Frequently Asked Questions on the Nuclear Study

1. What do you mean by spatial requirements?

The surface areas required by these technologies to produce a given amount of electricity.

2. Why are land use and spatial requirements relevant?

- There is a renewed push for the further expansion of wind and solar power to increase the share of renewables in the power mix in line with EU mandates.
- Compared to other technologies used to generate power, wind and solar power have relatively significant spatial (land, sea) impacts, both quantitatively and qualitatively, as well as impacts on the electricity system.
- The public's concerns about further expansion of wind and solar power generation are beginning to affect the planning of new renewable projects.

3. What did you conclude on land use and spatial requirements for wind/solar and nuclear energy?

For the Czech Republic, the amount of space required to generate 1,800 PJ by wind and solar would range from 14,630 km2 to 43,758 km2. To put this into perspective, the area required to provide this energy would cover 19% and 55% of the Czech Republic's available land. Achieving the same level of electricity output with nuclear power would require no more 269km2, i.e. only between 0.6 and 1.8% of the surface required by renewable energy.

We found that the amount of space required to provide annually 3000 PJ of power to The Netherlands by wind and solar power in 2050 would range from 24,538 to 68,482 km2. To put this in perspective:

- 24,538 km2 is roughly the size of the five largest provinces of The Netherlands combined (Friesland, Gelderland, Noord-Brabant, Noord-Holland, and Overijssel); and
- 68,482 km2 corresponds to about 1.8 times the entire land territory of The Netherlands.

For the EU to achieve carbon neutrality in 2050, it must begin now deploying renewable energy at a rate at least 4 to 7 times higher than the average rate over the last 12 years. Even if it will do so, to prevent an unfortunate outcome, the EU must also stop carbon emissions from outside EU territory anywhere in the world, which requires acquiring the current reserves of fossil fuels.

To generate the same amount of energy, nuclear power would require, on average, only 120 km2, which is less than half the size of the city of Rotterdam. Thus, due to their low power density, wind energy requires at least 266 (offshore) to 534 (onshore) times more land and space than nuclear to generate an equal amount of electricity; for solar on land, at least 148 times more land is required (disregarding, in all cases, the additional land required for the necessary network expansion and energy storage or conversion solutions).

4. The cost of wind/solar and nuclear energy is computed by a method called "levelized cost of electricity" or LCOE. What does this method involve?

The lifetime costs of energy generating facilities divided by the amount of energy produced, typically discounted to present value. LCOE considers only project-related cost, such as initial investments, operation costs and fuel costs during the facility's lifetime, and typically discounts the energy produced over a facility's lifetime, but not the intermittent energy produced by an intermittent power generation facility. To arrive at the total electricity system cost, the integration cost (including, but not limited to, profile cost) must be added to the LCOE. In this study, discounting of

power is not the preferred method for calculating LCOE; instead, we use synchronized lifetime analysis.

5. The study proposes a new method called 'synchronized lifetime analysis'. What is this?

The method used in this study to compare the cost of various power generating technologies, designed to avoid the distorting effects of discounting energy projects with different lifetimes or lead times.

6. How does the cost of renewable energy compare to the cost of nuclear energy?

In most plausible scenarios nuclear power is cheaper than all types of renewable energy (offshore wind, onshore wind, solar) in both the Czech Republic and The Netherlands, even before integration- and system-related cost is added, which is much higher for renewables.

7. What is 'climate neutrality'?

A state in which the emission and removal of greenhouse gases (GHG) produces a net zero result, i.e. as much GHG are emitted as are removed, so that there is no (further) temperature increasing effect arising from additional GHG. Note that there is a delay between the addition of GHG to the atmosphere and the resulting greenhouse (temperature-increasing) effect.

8. Will the EU achieve climate neutrality in 2050?

The EU's 2050 climate neutrality strategy involves a high risk of ineffectiveness.The EU's plan to become the first climate-neutral 14 continent in 2050 is merely aspirational; there is no proven pathway that will lead to this result.15 Much depends on factors that the EU does not control, such as technological breakthroughs, demand

for energy, the cost of moving towards climate neutrality, the general state of the economy (GDP), population growth, etc.

9. If the EU achieves climate neutrality, what effect will that have on the global temperature in 2050 and 2100?

EU 2050 climate neutrality, if achieved, will likely cause only a very small decrease in the average global atmospheric temperature increase, estimated at between 0.05 °C and 0.15 °C in 2100, and no more than between 0.02 °C and 0.06 °C in 2050, assuming no carbon leakage occurs.

Even if this can be achieved, this would mean that the average global temperature would still increase by some 3 °C (assuming estimates are accurate).

10. If the EU's climate neutrality objective is unlikely to be achieved, what does that mean for EU climate and energy policy?

The anticipated energy transition can hedge against the high risk of ineffectiveness risk by deploying 'no regrets' solutions that are good investments, bring down emissions, and have little adverse impact. Nuclear power is such a solution.

11. What do you mean by 'no regrets' solutions'?

Policies that confer benefits, and do not cause adverse impacts and negative externalities, irrespective of any positive effects they may have on the problem of climate change