

# Is ČEZ Ready for Decarbonization?

## *A Decade of Lost Opportunity Has Left the Company Playing 'Catch-up' on Renewables*

### Executive Summary

ČEZ Group, the largest energy group in Czechia and one of the largest energy groups in Central and Eastern Europe (CEE), announced a new strategy in 2021 to decarbonise its power generation, including constructing 6 gigawatts (GW) of renewables by 2030, phasing out coal by 2033, and building a new nuclear power plant (NPP) by 2037. However, NPPs globally have been fraught with delays and ČEZ has only a tiny share of the domestic renewables market today. How realistic then is this strategy, and what are its financial risks?

To address these questions, we first examine the company's historical activity. We then use a discounted cash flow model to estimate and compare investment metrics under different future scenarios.

Our key findings include:

- With absence of state support, ČEZ has failed to build out domestic renewables over the last decade. A decade of complacent management and strategy means it is behind on the energy transition and has significant challenges to overcome.
- An aggressive dividend policy has meant low investment levels and weak equity performance since 2011. ČEZ shares have rebounded in 2021, after divestments of foreign assets and an increase in carbon prices. Equity performance is still below 2011 levels.
- The proposed NPP, which would be commissioned in 2037, *i.e.* four years after the planned coal phaseout, could lead to a downgrade of ČEZ's credit rating, especially given the likelihood of NPP construction delays and cost overruns.
- 'Doubling down' on utility-scale solar photovoltaics (PV) would be more cost-effective than current plans to pursue new nuclear and renewables, especially when accounting for delays.
- ČEZ would benefit from increasing the currently low utilization of its hydropower assets and support from the EU Modernization Fund for investments in renewables' capacities.

### IEEFA Scenario Result Highlights (€ Billion): Solar PV Delivers Best Value

	Business-as-Usual (BAU)	BAU + Nuclear	BAU + Solar PV + Nuclear (ČEZ Strategy)	BAU + 2x Solar PV	BAU + Solar PV + Nuclear Delayed
Capital Expenditure, 2021-2037	25.9	32.6	36.6	30.8	40.8
Free Cash Flow, 2021-2060	76.6	82.7	91.1	86.2	82.0
<b>Enterprise Value (EV)</b>	<b>29.3</b>	<b>28.8</b>	<b>30.4</b>	<b>30.8</b>	<b>26.2</b>
<i>Relative EV (vs. BAU)</i>	<b>0</b>	<b>-0.5</b>	<b>+1.1</b>	<b>+1.6</b>	<b>-3.1</b>
<i>Relative EV (vs. ČEZ Strategy)</i>	<b>-1.1</b>	<b>-1.6</b>	<b>0</b>	<b>+0.5</b>	<b>-4.2</b>

Source: IEEFA.

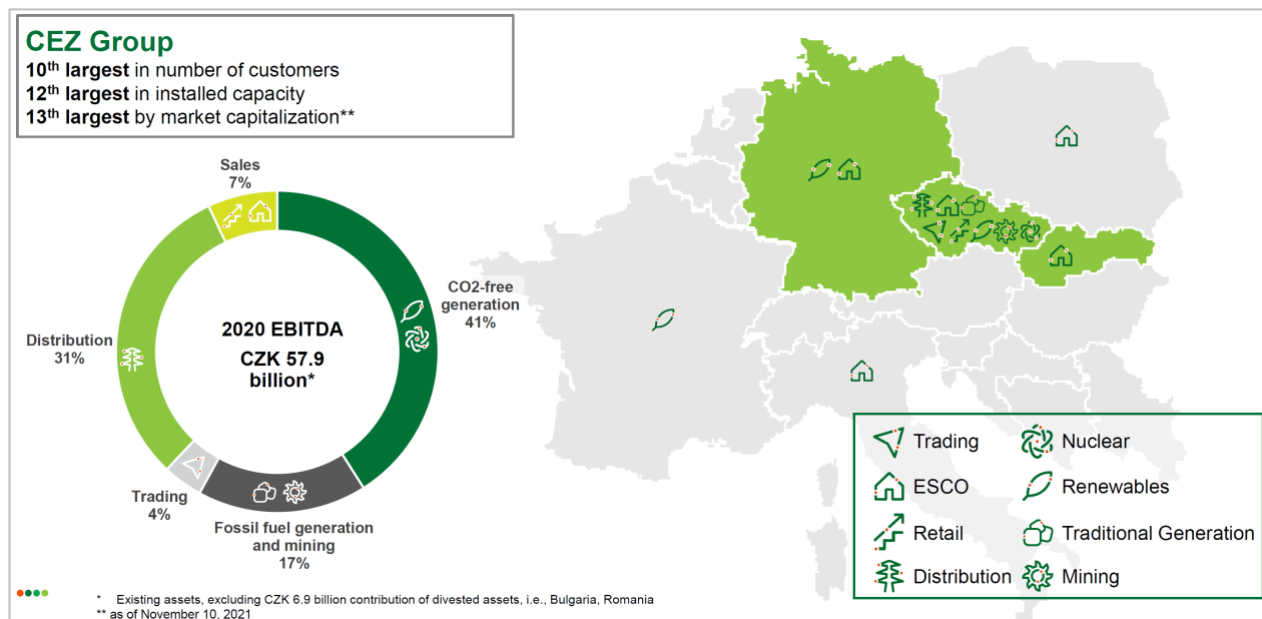
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## Introduction

ČEZ Group is one of the largest energy groups in the CEE region, with a market capitalisation of €17.8 billion at 2021 year-end and 2020 revenue of €7.9 billion.<sup>1</sup> It is vertically integrated in Czechia with mining, electricity generation, distribution,<sup>2</sup> sales and energy services (ESCO) activities. The company is 70% owned by the Czech state, with its shares publicly listed on stock exchanges in Prague (Czechia) and Warsaw (Poland).

**Figure 1: ČEZ Group at a Glance**



Source: ČEZ investment story presentation, November 2021.

As shown in Figure 1, ČEZ Group has been well known for its conventional electricity generation from nuclear power, coal and gas. In 2020, thermal (coal) power stations provided 57% of peak load electricity, with nuclear plants (32%) and combined cycle power plants (10%) accounting for the balance.<sup>3</sup> When looking at the renewables' share targets in the total electricity generation mix, IEEFA finds that a significant reserve lies in underutilized hydro potential. Only 14% of a possible net capacity factor of 60% for conventional hydropower capacities (even higher for pumped hydro capacities) has been used by ČEZ.<sup>4</sup>

<sup>1</sup> Due to the rise of the stock market, market capitalization of ČEZ Group rose 60.58% during 2021, to over €17.8 billion on December 31, 2021. Historical data on ČEZ stock performance are available from [Prague Stock Exchange](#).

<sup>2</sup> ČEZ Distribuce is the largest electricity distribution company in the Czech Republic with about 69% market share, followed by E.ON Distribuce that holds more than a quarter of the market.

<sup>3</sup> Energy Regulatory Office. [Yearly Report on the Operation of the Czech Electricity Grid for 2020](#).

<sup>4</sup> In 2020 ČEZ Group generated 2,381 GWh electricity from 1,961 MW of installed hydro power plants, of which 1,170 MW is related to pumped hydro power plants. According to National Renewable Energy Laboratory (NREL), [Data and Tools | Energy Analysis | NREL](#), Annual

Until 2020, ČEZ supplied electricity to customers in Czechia, Poland, Romania, Bulgaria, Slovakia and Hungary; heat in Czechia and Poland; and gas in Czechia, Poland, Slovakia and Romania. In addition to electricity generation and distribution services, ČEZ Group traded electricity, natural gas, black (or “hard”) coal, and CO<sub>2</sub> emission rights in more than 10 countries, and provided ancillary services to transmission grid operators in Czechia, Poland, Bulgaria and Slovakia. The company recently decided to withdraw from its international markets and focus on domestic operations.<sup>5</sup>

## Has the Last Decade Been a Missed Opportunity for ČEZ?

ČEZ's intention to move towards nuclear and renewable generation has been known since 2011, when the group announced a target to engage in investments with lower emission factors. A decade ago, Czechia was a leader in installed solar capacity that rose from 40 megawatts (MW) in 2008 to 1,960 MW in 2010 on high state subsidies that dropped from 15,565 CZK/MWh (megawatt-hours, about 620 €/MWh<sup>6</sup>) in 2006 to zero in 2014.<sup>7</sup> The group announced planned increases in renewables installations abroad by 2016 in locations with favourable weather conditions.<sup>8</sup> However, ČEZ Group was actually lobbying *against* renewables in the domestic market after the support scheme for new plants stopped in 2013, after Czechia achieved the EU target of renewables in overall electricity generation mix at the time.<sup>9</sup>

The orientation of ČEZ Group to conventional electricity generation in Czechia has seemed increasingly flawed since then. The price of renewables electricity generation technology has declined, coal has been recognised as a dirty source of power, and the EU has committed to increasing the share of renewables in the electricity mix of its member states.

Despite this, ČEZ's domestic investment policy has remained tightly linked to government strategies and investment decisions, as well as expected subsidies offered for operation of renewable capacities. Total electricity generation in Czechia was 81.4 TWh (terawatt-hours) in 2020, the lowest level since 2003.<sup>10</sup> ČEZ Group generated 56.7 TWh (69.7%). Figure 2 illustrates a lethargic ČEZ Group that has not done anything to increase its renewable share of total generated electricity for

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Technology Baseline, an average hydro power plant capacity utilization is 60%, meaning that ČEZ Group could produce 10,308 GWh electricity from its hydro power plants.

<sup>5</sup> ČEZ Group announced the sale of its Bulgarian assets for €335 m ([CEZ Group Completes Sale of Bulgarian Assets for EUR 335 Million | CEZ Group](#)). July 27, 2021.

<sup>6</sup> In the period 2011-2021 EURCZK exchange rate fluctuated from 25 to above 27. Where the rate was not explicitly stated like in annual financial statements, IEEFA used 25.60 EURCZK rate in the analysis.

<sup>7</sup> Lunackova, P. et al.: [The Merit Order Effect of Czech Photovoltaic Plants](#). Charles University in Prague, Institute of Economic Studies (IES), Prague. 2017.

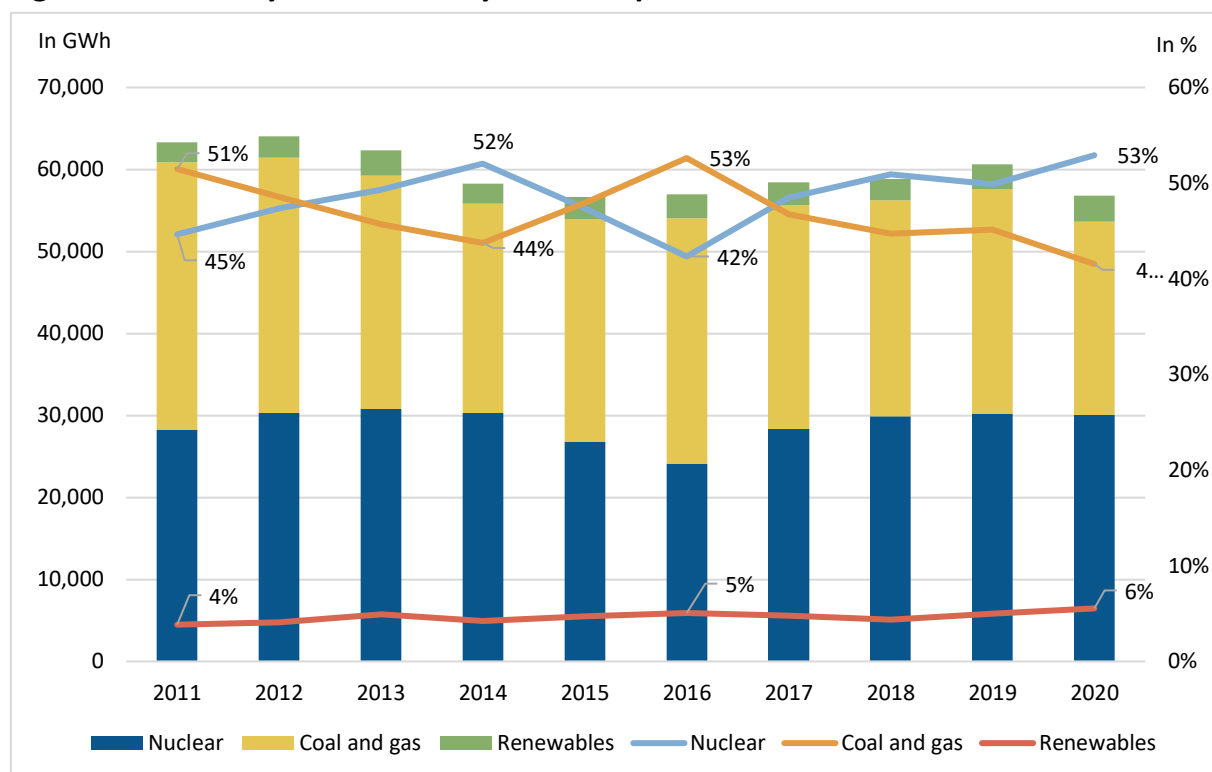
<sup>8</sup> ČEZ Group. Annual report. 2011.

<sup>9</sup> [Energy Atlas. Facts and figures about renewables in Europe](#). 2018.

<sup>10</sup> Energy Regulatory Office. Yearly Report on the Operation of the Czech Electricity Grid for 2020.

years. Overall electricity production has gradually declined, but there has been no material change in the conventional-to-renewables electricity mix.

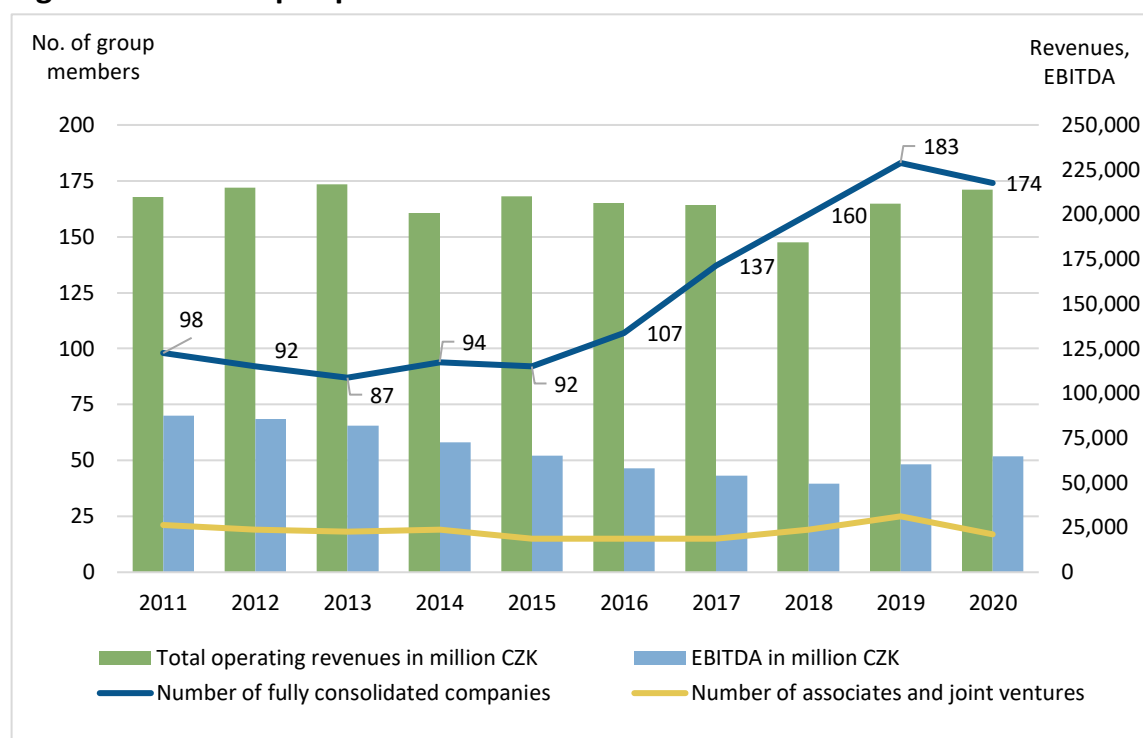
**Figure 2: Electricity Generation by ČEZ Group in Czechia, in GW and %**



Source: Based on ČEZ annual reports.

ČEZ Group has been operating in several segments, *i.e.*, electricity (ČEZ Prodej, s.r.o., ČEZ, a.s.), natural gas (ČEZ Prodej, s.r.o.), heat/thermal energy (ČEZ, a.s., ČEZ Energo, s.r.o.), and electricity distribution (ČEZ Distribuce, a.s.). These companies are also the largest within the ČEZ Group. However, the number of companies that comprise ČEZ Group is much larger, and it has been increasing in line with ČEZ Group's international operations. However, ČEZ's strategy to expand internationally has not proven so beneficial when comparing the expanding number of group companies with the consolidated revenues and EBITDA. Consolidated revenues increased less than 2%, while EBITDA has fallen almost 26% in the last decade. The number of consolidated companies almost doubled, from 98 in 2011 to 174 in 2020. Part of the explanation can be found in the soaring number of project finance companies that have not generated stronger corporate results in any way. Figure 3 shows a decade-long trend in opening group companies and stagnation in consolidated revenues and decline in EBITDA.

Figure 3: ČEZ Group Expansion



Source: Based on ČEZ annual reports.

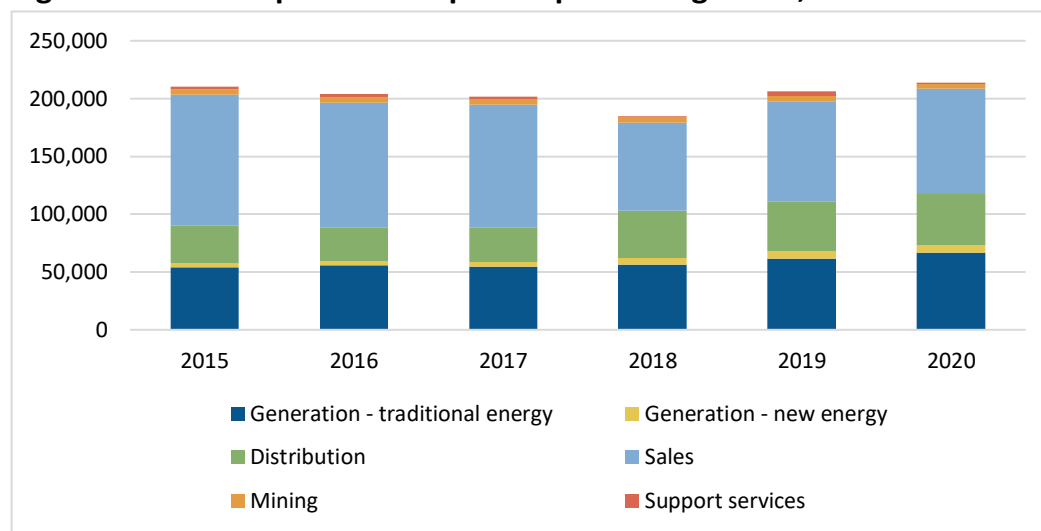
Since 2015, group operations have been organized into six major segments: *Traditional Electricity Generation, New Energy Generation, Distribution, Sales, Mining, and Other Services*. The company changed its organizational structure in 2021, by merging traditional and renewable electricity generation departments into one electricity generation segment. The merger means the public cannot distinguish between results from fossil-fuel and renewable power generation segments.

In financial terms, segment reporting offers valuable data for major sources of revenues and EBITDA within the group as shown in Figures 4 and 5. Most revenues come from Sales, followed by Traditional Electricity Generation and Distribution. EBITDA numbers do not correspond to the operational revenues due to tight margins in the Sales segment. The purchase and sale of electricity in the market is about 10 times greater than ČEZ Group's power production in Czechia, while gas procured accelerated from 40 TWh in 2013 to almost 540 TWh in 2020. Nevertheless, consolidated EBITDA is mostly earned in Traditional Electricity Generation and Distribution. S&P Global also confirmed that ČEZ's electricity generation fleet is predominantly fixed cost and contributes significantly to EBITDA of the group.<sup>11</sup> In addition, most electricity production is hedged for one or two years in advance.

<sup>11</sup> S&P Global. *CEZ a.s. Outlook Revised To Negative On Tight Financial Headroom Amid Market Turmoil; Ratings Affirmed*. March 31, 2020.

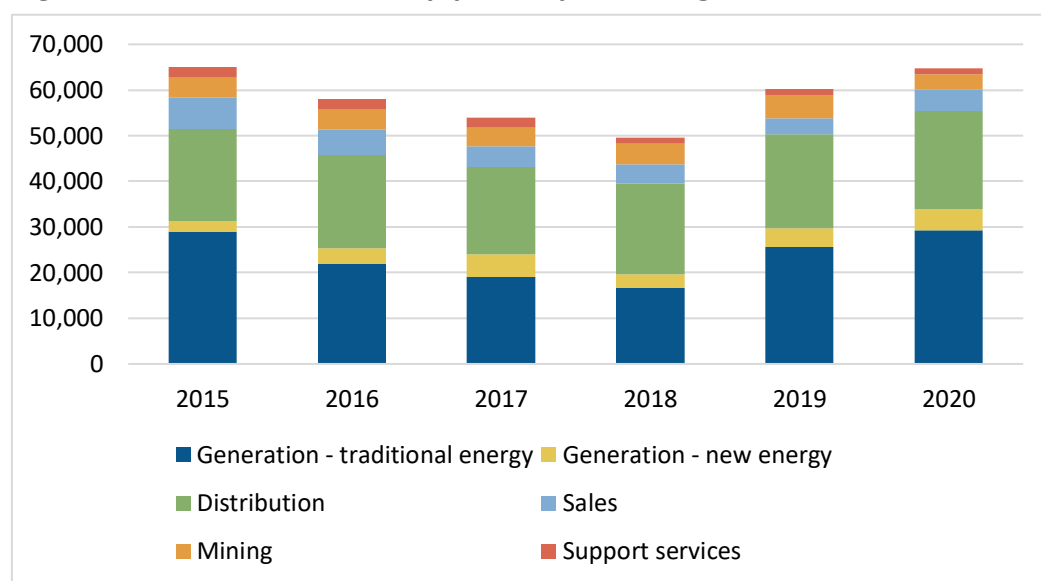
Electricity production from nuclear power plant (NPP)'s share in corporate EBITDA was 34% (out of a total 45% achieved by Traditional Electricity Generation), while EBITDA from Distribution was 33% in 2020. In line with the EBITDA earned, the company has channelled its investments mostly into Distribution and Traditional Electricity Generation. Very slight investments into renewables paid off in much larger EBITDA. Both figures suggest ČEZ should invest in distribution and new renewable electricity generation capacities, given their relatively low operational costs and higher contributions to EBITDA margin.

**Figure 4: ČEZ Group Revenues per Corporate Segments, in CZK Million**



Source: Adapted from ČEZ annual reports.

**Figure 5: EBITDA of ČEZ Group per Corporate Segments, in CZK Million**



Source: Adapted from ČEZ annual reports.



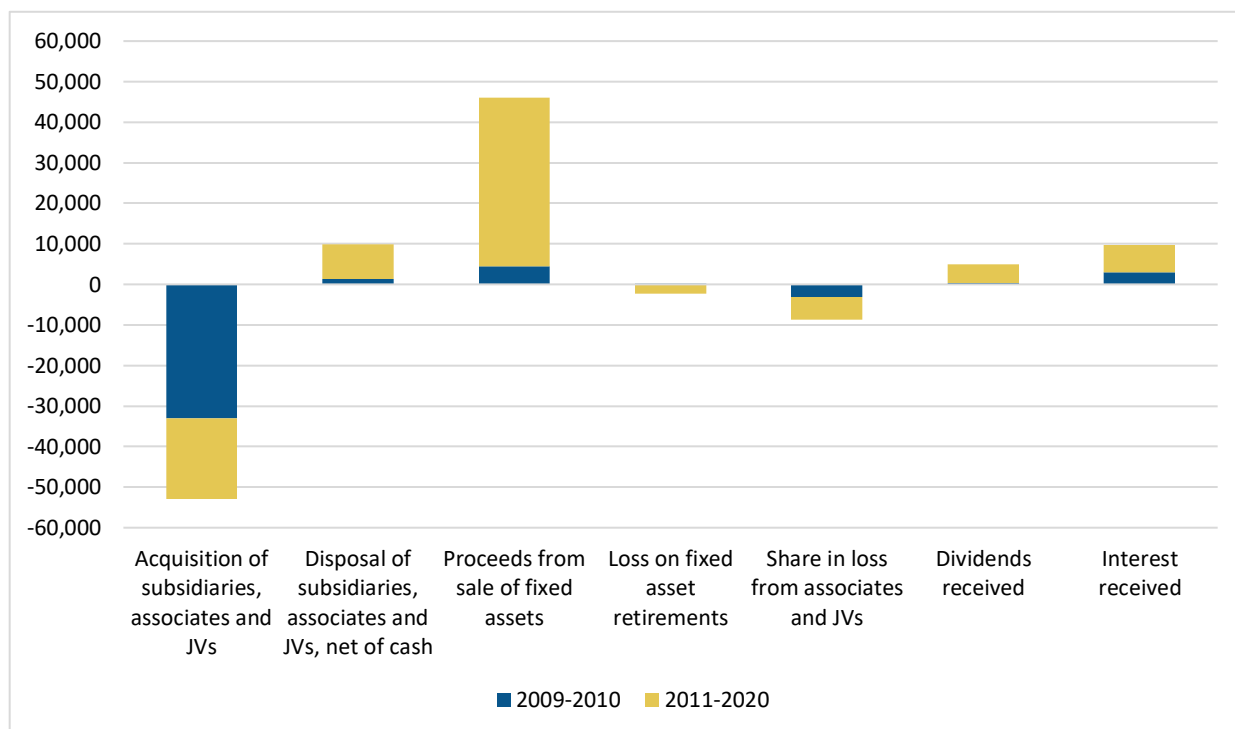
## Planned Investment and Divestment

ČEZ current strategy includes divestment plans in Romania (completed in the first quarter of 2021), Bulgaria (completed in July 2021), and Poland (put on hold until receiving a satisfactory offer). It also wants to provide energy services in Germany, northern Italy and Poland.

This strategy could mean a further decline in the number of customers, which fell from 9.3 million in 2010 to 7.4 million in 2019. The company's total electricity generation capacities in Czechia also fell from 12.8 GW in 2011 to 11.6 GW in 2020. The decline was caused by a gradual coal phaseout and an absence of investments in other electricity sources.

After a strategy of spreading to Eastern and Southern Europe to 2010, ČEZ group has since begun withdrawing from these markets. Figure 6 shows that cash outflows for M&A activities more than halved in the last decade compared to 2009-2010. Although it tries to present itself as an acquirer, ČEZ group has been disposing of subsidiaries, associates, joint ventures, and fixed assets. The company has tried to compensate for losses in joint ventures (primarily in Turkey) by earning interest income from loans approved to its related companies.

**Figure 6: Cash Outlays and Inflows From M&A Activities and Divestments, in CZK Million**



Source: ČEZ group annual reports.

**Table 1: ČEZ Group Strategy in the Last Decade, in CZK Billion**

Selected CF/P&L Item	2011-2015	2016-2020	2011-2020
Plant additions	-170.1	-66.6	-236.7
Disposals	29.2	18.3	47.5
Assets to be disposed of	9.7	54.7	64.4
Acquisition of subsidiaries	-9.6	-3.3	-12.9
Goodwill from acquisitions	2.3	8.2	10.5
Goodwill impairment	-1.7	-4.3	-6.0
Depreciation	139.6	143.7	283.3
Impairment losses net	-20.9	-11.9	-32.8
Dividends paid to shareholders	-114.6	-87.5	-202.1
Net income	159.1	64.0	223.1
Debt increase (decrease)	-24.6	-9.6	-34.2

Source: ČEZ group annual reports.

The data in Table 1 gives a deeper view on ČEZ strategy in the last decade. Its investment cycle was intensive until 2015 due to a lignite fleet upgrade. However, organic growth lagged depreciation. Its acquisition strategy was totally subordinated to disposals and planned asset divestments. Even though the investment outlays were larger until 2015, its net income was accompanied with larger dividend payouts and larger deleveraging from 2011-2015. Asset disposals seem to be associated with more profitable assets, as the company achieved a much weaker performance from 2016-2020 compared to 2011-2015. It invested less, paid higher prices for acquired assets, disposed more, achieved far lower net income, and paid out just 40% of dividends compared to the 2011-2015 period.

### Context: Energy Transition Targets

The power sector contributes 42% to global energy-related CO<sub>2</sub> emissions.<sup>12</sup> The EU's strategic goal is to be climate neutral across all economic sectors by 2050, led by the power sector, which would decarbonize by mid-2040,<sup>13</sup> to decrease GHG emissions by 55% by 2030 (compared to 1990 levels), and to limit average global warming to 1.5°C. The EU has also set a renewable electricity production target of 63% by 2030, almost doubling the current 34%, and climbing to 80% by 2050. All other electricity should be secured from other low-carbon sources such as NPPs.<sup>14</sup>

Czechia has committed to using 22% renewables in all sectors by 2030, and 16.9% renewables in electricity consumption. This target is well below fair contribution to the current EU-wide plan for a 32% share of renewables in total energy consumption by 2030. The National Energy and Climate Plan (NECP) advocates self-

<sup>12</sup> World Nuclear Association. [Carbon Dioxide Emissions From Electricity](#). May 2021.

<sup>13</sup> McKinsey Sustainability. [How the European Union could achieve net-zero emissions at net-zero cost](#). December 3, 2020.

<sup>14</sup> European Commission. [A Clean Planet for all. – A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy](#). November 28, 2018.

sufficiency in electricity generation based on advanced conventional technologies with high efficiency of conversion and an increasing share of renewable sources.<sup>15</sup> To accomplish a coal phaseout by 2033, Czechia has so far relied on the construction of new NPPs, seeing these as crucial for achieving its low-emission commitments. ČEZ itself has committed to electricity production without CO<sub>2</sub> emissions no later than 2050 and hopes a new NPP would help achieve its goal.

### *ČEZ, the Czech Government and New Nuclear Power Plants*

There are currently 4,290 MW of installed NPP capacity in Czechia—four units in Dukovany and two units in Temelin.<sup>16</sup> The Dukovany units were commissioned in 1986 and 1987, while the Temelin units were commissioned in 2000 and 2002. There were 2,270 people employed in nuclear energy sector at the end of 2014, of whom 40% were at least 50 years old.<sup>17</sup> The Czech Ministry of Industry and Trade prepared a detailed report on the involvement of Czech industry in the construction of the new NPP.<sup>18</sup> Most companies have been employed not only in the construction of the NPPs in Temelin and in Mochovce, Slovakia, but also in other countries. In 2011, ČEZ launched a tender for completion of two units of Temelin nuclear power stations, so there is still experience with delivering complex projects within the company.

The Czech national action plan for development of the nuclear sector in the Czech Republic (NAP NE) advocates the construction of 2,500 MW of nuclear capacities by 2035.<sup>19</sup> The arguments for such a strategic orientation include energy security and fulfilment of the obligations of transition to a low-carbon economy, ensuring industrial production and export potential.<sup>20</sup> However, this plan needs to be updated since it used data on electricity generation costs from renewables that are much higher than today's prices.

According to NAP NE, the additional annual costs of low- and intermediate-level nuclear waste repositories are as much as CZK 60 million (€2.5 million). Czechia no longer mines uranium domestically.<sup>21</sup> However, nuclear fuel is imported from Russia and stored domestically for several years before use. In July 2020, ČEZ signed

<sup>15</sup> The Czech Republic. [National Energy and Climate Plan of the Czech Republic](#). November 2019.

<sup>16</sup> Installed power generation capacities are disclosed in ČEZ Group annual reports.

<sup>17</sup> Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.

<sup>18</sup> The Czech Republic., Ministry of Industry and Trade. [Possibilities of involvement of the Czech Industry in upcoming NNS projects in the CR and other countries in individual projects, maintenance of professional background of suppliers from the CR for the construction of NNS and future service](#). 2017.

<sup>19</sup> Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.

<sup>20</sup> The share of nuclear industry and infrastructure in the employment rate is approximately 15,000 people and the share of GDP is approximately 2%. The projections include that 70% of investment would be realized by domestic firms. See: Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.

<sup>21</sup> Thirty mines have been mined out or closed up until 1993. Of two remaining uranium deposits, one was mined out in 1996 and the last one was closed up in 2017. See: Miloš, R. [History of Uranium Mining in Central Europe](#). December 2017.

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two agreements with the Czech government to build a nuclear power plant in Dukovany, where there are already four operating nuclear power units of 510 MW each.

The agreement with the Czech government envisages the construction of a 1,200-MW nuclear power block, with the possibility of building an additional 1,200 MW block, also in Dukovany. It targets permitting by 2029 and commissioning by 2036. The tender for the supplier and fuel assemblies is expected to be completed by the end of 2022. The approval of the supplier is subject to the consent of the European Commission (EC). The Czech government keeps the right to control the tender process due to security reasons. ČEZ accepts an obligation to manage the NPP project and to finance its preparation. The government would grant an interest-free loan until the date of commissioning of the new NPP and offer a long-term guaranteed price or premium on investment costs for electricity from the project. However, ČEZ has a right to sell the project to the government for a fixed price of CZK 4.5 billion (approx. €177 million) in 2024 if an electricity purchase contract is not signed with the government and if the second implementing agreement is not agreed upon (both subject to prior consent of the European Commission).

ČEZ also signed an agreement with GE Hitachi Nuclear Energy to investigate the economic and technical feasibility of the construction of small modular nuclear reactors in Czechia. Such small reactors would target a total capacity of more than 1,000 MW after 2040. It is argued that without more investment into nuclear power plants and coal phaseout, Czechia could become a significant net importer of electricity by 2040.<sup>22</sup>

### *ČEZ's Ability to Deliver on Planned Investments*

ČEZ and Czechia's long-term reluctance to propose more ambitious plans for investments in renewable electricity generation infrastructure might open the door to various competitors that already operate more renewables in Czechia than ČEZ (Jufa Investment Group, Solar Global, Solartech, EkoTechnik Czech s.r.o., S&M CZ, Achema group, Photon Energy, Nova Green Energy, Solek, Vestas). A window of opportunity emerges for ČEZ Group as other players in Czechia have also been waiting for state subsidies for renewables. Little construction of new renewable capacities has happened in the Czech domestic market during the last decade. ČEZ competitors owned and operated 1,957 MW of solar PV installations (94% of the total) and 331 MW of wind power plants (98% of the total) at the end of 2020.

Table 2 compares the current state of renewable installations to the desired situation in 2030. All other projections mostly exceed Czechia's NECP goals for investments into utility-scale solar PV and onshore wind technology.

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<sup>22</sup> ČEPS. Resource Adequacy Assessment of the Czech Power System until 2040 (MAF CZ), 2019.

**Table 2: Existing and Potential Renewable Electricity Generation Installations in Czechia by 2030, in MW**

	Solar PV	Wind
<b>Existing Capacities in Czechia (2020)</b>	<b>2,082</b>	<b>339</b>
ČEZ Group	125	8
Others	1,957	331
<b>Expected Additional Capacities in Czechia by 2030</b>		
Ember (2020) <sup>23</sup>	7,900	3,700
BNEF (2020) <sup>24</sup>	6,300	6,700
Czechia NECP (2019) <sup>25</sup>	1,900	700
Nitsch <i>et al.</i> (2018), <sup>26</sup> SolarPower Europe <sup>27</sup>	-	3,985
<b>ČEZ Group (2020)</b>	<b>6,000</b>	

Source: ČEZ annual reports and Investor presentations.

As shown in Table 2, BNEF envisages a 13 GW investment in renewables for Czechia by 2030, while the UK-based think tank Ember projects an 11 GW investment in renewables by 2030. Ember estimates 45,000 new jobs could be generated by this investment, although it did not specify if the new jobs would be temporary or permanent.

The Czech NECP offers the most conservative projection, estimating there will be less than 1,900 MW of installed solar PV and slightly more than 600 MW of wind power added by 2030. However, ČEZ Group is more ambitious and has announced the construction of as much as 1.5 GW of renewables capacity by 2025 and 6 GW by 2030, as well as plans for positioning itself as a major player in renewable electricity generation in Czechia.<sup>28</sup> ČEZ Group counts on co-financing from the grants from the EU Modernization Fund until 2030. The fund supports projects for generation and use of energy from renewable sources, energy efficiency, and facilities for the accumulation and distribution of energy.<sup>29</sup>

Czechia is eligible to receive 15.6% of total resources of the EU Modernization Fund—a minimum of CZK 150 billion, or slightly less than €6 billion. A minimum of 38.7% of the total Czech allocation, or €2.3 billion, can be invested into new renewable energy sources. The total resources available in the fund depend on the

<sup>23</sup> Ember. [Coal-free Czechia 2030](#). November 2020.

<sup>24</sup> Bloomberg NEF. [EU Climate Goals Accelerate Eastern European Decarbonization](#). November 17, 2020.

<sup>25</sup> The Czech Republic. [National Energy and Climate Plan of the Czech Republic](#). November 2019.

<sup>26</sup> Nitsch, F. et al. [Wind power potential assessment for the Czech Republic based on Austrian and Danish site characteristics](#). September 24, 2018.

<sup>27</sup> SolarPower Europe. [National Energy and Climate Plan – Czech Republic. SolarPower Europe Assessment](#).

<sup>28</sup> ČEZ Group. [Annual Report 2020](#).

<sup>29</sup> To firm its intentions to become the leader in renewables' electricity generation in domestic market, ČEZ bought 66% interest in ZOHD Group B.V. that owns a 100% stake in three companies engaged in the production and installation of solar panels. ČEZ Group. [Interim consolidated financial statements as of September 2021](#). November 2021.

price of carbon allowances. At carbon allowance prices of 60 €/ton, the 38.7% allocation to renewables projects climbs to CZK 114 billion, or more than €4.4 billion. Sixty percent of the amount can be awarded to the existing electricity producers. If the award of funds corresponds to market share, ČEZ can count on about €1.85 billion (CZK 47.3 billion) in support in the next decade.<sup>30</sup> The maximum amount of the support covers CZK 6.2 million to 7.3 million/MW or € 0.24-0.29 million/MW. ČEZ submitted 24 photovoltaics projects with total capacity of 233 MW to the first round of the auction for support from the modernization fund in October 2021.<sup>31</sup>

ČEZ Group has planned from CZK 1 billion to CZK 1.8 billion for investments into renewable capacities from 2021 through 2024, but these projections have been raised to CZK 6.5 billion until 2025, probably due to the expected resources from the Modernization Fund that could reach CZK 4.7 billion annually. Even if the grant funds are awarded, ČEZ would still need to cover at least 50% of investments into renewable capacities (hopefully by means of cash inflow from divestments), or the difference between the grant and full price of investment in CZK million/MW of installed capacity.<sup>32</sup> In addition, ČEZ Group also plans substantial capex for its energy service company (ESCO) projects and batteries (a 300-MW electricity storage construction by 2030),<sup>33</sup> as much as CZK 8.9 billion by 2025, and CZK 6.7 billion from 2025 to 2030. The plans probably include a portion of grant from the Modernization Fund, as expected capex significantly increases in the coming decade compared to 2021.

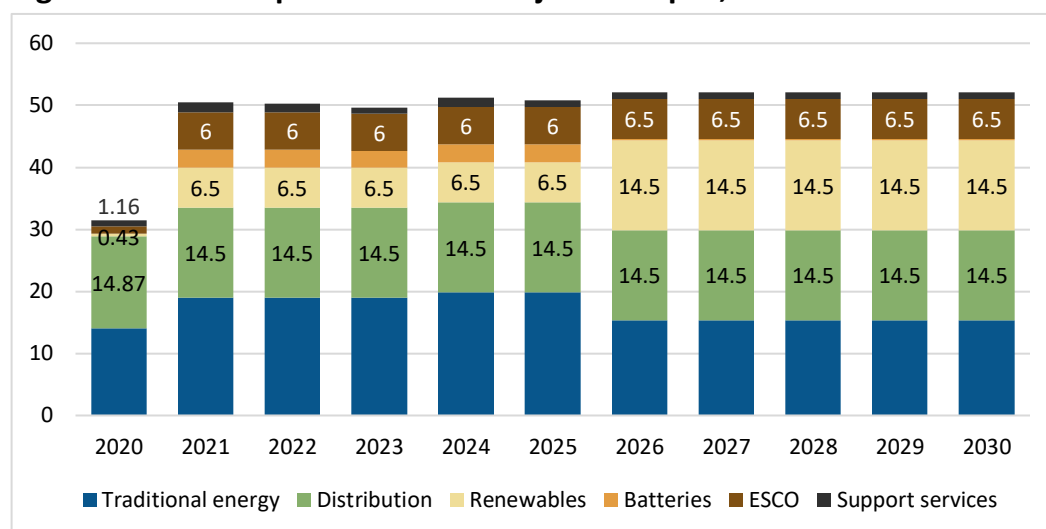
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<sup>30</sup> See information available from: [the State Environmental Fund of the Czech Republic](#).

<sup>31</sup> The EU Modernization Fund supports the EU Green Deal Investment Plan in renewable energy, energy efficiency, energy storage, energy networks, and just transition in carbon-dependent regions. It was formed for the benefit of Czech Republic, Poland, Hungary, Slovakia, Romania, Bulgaria, Estonia, Lithuania, Latvia, and Croatia.

<sup>32</sup> CEZ Group. [Investment Story](#). November 2021.

<sup>33</sup> The construction of 300 MW storage capacity is planned until 2030.

**Figure 7: ČEZ Group's Actual and Projected Capex, in CZK Billion**

Source: ČEZ Group *Annual Report 2020*, March 2021 and ČEZ Group *Investment Story* November 2021.

Total cumulative capex ranges from CZK 500 billion to CZK 550 billion from 2021-2030 (CZK 513 billion is shown in Figure 7), of which 45% is planned for maintenance, 45% for organic growth, and 10% for acquisitions. Even though the planned investments in renewables and energy efficient projects are the largest ever, traditional electricity generation and mining, *i.e.* traditional energy, and distribution still account for two-thirds of total capex until 2025, and 57% of total capex from 2025 to 2030. The planned annual investments into gas capacities of CZK 9 billion from 2021 to 2025 (and CZK 4.5 billion until 2030) suggest that ČEZ prefers reliance on electricity generation from conventional sources in the future, despite planned heavy investment into renewables between 2026 and 2030.

Although there are some concerns over the stability of the electrical grid with an increased share of renewables, the Czech transmission system is designed well. The transmission system interconnectivity corresponds to maintaining the transmission system import and export capacity, relative to the maximum load at the level of at least 30% to 35%, which is in line with the EU goal of a 15% interconnectivity target relative to installed capacity by 2030. However, electricity networks should be modernized to allow for the further development of new electricity generation sources.

ČEZ has a strong customer orientation, backed by equity investments into companies dealing with battery storage systems, smart power, and heat solutions. Its strategy to remain the largest domestic player in the power sector is complemented by its plans to build a network of charging stations for electric vehicles. By 2025, it plans to have 800 charging stations (four times more than in 2020).<sup>34</sup> It also plans to integrate its charging infrastructure with car manufacturers'

<sup>34</sup> ČEZ Group. *Investment Story*. July 2021. According to its annual report (2020), ČEZ Group operated with 540 independent charging points gathered into 270 charging stations.

software to help drivers find the nearest charging station. It also conducts research and development efforts into battery production and using car batteries in the Czech distribution grid. ČEZ Group plans to add 11,000 (eleven thousand) kilometres of fibre optic networks by 2030 to the existing 4,200 kilometre network.<sup>35</sup>

### *Does ČEZ Have Too Many Employees? Can They Be Retrained?*

The number of ČEZ Group employees has been constantly growing since 2013. The growth in employment, however, has been uneven. Sales personnel increased by almost 6,000 (six thousand), while support personnel decreased by approximately the same amount. However, employment grew in Traditional Electricity Generation (3,500), Mining (1,900), and Distribution (1,500). In particular, the Mining segment that is expected to close down by 2038 has more than 4,500 employees.

Although the crowding-out effect of employment from conventional electricity generation technologies might be significant during a gradual coal phaseout, evidence shows that employment in the renewables sector should exceed the job losses in fossil-fuel based electricity generation.<sup>36</sup> The company, however, does not possess much renewable power plant construction experience. Only 0.6% of the total workforce worked in renewables at the end of 2020.

A recent analysis of ČEZ Group employees shows that 38% of the company's workforce was older than 50.<sup>37</sup> ČEZ Group managed to reduce its workforce from 32,800 to 27,200 people from the end of 2020 to the end of the third quarter of 2021.<sup>38</sup> It was the first reduction of employment in the last decade, partly caused by the divestment of ČEZ companies in Romania and Bulgaria, and partly by retirement of workers within the group. With this decrease in workforce, the company returned to the number of employees it had five years ago. This gives it financial room to either employ additional workforce in renewable electricity generation, or to retrain existing workers and/or engage in a voluntary early retirement program. However, the reduction in employment during 2021 has not been recorded in ČEZ consolidated financial statements for the first three quarters of 2021.

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<sup>35</sup> ČEZ Group. [Investment Story](#). July 2021.

<sup>36</sup> International Labour Office. [Skills and Occupational Needs in Renewable Energy](#). 2011.

<sup>37</sup> ČEZ Group. [Annual Report 2020](#). Spring 2021.

<sup>38</sup> ČEZ Group. [Presentation on ČEZ Group Financial Results in Q3 2021](#). November 9, 2021.



## IEEFA Investment Scenarios' Impact on Corporate Financial Statements and Shareholder Wealth

Based on ČEZ Group announcements of investments in Czechia, before analysing the impact of investments on corporate financial statements, IEEFA calculated the feasibility of two possible projects on a standalone basis:

- Building a NPP with commissioning in 2037 (nuclear scenario), also considering sensitivities for likely delays and cost overruns
- Building renewables power plants with commissioning in 2025 (renewables scenario).

In both scenarios, investments in electricity transmission and distribution network are not considered as they are done by Czech Transmission System Operator—ČEPS a.s., a separate state-owned company. The same holds for investments in land for the construction of renewables-based power plants.<sup>39</sup>

The impact of investing in NPP and renewables (*i.e.*, in utility-scale solar PV) on corporate financial statements of ČEZ Group and the wealth of its shareholders has then been assessed until 2060. Two investment scenarios have been considered through 2037, with detailed assumptions and descriptions of these projects included in the Appendix.

- Investing in utility-scale solar PV power plants and NPP thereafter (most likely scenario). This scenario assumes eight consecutive years of adding 1,000 MW of solar PV installations and commissioning a 1,200-MW NPP thereafter. Commissioning of the first solar PV power plant starts in 2025, while the last one is commissioned in 2032. All other previous assumptions for investments are valid with a 4% annual decrease in solar PV technology costs. It is denoted as solar PV + nuclear (NPP) scenario.
- Investing in utility-scale solar PV and utility-scale solar PV power plants instead of investment in NPP (possible scenario). This scenario assumes 14 consecutive years of adding solar PV installations starting in 2025 and ending in 2038. In the first wave of investment, eight 1,000-MW solar PV power plants are installed, while six 400-MW plants would be installed thereafter, *i.e.*, 10,400 MW in total. All other previous assumptions for investments are valid with a 4% annual decrease in solar PV technology costs. It is referred to as the 2x solar PV scenario.

IEEFA also analysed the impact of solely investing in NPP on corporate financial statements of ČEZ Group but disregarded it as the sole investment option, due to the coal phaseout trend, long pre-investment and investment period for the NPP, and

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<sup>39</sup> The land for Dukovany NPP is already available. According to [Macháč, J. and L. Zaňková \(2020\)](#), 1 MW of installed PV power plant capacity occupies 2.8 ha of land.

grant resources available for renewable capacities. For the delayed NPP installation scenario IEEFA assumed NPP commissioning in 2041.

IEEFA could not assume earnings from carbon dioxide allowances that could be realized in this period. It is assumed that the total value of CO<sub>2</sub> allowances in the consolidated balance sheet equals the amount of CO<sub>2</sub> allowances recorded on September 30, 2021, *i.e.* €2.5 billion. The new NPP project is treated as fully operational 60 years from its commissioning, even though it was reflected in consolidated corporate statements until 2060. IEEFA also supposed that NPP investment costs were kept within the estimated budget of €6 billion that corresponds to most recent ČEZ estimates.<sup>40</sup> In other words, the electricity price required for project feasibility during the entire operational period of the NPP of 60 years is included in calculations, even though the NPP's operational period is longer than the period analysed in corporate financial statements.

Historical estimates are assumed for electricity revenue growth (2.5%), gas, coal and heat revenue growth (0.4%), and services and other revenue growth (1.5%) in consolidated corporate financial statements. Income statement items are based on their historical share in revenues. Balance sheet items are either fixed numbers or based on historical shares in net Property, Plant & Equipment (PP&E), equity or long-term debt. Capital expenditures are historically 16% of revenues. Income tax is assumed to be 19% and dividend payout ratio 95% of net income. With divestments of assets in Romania and Bulgaria in 2021, ČEZ had an opportunity to decrease debt significantly. However, it decreased long-term debt by €750 million, while increasing the short-term debt by almost the same amount and increasing the payment of dividend for €374 million to €1.08 billion.<sup>41</sup>

Long-term debt-to-equity and net debt to EBITDA ratios are compared in the figures below in three scenarios—business-as-usual (BAU), investment into solar PV power plants and NPP thereafter (solar PV + NPP), and investments into solar PV power plants for 14 consecutive years (2x solar PV). The scenario of investment into solar PV with a delayed NPP project is also considered.

The target net debt to EBITDA ratio of ČEZ Group is 2.5x in 2025 and 3x in 2030.<sup>42</sup> Figures 8 and 9 show that debt ratios are most favourable in BAU scenario. However, this scenario is not sustainable since investments in additional power generation capacities are a must for electricity supply sustainability.

The IEEFA analysis showed investment in 2x solar PV scenario never caused the long-term debt to exceed equity by more than 91%, whereas investment into solar PV power plants and NPP thereafter caused a jump in long-term debt over equity of 136% before NPP commissioning, and even of 176% in case of delayed NPP commissioning. Similarly, investing in 2x solar PV only caused much lower net debt to EBITDA ratio, compared to investment in solar PVs and NPP together (maximum level of 3.31x compared to 3.92x, respectively), and especially compared to

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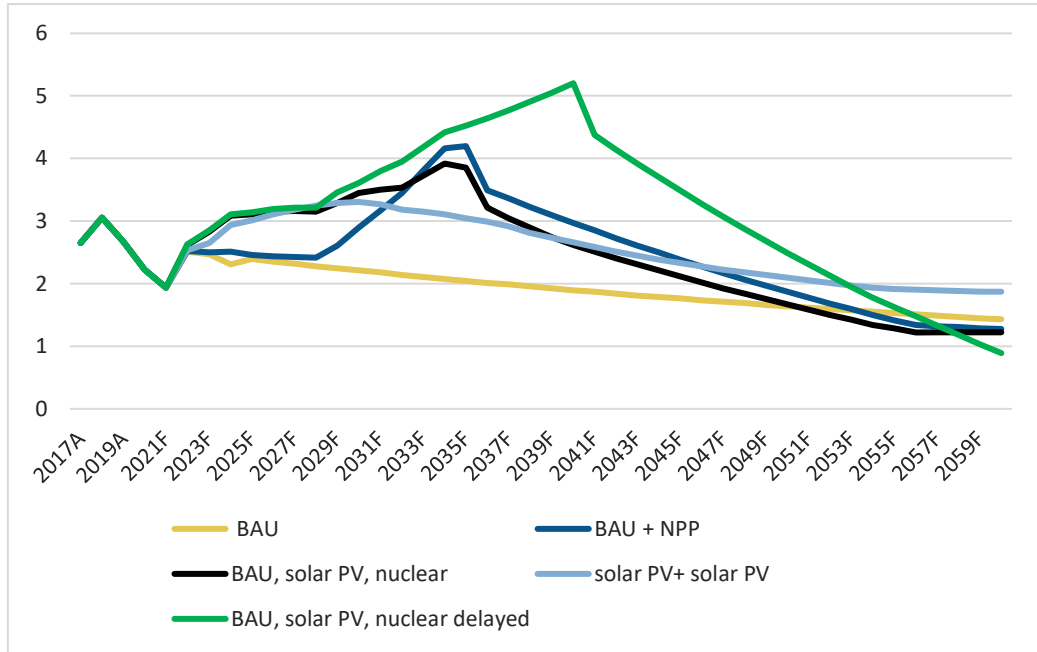
<sup>40</sup> ČEZ Group. [Investment Story](#). November 2021.

<sup>41</sup> ČEZ Group. [Interim consolidated financial statements as of September 30, 2021](#).

<sup>42</sup> ČEZ Group. [Investment Story](#). October 2021.

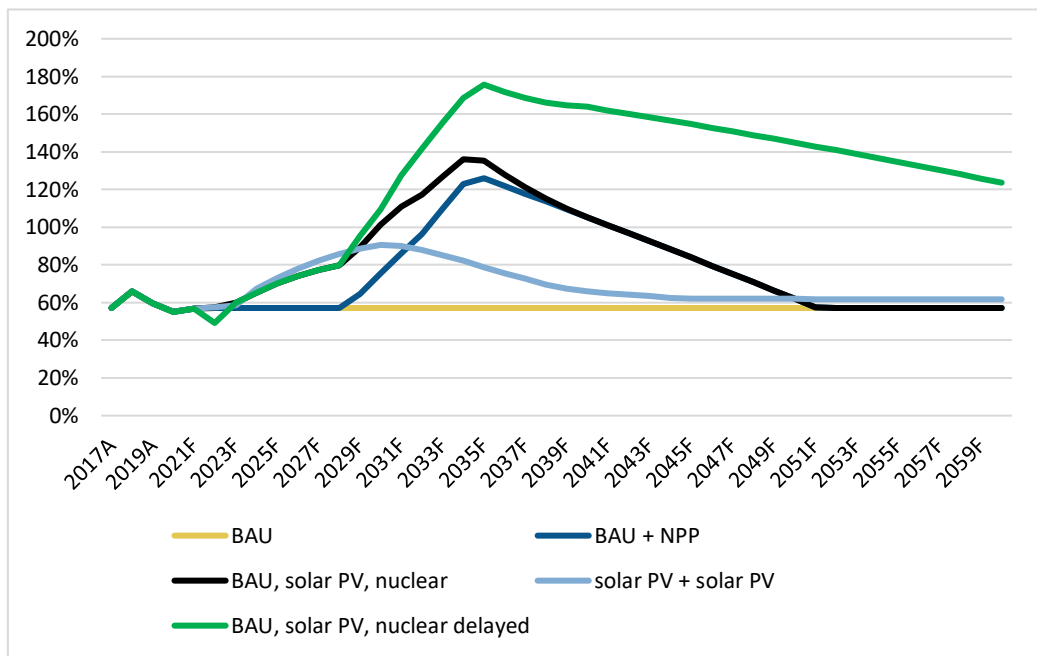
investment in solar PV and delayed NPP, where the maximum level of net debt to EBITDA ratio reaches 5.2x.

**Figure 8: Net Debt-to-EBITDA Ratio Under Different Investment Scenarios**



Source: IEEFA.

**Figure 9: Long-Term Debt-to-Equity Ratio Under Different Investment Scenarios**



Source: IEEFA.

With investment in 2x solar PVs, net debt to EBITDA never exceeded 3.31x. With the investment in solar PV plus nuclear, net debt to EBITDA would be above 3.5x from 2031 to 2035, then drop below 3x after 2037. If NPP investment were delayed and initially estimated costs were higher by 1.5x, the long-term debt to equity ratio would jump to around 176% in 2035 before declining below 150% in 2048. In the latter case, net debt to EBITDA would reach 5.2x in 2040. Delaying the NPP project would significantly endanger the indebtedness and credit rating of ČEZ.

Capex, revenues, dividends, and free cash flow have been compared under various investment scenarios to estimate their impact on both corporate and shareholders' wealth. The results are shown in Table 3.

**Table 3: Corporate and Shareholders' Wealth in Various Investment Scenarios, in € Billion**

Selected Indicator	BAU	BAU + Nuclear	BAU + Solar PV + Nuclear (ČEZ Strategy)	BAU + 2x Solar PV	BAU + Solar PV + Nuclear Delayed
CAPEX 2021-2030	-13.8	-15.8	-19.7	-17.5	-20.2
CAPEX 2031-2037	-12.1	-16.9	-16.9	-13.3	-20.6
<b>Total capital expenditures 2021-2037</b>	<b>-25.9</b>	<b>-32.6</b>	<b>-36.6</b>	<b>-30.8</b>	<b>-40.8</b>
<b>Revenues, 2021-2060</b>	<b>493.0</b>	<b>511.9</b>	<b>528.5</b>	<b>512.7</b>	<b>522.9</b>
Dividends paid, 2021-2037	-13.3	-13.1	-13.7	-16.4	-12.5
Dividends paid, 2038-2060	-27.0	-27.7	-36.4	-31.1	-19.5
<b>Total dividends paid, 2021-2038</b>	<b>-40.3</b>	<b>-40.8</b>	<b>-50.1</b>	<b>-47.5</b>	<b>-32.0</b>
<b>Free cash flow, 2021-2060</b>	<b>76.6</b>	<b>82.7</b>	<b>91.1</b>	<b>86.2</b>	<b>82.0</b>
<b>Enterprise value (EV)</b>	<b>29.3</b>	<b>28.8</b>	<b>30.4</b>	<b>30.8</b>	<b>26.2</b>
Relative EV (vs. BAU)	0	-0.5	+1.1	+1.6	-3.1
Relative EV (vs. ČEZ Strategy)	-1.1	-1.6	0	+0.5	-4.2

Source: IEEFA.

Investing in solar PV power plants only is the cheapest option, with the exception of the business-as-usual scenario. It is almost €6 billion cheaper than investing in solar PV and nuclear, and more than €10 billion cheaper compared to a solar PV and delayed NPP investment scenario.

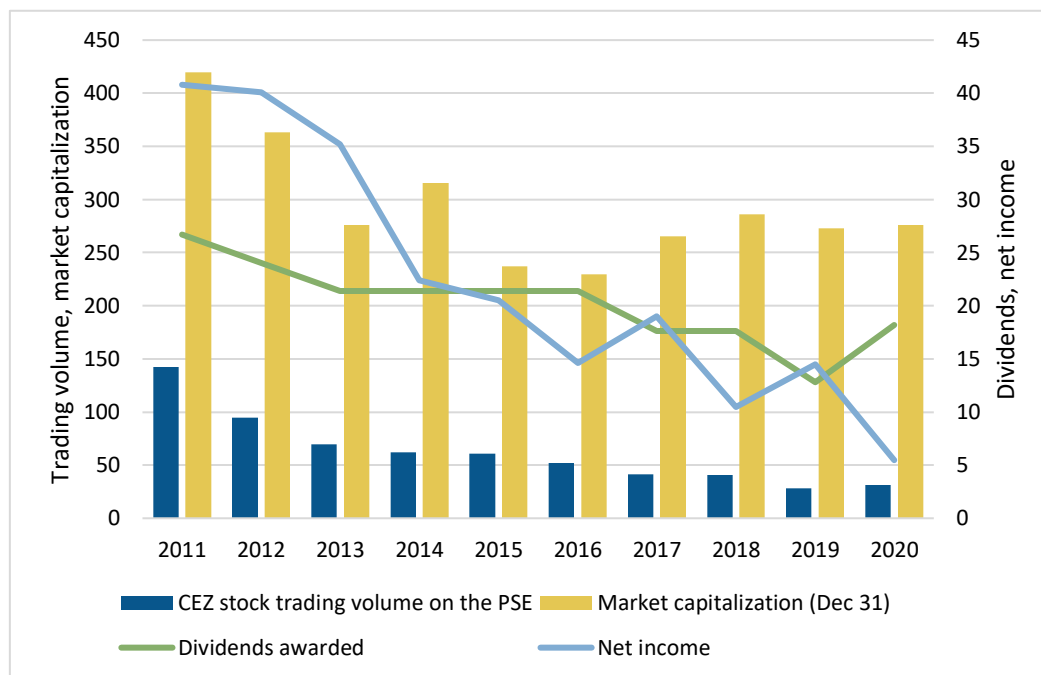
Higher investment costs in solar PV power plants and NPP, compared to investing in 2x solar PV, are compensated by higher revenues. However, the risk of exaggerated nuclear investment costs completely offsets that advantage. Shareholders' wealth and the value of the firm are the best under investing in 2x solar PV power plants, followed by investments into solar PV and NPP, assuming there is no delay in NPP commissioning or increase in initial cost estimates.

The worst scenario (delayed NPP together with solar PV installations) could cost ČEZ shareholders up to €4 billion in relation to the current ČEZ strategy scenario, which assumes no delays or cost overruns in NPP construction.

The rise in costs during NPP construction could cause a meltdown in shareholder dividends. The best option for both corporate and shareholders' wealth is investing in 2x solar PVs. This scenario is closely followed by investment into solar PV power plants and NPP, provided that the costs of NPP are kept within the budget and that the average price of electricity is held at 79 €/MWh during the entire lifetime of the NPP. This calculation is done under the assumption of 100% debt financing of the NPP project, of which 70% of the loan is interest-free, with the remaining 30% financed at a 5% interest rate. Without considering grid investments, first wave of investment into solar PV power plants requires the price of 68.5 €/MWh, and the second wave of investment the price of 30 €/MWh during the entire lifetime of the projects. The higher price of the NPP construction might be regarded as the price for the stability of the electricity system if alternative options such as battery storage projects are not considered.

The potential for shareholders to receive even higher dividends compared to the business-as-usual scenario is very appealing, especially when considering that ČEZ stock trading volume and market capitalization continuously decreased until 2020. New investments also promise higher revenues and free cash flow that ČEZ Group needs since it has suffered from declining annual net income over the last decade (Figure 10).

**Figure 10: Shareholders' Indicators, in CZK Billion**



Source: ČEZ annual reports.

## Investment Scenarios' Impacts on ČEZ Credit Rating

ČEZ Group actively participates in the financial markets. Not only are its shares listed and traded on the Prague and Warsaw stock exchanges, but it also regularly issues bonds. The group is exposed to three currencies—mostly to euros, followed by the dollar and yen. Long-term debt accounted for about 76% of its total interest-bearing debt at the end of 2020, and bonds had 81% share of the debt. Interest rates for bonds range from 1% to 5%, while the majority of bank loans have interest rates of as much as 2%.

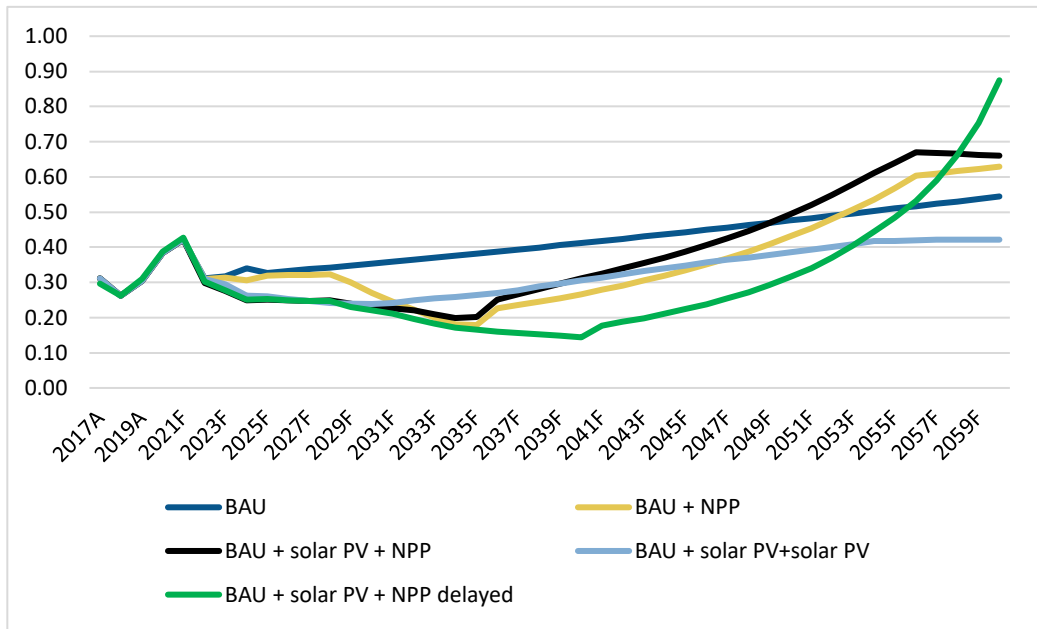
ČEZ Group is regularly scrutinized by major credit rating agencies. Given the 70% government ownership in ČEZ Group, ČEZ is considered a government-related issuer under Moody's methodology. A 2019 recommendation to increase its credit rating cited government's continued strong support for ČEZ; the fundamental strength of corporate financial statements; and adequate risk mitigation measures related to company's involvement in development of the new NPP.

But ČEZ's credit rating could fall if the company is not able to maintain a financial profile commensurate with the current guidance, *i.e.*, funds from operations (FFO)/net debt around mid-twenties and retained cash flow (RCF)/net debt in the high teens, and if the company's risk profile weakens as a result of its involvement in new NPP development without any public support mechanism.

FFO is calculated as the sum of net income, depreciation and amortization, and gain/loss on sale of property, reduced by interest income. A FFO/net debt ratio of 40% implies the possibility of the company to service its net debt for the next 2.5 years. RCF is calculated as the sum of funds from operations and net dividends received. Hence, the lower the net debt, the higher the RCF ratio.

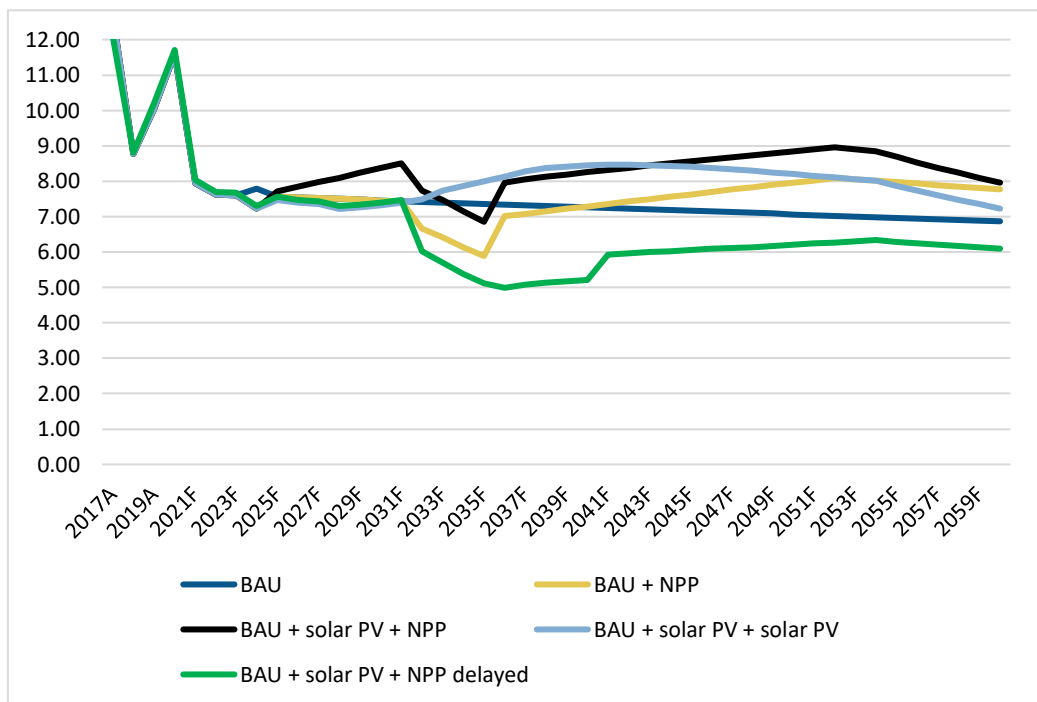
Figures 11-13 show that with investments in solar PV and NPP, the FFO/net debt ratio goes from 0.2 in 2034 to more than 0.30 after 2040. The situation is better with the investment into 2x solar PV as FFO/net debt never falls below 0.24, and the ratio climbs above 0.30 after 2038. A similar situation holds for the variant of interest coverage ratio, *i.e.*  $(\text{FFO} + \text{interest expense}) / \text{interest expense}$ . The highest interest coverage ratio is expected with 2x solar PV scenario, followed by investment in solar PV and NPP. However, this ratio works for 2x solar PV investment scenario until 2043, and then the trend is reversed for the benefit of solar PV and NPP investment scenario.

**Figure 11: 'FFO/Net Debt' Ratio Under Different Investment Scenarios**



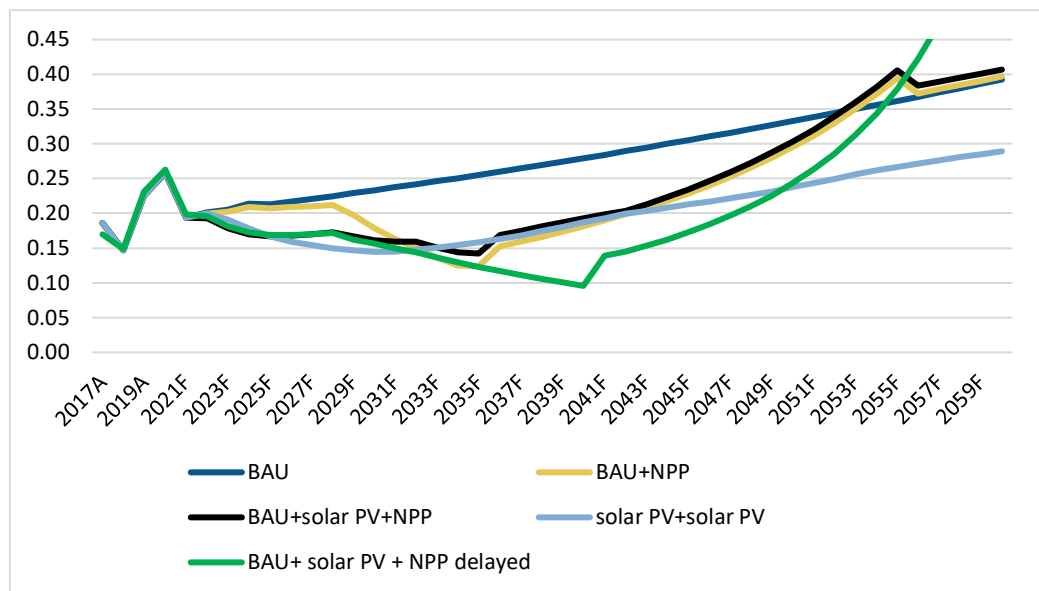
Source: IEEFA.

**Figure 12: '(FFO+Interest Expense)/Interest Expense' Under Different Investment Scenarios**



Source: IEEFA.

**Figure 13: ‘RCF/Net Debt’ Ratio Under Different Investment Scenarios**



Source: IEEFA.

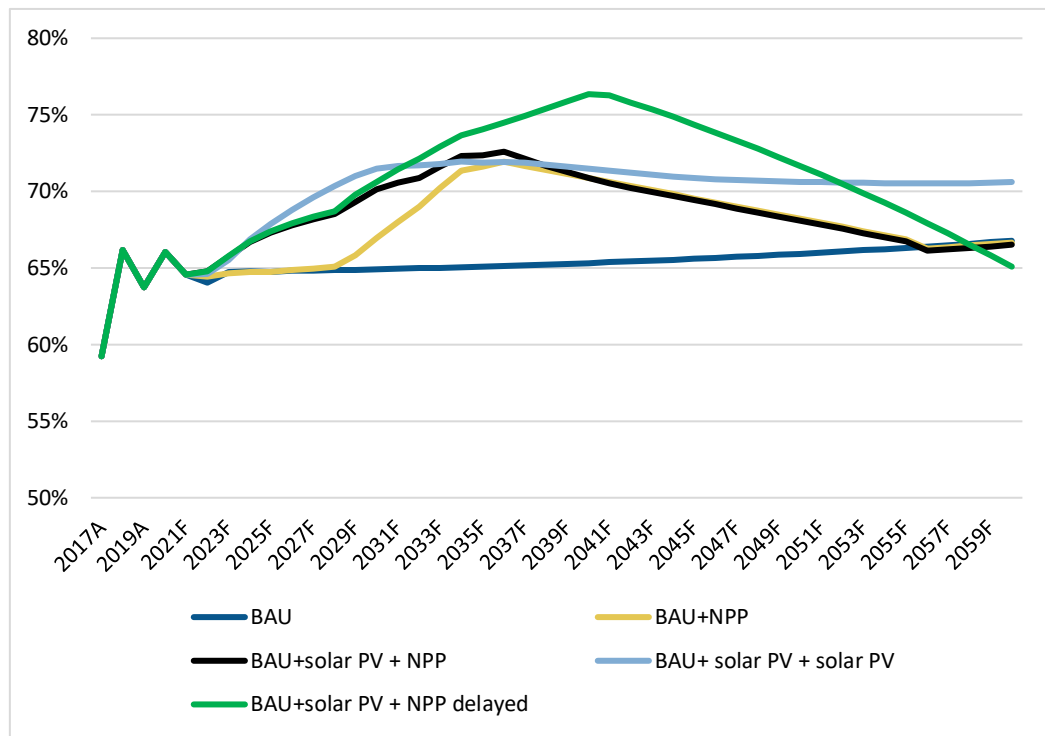
The RCF-to-net-debt ratio is the highest with the BAU scenario until 2052. After 2045, BAU + solar PV + NPP gives a slightly better value than investment in solar PV power plants only. Investment into solar PV power plants and delayed NPP is the worst of three cases.

Moody’s assigned a baa2 rating to ČEZ in February 2021. It means that obligations are judged to be of moderate credit risk and may possess certain speculative characteristics. S&P Global affirmed its A- credit rating in 2020 with a negative outlook.<sup>43</sup> Due to an already high debt share in total assets and the need for debt refinancing, ČEZ has a good but not excellent credit rating, which is illustrated by Figure 14. Investing in a scenario that does not include NPP will probably not cause any decline in its credit rating. However, opting for NPP—especially if the project is over budget and delayed, and the company sustains its strong dividend payout policy—is likely to lead to a credit rating downgrade.

<sup>43</sup> S&P Global Ratings. [CEZ a.s. Outlook Revised to Negative On Tight Financial Headroom Amid Market Turmoil; Ratings Affirmed](#). March 31,2020.



**Figure 14: Debt-to-Asset Ratio Under Different Investment Scenarios**



Source: IEEFA.

Since IEEFA scenarios showed the most conservative cases, without public support for investing into renewables, the question is not whether to invest, but where to invest first and how quickly to invest. The investment scenario should not only be focused on rising debt levels and credit rating, but should be concentrated on business operations restructuring.

Only investments in new power generation capacities can make a coal phaseout scenario feasible by 2035 and can improve the composition of ČEZ electricity mix. The data in Table 4 show that a substantial or almost complete fossil fuel exit is possible by mid-2030, since coal-fired power plants were commissioned in the second half of the 1990s. As shown by Table 4, all investment scenarios presented increase installed electricity generation capacities substantially compared to baseline year 2020 by 2035 and especially by 2040. All investment plans exceed NEP NE projections of the share of renewables in the total electricity generation capacity in 2040. The current ČEZ investment plan is similar to the IEEFA scenario for investing in solar PV and NPP.

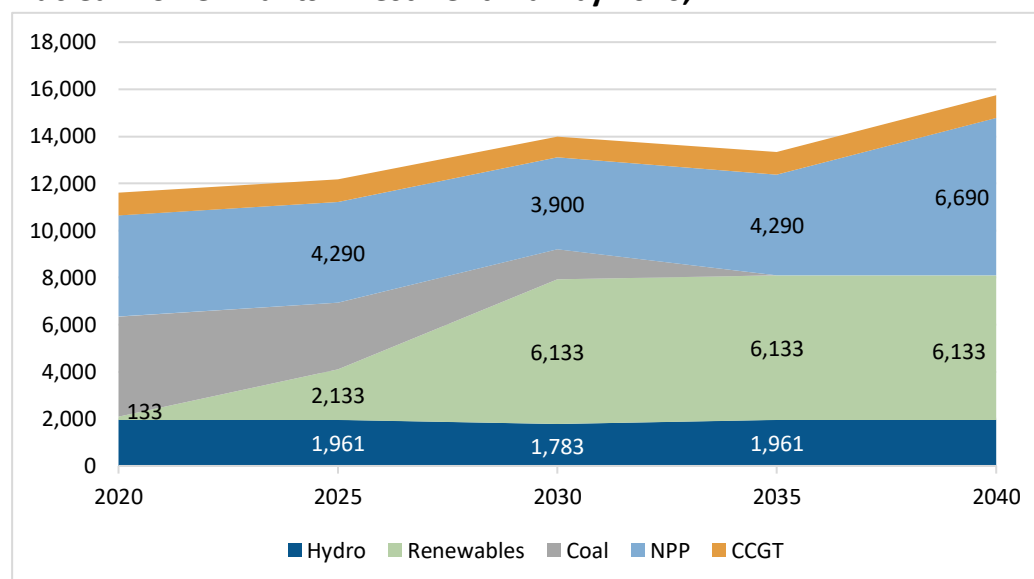
**Table 4: IEEFA Projections of Installed Electricity Generation Capacities by 2040 for ČEZ in Czechia, in MW**

Installed Power Plants	2020	2025	2030	2035		2040		
		BAU + Solar PV	Solar PV + NPP	Solar PV + Solar PV	Solar PV + NPP	Solar PV + Solar PV	NEP NE	
Hydro	16.9%	16.1%	12.4%	12.8%	11.6%	11.0%	11.0%	18-25%
Renewables	1.2%	17.5%	45.2%	53.0%	57.4%	45.8%	59.4%	
Coal	36.7%	23.3%	9.0%	0.0%	0.0%	0.0%	0.0%	11-21%
NPP	37.0%	35.2%	27.2%	28.0%	25.3%	37.7%	24.2%	46-58%
CCGT	8.3%	7.9%	6.1%	6.3%	5.7%	5.4%	5.4%	5-15%
<b>Total capacities in MW</b>	<b>11,602</b>	<b>12,184</b>	<b>14,333</b>	<b>15,348</b>	<b>16,948</b>	<b>17,748</b>	<b>17,748</b>	

Source: IEEFA.<sup>44</sup>

Figures 15 and 16 show similarities and differences between IEEFA's two investment scenarios, *i.e.* investing in solar PV and nuclear, as opposed to going only towards renewables. It is clear that both proposed IEEFA investment plans offer a cleaner power generation mix than the combination proposed by Czech authorities. And they all consider an increase in installed power capacities by 2040 by 53% under both solar PV + NPP and pure solar PV investment plan, compared to the 2020 level.

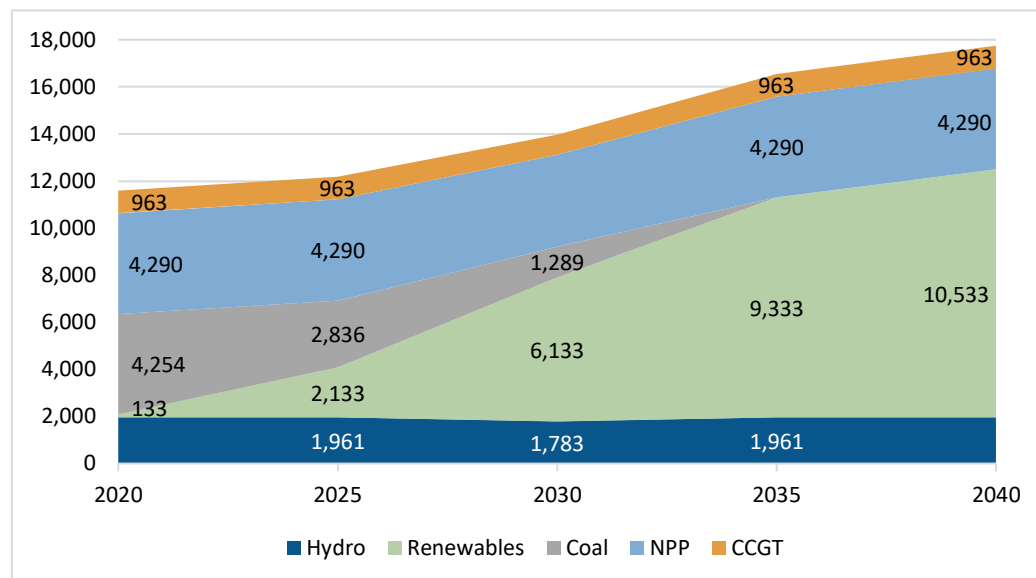
**Figure 15: IEEFA-Projected Power Generation Capacities Under Solar PV + Nuclear Power Plants Investment Plan by 2040, in MW**



Source: IEEFA.

<sup>44</sup> ČEZ Group. [Clean energy of tomorrow. Investment story](#). October 2021. IEEFA developed installed power generation mix based on disclosed electricity generation mix in 2030 by means of net capacity factors for power generation in 2020.

**Figure 16: IEEFA-Projected Power Generation Capacities Under Pure Solar PV Investment Plan by 2040, in MW**



Source: IEEFA.

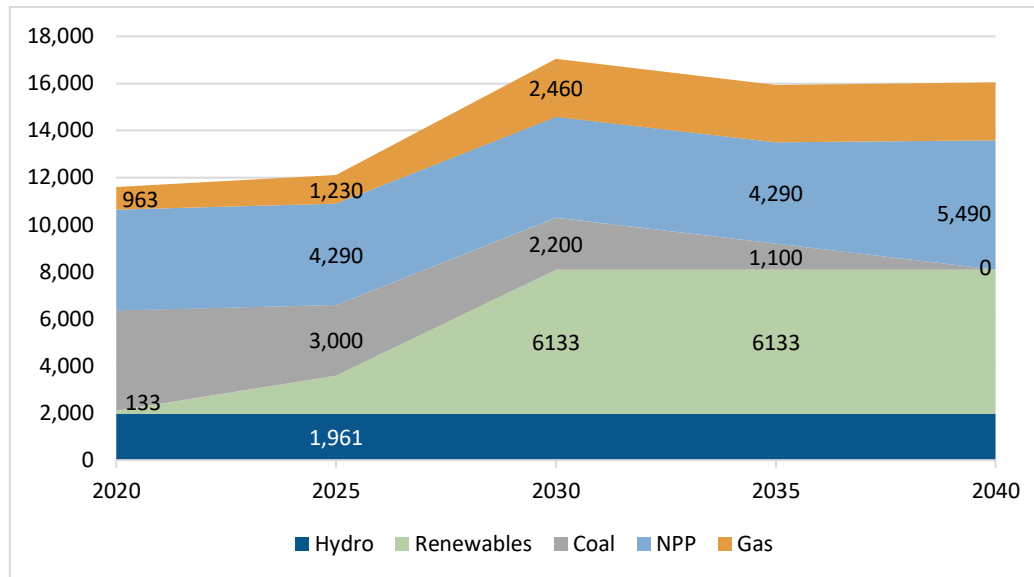
Figure 17 presents the expected investment plan disclosed by ČEZ, *i.e.* its simulation conducted by IEEFA based on the data disclosed in most recent presentation for investors.<sup>45</sup> ČEZ projections of installed power generation capacities by 2030 are similar to IEEFA projections. However, ČEZ assumes a substantial increase in gas-fired power plants that would be ready for hydrogen combustion. It is expected that ČEZ would adjust its plan to terminate coal mining by 2038 to be in line with the most recent Czech Coal Commission's recommendation to phaseout coal by 2033.<sup>46</sup>

The ČEZ scenario differs from IEEFA's solar PV + NPP scenario in that IEEFA did not add gas-fired capacities and assumed a faster coal exit. Both IEEFA investment scenarios enable an increase in consolidated EBITDA by 29% in the case of both pure solar PV and solar PV and nuclear scenario until 2030 compared to 2020 levels (without the electricity price rise, further assets divestments, and public support). ČEZ was less conservative by assuming a 40% EBITDA rise by 2030 that would lessen the chance of a temporary credit rating downgrade during the investment cycle as they count on public support funds and extra funds from divestments.

<sup>45</sup> ČEZ Group. *Clean energy of tomorrow. Investment story*. October 2021.

<sup>46</sup> NewEurope. *Czech Republic pledges to exit coal by 2033*. January 7, 2022.

**Figure 17: Projected Installed Power Generation Capacities in ČEZ by 2040, in MW**



Source: IEEFA.

ČEZ targets increased flexibility of its electricity generation mix by adding additional gas and electricity storage capacities. It could mean an opportunity for ČEZ to withdraw from the nuclear investment project in Dukovany, if the new government makes such a decision; ČEZ could easily switch to renewables and additional storage instead of nuclear after 2030. In addition, ČEZ is also considering investing in small nuclear reactors after 2040.

A gradual phaseout of installed NPP capacities is expected around 2045. The projections on future technology development and the costs of storage construction for nuclear waste, coupled with the desired stability of electricity supply, would be the leading factors to consider when deciding on the best investment option. Shareholders would gain most in case of pure solar PV investment scenario, while investing into solar PV and nuclear is the second-best option, provided that there are no time and budget overruns. The possibility of a credit rating downgrade is not likely in case of either investing in 2x solar PV and solar PV with nuclear without delays and cost overruns, especially if some public support for renewables is available. While investing in solar PV and NPP is not ruled out, the true question is whether it really adds value for shareholders and taxpayers, especially considering likely project delays, budget overruns, and possible interest rate increases during such a long period that lead to inevitable credit rating downgrade.

## Conclusion

ČEZ has failed to establish a domestic base of renewable generation over the last decade. Instead, the company relies on its aging coal and nuclear fleet, and it has continued to mine lignite while developing and selling renewable assets abroad. Being 70% owned by the Czech state and operating in the country that is a net exporter of electricity, ČEZ has been complacent, only announcing a new strategy of investing in renewables in 2021, after difficulties insuring its coal activities and amid expectation of public grants. The company has some debt burden and can expect internal issues related to organizational restructuring, the sale of foreign assets and excess workforce in traditional electricity generation.<sup>47</sup>

Since 2011, divestments and a rise in the workforce have lowered profitability. An aggressive dividend policy has meant consistently low investment levels while its financial performance has stagnated. ČEZ currently benefits from a lower carbon intensity, which has been combined with record high carbon prices throughout 2021 to lift its share price back to 2012 levels.

In May 2021, ČEZ announced the plan to reduce coal power to 12.5% of generation by 2030, in line with government's plan to phase out coal by 2033.<sup>48,49</sup> However, officially disclosed planned generation capacities target a complete coal phaseout in 2030. An earlier exit is supported by the International Energy Agency in its latest report on Czechia.<sup>50</sup> If the new government opts for an earlier coal exit, ČEZ might be ready for it, provided that it does not postpone investing in renewables.

IEEFA first analyzed investing in renewables and nuclear power plants on a stand-alone basis and considered the impact of two investment scenarios on the ČEZ Group's corporate financial statements—investing into solar PV only for 14 consecutive years and investing into combination of solar PVs and nuclear power plants. Both investment scenarios enable increase in EBITDA of 29% by 2030 compared to 2020 under conservative assumptions, *i.e.* without an increase in electricity prices, further divestments of assets and public support for investment into renewables' capacities.

In IEEFA's view, ČEZ should strongly commit to investing in new, large-scale solar PV capacities, which would deliver better value to the company, its shareholders, and Czech taxpayers. The group would also benefit from increasing the utilisation of its hydropower assets, from only 14% today to a projected 60%. The company might be at risk of future credit downgrades, especially if it dedicates too many resources to planned nuclear power plant construction, given the likelihood of construction delays and cost overruns. Decarbonisation and growth are

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<sup>47</sup> In its July 2021 presentation for investors, ČEZ Group reported net debt to EBITDA of 2.2x and indicated this is below an industry average leverage of 3.3x

<sup>48</sup> Europe beyond coal. [CEZ announces plan to slash coal by 2030, ahead of Czech government coal exit vote](#). May 20, 2021.

<sup>49</sup> NewEurope. [Czech Republic pledges to exit coal by 2033](#). January 7, 2022.

<sup>50</sup> Nuclear Engineering International. [IEA says climate targets will accelerate Czech coal phase-out](#). September 20, 2021.

nevertheless financially feasible, but require more ambition and a detailed plan, particularly when it comes to renewable power.

Our findings show that large, immediate, and continuous investment in solar PV capacities over the next decade is a preferred financial strategy for ČEZ, when compared to pursuing new nuclear projects or a mix of new nuclear and solar PV. It would add much-needed renewables capacity, transform ČEZ Group from laggard to leader in renewable electricity production in Czechia, and achieve both Czech and EU climate targets. Meanwhile, electricity security would not be jeopardized because of power available from existing nuclear power plants, unused hydro potential, and the accelerated development of battery storage technology.

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## Appendix: Nuclear and Renewables Project Modelling Assumptions

### *Nuclear Scenario*

The Czech government expects investment costs of the new NPP to be around €6 billion.<sup>51</sup> About 6% of total investment costs relies on preparation costs (design, architecture, engineering, procurement, and construction management).

The Massachusetts Institute of Technology considers the construction of new NPPs to be unfeasible, either in the U.S. or in Western Europe, due to high capital costs.<sup>52</sup> Similarly, other research foresees massive cost escalations in NPP construction and increasing competition of renewables in Western Europe by 2040.<sup>53</sup> After that period, the construction of NPPs would depend on the development of electricity storage capacities.

Construction costs are the most significant part in the overall cost of nuclear power generation. Once built, NPPs have low operational costs and provide low-carbon electricity. The financial feasibility of NPPs mostly depends on construction delays, which cannot be predicted by investors, and the price of capital.

The typical project term varies from 30 to 60 years. When considering the feasibility of the announced NPP construction, the assumptions used are shown in Table 1.

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<sup>51</sup> Reuters. [Czech government approves interest-free loan to push down cost of planned nuclear plant](#). July 20, 2020.

<sup>52</sup> MIT. [The Future of Nuclear Energy in a Carbon-Constrained World](#). 2018.

<sup>53</sup> S&P Global. [The Energy Transition: Nuclear Dead or Alive](#). November 11, 2019.

**Table 1: The Investment Assumptions for the NPP Construction**

Pre-construction period	9 years
Construction period	7 years
First year of operations	2037
Installed power	1,200 MW
Net capacity factor	92%
Fixed annual O&M costs per kW of installed power	€ 97.50
Variable O&M costs (incl. nuclear fuel) per MWh of generated electricity	€ 7.38
Decommissioning reserve in EUR (annual)	12,765,957.45
Project term	60 years from commissioning date
Maximum debt sizing, % of overnight costs	100%
All-in interest rate	2.50%
DSCR	1.2
Loan term	20 years
Depreciation term	20 years
PPA term	30 years
Post-PPA term	30 years
Overnight investment costs	€ 6,000,000,000

Source: NREL, IAEE Energy Forum, <sup>54</sup> SFEN (2018),<sup>55</sup> and NEP NE (2015).<sup>56</sup>

The overnight investment costs are estimated according to Czech government projections. However, given the prevalence of cost overruns in new nuclear projects globally, we have considered investment costs of as much as €9 billion in our sensitivity analyses. These are in line with International Association for Energy Economics (IAEE) Energy Forum's estimates that weigh with investment costs of about 6,000 €/kW of installed capacity in Western Europe. The same authors concluded that NPP projects are not feasible in Western Europe at interest rates that exceed 5%. IEEFA calculations show that interest rates play a major role in NPP project feasibility.

Assuming 100% debt financing, if the annual interest rate is 2.5%, a NPP project with investment costs of €6 billion would be feasible at the constant electricity price of 98.5 €/MWh over 60 years (30 years during and 30 years after the PPA term). A 1.5% fixed annual interest rate would reduce the required electricity price to 79 €/MWh. The higher the electricity price during the PPA term, the lower the electricity price can be during the post-PPA term for the NPP project to stay feasible. If ČEZ Group cannot increase its debt at an interest rate of as much as 1% annually for the implementation of the NPP project, then it should avoid keeping the project on its balance sheet. In such a case, the excess investment costs would likely offset

<sup>54</sup> IAEE Energy Forum / Groningen Special Issue. [Cost Estimates and Economics of Nuclear Power Plant Newbuild: Literature Survey and Some Modeling Analysis](#). June 2018.

<sup>55</sup> SFEN Technical Note. [The cost of new nuclear power plants in France](#). March 2018.

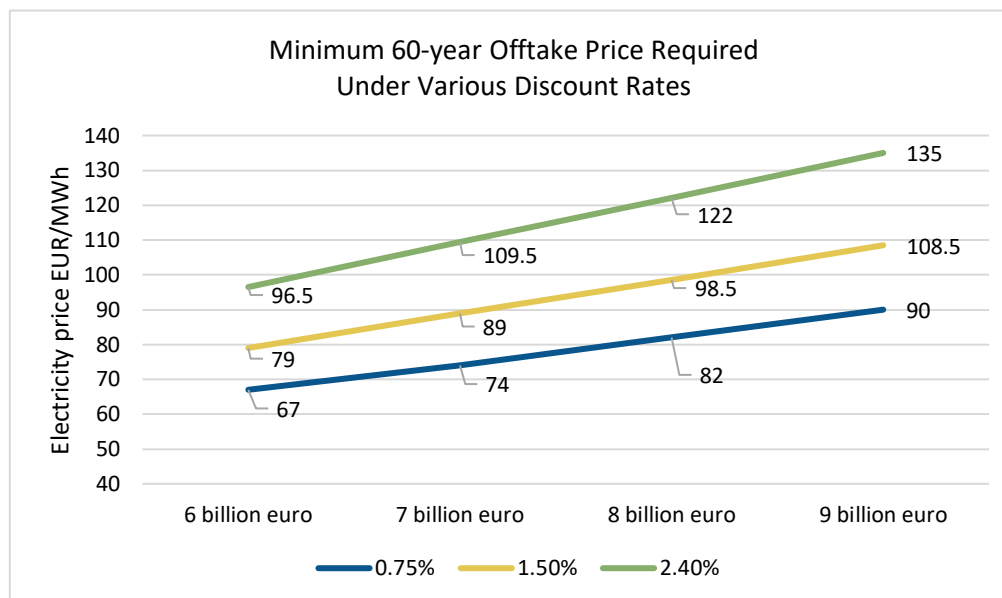
<sup>56</sup> Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.



an increasing CO<sub>2</sub> price in the market and would therefore make the project a bad investment.

The PPA price and post-PPA price should be considered together. For instance, a €6 billion investment at a 2.4% interest rate requires a 96.5 €/MWh PPA price in both the PPA and post-PPA period. Due to the lesser effect of both the revenues and costs on net present value with the flow of time, ČEZ Group should strive to contract as high an electricity price as possible during the PPA term, especially if the discount rate is more than 1%. All calculations have been done without the impact of the carbon price.

**Figure 1: Sensitivity of Electricity Price to Investment Costs During and After PPA Term at Varying Discount Rates for Feasible NPP Projects**



Source: IEEFA.

Overall, investment costs account for about two-thirds of total costs of the NPP, while the rest belong to operational costs and plant decommissioning. IEEFA calculations considered an electricity price of 60, 70 and 80 €/MWh during the PPA term and its interdependence with the post-PPA prices with different amounts of investment costs, varying from €6 billion to €9 billion. The data illustrated in Figure 1 show that higher investment costs increase the dependence of the project sustainability on post-PPA prices. If, under the worst case, the newly built NPP would be closed upon the expiration of a 30-year PPA term, the guaranteed prices of electricity should range from 144.5 €/MWh for a €6 billion investment to 201.5 €/MWh for a €9 billion investment for financial feasibility of the NPP project under a discount rate of 2.4%. With a 1.5% discount rate, the required PPA price would move down to 131 €/MWh for a €6 billion investment, and to 179 €/MWh for a €9 billion investment.

Operational costs assumed by IEEFA are about 5 €/MWh lower compared to NEP NE estimates due to decline in nuclear fuel prices.<sup>57</sup> However, an increase in decommissioning costs of just 0.5 EUR per kilowatt-hour (€/kWh) of installed capacity requires an increase of electricity price of 1 €/MWh during the PPA term for the financial feasibility of the project. These are not the final costs, since the state takes care of the significant costs of radioactive waste storage and disposal.<sup>58</sup>

Nuclear energy costs need to be linked to the increasing price of green certificates (which can be sold by ČEZ Group) and the indirect price of nuclear waste storage (a burden for taxpayers). The existing storage of Dukovany would be exhausted around 2050 and the construction of a new nuclear waste storage site should start at that time with its operational start by 2065. The site should be selected by 2025, according to NEP NE.<sup>59</sup> Estimated costs of its construction are about €4.4 billion. Since the operational period for the existing NPPs is expected to be 60 years, storage is necessary for disposal of the nuclear fuel waste from the operating power plants. Such costs should be considered when considering investing in a new NPP. While these additional sunk costs will not be borne directly by ČEZ, they represent the true costs of new nuclear for Czech taxpayers.

### *Renewables Investment Scenario*

Investing in renewables is a must for ČEZ Group, regardless of whether it invests in a NPP project. It is not only a desirable path for all companies wanting to successfully implement a decarbonization strategy, but it is affordable and can increase power installations significantly in a rather short time.

IEEFA considered investments into both wind and solar utility-scale PV power plants. Historically, annual average wind capacity factors in Czechia have ranged from 23% to 25%, but they could reach up to 35% by the end of the decade with improved new turbines. Solar PV in Czechia has average capacity factors around 11%, and this is not expected to significantly increase over time.<sup>60</sup>

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<sup>57</sup> Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.

<sup>58</sup> The EC reports 1.4 billion EUR costs per 1 GW of installed NPP capacity in Germany, followed by 1.1 billion EUR per 1 GW in Lithuania. See: European Commission. [Nuclear Illustrative Programme presented under Article 40 of the Euratom Treaty for the opinion of the European Economic and Social Committee](#). April 4, 2016.

<sup>59</sup> Ministry of Industry and Trade and Ministry of Finance of the Czech Republic. [National Action Plan for the Development of the Nuclear Energy Sector in the Czech Republic](#). May 22, 2015.

<sup>60</sup> Bloomberg NEF. [Investing in the Recovery and Transition of Europe's Coal Regions](#). July 6, 2020.

**Table 2: The Investment Assumptions for Utility-Scale Solar PV and Wind Power Plants Construction**

Characteristics	Solar PV	Wind Power Plant
Pre-construction period	1 year	1 year
Construction period	2 years	2 years
First year of operations	2025	2025
Installed power	750 MW	750 MW
Net capacity factor	12%	24%
Fixed annual O&M costs per kW of installed power	1.5% of annual CAPEX	30 EUR/kW of installed capacity
Variable O&M costs per MWh of generated electricity	-	0.005 EUR/kW of installed capacity
Project term	30 years from commissioning date	30 years from commissioning date
Maximum debt sizing, % of overnight costs	80%	80%
All-in interest rate	2.5%	2.5%
DSCR	1.2	1.2
Equity return	8%	8%
Depreciation term	10 years	10 years
PPA term	15 years	15 years
Post-PPA term	15 years	15 years
Degradation factor	0.25%	-
Overnight investment costs	€ 393,750,000	€ 825,000,000

Source: Kost et al. (2018);<sup>61</sup> Lugo-Laguna et al. (2021).<sup>62</sup>

With investments into renewables, an operational term of 30 years is considered,<sup>63</sup> and a mixed financing of 20% equity and 80% debt. The assumptions used in a standalone feasibility analysis of wind and utility-scale solar PV projects are shown in Table 2. They are the same for both projects for depreciation term, PPA and post-PPA term, installed capacity, debt-service coverage ratio (DSCR) debt-to-equity ratio, interest rate and expected equity return, as well as for the duration of pre-construction and construction period. The difference between the projects is in capex, operation and maintenance costs, and a degradation factor that is applicable only for slight reduction in revenues in solar PV power plants over time.

The feasibility of both wind and utility-scale solar PV projects is directly proportional to their capacity utilization. With a 12% net capacity factor, solar energy is very competitive. Wind energy, with a 24% net capacity factor, lags behind due to higher investment costs compared to solar. IEEFA based its calculations on technology costs disclosed by the Fraunhofer Institute for Solar Energy Systems and

<sup>61</sup> Fraunhofer Institute for Solar Energy Systems ISE. [Levelized Cost of Electricity – Renewable Energy Technologies](#). March 2018.

<sup>62</sup> Lugo-Laguna, D. et al. [A European Assessment of the Solar Energy Cost: Key Factors and Optimal Technology Sustainability](#). 2021.

<sup>63</sup> New models of PV modules can increase the service life of PV systems to 40 or even 50 years.

recent European research.<sup>64</sup> Some cost reserve has been left for less experience with implementation of renewables' investments. Just for comparison, ČEZ estimated the feasibility of the solar PV power plant at the level of electricity prices between 48 and 66 €/MWh, and feasibility of wind power plants construction at the level of electricity prices of 61 €/MWh. The technology and net capacity factor used in ČEZ calculations is not disclosed.

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<sup>64</sup> Lugo-Laguna, D. et al. *A European Assessment of the Solar Energy Cost: Key Factors and Optimal Technology*. Sustainability. 2021.

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

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