

Nuclear Research & Innovation benefits for a low-carbon economy, industrial competitiveness and sustainable development

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FISA2019 and EURADWASTE '19 Pitesti, 04.06.2019



ABOUT FORATOM



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





Membership

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



CEZ (Czech Republic) and PGE EJ 1 (Poland) are Corporate Members

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EU Energy Policy:

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

Nuclear technology:

- Nuclear safety
- Nuclear transport
- IRD
- Supply Chain
- Waste disposal

Communication:

- Nuclear advocacy
- Perception of nuclear energy
- Promotion of nuclear energy
- Young generations in nuclear





NUCLEAR IN THE EU

What does nuclear contribute to the EU's economy?



1,100,000 126 26%

NUCLEAR REACTORS IN OPERATION

TURNOVER € BILLION/YEAR

JOBS

ELECTRICITY

PRODUCTION

50%

LOW-CARBOM ELECTRICITY



New build in the EU – construction & plans



- nuclear power plants under construction

- nuclear projects being developed or planned

Nuclear capacity "under construction" - ca. 7,500 MW

Nuclear capacity "planned" – between 10,000 - 20,000 MW



EU ENERGY POLICY



Key challenges at EU level

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pronuclear vs. antinuclear countries



New build projects facing opposition by selected EU members



Future of the Euratom Treaty

EU Energy Policy

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Nuclear energy in the EC strategy (Nov 2018)

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EC Communication*:

"Renewables together with nuclear energy will be the backbone of a carbon-free European power system"

EC in-depth analysis**:

- Nuclear will remain an important component in the EU 2050 energy mix
- Capacity of nuclear in 2050 between 99-121 GW
- Share of nuclear in the electricity mix in 2050 ca. 15%
- *"The consumption of natural gas is expected to be severely reduced by 2050 in all scenarios"*
- *"In the baseline, hydrogen* use develops only as a niche application for road transport and industry"

Authors of the strategy referred directly to the study commissioned by FORATOM

* https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf ** https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

Hourly production intensity vs. hourly load by EU MSs





EXPERT STUDIES

FTI CL Study (commissioned by FORATOM)

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Pathways to 2050: role of nuclear in a low-carbon Europe

Final report



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

3 nuclear scenarios



3 nuclear scenarios:

- 1. <u>High</u> 150 GW, <u>share ~25%</u> (maintaining the current one)
- 2. <u>Medium</u> 103 GW, share ~15% (in line with the EC strategy)
- 3. Low 36 GW, share ~4%

The study assesses the impact of each scenario on the key dimensions of Europe's energy policy:

- 1. security of supply
- 2. sustainability
- 3. economics



Benefits of having a 25% nuclear share in 2050*

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Sustainability

- Allowing the EU to meet its climate goals
- 700 million t. of CO₂ avoided per year (it emits 30x less CO₂ than gas, 65x less than coal, 3x less than solar)
- Compliance with air quality standards
- No need for vast volumes of land / raw materials

Energy security

- 85-90% capacity factor = a reliable source of electricity
- Decreased dependence on fossil fuels imports
- System flexibility much needed to support the RES developments
- Limited reliance on yetto-be-proven technologies

Economy

- ✓ High residual investment value (avoiding reducing the value by €1 trillion)
- ✓ Mitigation of the cost impact of the low-carbon transition on customer cost by €350bn
- ✓ Reducing network & balancing costs by 160bn€
- Positive & significant impact on jobs, GDP, revenues, etc.



Deloitte Study (commissioned by FORATOM)

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NUCLEAR ENERGY: POWERING THE ECONOMY CARBON-FREE GROWTH, JOBS AND LEADERSHIP IN INNOVATION



Key findings

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2019 Impact of the nuclear sector on EU economy		
1,129,900*	numbers of jobs	
47%	of the total numbers of jobs in the nuclear sector are highly skilled, equaling a number of 531,900	
€507.4 bn	in EU GDP, which equals – 3-3.5% share of 2019 EU GDP	
€383.1 bn	disposable household incomes	
€124.2 bn	public revenues generated through tax payments	
€1,092.3 bn	investments undertaken in the EU	
€18.1 bn	trade surplus within the EU	



*This figure does not include the full spectrum of jobs in fission R&D, therefore the actual number is even higher...

Nuclear energy's economic impact



*Deloitte study "Nuclear energy: powering the economy – carbon-free growth, jobs and leadership in innovation ** Other = Ireland, Denmark, Greece, Slovenia, Luxembourg, Croatia, Lithuania, Latvia, Estonia, Cyprus, Malta combined



RESEARCH & INNOVATION CHALLENGES

Different approaches towards nuclear R&D

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Strategic areas for existing and future related technologies Small Modular Reactors (SMR) and Accident Tolerant Fuel (ATF).

over €1.1bn in 2019



R&D programmes & near-term innovation (floating nuclear reactor technology, advanced fuel cycle programme, focusing on the full recycling of fuel)

€1bn per year



Nuclear R&D (SMRs, advanced materials manufacturing, digitalization, large nuclear systems & component testing facilities, advanced fuel R&D programmes)

"Heavy investments" in R&D, but difficult to precisely estimate

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Significantly less ambitious and of multiple orders of magnitude less than what is needed!!!







Challenge: Expand value added R&D outside of Euratom

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- Business as usual R&D funding & scope will not meet the needs of the EU nuclear industry
- Synergies with Horizon Europe must be delivered upon to allow support for forward looking R&D
- Areas such as Health & Materials are examples where Horizon Europe can lead common projects. Thus enable more available funds inside Euratom R&D to be focused on additional areas.



Just over half of the fission R&D budget is dedicated to fission power R&D projects:

~ €40-50m / year !!



Euratom R&D H2020 Ave Spend Over calls 2019-2020

EU planned budget on research & innovation



Proposed areas on which nuclear R&D should focus

R&D to improve the performance, safety and efficiency of existing L&HWR reactors.	R&D to support LTO	Cross cutting sectorial R&D		
Innovative Reactors	Advanced Fuel Programmes	Fast Reactors		
Nuclear R&D infrastructure, networks and demonstration projects	Innovation in Decommissioning	Industrial applications of Nuclear Energy with existing and future technologies.		

These areas have common themes and cross-cutting aspects, which means that selected synergies could be funded under Horizon Europe

Colaboration outside of the Nuclear Sector: Case study – RIMA project





Robotics for Inspection and Maintenance

RIMA - European project to drive innovation in robotics for I&M by establishing a pan-European network of Digital Innovation Hubs. The objective of RIMA is to **reinforce the leadership of Europe** in I&M robotics by connecting technology to industrial/sectorial needs and foster efficient cross border cooperation in Europe.

Project funded under the Digitising European Industry Call of <u>Horizon 2020</u>



FORATOM role

- Member of the RIMA consortium
- Bridge the gap between:
 - <u>SMEs within the robotics</u> <u>community</u>
 - Potential <u>end users within the</u> <u>nuclear industry</u> (licencees, I&M service providers, operators, etc.)



KEY TAKEAWAYS



Importance of investing in nuclear R&D

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The EU is lagging behind in nuclear R&D when compared to other international actors... In order for the EU to maintain its technological leadership, which can help the EU decarbonise its power sector in line with the Paris Agreement:

1. Euratom 2021-2025 funding for fission R&I should be increased

2. Horizon Europe & Euratom 2021-2025 <u>should be set up to</u> <u>complement each other</u> (common themes & cross-cutting aspects)

3. <u>Cohesion</u> and <u>synergy</u> with R&D in the SET Plan Action 10 'Nuclear' <u>must be considered</u> & <u>support given for shared benefits</u> across R&D programmes

4. The scope of the WP Euratom 2021-2025 <u>should be reflective of the</u> <u>direction of Member States, industry & academia stakeholders</u>





FORATOM IRD WG planned activities

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Innovation, Research & Development Working Group's industry view on the priority areas of R&D (9 fiches)



Position paper on IRD to meet the EU objectives (Q4 2019)



Direct engagement with key stakeholders (promotion of agreed messaging)



Participation in events (promotion of agreed messaging)



Participation in various projects, such as RIMA (promotion of agreed messaging)

Thank you

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Join us on **26 June 2019** in **Bucharest** to discuss key challenges affecting EU's energy sector, the role of longterm operation of nuclear power plants and how to ensure that the industry has access to the skills it needs.

Registration: events.foratom.org/nuclear-in-a-changing-world/

Official hashtag: #NuclearEurope2019

