic, is discussed in this section. The NPP would not probably be replaced by a single type of energy source or one technology. A combination of different technologies employing various energy sources and other measures would have to be employed as a replacement of nuclear power. However, only thermal power plants would currently be able to replace NPP in their baseload role.

Coal-fired power plants

The coal-fired power plants currently produce the most substantial portion of power in the Czech Republic. In 2017 about 37 TWh of power was produced in brown-coal-burning power plants and 4.5 TWh in black-coal-burning power plants. Coal is the only fossil fuel available in large quantity in the country. Coal-fired plants, like the NPP, are mostly used as baseload power plants. They often substitute NPP during their shutdowns for refuelling, maintenance, *etc*. In spite of the advancements in coal burning technologies, the coal-fired power plants are still viewed as *dirty*. This view is not unfounded as the coal-fired power plant produce large amounts of CO_2 and other emissions. The production of power from coal would decrease significantly in the Czech Republic in 2020 when several units of coal-fired plants with a total capacity of 1050 MWe are planned to be decommissioned. All units scheduled for decommissioning used brown coal as a fuel and the main reason for decommissioning is extensive air pollution. The total emissions of coal-fired plants should decrease by 80% when the units are decommissioned. No new coal-fired power plants are currently under construction in the Czech Republic. As the lifespan of coal-fired power plants is over 30 years, any newly-built coal-fired power plant would be in operation beyond 2050. That would be against the long-term goal of reducing the GHG emissions footprint of power generation.

Combined cycle power plants

The total capacity of the combined cycle power plants in the Czech Republic is nearly 1.4 GWe. The Pocerady combined cycle power plant was commissioned in 2013, but it has not been used very much during several years following the commissioning because of the low electricity prices. The plant uses natural gas as a fuel, and it consists of two gas turbines (284 MW each) and one 270 MW steam turbine (total nameplate capacity of 838 MW). The Vresova combined cycle power plant was commissioned in 1996. It consists of two units (198 MW each). The power plant uses coal gas as a primary fuel and natural gas as a secondary fuel. Coal gas is obtained by gasification of brown coal. The Vresova combined cycle power plant boasts with a high capacity ratio.

The combined cycle power plants exhibit high thermal efficiency, but the influence of the fuel price to the power price is much higher than in case of the NPP. The natural-gas-fired combined cycle (NGCC) power plants are potentially the best option for the

replacement of the NPP in the Czech Republic. The projected GHG emission of newly built NGCC of less than 454 kg-CO_2-eq./MWh would mean up to 13 Mt of additional CO_2 emissions if the electricity production of the NPP was entirely replaced with NGCC. That would increase the total greenhouse emissions of the Czech Republic, which were 131.3 Mt of CO_2 equivalents in 2016 [9], by about 10%. As the Czech Republic was already above the EU average of the CO_2 equivalents emissions per capita in 2016 (12.4 tones in CZ *vs*. 8.7 tones in EU28), the situation would likely get worse if the nuclear fuel was replaced with natural gas.

Small scale (local) cogeneration

Small scale cogeneration is a promising option in the energy mix. Both NPP and coal-fired power plants produce a lot of heat that is mostly not utilized. Small scale cogeneration plants (*e.g*. based on the combustion engine technology) can be installed locally and serve the needs of both electricity and heat. The consumption of heat and electricity in the Czech Republic is higher in winter than in summer, and that could be a good opportunity for the installation of local heating systems based on small-scale cogeneration units. Through such installation would not be able to replace the production of the NPP they would very well supplement solar power plants, which produce much less electricity in winter than in summer.

Waste-to-energy plants

Municipal solid waste is a fuel that can also be used in power generation. Unlike other fuels, municipal waste can pay for itself as the inhabitants pay for waste disposal. The actual cost of waste as a fuel depends on many factors. Municipal waste needs to be sorted out, dangerous and non-combustible items must be removed before municipal waste can be incinerated.

The first waste incineration plant in the Czech Republic was built between 1984-1989 in the city of Brno. The plant was refurbished at the beginning of the 21_{st} century, and a 22.7 MW turbine was installed in the plant. Similar plants were built in other cities (Prague, Liberec, Pilsen). Beside the waste-to-energy plants using municipal waste, several plants utilising industrial waste and hospital waste were built. The waste-to-energy plants using municipal solid waste as a fuel produced 196 GWh of electricity and the plants burning industrial and hospital waste produced 3.2 GWh of electricity in 2017. The waste-to-energy plants are a promising technology that can significantly improve energy efficiency and environmental impacts of solid waste disposal, but it is not a solution for the baseload power generation. Even more so when many countries start to implement the circular economy in which most waste is recycled reducing the amount of combustible waste for energy generation.

Hydropower

Worldwide, the hydropower plants produced 4170 TWh of electricity in 2016 [10]. That was more than the NPP (2606 TWh), the wind power plants (958 TWh) or the solar photovoltaic plants (328 TWh). In the Czech Republic, hydropower (including pumped storages) only accounts for about 4% of the total power production. The hydropower plants (excluding pumped storages) produced 1.9 TWh of electricity in 2017. That was only a fraction of what the NPP produced in 2017 (tab. 1). Due to their short response time, the hydropower plants are handy peak-load power sources. Two largest hydropower plants in the Czech Republic are pumped storages (650 MW and 475 MW). The largest impoundment hydropower plant (Orlik) is on the Vltava River and has a nameplate capacity of 364 MW. The total nameplate capacity of hydropower plants in the Czech Republic (excluding pumped storages)

is just over 1 GW. The geographic location of the Czech Republic does not provide much potential for expansion of hydropower. The rivers lack the heads and the flow rates for the installation of large-capacity hydropower plants.

Wind energy

The total installed wind power capacity in the Czech Republic was 320 MW, and the total amount of produced electricity was 609.3 GWh in 2018, tab. 3. Unlike in many European countries, only a few wind power installations in the Czech Republic can be called wind parks. The majority of the wind power installations involve less than 5 turbines (often only one). The largest installation, Krystofovy Hamry wind park, consists of 21 wind turbines, each with the nominal output of 2 MW, giving the park the total nominal capacity of 42 MW. It is well below the large onshore wind parks found in Europe, such as Fantanele-Cogealac, Romania (600 MW).

Table 3. Installed wind power and electricity production [11]

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Power [MW]	215	217	260	269	283	283	283	308	320
Prod. [GWh]	336	397	416	479	472.4	573	496.9	591	609.3

The installed wind power capacity in the Czech Republic will keep increasing in the future, but the wind power is not a viable alternative for the existing NPP. Leaving aside the issues with the available wind potential and the need for energy storage, there are other problems that need to be overcome. In comparison to nuclear power, wind power requires much larger land areas to deliver the same amount of electricity. That would mean installing hundreds or even thousands of wind turbines. As the installation of wind turbines needs to be approved by local authorities, power utilities and other parties, the process of acquiring necessary permits to build enough wind turbines would be quite time-consuming. At many locations the installation of the wind turbines would be challenged by residents and various interest groups, prolonging or thwarting the installation process. It is fair to say that the construction of a new NPP would face the same challenges. That is one of the reasons why the potential future replacement or expansion of the existing nuclear power capacity in the Czech Republic is planned within the area of the two existing NPP. The impact of the replacement of a NPP with wind power on the reliability of the power system was analysed by Čepin [12]. The author considered a base case scenario with the power system consisting of 12 power plants; 1 nuclear, 6 thermal, 4 hydroelectric, and 1 hydro pumped storage. The scenario, in which the NPP (696 MW) would be replaced with three wind power plants (1160 MW each), was analysed for different wind data. The author concluded that the replacement decreased the reliability of the power system and either power storage or a backup power source would be needed to maintain the reliability of the power system.

Solar energy

Solar radiation is the most abundant source of renewable energy on Earth. The Czech Republic does not have a climate suitable for solar thermal power plants, therefore, the photovoltaic power plants are currently the most suitable technology for electricity production from solar radiation. The total installed capacity of the photovoltaic plants was 2069.5 MW in

2017. The photovoltaic power plants produced 2193 GWh of electricity in 2017. The total installed capacity has not changed very much since 2010 as the subsidies for the electricity produced from solar radiation wound down, and the new legislation is limiting the use of arable land for photovoltaic plants. The building integrated photovoltaics will become more common in the near future as a result of the legislation requiring nearly-zero energy buildings from January 1, 2020. Nonetheless, solar photovoltaics is unlikely to become an alternative to nuclear power in the next two decades.

Import of electricity

The Czech Republic has been a net exporter of electricity for a long time. The net export in 2017 was 13 TWh. That is more than the total production of the Dukovany NPP in 2017 (11.86 TWh) and almost as much as the Temelin NPP produced that year (16.48 TWh). While the current electricity production exceeds the consumption of the Czech Republic, the shutdown of both NPP together with the planned decommissioning of several coal-fired units would change the Czech Republic from the net exporter to the net importer of electricity. The net imports of the electricity would not probably be as large as may appears from the total production of the NPP and the coal-fired units scheduled for decommissioning. Some coal-fired and natural gas-fired power plants operate at lower capacity factors than is their potential, and their capacity factors could be increased to partially cover for missing production. However, the reliability of the power supply would decrease, and the prices of electricity would go up. With many nuclear and coal-fired power plants in Europe scheduled for decommissioning in the next decade, it is not entirely clear from where the electricity would be imported.

Energy savings

Energy savings are often mentioned as an alternative to building new power sources. Though energy conservation is important, it is not an option for replacing the existing power plants. Almost all predictions indicate an increase in the electricity demand in the Czech Republic in the next decades. Leaving aside consumption of electricity in the industrial sector, where a positive correlation between the increasing production (GDP growth) and the power consumption has been shown [13], other sectors will contribute to the increasing demand. The largest increase can be foreseen in the area of transportation, where the expansion of electromobility is expected.

Discussion

At present, the Czech Republic (Czechia) is heavily dependent on NNP for power generation. The most recent data [14] indicate that the NPP produced 30.25 TWh (gross) of electricity in 2019 and their share on the total electricity production was 35%. Retiring nuclear reactors in the middle of their lifespan would not bring any economic benefits as the acquisition costs have already been incurred and the costs of decommissioning for the reactors in the middle and at the end of their lifespan can be expected to be quite similar. Moreover, operating costs of existing NPP make produced electricity very price-competitive on energy markets. The only reason for possible early retirement of nuclear reactors is the concern about nuclear safety. Current energy road maps, *e.g.* State energy policy of the Czech Republic [15], do not consider complete abandonment of nuclear power generation in the next 20 years. The largest electricity producer in the country, CEZ (Czech Power Company), which operates existing NPP, has applied for the permission to build up to 2400 MWe of new nuclear power

generating capacity at the location of Dukovany NPP. That does not mean that new nuclear reactors will eventually be built in Czechia to replace the existing reactors when these are retired. Besides the issues concerning nuclear safety, the national energy security, carbon emissions obligations, payback time, and public acceptance will play a role in the final decision.

As for the possible replacement of NPP in Czechia, the NGCC power plants are the most viable option in the near term. Considering the thermal efficiency of new NGCC of 58% [16], the production of 1 MWh of electricity would require 184 m^3 of natural gas. If the entire production of NPP (30 TWh) was replaced by NGCC, the consumption of natural gas in Czechia would increase by 5.5 Gm^3. The total consumption of natural gas in Czechia was 8.183 Gm^3 [17] in 2018, it means the potential increase of 67%. Czechia is connected to the Transgas pipeline transferring natural gas from the Russian Federation to Europe. The pipeline has a sufficient capacity (120 Gm^3/y) to provide for the increase in natural gas consumption. In the future, natural gas could also be imported through the existing pipeline network from LNG terminals in European ports [18].

Table 4 outlines possible scenarios for energy mix in the Czech Republic in 2040. The state energy policy of the Czech Republic expects decreasing share of coal-fired power plants and the increasing share of renewables. The presented low-carbon scenario would require large penetration of new technologies, electricity storage in particular. The installed capacity of 3.1 GW of electricity storage (on top of 1.1 GW of the existing pumped-storage capacity) is considered in the low-carbon scenario. The total capacity of solar PV is 14.9 GW and of wind 2.8 GW in this scenario.

Table 4. Energy mix scenarios (installed capacity in GW)

Year	2020	2040	2040	2040
	Current situation [19]	State energy policy scenario [19]	Low-carbon (new technologies) [19]	Non-nuclear
Renewables	5.6	10.0	21.1	54.9
Nuclear	4.3	4.3	4.3	0.0
Natural gas	2.0	6.8	6.5	6.2
Black coal	1.3	0.4	0.4	1.3
Brown coal	8.9	2.0	2.0	0.0
Total	**22.1**	**23.5**	**34.3**	**62.4**

The non-nuclear scenario was devised by the authors. The scenario relies heavily on renewables and energy storage and it would be extremely difficult to implement by 2040. Power plants running on black coal were considered (preserved) in the non-nuclear scenario in order to increase energy security of the energy mix, as coal is the only fossil fuel found in relatively large quantities in Czechia. Black coal (besides being a cleaner fuel than brown coal) can be economically transported over larger distances than brown coal (due its higher heating value) making imports of black coal from other countries a viable option.

The ongoing research and development in the area of nuclear power generation indicates that NPP may still be a viable option in the future [20]. Brook *et al.* [21] argue that only NPP have the capacity to provide sustainable and reliable supply of large amounts of electricity with minimal emissions of greenhouse gasses. Nuclear fusion technology offers several advantages over current fission-based NPP (abundant and non-expensive fuel, safety, better control of energy output) while keeping the advantageous features of current NPP

(small land footprints, near-zero direct GHG emissions). However, fusion-based NPP will not likely be available for the large-scale energy production before 2050 [22]. In the meantime, new generations of fission-based NPP, like SMR [23], can be used as a bridge to better future solution (*e.g.* nuclear fusion).

Conclusions

Retiring or replacing NPP is a political decision. The NPP have several advantages, from long lifespan to small land use, to very small carbon footprint. Two main problems of nuclear power are the far-reaching consequences and costs of an improbable but possible nuclear disaster and the costs and hazards of nuclear waste management and storage. The current energy mix in the Czech Republic and available resources indicate that the replacement of nuclear plants with other energy sources is unlikely in the next two decades. Environment-friendly alternatives for nuclear power need to be carefully explored and analysed – a suitable solution should be selected with environmental footprints [24]. Natural gas-fired power generation plants seem to be the most suitable alternative for the NPP at the moment. The replacement of the power production in the NPP with natural gas-fired power plants would increase the GHG emissions in the Czech Republic by up to 10% and make the electricity prices more closely correlated with the price of natural gas.

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