Nuclear the backbone of 2050 carbon-free Europe. FORATOM view

Dr. Teodor Chirica, President FORATOM

Budapest Energy Summit, 3-6 December 2018

Key policy drivers at EU level

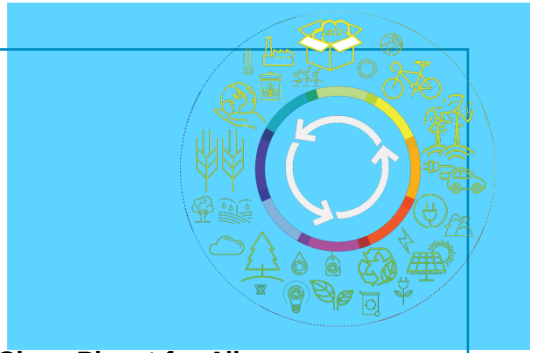
EU energy & climate goals:
CO_2 emissions goals vs. RES goals

Clean Energy Package
(role of nuclear)

Balance of power
pronuclear vs. antinuclear countries

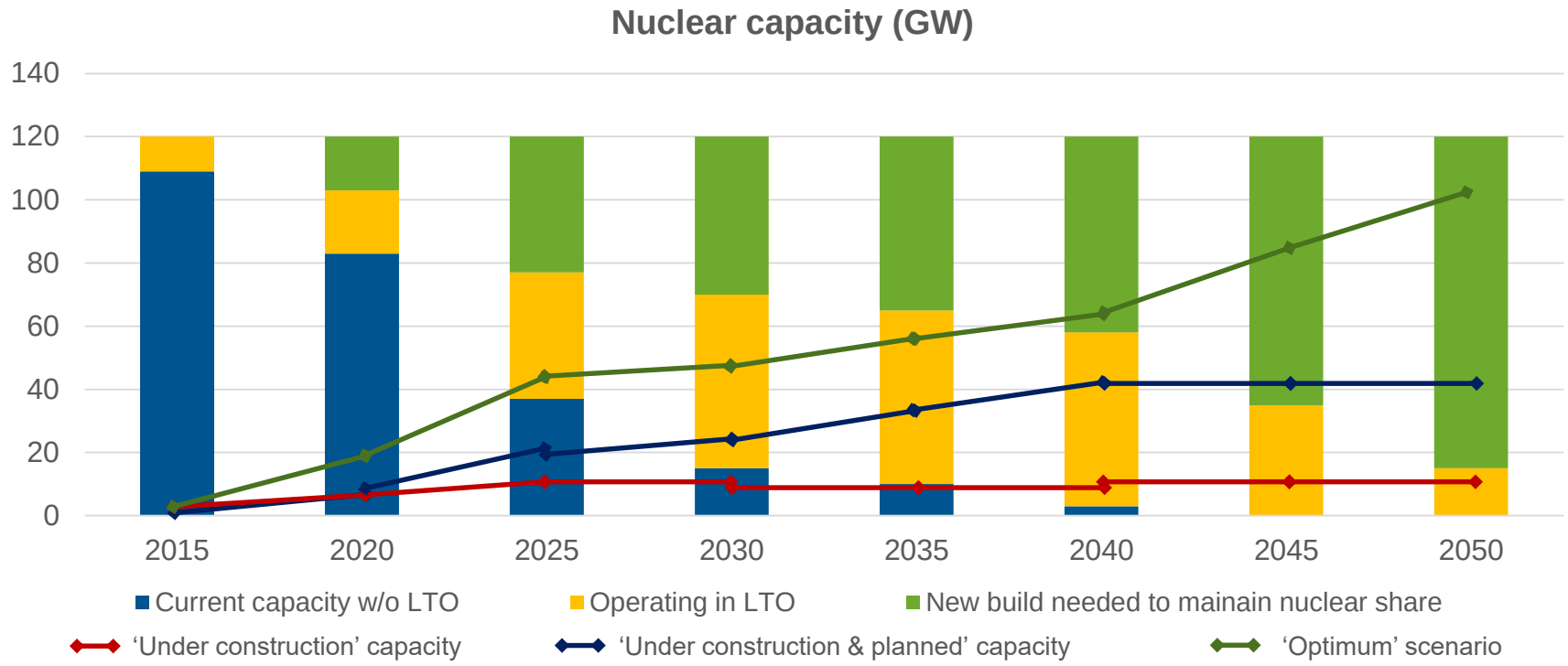
New build projects facing opposition
by selected EU members

Future of the Euratom Treaty
(EC's 2018 Work Programme)



A Clean Planet for All
(EC COM(2018) 773, 28 November 2018

EU institutions approach towards nuclear – PINC 2017



Source: PINC, European Commission, 2017

EC Communication - A Clean Planet for All

European Commission's
A Clean Planet for all COM(2018) 773, 28 November 2018

- ✓ **March 22, 2018** "the EUCO invites the EC to present by the Q1/2019 a proposal for a Strategy for long-term EU greenhouse gas emissions reduction in accordance with the **Paris Agreement**, considering national plans, too
- ✓ **November 28, 2018**, EC presented the "A Clean Planet for all"
- ✓ Commissioner for Climate Action and Energy, Miguel Arias Cañete said: "The EU has already started the modernization and transformation towards a *climate neutral economy*", EC Press release, **28 November, 2018**
- ✓ Nuclear is expected to play a role, together with RES, to the carbon-free European power system, in mitigation scenarios and security of supply, with a **nuclear share of about 15%** ('*nuclear*' is highlighted more than 40 times)
- ✓ LTOs represent the majority of nuclear investments in the ST to MT
- ✓ Nuclear investments currently remain a challenge in the EU, due to the important up-front costs on the one hand and less certain electricity market prices on the other hand

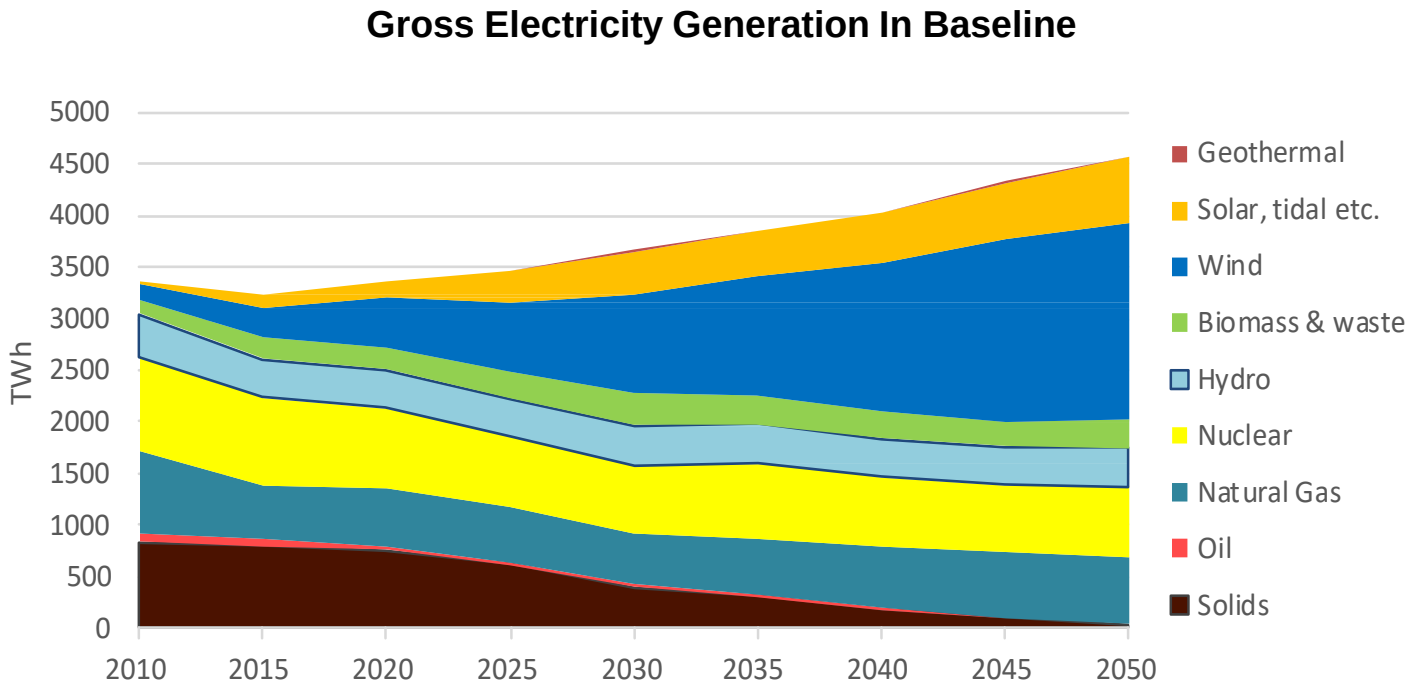
EUROPEAN COMMISSION

Brussels, 28 November 2018

IN-DEPTH ANALYSIS IN SUPPORT OF THE COMMISSION COMMUNICATION COM(2018) 773

A Clean Planet for all
A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy

EC COM(2018) 773, 28 November 2018
A Clean Planet for All

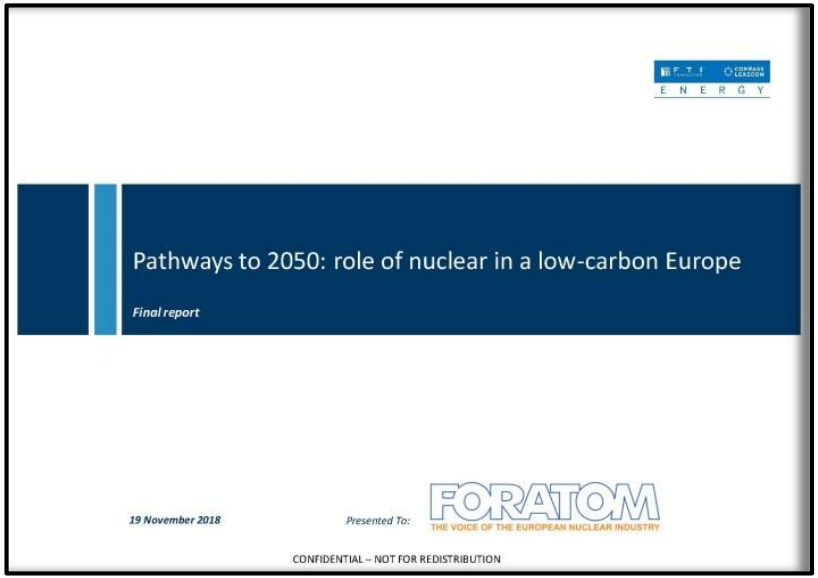


Source: Eurostat (2010, 2015), PRIMES.

FORATOM Pathway to 2050:
Role of nuclear in a low-carbon Europe

Role of nuclear in a low-carbon Europe

- ✓ On **22 November 2018**, FORATOM organized in Brussels a briefing for journalists presenting its new study “Pathways to 2050: role of nuclear in a low-carbon Europe”
- ✓ “If Europe is serious about decarbonizing its economy by 2050 then one quarter of the electricity produced in the EU will need to come from nuclear”, FORATOM Press release, **22 November 2018**
- ✓ Three nuclear capacity scenarios in 2050: **low** (36GW), **medium** (103GW) and **high** (150GW), contemplating also at the European nuclear sector’s contribution to security of supply, decarbonisation and sustainability, and affordability and competitiveness
- ✓ The study produced by **FTI Energy** on behalf of FORATOM, the European nuclear trade association, is quoted by the Commission Communication “A Clean Planet for all”
- ✓ “EU confirms nuclear as backbone of 2050 carbon-free Europe”, FORATOM Press release, **29 November 2018**



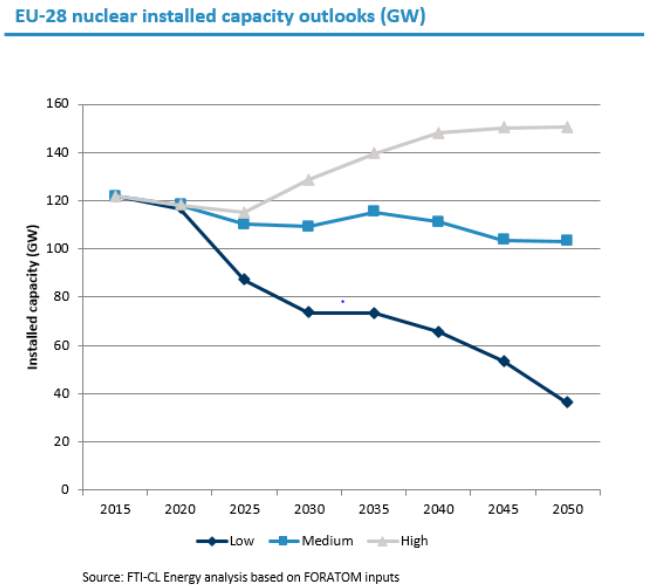
FORATOM Pathway to 2050:
Role of nuclear in a low-carbon Europe (cont'd)

Comparison of existing scenarios and modelling of 3 scenarios

Collect an extensive list of the available EU energy scenarios

Apply the exclusion criteria (Decarbonisation trajectory 95% / Penetration of electrification) and test scenarios of robustness and credibility

Design **three nuclear installed capacity scenarios (Low / Medium / High)** reflecting different degrees of ambition for the role of nuclear in decarbonising the EU power sector



FORATOM foresees the need to increase the total installed capacity from **120 GW** today to around **140-150 GW** by 2050.

FORATOM Pathway to 2050:
Role of nuclear in a low-carbon Europe (cont'd)

Overall, a number of key questions emerge regarding the role of nuclear in the Europe future energy trajectories

Security of supply

- Can a EU scenario with fully decarbonized electricity mix be credible, secure and cost efficient without a significant share of nuclear?

Economics

- How to manage nuclear plant closures and new build in different countries to avoid locking in inefficient fossil fuel technologies and emissions in transition to a decarbonised power sector?

Sustainability

- What is the role that nuclear can play in a EU decarbonisation scenario with growing power demand driven by strong electrification of the economy?

The "FORATOM Vision 2050" study produced by **FTI-CL** aims at **delivering fact-based evidence in response to these key questions** by analysing the contribution of the European nuclear sector to achieving European energy policy objectives of reliability, decarbonisation and cost efficiency.

FORATOM Pathway to 2050: CONCLUSIONS

Important contribution of nuclear to the transition towards a decarbonized EU economy:

- **In the ST/MT**: Nuclear LT Operation helps (i) ensure compliance w/ EU emission targets (ii) avoids temporary increase of emissions (iii) avoids locking in fossil fuel investments;
- **In the LT**: nuclear supports vs RES by (i) providing proven carbon free flexible power (ii) reducing reliance on yet to be proven storage technologies.

<u>Key enablers</u> for a sustainable role of nuclear power in the European power system:

- New nuclear needs to **demonstrate significant cost reductions** to succeed in EU markets (series effect).
- **Timely development & cost reduction of storage technologies as well as flexible operation of nuclear** critical to ensure nuclear - vRES complementarity**.**
- To address the high vRES environment challenges, **the market design should (i) reward dependable & flexible sources system value and (ii) provide stable LT investment signals.**

FORATOM's policy recommendations

Security of Supply:**The role of nuclear in achieving climate goals and security of supply at a reasonable cost should be recognised**.

- A cost-effective transition requires a significant share of dispatchable non-weather dependent generation.
- All low-carbon energy sources should be treated on an equal footing and rewarded for their own merits.

Sustainability:**The EU ETS should be the main decarbonisation instrument and any overlapping with other policies should be avoided**

- Within the framework on sustainable finance, the regulation should focus on environmental impacts and include technologically neutral criteria.
- In the ST, more efforts should be made to preserve the existing nuclear fleet as long as safety objectives are met.

Economics: **Actions on market design (i.e. LT arrangements) needed to restore investors' confidence in particular for large scale, capital intensive low-carbon generation projects**

- When comparing electricity sources, all costs & externalities (incl. system costs) should be taken into account.

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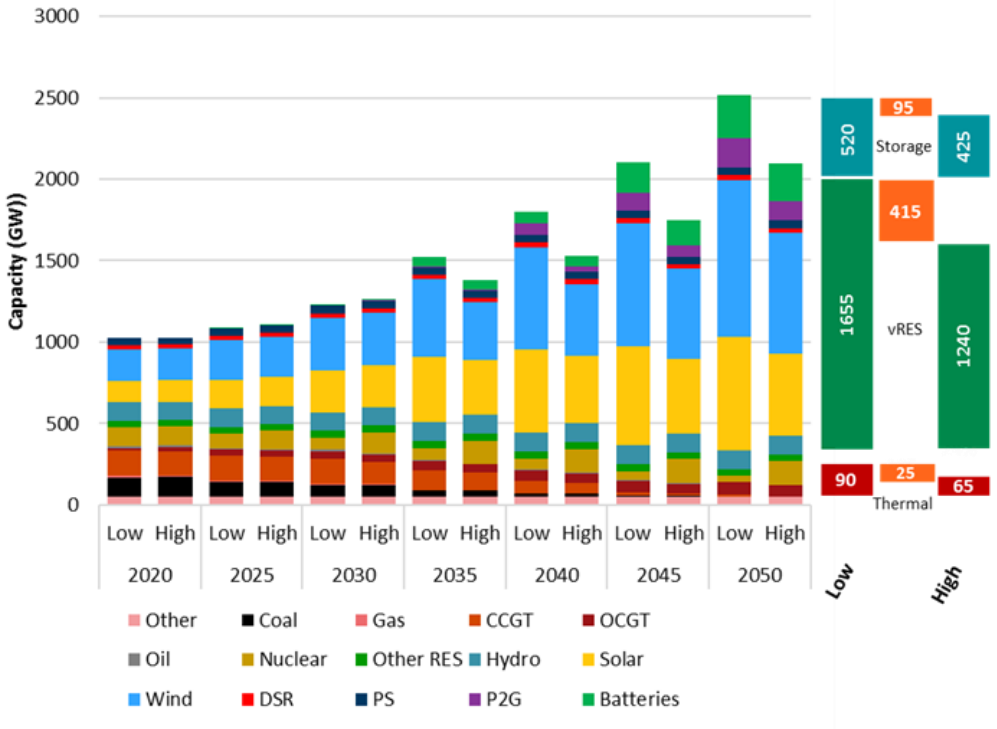
FORATOM Pathway to 2050:
Security of Supply – need for additional capacities

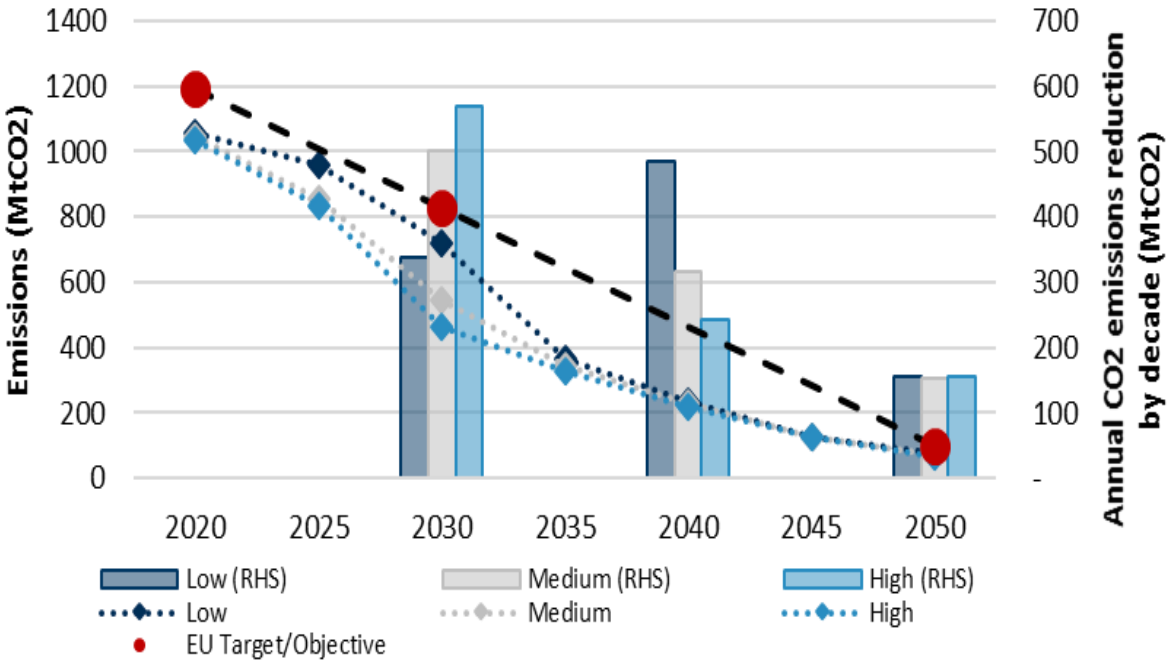


Decarbonising the European power mix by 2050 while maintaining security of supply will require the mobilisation of all low-carbon. Challenges:

- Low nuclear scenario – more thermal to compensate the reduction of nuclear
- Reliance on immature technologies
- Increase dependence on imports

Source: *FTI-CL Energy modelling*

FORATOM Pathway to 2050:
Sustainability: EU decarbonisation targets



Source: *FTI-CL Energy modelling*

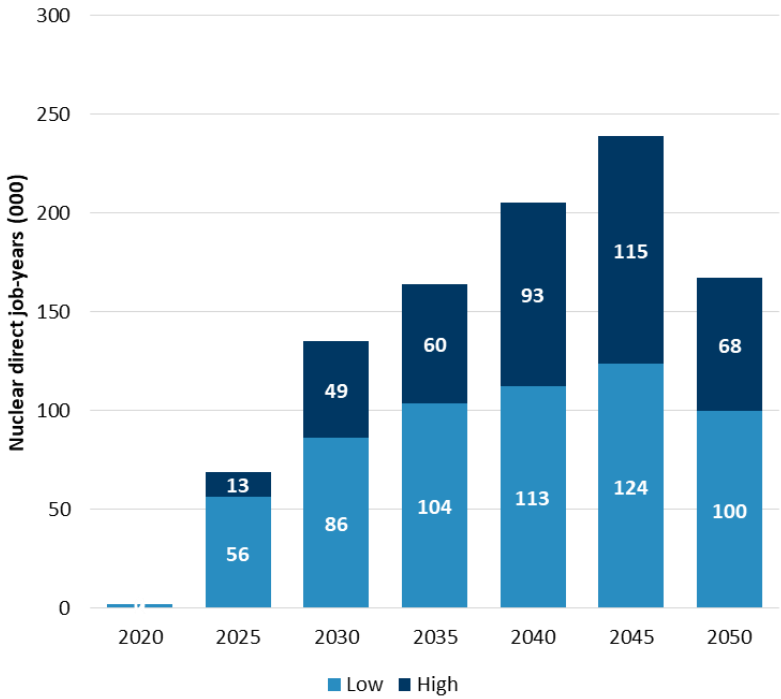
An efficient power sector transition towards low-carbon technologies will need to account for both carbon emissions and other environmental impacts, including air pollution and impact on land use.

Anticipated nuclear closures in the nuclear low scenario would increase CO2 emissions from the power sector by 2270Mt or +c17% between 2020 and 2050 but with highest efforts between 2028-2032

Early closure an no new nuclear build would induce about 66TWh of additional curtailed energy in 2050

FORATOM Pathway to 2050:
Economics: Potential cost reductions and new jobs creation

% reduction compared to 2015	2030	2050
Nuclear	33%	37%
Wind onshore	17%	31%
Wind offshore	42%	50%
Solar PV	47%	59%
Power to gas	53%	72%
Battery	67%	77%



Source: *FTI-CL Energy modelling*