



Perspectives and opportunities for LTO in Europe

Andrei Goicea

FORATOM Policy Director

03.02.2021

FORATOM



FORATOM - the voice of the European nuclear industry in energy policy discussions with EU Institutions & other key stakeholders.

Key topics:

EU Energy Policy:

- Economics of nuclear
- EU energy mix
- Euratom Treaty
- Security of energy supply
- Sustainability
- Special projects - Brexit

Nuclear technology:

- Innovation, R&D
- Nuclear safety*
- Nuclear transport
- Supply chain
- Waste disposal

Communication:

- Nuclear advocacy
- Perception of nuclear energy
- Promotion of nuclear energy
- Public opinion

* Topic overseen by ENISS

Legal aspects

Membership



The membership of **FORATOM** is made up of 15 national nuclear associations representing more than 3,000 companies.

Belgium

Bulgaria

Finland

France

Hungary

Italy

Netherlands

Romania



Slovakia

Slovenia

Spain

Sweden

Switzerland

Ukraine

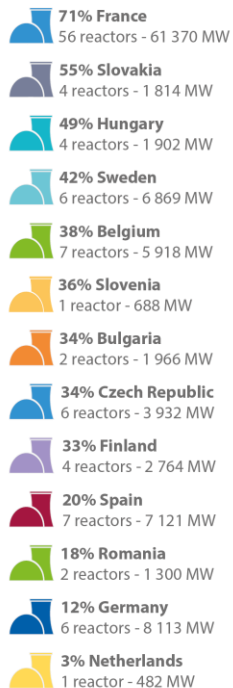
United Kingdom

CEZ (Czech Republic), PGE EJ 1 (Poland) and Fermi Energia (Estonia) are Corporate Members

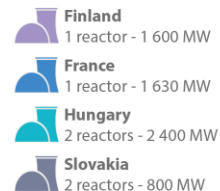
Nuclear energy in EU27

106 Operational nuclear reactors in the EU

Nuclear share of electricity



Nuclear power plants under construction



EU ELECTRICITY PRODUCTION

26%

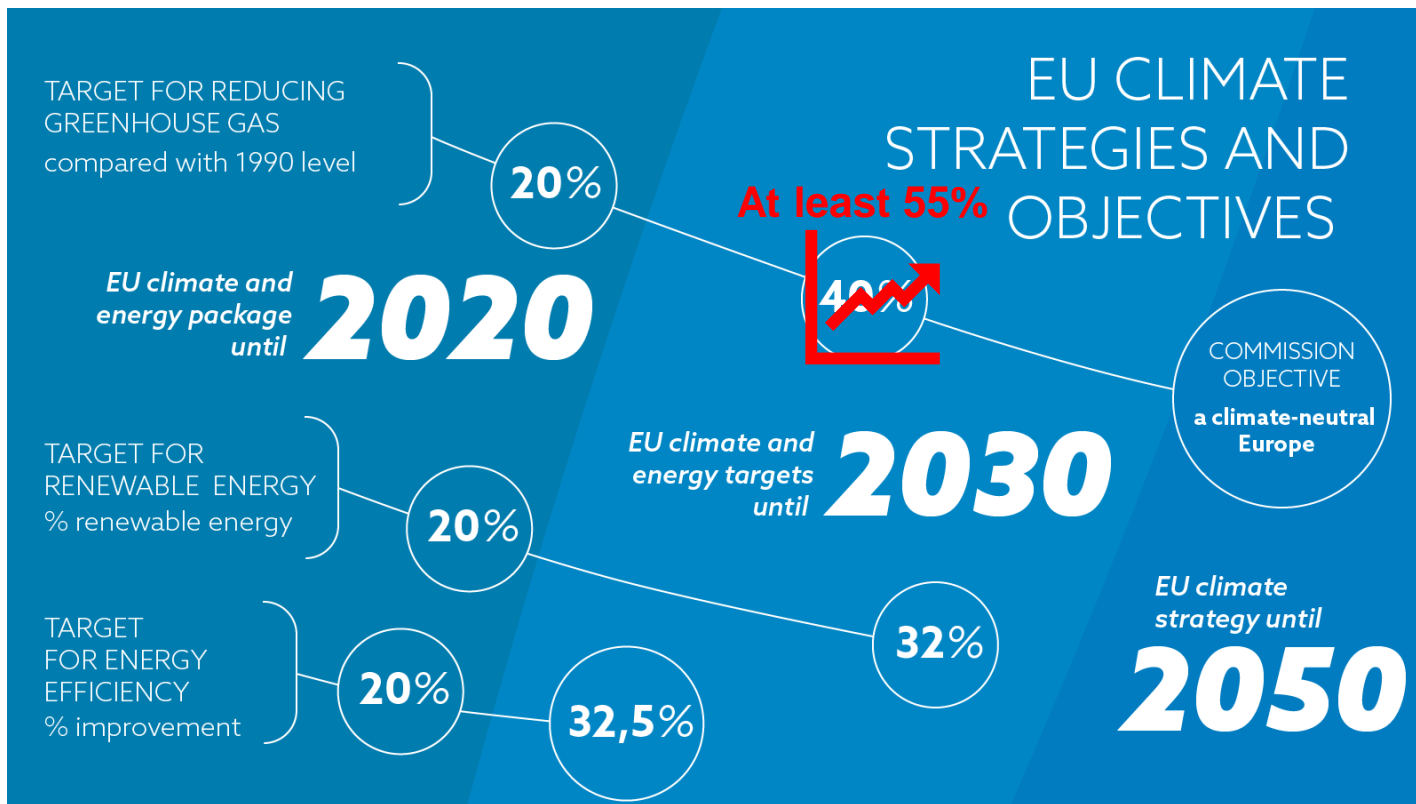


EU LOW-CARBON ELECTRICITY

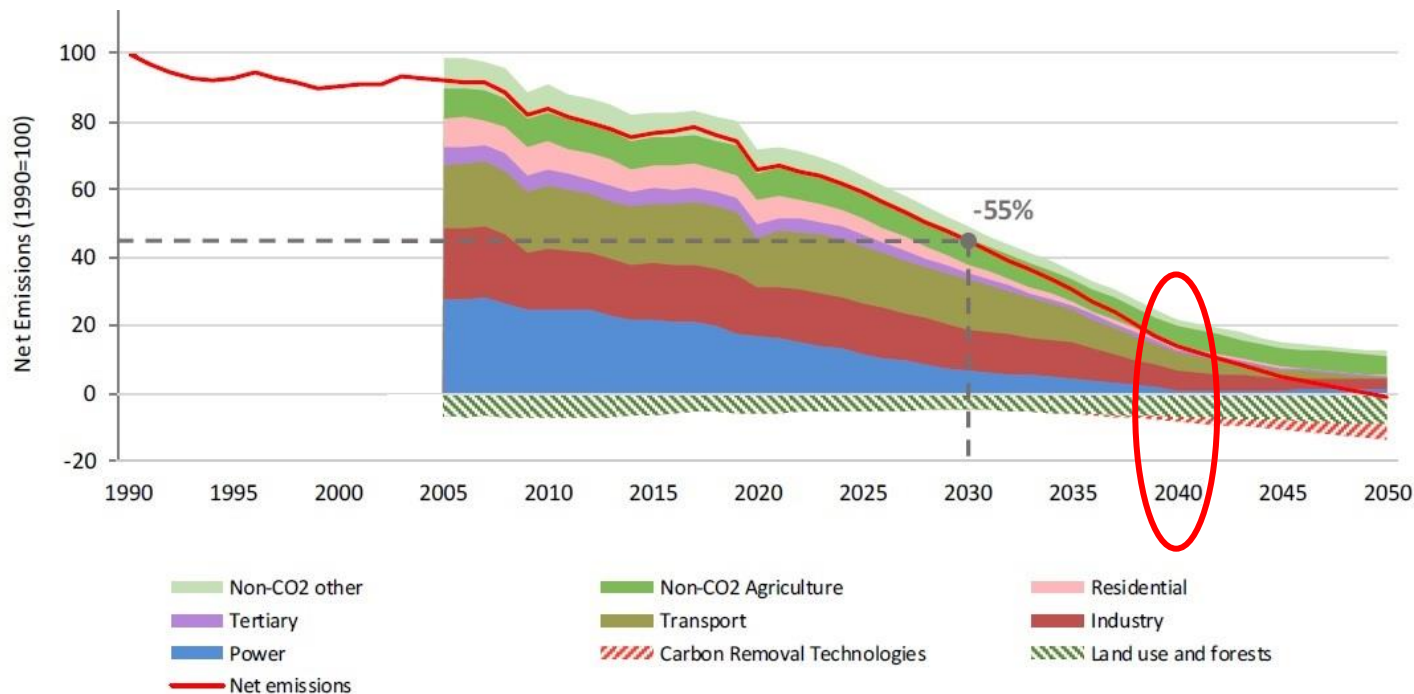
50%



Decarbonisation of the EU economy



Decarbonisation of the EU economy



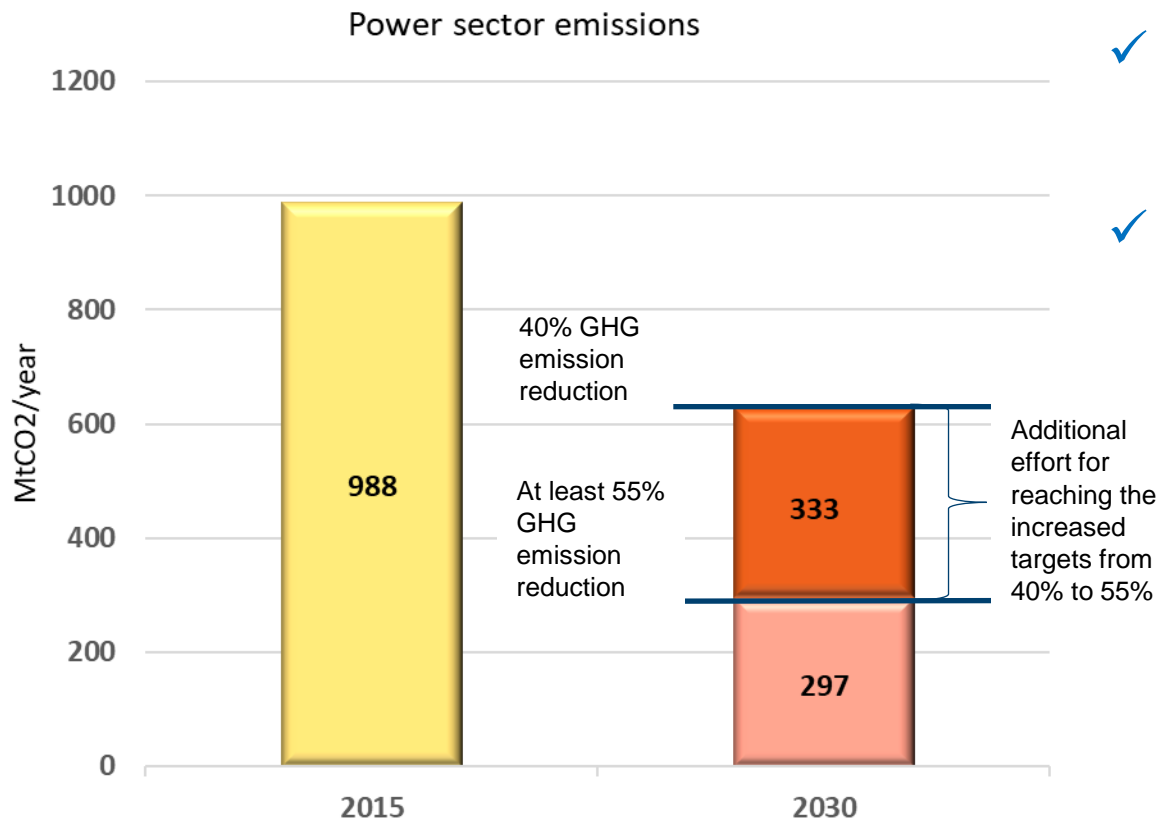
Source: Stepping up Europe's 2030 climate ambition - COM(2020) 562 final



www.foratom.org | foratom@foratom.org |

Impact of the lifetime extension of the existing nuclear fleet on the new decarbonization targets

7



- ✓ FORATOM made its own analysis based on the Impact Assessments of the different communications related to decarbonisation targets.
- ✓ For the power sector, for
 - 40% GHG emissions reduction targets, the maximum annual emissions are 630 MtCO₂
 - At least 55% GHG emissions reduction targets, the maximum annual emissions are 297 MtCO₂

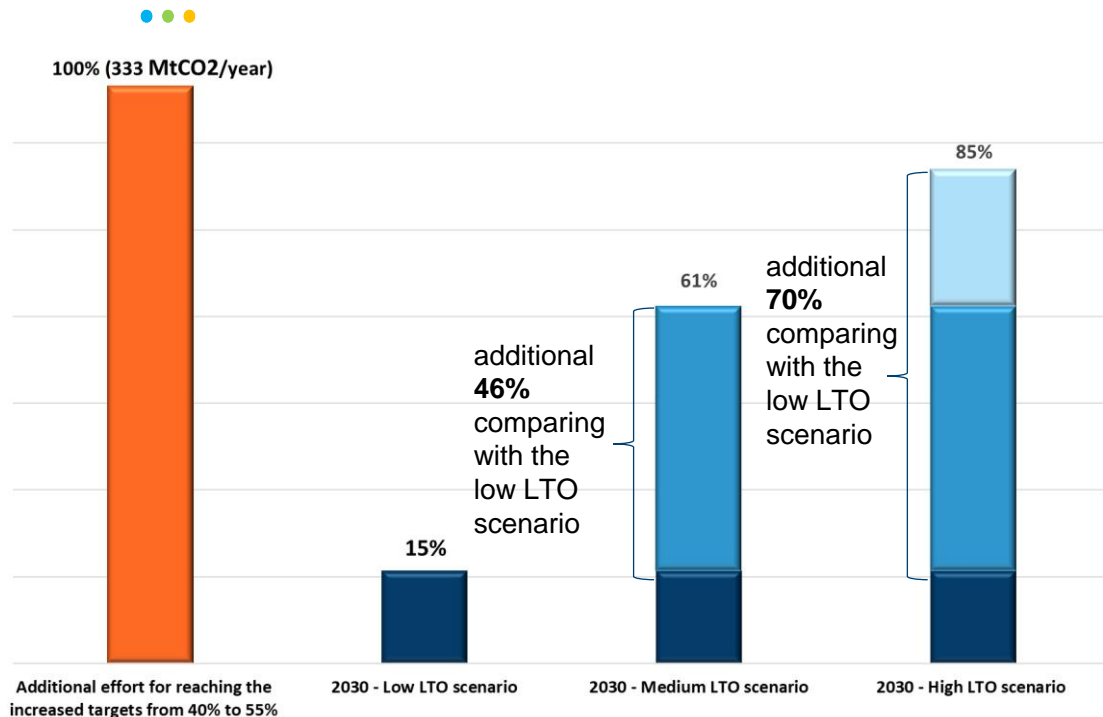


Impact of the lifetime extension of the existing nuclear fleet on the new decarbonization targets

- ✓ FORATOM calculated the CO₂ emissions savings on the additional effort for reaching the increased targets from 40% to 55% for the power sector by extending the lifetime of the existing nuclear fleet by comparing 3 scenarios in 2030:

- low LTO scenario - only 18 GW of nuclear capacity remaining in operation
- medium LTO scenario – 76 GW of reactors will be in operation
- high LTO scenario – all the current nuclear capacity (105 GW) will remain in operation

— Note: No nuclear new build after 2020 is taken into account.



Background



IPCC

- At an international level, the latest IPCC report (Global Warming of 1.5°C, October 2018) recognises that nuclear power is essential if the world is to keep global warming to below 1.5 degrees.
- According to one of the IPCC scenarios, a six-fold increase in global nuclear capacity is needed if we want to achieve our climate goals.



IEA

- According to its report launched in May 2019 - Nuclear Power in a Clean Energy System – “*Lifetime extensions of nuclear power plants are crucial to getting the energy transition back on track*”
- Recommendations of “Energy Policy Review” 2020 of IEA is for concerned MS “...*to keep the nuclear option open by supporting the lifetime extension of existing nuclear power plants as well as new plants...*”



European Commission

- “Clean Planet for All” – confirms that nuclear will form the backbone of a carbon-free European power system together with renewables.
- Nuclear capacity will be in the range of 99 to 120 GW (15% in the electricity mix)



European Commission

- “Stepping up Europe’s 2030 climate ambition” communication – consider for 2030 a nuclear capacity of 92 GW, that cannot be achieved without a extensive programme of lifetime extension of the current fleet of nuclear reactors

Currently the 105 GW of installed nuclear capacity in the EU accounts for around 1/4 of the electricity generated and almost 50% of the low-carbon electricity. Nuclear power will clearly play an important role in the 2050 carbon-free power sector.

During the transition towards 2050, nuclear power will mainly rely on LTO.

Background



EC topics which may impact investments in LTO:

- ✓ Clean Energy for all Europeans legislative package
- ✓ EU-ETS carbon pricing
- ✓ European Green Deal
- ✓ 5th State of the Energy Union
- ✓ A more efficient and democratic decision making in EU energy and climate policy



Benefits of nuclear LTO

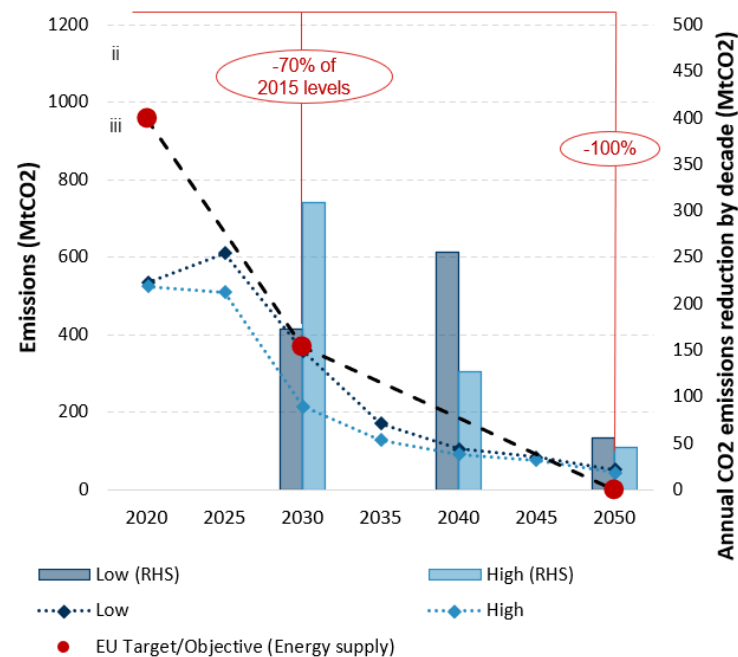


Benefits of nuclear LTO

Decarbonisation

- ✓ An early closure of nuclear plants would require new thermal plants in order to ensure security of supply, as well as additional thermal generation from existing plants which would generate **1590 Mt** of additional CO₂ emissions or **19% of total CO₂ emissions from the power sector** over 2020-2050 in the low scenario.
- ✓ While both scenarios achieve the CO₂ emission reduction target in 2030 and the 2050 objective, **maintaining nuclear energy through extensions and new investments would significantly lower the CO₂ emission impact of the power sector, thereby further strengthening the role of electricity in the transition.**
- ✓ Furthermore, anticipated closure of nuclear in the low scenario would lead to increased CO₂ emission by 2025, thus **jeopardizing 2030 increased ambition.**

The updated “Pathways to 2050: Role of nuclear in a low-carbon Europe” Compass Lexecon report soon to be released



A decrease in the share of low-carbon capacity resulting from not investing in the LTO of existing nuclear reactors will increase emissions in the medium term.

Reasons: dependence on fossil fuels to back up needs

Benefits of nuclear LTO



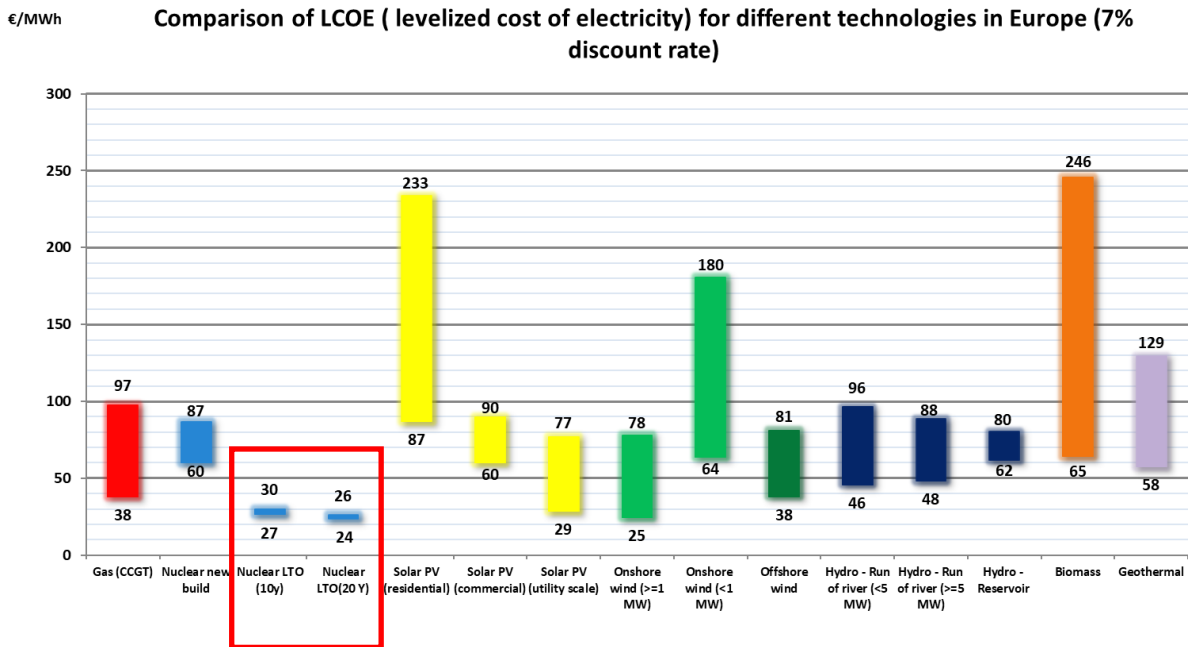
Benefits of nuclear LTO

Economy

Nuclear LTO is the most economically advantageous compared to other power sources

✓ According to different sources (IEA or EC), the Levelized Costs of Electricity (LCOE) for LTO is the lowest among all technologies.

✓ The nuclear life time extension and new build in the high scenario would mitigate the impact of the low carbon transition on consumer costs, by saving a total of **392bn€** compared to the low nuclear scenario over 2020-2050 thanks to lower total generation costs



FORATOM takeaways from the “[Projected Costs of Generating Electricity 2020](#)” IEA report

(preliminary results of the updated “Pathways to 2050: Role of nuclear in a low-carbon Europe” Compass Lexecon)



Benefits of nuclear LTO

Economy

EU-ETS carbon price will have an important impact on the decision to choose lifetime extension of existing nuclear fleet and to close fossil fuel capacity instead

- ✓ With a price of over 30€/ tonne of CO₂, the operation of fossil fuel power plants are not economical anymore and are starting to shutdown
- ✓ In this context, the lifetime-extension of the nuclear power plants is very important in order to keep the dispatchable generation at a safe level for the grid



Price / tonne of CO₂ - <https://ember-climate.org/data/carbon-price-viewer/>



Benefits of nuclear LTO

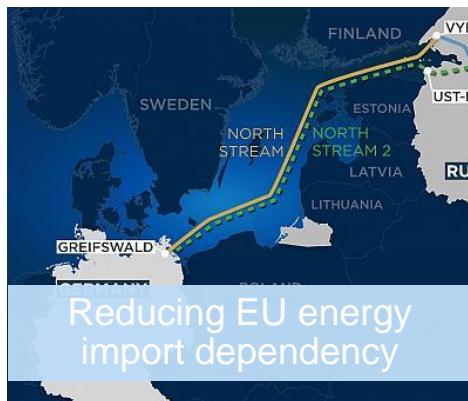


Nuclear LTO provides a great advantage thanks to the “...timely implementation of reasonably practicable safety improvements”.

- ✓ Safety improvements bring older generation reactors to a level of nuclear safety standards in compliance with the amended Nuclear Safety Directive.
- ✓ There is no cliff edge effect in either the level of safety or technical degradation due to ageing when reaching the original design lifetime.



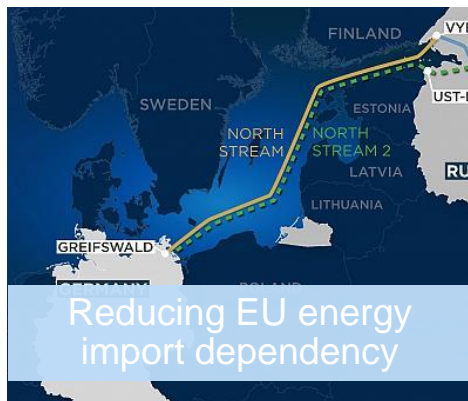
Benefits of nuclear LTO



- LTO reduces the EU's dependency on fossil fuels and energy imports
- If the current nuclear fleet is kept running, the capacity margins remain positive

- ✓ Based on the findings of the updated “Pathways to 2050: Role of nuclear in a low-carbon Europe” Compass Lexecon report, the low nuclear scenario would **increase fossil fuel consumption** (gas and coal) **by 4150TWh**. This would in turn increase Europe's fossil fuel dependency as follows:
 - **26% increase** in power sector consumption of **gas** between 2020-2050
 - **12% increase** in power sector consumption of **coal** between 2020-2050.
- ✓ The margins of security of supply of France and the 6 neighbouring countries considered by [France Stratégie](#) (Germany, Belgium, Spain, Italy, the United Kingdom, Switzerland) could decrease "**from 34 GW in 2020 to 16 GW in 2025 and then turn negative to - 7.5 GW in 2030 and - 10 GW in 2035**" based on the announced evolution of the electricity fleet. France, Germany, Belgium and the United Kingdom would be particularly affected by these risks, **the shut-down of nuclear capacities being one of the reasons**.

Benefits of nuclear LTO



Low-carbon nuclear generation provides firm capacity to the electricity system

- ✓ Intermittent renewables cannot replace firm thermal capacity in terms of providing system reliability.
 - The wind and solar technologies available today cannot address the level of firm capacity required by the system operator
 - In contrast thermal and, in particular nuclear generation provide a firm capacity of more than 90% of their installed capacity.
- ✓ In the view of [France Stratégie](#), the “threshold (from which the electrical system becomes unstable) is currently estimated at 40% vRES” in the case of Europe

Challenges facing nuclear LTO in the EU



Regulatory aspects



Industrial challenges



Jobs



Industrial & Energy Sovereignty



Specific taxes



Public acceptance



Stakeholders awareness



Market failure

Regarding LTO, what has to be done at EU level?

Ensure a coherent, consistent & stable EU policy framework (including Euratom).

Pursue the ambitious net-zero CO₂ emissions target for the EU in 2050 and to choose the most economic and technical feasible path to achieve it.

Develop & implement a strong industrial strategy to ensure that Europe maintains its technological leadership.

Support human competences development