



NUCLEAR LTO, VITAL IN MEETING EU LONG-TERM ENERGY AND CLIMATE GOALS

Low capital investment costs, short realization time required for upgrade works and – above all – the possibility to retain reliable and affordable source of electricity at affordable cost are only some of many undeniable advantages of pursuing the long-term operation (LTO) of nuclear reactors and by doing so keeping nuclear energy in the energy mix. However, in a long-term perspective, nuclear LTO has even a more important task to fulfil. If the European Union wants to deliver on its promise and meet its energy and climate goals, nuclear LTO will have to play an indispensable role in the EU's future energy mix. Achieving this objective will require not only major efforts on the nuclear sector's end, but also a firm recognition by the EU and its Member States on an individual basis followed by rewarding nuclear LTO with incentives for the benefits it brings to the system.

EU STATE OF PLAY

Currently there are 126 operational nuclear reactors in 14 Member States, generating more than a quarter of the overall electricity production in the EU. Nuclear energy provides clean and reliable electricity, guarantees security of energy supply, contributes to the economic development both at national and local level and decreases significantly CO₂ emissions. New nuclear reactors are currently under construction in Finland, France, Hungary, Slovakia and the UK and many other European countries are planning or considering new build projects.

The European Commission in its Nuclear Illustrative Programme¹ (PIN) published in 2017 confirmed that nuclear energy is expected to maintain its significant role in Europe's future energy mix up to 2050. The Commission predicts that the share of nuclear energy in the energy mix may decrease from 25% to approximately 20% in 2050.

Even though many EU Member

States have confirmed that they will rely on nuclear energy to produce a significant part of their electricity for the coming decades, after the reactors, which are currently under construction or even planned, are completed, the anticipated capacity of nuclear energy in the EU can be still difficult to reach.

One of the reasons behind this possible scenario is the fact that – on average – the age of a nuclear reactor in Europe is around 30 years, while its expected life is between 30 and 50 years. From the currently operating reactors in the EU, roughly 40% will reach 40 years of operation in the next 5 years. According to the European Commission², approximately 50 of the 126 reactors in operation nowadays will have to be shut down by 2025. To make things more striking, without LTO, around 90% of the currently operating reactors will be shut down by 2030.

To put it into perspective, the early closure of those 50 reactors would translate into slowing down significantly the decarbonisation of



YVES DESBAZEILLE

Director General

FORATOM

Graduated in electrical engineering from the Ecole Supérieure d'Electricité (SUPELEC) in France.



WITOLD STRZELECKI

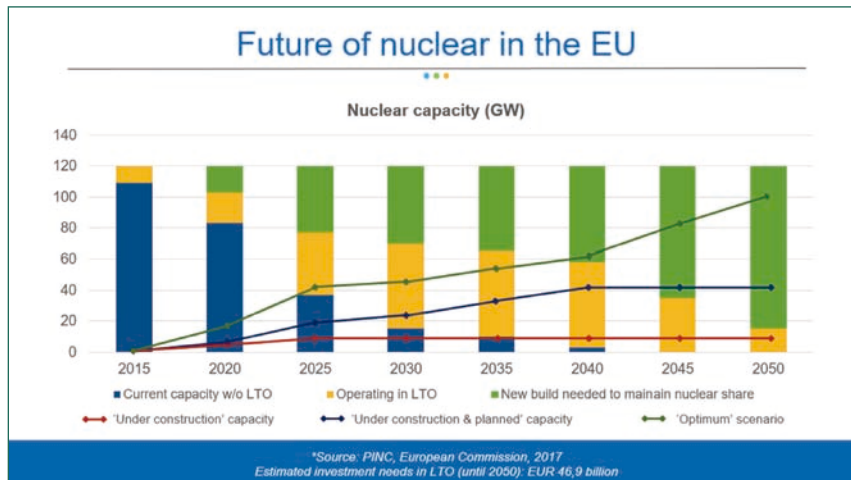
Communications Manager

FORATOM

Postgraduate Degree in Brand Management, Master's in International Relations and Bachelor's in Journalism and Social Communications.

¹ European Commission's Nuclear Illustrative Programme.

² Nuclear Illustrative Programme, European Commission.



Europe, maintaining CO₂ emissions at the current level and losing the equivalent of around 7 years of renewable energy expansion. Also, case studies from selected European countries prove that shutting down nuclear reactors can have detrimental effects –for instance– on climate. Germany, following its decision of 2011 to phase out its nuclear fleet, is officially set to miss the 2020 emission targets by a wide margin. If the country had decided in 2011 to phase out 20 GW of coal plant capacity instead of nuclear, it would have easily reached the emission targets to which the country had committed.

Taken these numbers into account, it is quite evident that, apart from encouraging countries to invest in new build projects, pursuing nuclear long-term operation has to gain momentum across the EU and should be considered as one of the key go-to solutions.

To some extent, the European Commission is aware of these facts as it admits that maintaining nuclear in the mix will require investment in nuclear LTO of around €40-50 billion by 2050³. However, publishing the number may not be enough to trigger the required investments...

5 PROS OF LTO

Nuclear utilities are choosing to pursue LTO programmes for a number of reasons as nuclear LTO is considered to represent one of the best economical options when proved to be safe and authorized by appropriate

regulatory authorities. It brings many undeniable benefits to the system. It contributes to securing energy supply in the EU, helps counteract climate change, allows to preserve nuclear expertise and maintain highly-skilled jobs. Not to mention its impact on national economies.

It is, therefore, in the best interests of consumers and a reasonable option for most operators to pursue LTO licences which will allow to keep their production capacity at the current level.

Low costs

Extending the life of a power plant incurs a much lower capital investment cost than the building of a new NPP: well below 1,000 €/kW. With the current pressures on the availability of capital and the associated importance of minimising investment risk, utilities themselves may be in a position to make a part of the investments on their own balance sheet.

According to the EC study "Synthesis on the Economics of Nuclear Energy"⁴ for Europe and referenced by the OECD EIA-NEA report "Projected Costs of Generating Electricity"⁵, the levelized costs of electricity (LCOE) for LTO of a nuclear reactor are ranging between €23/MWh to €30/MWh (with discount rate assumption of 10%), that is 32 to 40 USD/MWh in the OECD report, considering an overnight refurbishment cost (ORC) ranging between 400 to 850 million €. The LTO LCOE remain the lowest out of all the energy sources

⁴Synthesis on the Economics of Nuclear Energy, DG Energy.

⁵Projected Costs of Generating Electricity, OECD IEA-NEA.

³Nuclear Illustrative Programme, European Commission.

new build projects, when they are not submitted to specific, undue taxes and levies. On top of that, LTO represents sound asset investment management. From the beginning of operation, plant management and maintenance plans take into account the objective of long-term operation. It should be kept in mind that utilities have made investments in the upkeep of their NPPs since the start-up of operations, as well as reducing the cost impact of LTO at the end of a unit's original design basis lifetime.

Security of energy supply

Keeping nuclear energy in the mix allows to secure energy supply in each country that chooses this option as it decreases the country's dependency on import of fossil fuels.

Positive economic impact

The actual work carried out for the LTO of an NPP can have a positive impact on job creation, and the continued operation of the plant ensures sustaining direct or indirect jobs resulting from its operation. The local communities around each NPP have also grown and thrive economically, as a result of income generated by the plant operation.

Public acceptance

In terms of public acceptance, nuclear LTO comes with a relatively high approval among the public in the closest vicinity of NPPs as they are used to the power plant which is currently operating.

Environmental impact

And last but not least, phasing out nuclear power plants leads to higher costs and higher CO₂ emissions. Replacing a nuclear fleet with coal or even with renewables which have to use gas as their back-up can easily result in greater emissions even than possibly caused by coal when the impact of methane leaks and life cycle analysis are taken into account.

Because of these reasons, operating NPPs are proven to be reliable and competitive with LTO through lifetime extension and investments for safety upgrades. For the 2030-2040 timeframe, LTO is expected to have been applied to more than 50% of the entire nuclear fleet in operation. That is why, several EU countries are pursuing nuclear LTO after refurbishment/safety upgrades of nuclear reactors that are close to reach their operation lifetime, just to



mention Belgium, Bulgaria, Czech Republic, Finland, France, Hungary, Slovenia or the UK.

CHALLENGES

The decision to pursue an extension of the operating lifetime for an NPP has to be made by the utility which has an LTO strategy managed in an integrated approach with a long-term vision to ensure safe operation and to justify the corresponding investments.

Several risks have to be taken into account by utilities before choosing to pursue an LTO licence.

- In most countries, authorisation by the national nuclear safety regulator must be sought and granted in order for LTO to be implemented. In all its operations, the EU nuclear industry sets high standards for safety as a priority and carries out continuous safety improvement programmes in its existing plants as required by the EC's Council Directive 2009/71/Euratom⁶ of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations. Potential regulatory stumbling blocks on granting LTO could include time delays in issuing authorisations and possible changes in safety requirements.
- It is important to maintain public and political support for LTO, and the risk of a loss of confidence is a risk that needs to be managed as part of a utility's energy strategy and LTO goals. Only political support and a stable and predictable legal and regulatory framework coupled with clear national energy policy can give a solid foundation for nuclear investment.
- Also, at EU level a firm recognition by the EU of the role nuclear energy plays and will have to play in the future. Without giving a strong signal in favour of nuclear energy, and especially, LTO, many operators may be reluctant to making the decision to pursue LTO.

BENCHMARKS

Some countries are already proving how nuclear has an important role to continue playing. From the previously mentioned countries, which al-

ready have proceeded with nuclear LTO or are currently conducting this process, two examples are worth mentioning and following:

• 'Grand Carénage' programme in France

France has the largest nuclear fleet in the European Union. It consists of 58 PWR reactors in operation (+ one reactor currently under construction): 34 900 MWe reactors, 20 1,300 MWe reactors, 4 1,450 MWe reactors and the 1st EPR reactor in France being built in Flamanville. The average age of French reactors is 30 years (the majority of them were commissioned between 1978 and 1998). Currently, EDF is conducting a major renovation process called the "Grand Carénage" programme.

• LTO of CEZ's Dukovany NPP

CEZ operates two nuclear power plants in the Czech Republic: Dukovany NPP and Temelin NPP. In 2009, CEZ launched its Long-Term-Operation (LTO) project focusing on extending the planned operating lifetimes of the Dukovany reactors by 10 years. In the Czech Republic, LTO operational permit is not time limited, but LTO operation is conditioned by set of requirements given in each permit. Currently, the Dukovany NPP is ranked among the top 20% best operated power plants in the world, based on the criteria of the World Association of Nuclear Operators (WANO).

NEXT STEPS

The future of the European energy mix in the long-term perspective is one of the key topics currently discussed at EU level as the European Commission has recently announced its plans to update the EU low-carbon economy roadmap for 2050⁷ in the forthcoming months. If the bloc wants to deliver on its promise and decarbonise its economy in an affordable way while at the same time ensure security of supply, it has to consider nuclear energy together with other low-carbon energy sources as an indispensable tool

for reaching this goal in line with the conclusions of the Paris Agreement.

The case for long-term operation is robust. The 126 operating nuclear power plants are an important asset for Europe, strongly contributing to final energy price moderation, security of supply, CO₂ emissions reduction and employment. That's why, facilitating nuclear LTO is so crucial considering we want to meet the EC's objectives.

This task will require joint efforts from all parties involved in the process:

- **EU institutions** – should recognise the role of nuclear and maintain political support for LTO, providing a stable legal framework for investments and at the same time minimise the risk of a loss of confidence.
- **National governments** – have to be aware of the main issues at stake and address the existing barriers preventing LTO from materializing.
- **Regulators** – have to make sure they provide a predictable regulatory framework that operators need in order to invest in LTO.
- **Utilities** – have to make their best in communicating the drivers of nuclear safety and continuously improve (also safety upgrades) their units which can make the process more desirable for their stakeholders.

The current risks the EU has to face are well known and explained at large in this article. The long-term operation of nuclear power plants is capable of addressing all those challenges and the EU should be eager to admit and help overcome them assuming it wants to meet its climate and energy goals. If this is – indeed – the EU's objective, nuclear LTO will have to play an indispensable role in Europe's future energy mix.

About us: The European Atomic Forum (FORATOM) is the Brussels-based trade association for the nuclear energy industry in Europe. The membership of FORATOM is made up of 15 national nuclear associations and through these associations, FORATOM represents nearly 3,000 European companies working in the industry and supporting around 800,000 jobs.■

⁷ <https://www.euractiv.com/section/energy/news/eu-leaders-take-brussels-to-task-over-2050-low-carbon-roadmap/>

⁶ EC's Council Directive 2009/71/Euratom.