WORLD NUCLEAR ASSOCIATION

La Energía Nuclear en el Mundo

Dr. Sama Bilbao y León

Director General

Real Academia de la Ingenería de España
"El papel de la energía nuclear en la transición energética española"
Madrid, 25-26 de abril de 2023

We are the voice of the global nuclear industry

We work with, support and represent the industry

wnn world nuclear news

We inform and communicate on nuclear energy

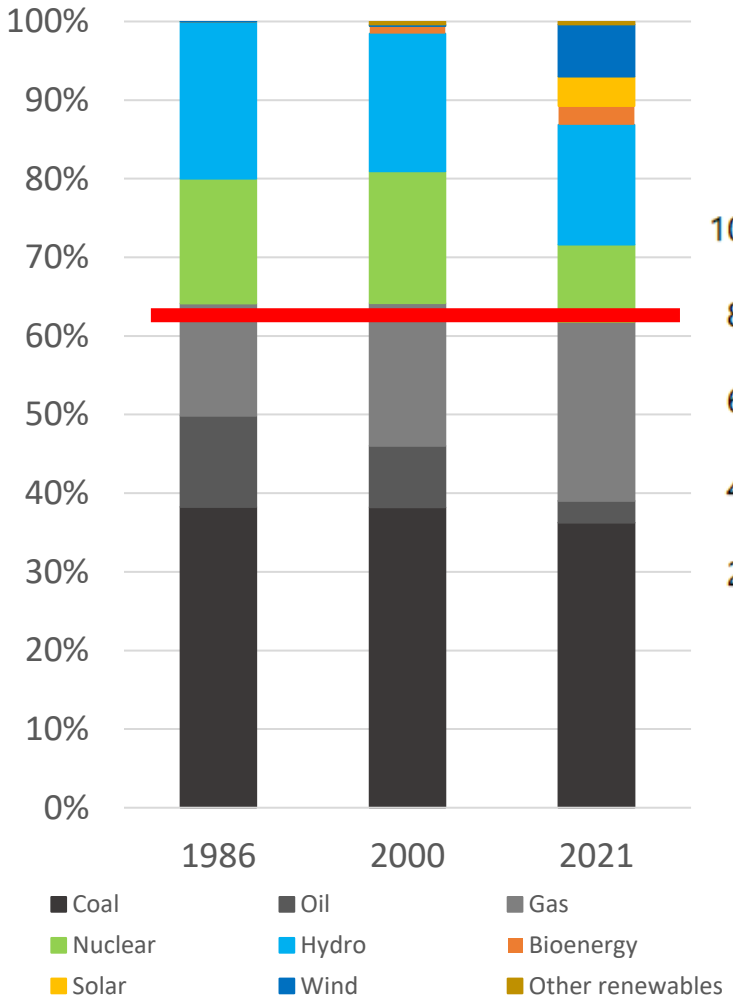
WORLD NUCLEAR UNIVERSITY

We inspire and develop the nuclear leaders of tomorrow

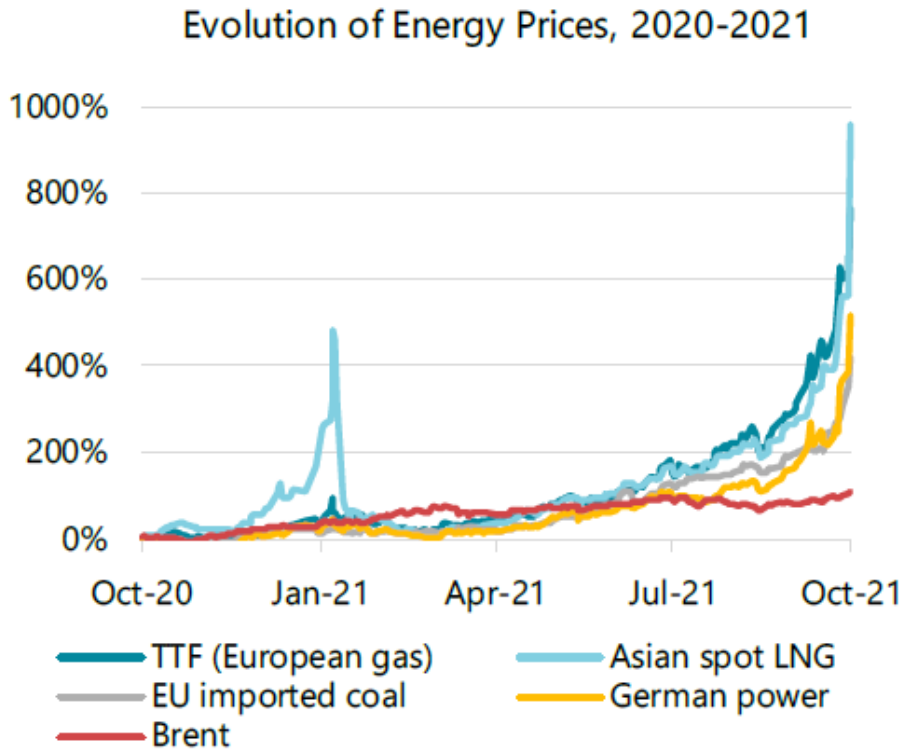
HARMONY
What will power our electric future?

We are a thought leader for nuclear energy in the global energy debate

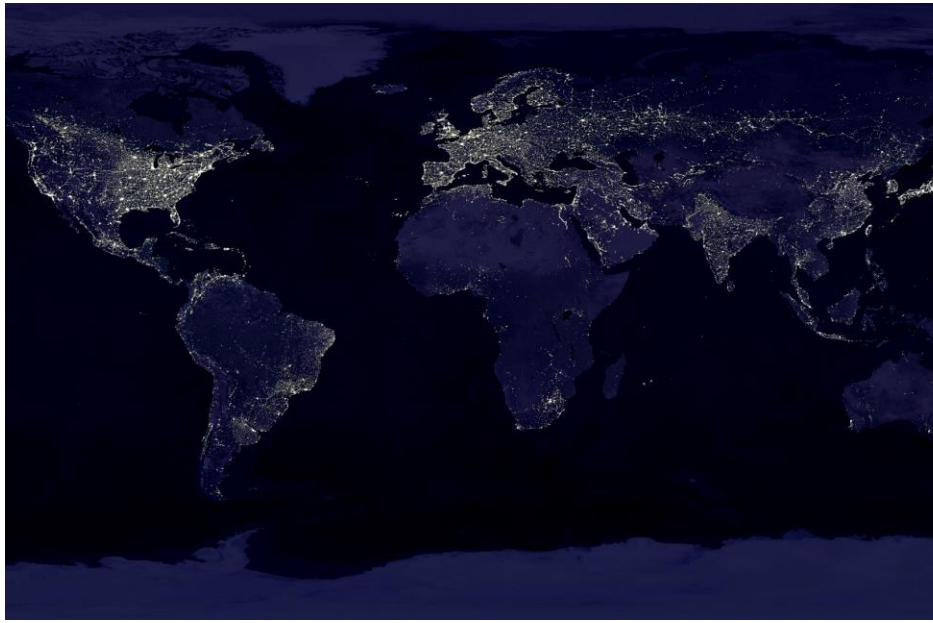
Thought leadership & action are needed to address the ENERGY TRILEMMA



ENERGY SUSTAINABILITY



ENERGY SECURITY



ENERGY EQUITY

Nuclear is the 2nd largest source of low carbon electricity – the 1st in OECD countries

Operable Reactors

438

394,447 MWe

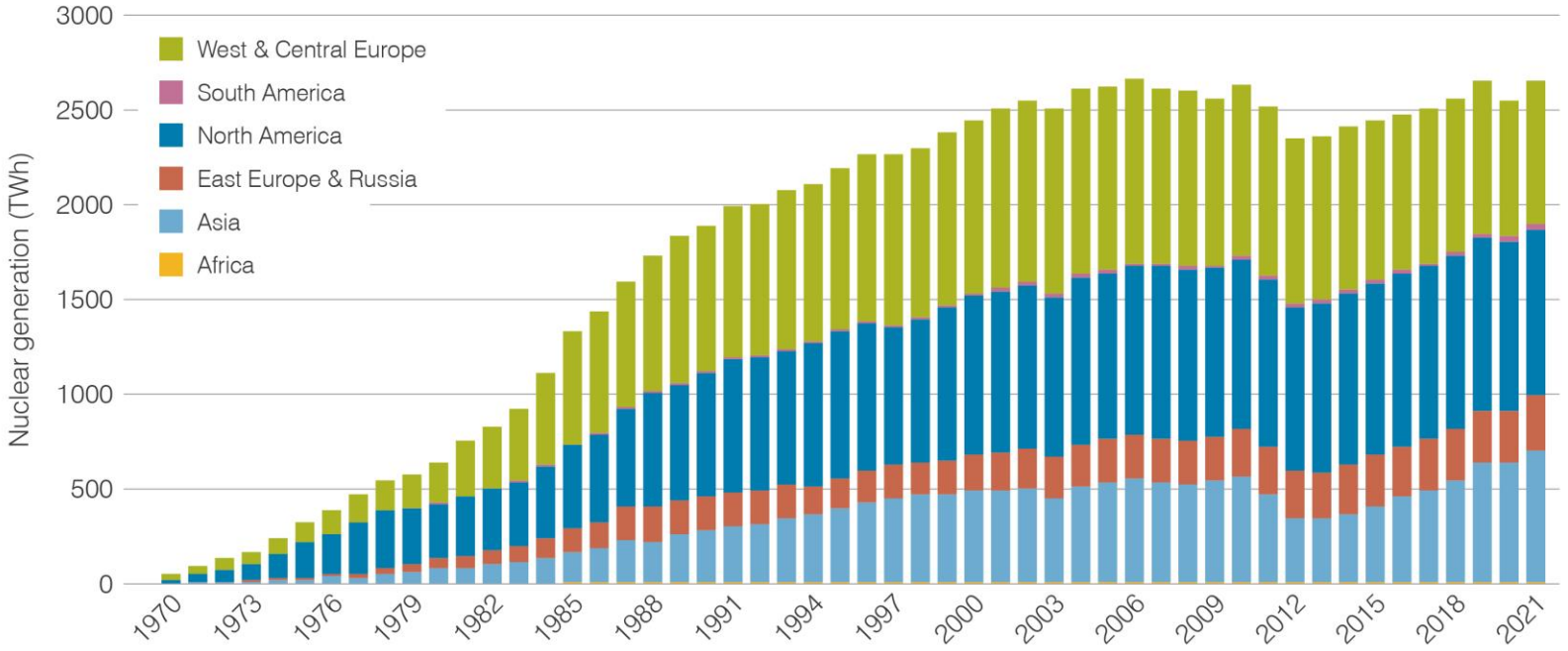
Reactors Under Construction

58

60,512 MWe

Share of Global Electricity Generation

10 %



	REACTORS PLANNED March 2023		REACTORS PROPOSED March 2023		URANIUM REQUIRED 2021
WORLD*	104 units	107,197 MW	341 units	376,652 MW	62,496 tonnes

WORLD NUCLEAR ASSOCIATION

Lifetime extensions of the existing nuclear fleet are crucial

Surry units cleared for 80-year operation

05 May 2021

Share

The US Nuclear Regulatory Commission (NRC) has approved an application by Dominion Energy's Virginia subsidiary for a 20-year extension to the operating licences of the twin-unit Surry nuclear power plant. This will enable the two pressurised water reactors to operate until 2052 and 2053, respectively.

NRA approves use of Japanese reactors beyond 60 years

14 February 2023

Share

Japan's Nuclear Regulation Authority (NRA) has approved draft legislation to extend the operating life of the country's nuclear power reactors beyond 60 years. It also approved an amendment to the Nuclear Reactor Regulation Law to remove the rule specifying the operational periods of reactors.

Nuclearelectrica selects Candu for Cernavoda refurb pre-project work

08 March 2023

Share

A two-year USD65 million agreement will see Candu Energy, part of SNC-Lavalin Group, conduct pre-project work for the lifetime extension of unit 1 of Romanian nuclear operator Nuclearelectrica's Cernavoda nuclear power plant.

Countries in all continents are looking to nuclear energy to meet net-zero goals

Cabinet approves change in Japanese nuclear policy

10 February 2023

Share

Japan's Cabinet has approved a policy to allow new nuclear power reactors to be constructed and the operation of existing reactors to be extended from 40 to 60 years.

Philippines relaunches nuclear energy programme

03 March 2022

Share

President Rodrigo Duterte has signed an executive order that outlines the government's position for the inclusion of nuclear energy in the Philippines' energy mix, taking into account economic, political, social and environmental objectives.

The executive order calls for the start up of the mothballed Bataan plant to be investigated (Image: Jiru27/Wikimedia)

Brazilian parliamentary group to promote new nuclear

09 February 2023

Share

Federal Deputy Julio Lopes has launched the Joint Parliamentary Front for Nuclear Technology and Activities, as the industry took a high profile at the *Welcome Energia 23* event in Brasilia, including discussions about small modular reactors (SMRs) and a fourth Angra unit.

Poland's government confirms Westinghouse for nuclear plant

03 November 2022

Share

The Council of Ministers has formally approved the decision that the first nuclear power plant in Poland will use three Westinghouse AP1000 reactors - with the US company calling it an "historic day" as it looks to build a fleet of the reactors in central Europe.

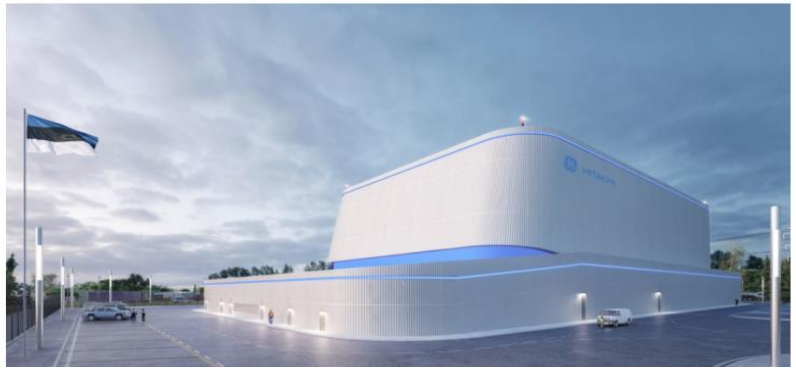
Uganda set to become Africa's third nuclear-powered country by 2031

BWRX-300 selected for Estonia's first nuclear power plant

08 February 2023

Share

Estonia's Fermi Energia has selected GE Hitachi Nuclear Energy's (GEH's) BWRX-300 small modular reactor (SMR) for potential deployment in the Baltic country by the early 2030s. Two other SMR designs had been under consideration.



Countries in all continents are looking to nuclear energy to meet net-zero goals

Nuclear makes a comeback in the Netherlands

Nuclear Policies 15 December 2021

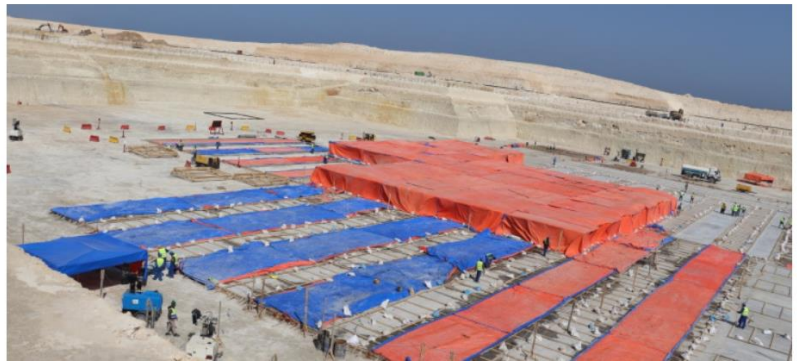
The Netherlands' new coalition government has placed nuclear power at the heart of its climate and energy policy. Some EUR500 million (USD564 million) has been earmarked to support new nuclear build in the period to 2025.

Third Egyptian reactor receives construction permit

31 March 2023

Share

Egypt's nuclear regulator has issued a construction licence for unit 3 of the El Dabaa nuclear power plant, which will eventually house four Russian-supplied reactors. Construction of unit 3 is scheduled to begin in the coming months.

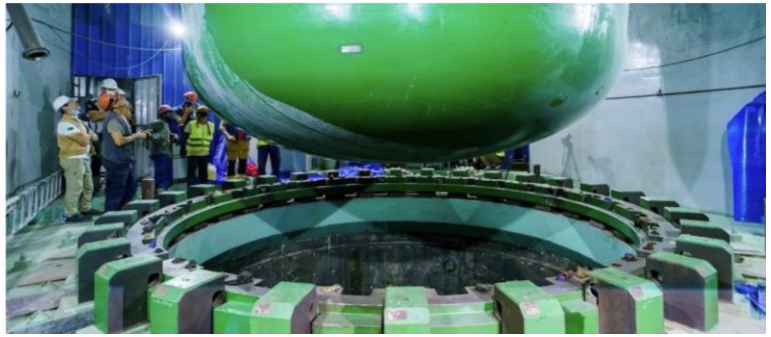


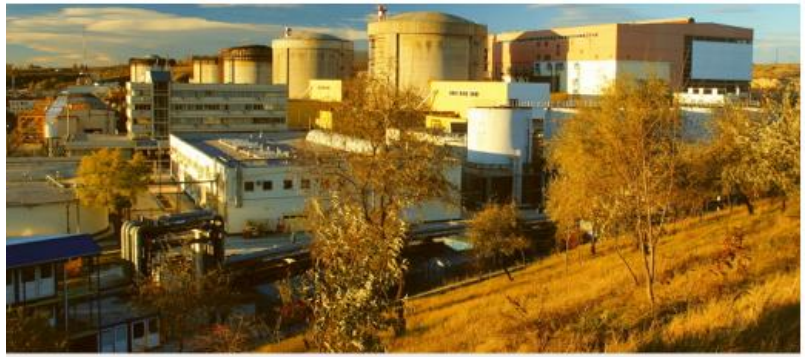
Bangladesh plans another nuclear power plant

11 October 2021

Share

Bangladesh wants to build another nuclear power plant after its first one is completed, Prime Minister Sheikh Hasina said yesterday as work at the Rooppur plant reached a critical milestone. "If we are able to build another nuclear power plant, we will no longer face a power crisis," she said after inaugurating the installation of the reactor pressure vessel at Rooppur 1. Hasina's words were reported by the country's official news agency *Bangladesh Sangbad Sangstha* after a briefing from her press secretary Ihsanul Karim on a meeting with Rosatom head Alexey Likhachov.





First contract signed for Cernavoda completion

A year-long, CAD8.4 million (USD6.6 million) contract will see Canada's Candu Energy prepare the licensing basis for two new Candu pressurised heavy water reactors at Romania's Cernavoda nuclear power plant. The signing was celebrated by the governments of Romania and Canada, as well as the USA.

Financial

PM announces aim to boost nuclear power generation to 25% of UK's electricity

Jasper Jolly and Rob Davies

Boris Johnson has told nuclear industry bosses that the government wants the UK to get 25% of its electricity from nuclear power, in a move that would signal a significant shift in the country's energy mix.

Johnson yesterday met executives from major nuclear utilities and technology companies including the

hopes will give long-term investors more certainty on returns.

The government wanted to show the nuclear and investment industries it has a "clear ambition for more nuclear" in part to balance out intermittent renewable power sources, according to a government source.

The prime minister last week met oil and gas executives to discuss increasing investments in the North Sea, and it is understood that he will next week meet executives from the offshore wind industry to discuss plans for further expansion

in 2020 pulling out of plans to build a new reactor at Wylfa, north Wales, and geopolitical tensions making the government less keen on attracting Chinese investment to Sizewell C on the Suffolk coast.

Meanwhile the existing fleet has been in decline, with Hunterston B in Scotland retiring earlier this year, Hinkley Point B in Somerset due to follow suit in the summer, and Heysham 1 and Hartlepool due to shut down in 2024. At that point, nuclear capacity is set to fall as low as 3.6GW.

A cross-party group of MPs who campaign on nuclear issues has called for annual capacity to increase

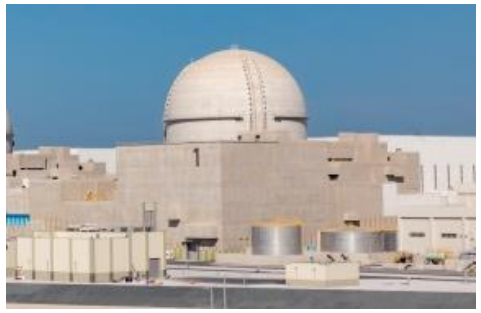
Construction begins of fourth Turkish reactor

21 July 2022

Share

First safety-related concrete has been poured for the fourth unit of the Akkuyu nuclear power plant under construction in the Mersin province of Turkey. The Akkuyu project - Turkey's first nuclear power plant - is based on an intergovernmental agreement Russia and Turkey signed in 2010.

Lots of excitement about new nuclear projects, large and small



Barakah 1, 2 & 3 - UAE
APR-1400
In operation

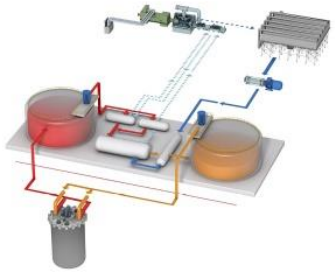
Fuqing 5 & 6 - China
Hualong One
In operation

Shin Hanul 1 - Korea
APR-1400
In operation

Vogtle 3 , USA
AP1000
Grid Connection

Karachi 2 & 3, Pakistan
Hualong One
In operation

NuScale, US
77 MWe PWR
Under Review



Natrium, US
345 MWe SFR - MS storage
Under Development

Nuward , France, 300-400
MWe PWR in development

BWRX300, Canada,US,UK
300 MWe BWR
Under Review

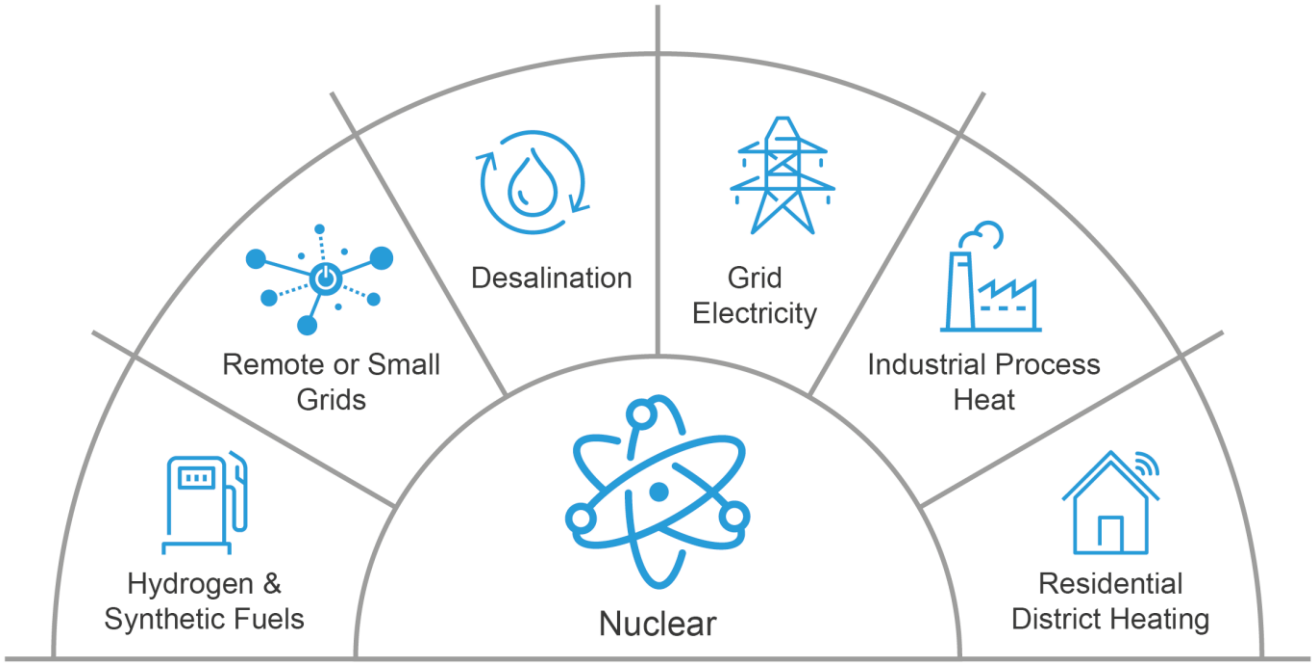
Rolls Royce SMR, UK, 470
MWe PWR, in development

Nuclear energy could decarbonize the entire economy

Akademik Lomonosov
KLT-40S – Russia In operation

Sibir, Russia
RITM-200, PWR, 2x175 MWth
Civil Maritime - In Operation

HTR-PM, China, 2x110
MWe HTGR In operation



Seaborg, Denmark
MSR, 250 MWth
Electricity & Heat - Under Development

Xe-100, X-energy, USA, Canada, UK
80 MWe HTGR
Under Development

Aurora/Oklo, US
1.5 MWe Heatpipe FNR
Under Review

Terrestrial, Canada, 190
MWe IMSR Under
Development

Yanlong DHR, China
400 MWth Pool Low Temp
District Heating - Under Development

Nuclear energy is sustainable

UN life cycle assessment publication highlighting the sustainability of nuclear energy compared with other electricity sources.

Greenhouse gas (GHG) emissions

- nuclear power's lifecycle emissions are estimated with the lowest GHG of all technology assessed.

Human health

- nuclear power shows low impact on human health

Ecosystems

- nuclear power shows a very low score on the ecosystem damage indicator

https://unece.org/sed/documents/2021/10/reports/life-cycle-assessment-electricity-generation-options

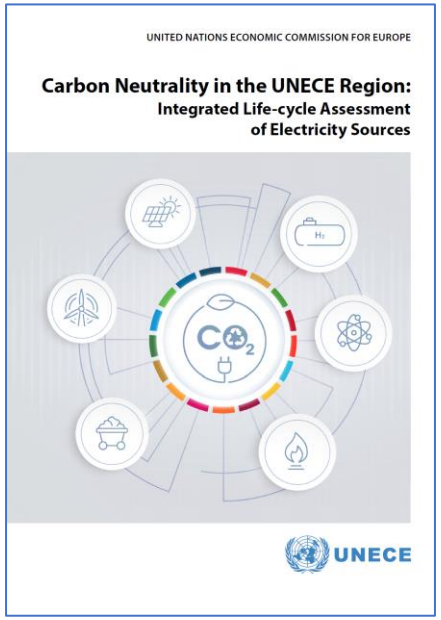
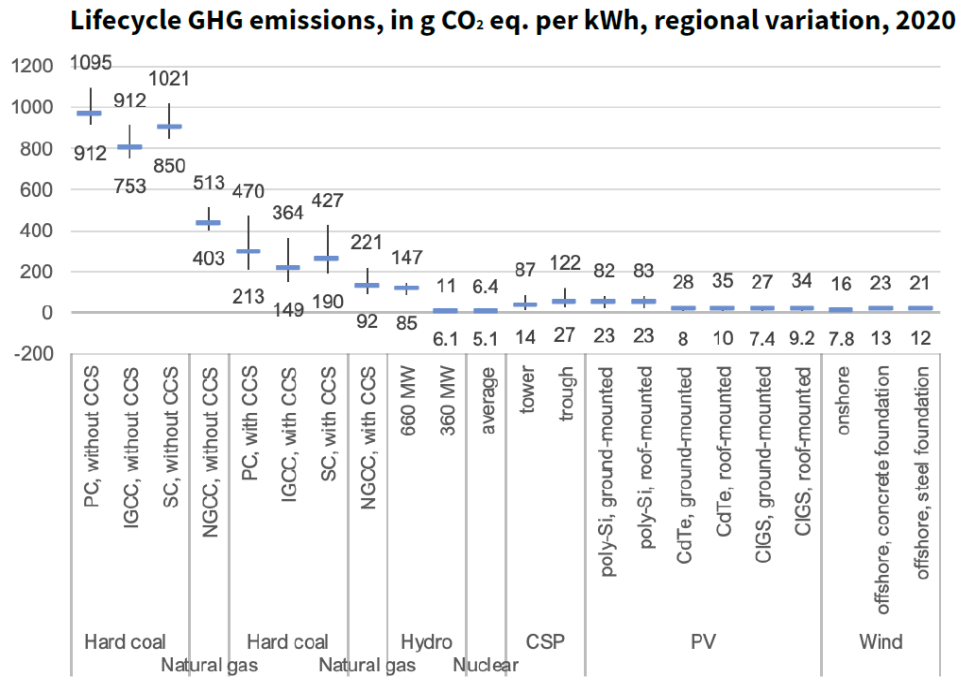


Figure 1 Lifecycle greenhouse gas emission ranges for the assessed technologies



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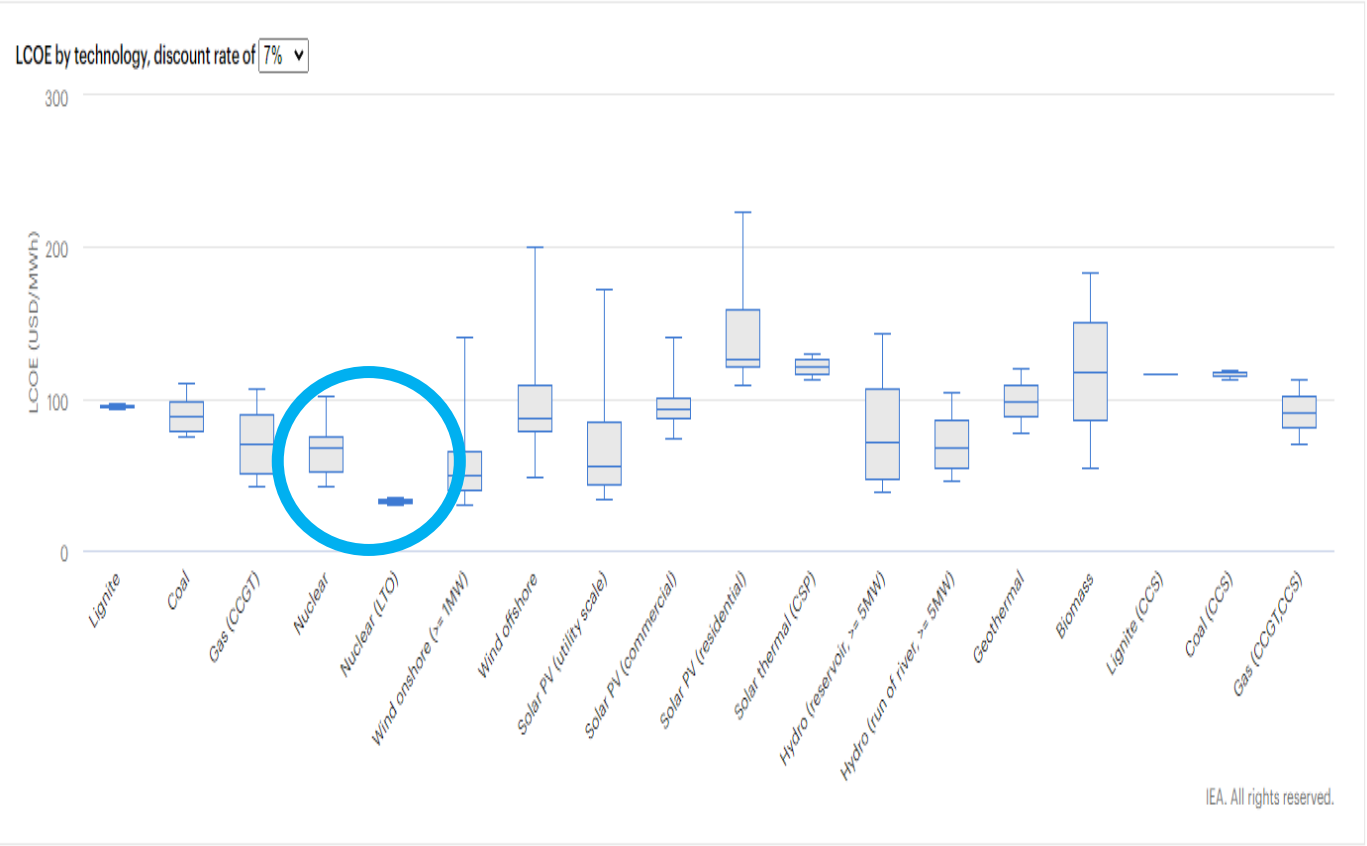
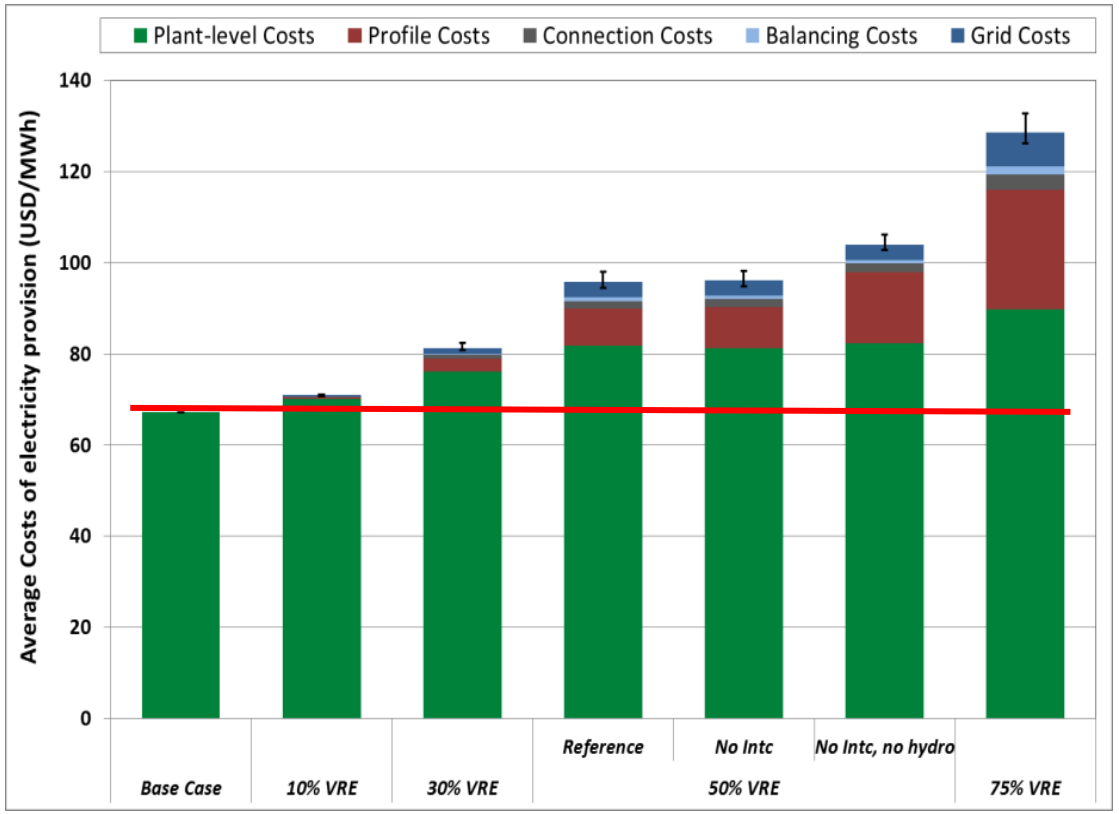
Existing nuclear and new nuclear are competitive low-carbon solutions

LEVELIZED COST OF ELECTRICITY



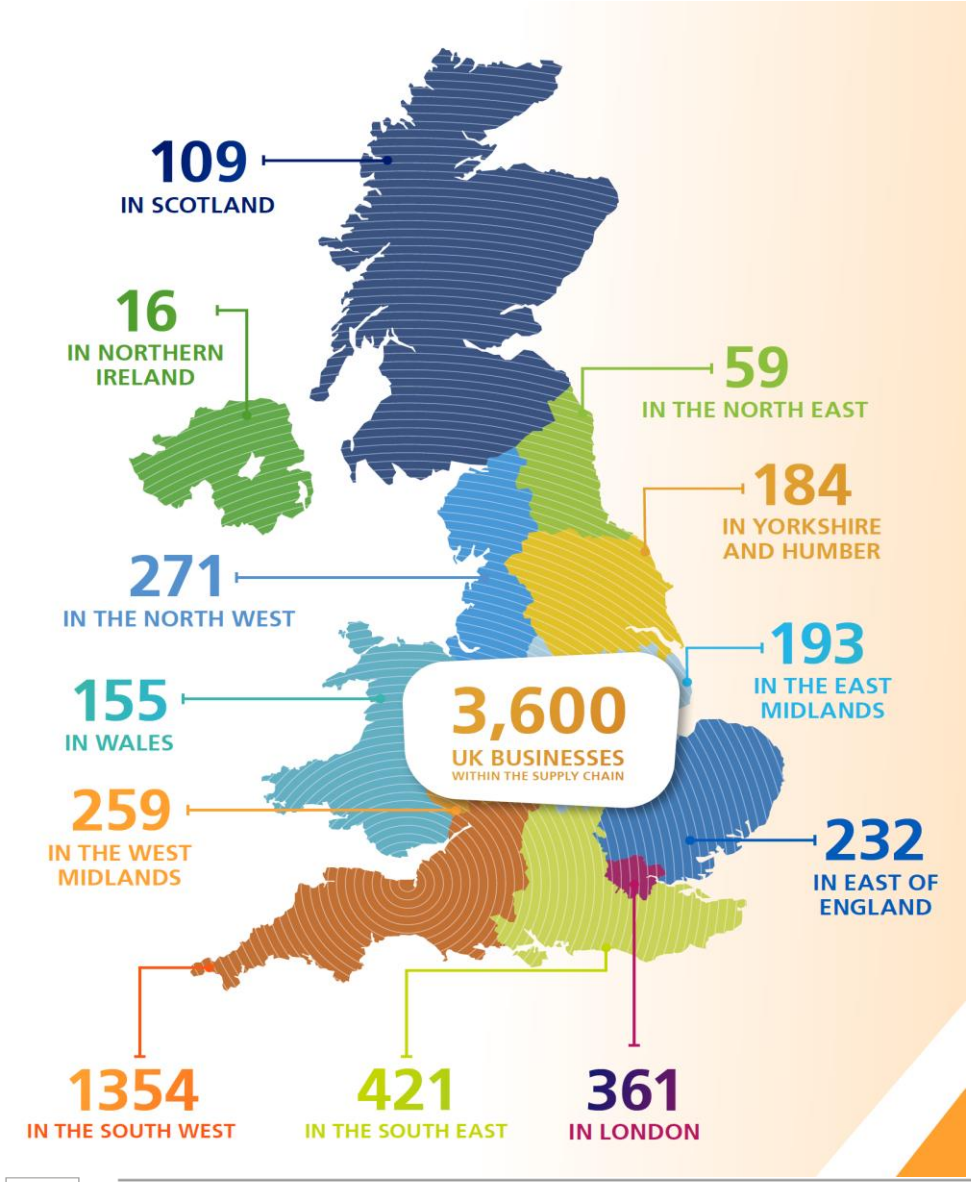
Source: IEA/NEA 2020 with cost of capital of 7% and CO2 price @ 30 USD/tCO2
https://www.oecd-nea.org/jcms/pl_51110/projected-costs-of-generating-electricity-2020-edition

SYSTEM COSTS



Source: OECD/NEA, 2019 https://www.oecd-nea.org/jcms/pl_15000/the-costs-of-decarbonisation-system-costs-with-high-shares-of-nuclear-and-renewables

Nuclear energy is a catalyst for economic development

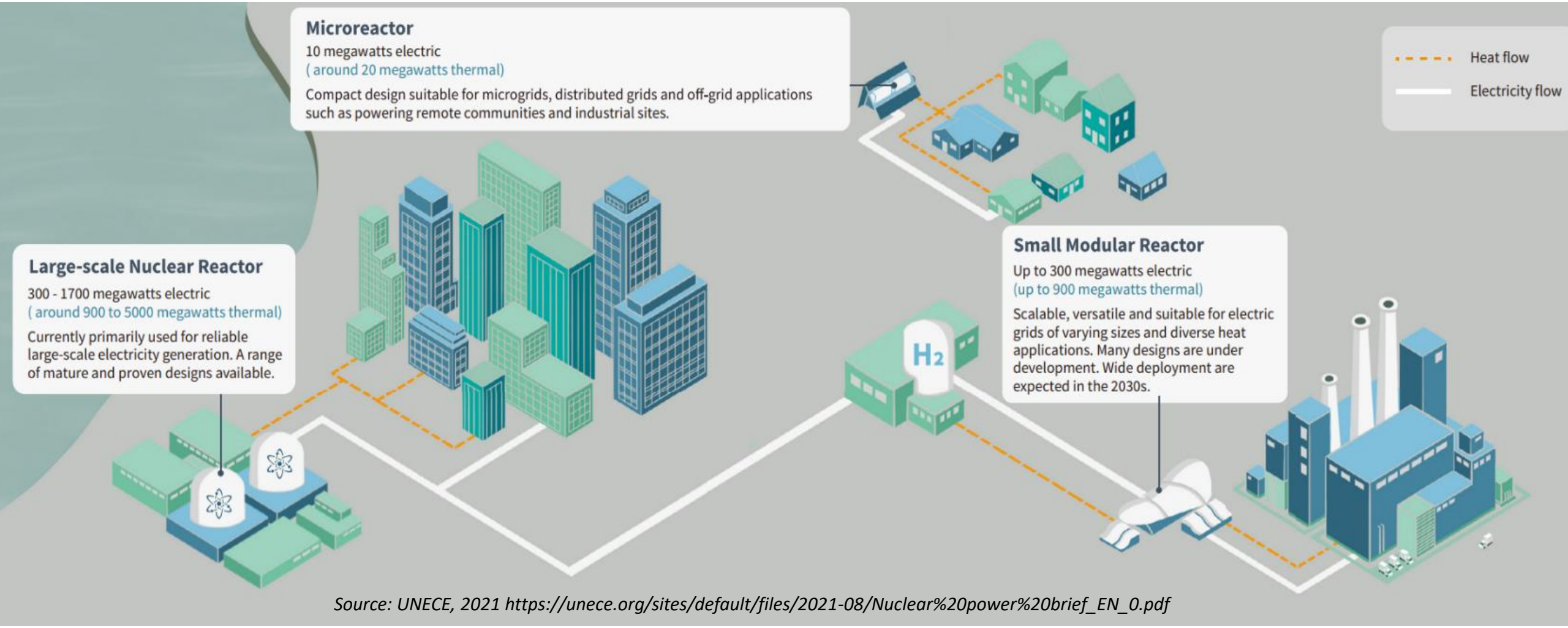


	Nuclear Energy Investments Multiplier	Renewable Energy Investments Multiplier	Fossil Fuel Energy Investments Multiplier
Impact	4.11	1.19	0.65
1 Year	3.97	1.20	0.64
2 Years	3.88	1.19	0.62
3 Years	3.83	1.17	0.59
4 Years	3.80	1.14	0.55
5 Years	3.78	1.11	0.52

Source: IMF Working Paper, 2021, Building Back Better: How Big Are Green Spending Multipliers? by Nicoletta Batini, Mario Di Serio, Matteo Fragetta, Giovanni Melina, and Anthony Waldron

More ambition for nuclear energy is needed

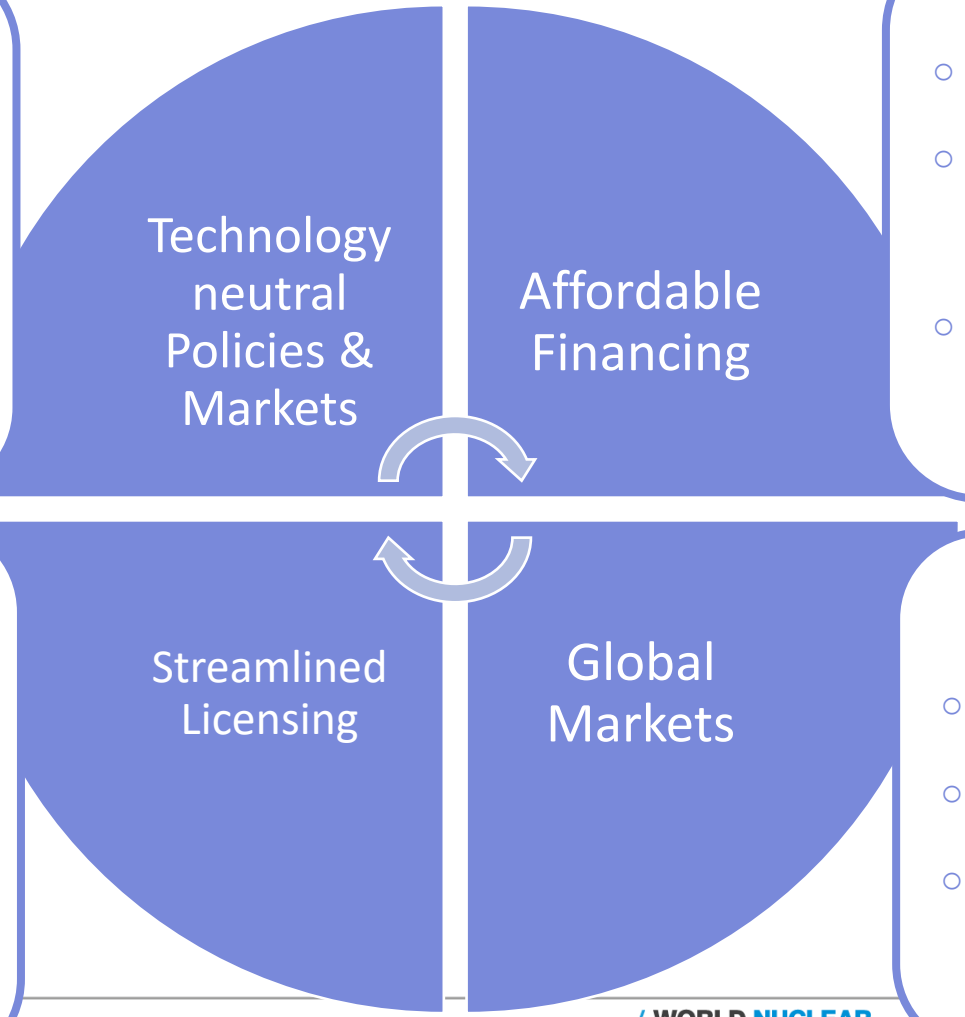
UNECE



Source: UNECE, 2021 https://unece.org/sites/default/files/2021-08/Nuclear%20power%20brief_EN_0.pdf

Much work needed to deploy nuclear power with speed and at scale

- Policies and markets that recognize and value the attributes of all low carbon energy sources
- Markets that ensure stability, reliability and affordability of energy
- Markets that have embedded signals incentivizing long-term planning and investment

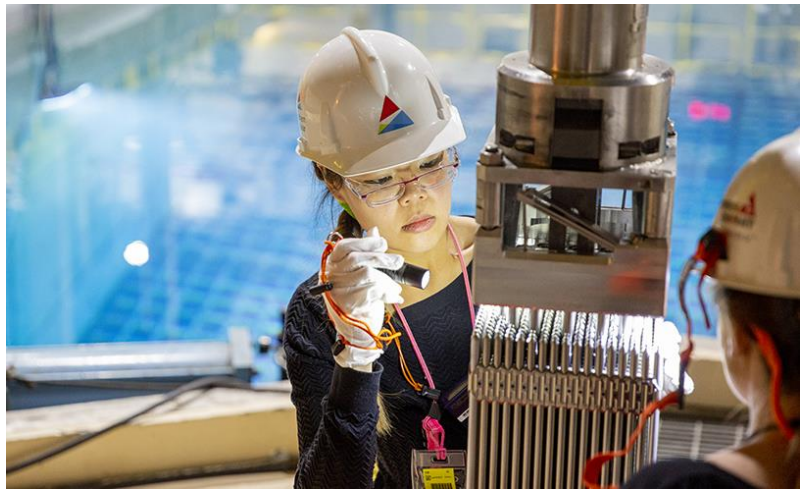


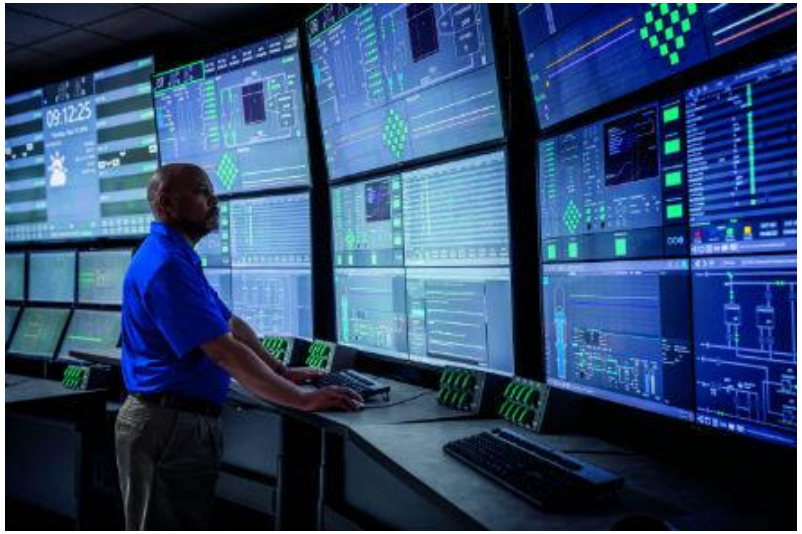
- Science-based technology-agnostic criteria for ESG and Climate Financing
- Inclusion of nuclear in lending policies of international development banks, multilateral banks and other international financial institutions
- Innovative financing frameworks that optimize the social value of investments

- Provide mandate and resources for regulators to streamline and collaborate
- Optimized licensing processes that allow regulators to collaborate and accept each others methodologies & analyses
- Increased convergence in Codes & Standards

- Rebuilding of capabilities and acceleration of learning curves for nuclear projects
- Establishment of a global market with its associated global supply chain
- Moving from projects towards products

Nothing will happen without a diverse all inclusive talented workforce

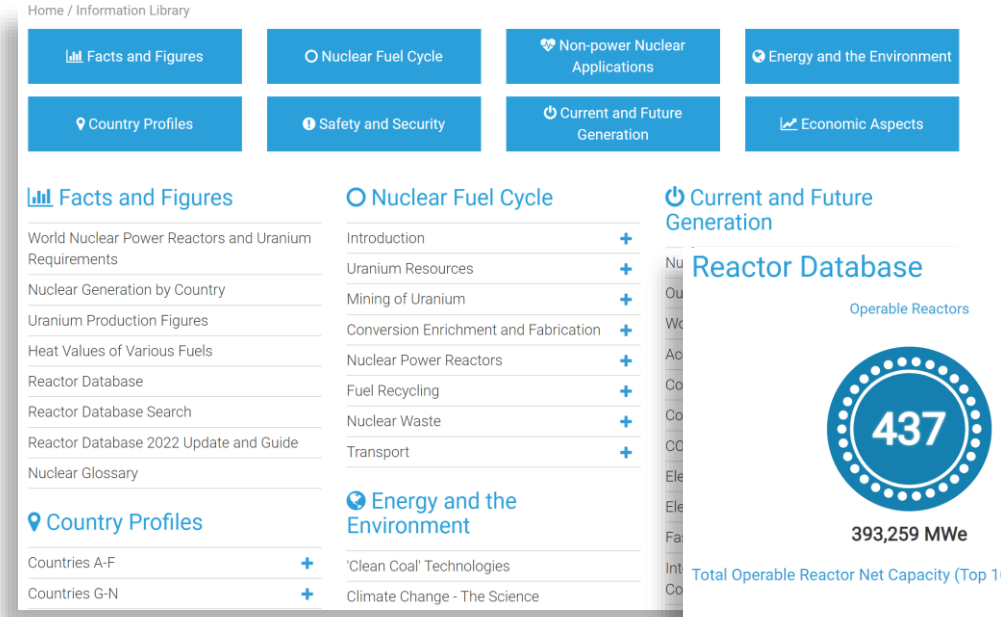


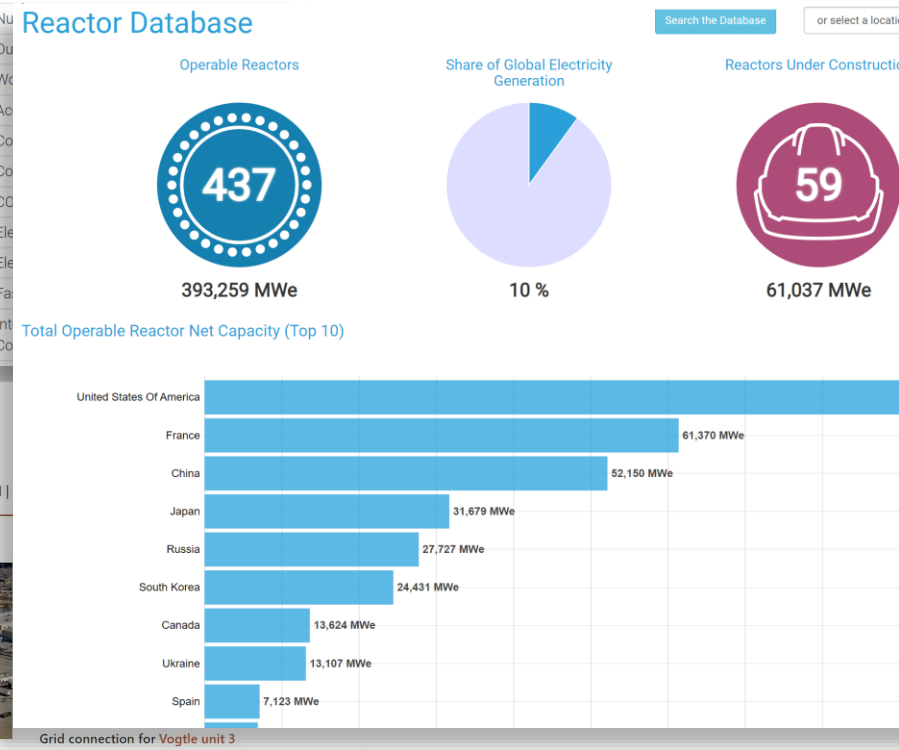


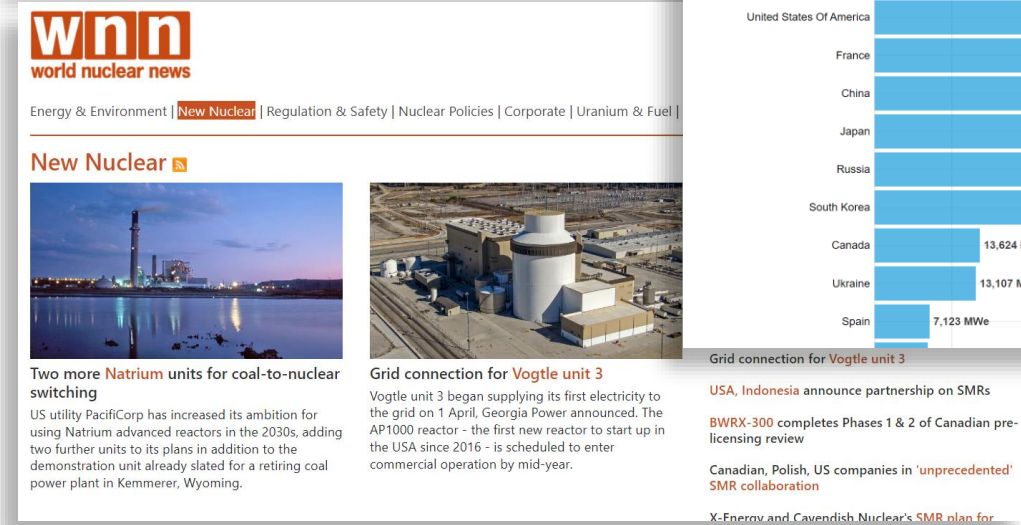
Nuclear energy needs to be an essential part of any serious clean energy transition

- Clean: low-carbon source of electricity and heat
- Compact: efficient use of land and resources
- Always on: reliability and stability for the grid
- Independent: resilient to weather or geopolitical impacts
- Affordable and stable costs
- Positive socio-economic impacts – jobs and trickle-down impacts
- Proven and scalable

We provide authoritative information about nuclear







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La energía nuclear ofrece una oportunidad única para construir un futuro más limpio y equitativo, donde todos tengan acceso a energía limpia abundante y asequible las 24 horas del día, los 7 días de la semana, y la calidad de vida que conlleva.

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