

Cambridge Judge Business School

June 2022

The outlook for nuclear power in Europe

Simon Taylor

EPRG, Judge Business School

University of Cambridge



UNIVERSITY OF
CAMBRIDGE
Judge Business School



Agenda

Overview of European nuclear: stable, negative, positive

Issues:

- Safety
- Costs
- ESG
- Energy security

European energy policy faces new pressures

FINANCIAL TIMES

UK COMPANIES TECH MARKETS CLIMATE OPINION WORK & CAREERS LIFE & ARTS HTSI

EU energy [+ Add to myFT](#)

Germany fires up coal plants to avert gas shortage as Russia cuts supply

Emergency move is 'bitter but essential' to ease threat of energy shortage, economic minister Robert Habeck says



The coal-fired power station in Garzweiler. The emergency move to reopen the plants is at odds with German policy to phase out coal by 2030 © Ina Fassbender/AFP/Getty Images

FINANCIAL TIMES

UK COMPANIES TECH MARKETS CLIMATE OPINION WORK & CAREERS LIFE & ARTS HTSI

Energy crisis [+ Add to myFT](#)

IEA chief warns Europe to prepare for total shutdown of Russian gas exports

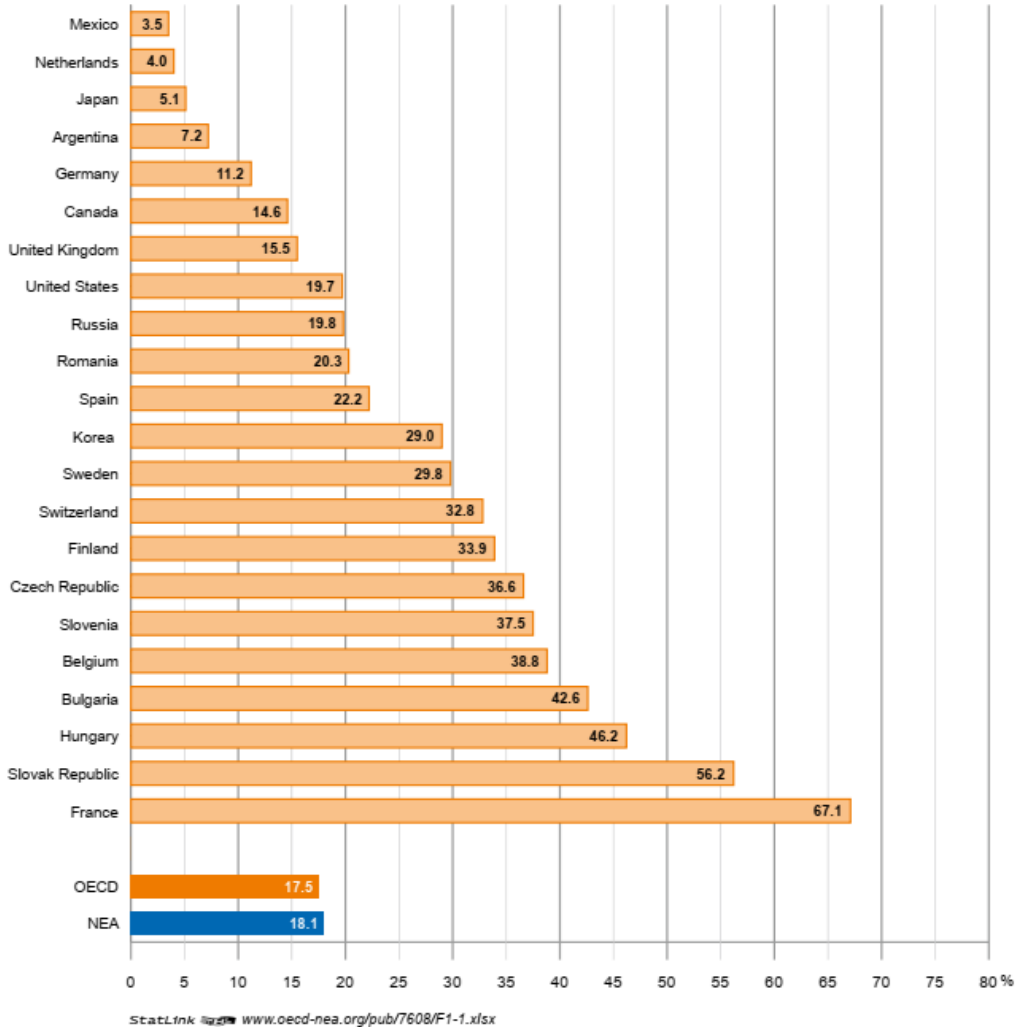
Fatih Birol says governments should keep ageing nuclear plants open and take other contingency measures



A French nuclear plant. 'The nearer we are coming to winter the more we understand Russia's intentions,' said Fatih Birol © Jean-Marie Hosatte/Gamma-Rapho/Getty Images

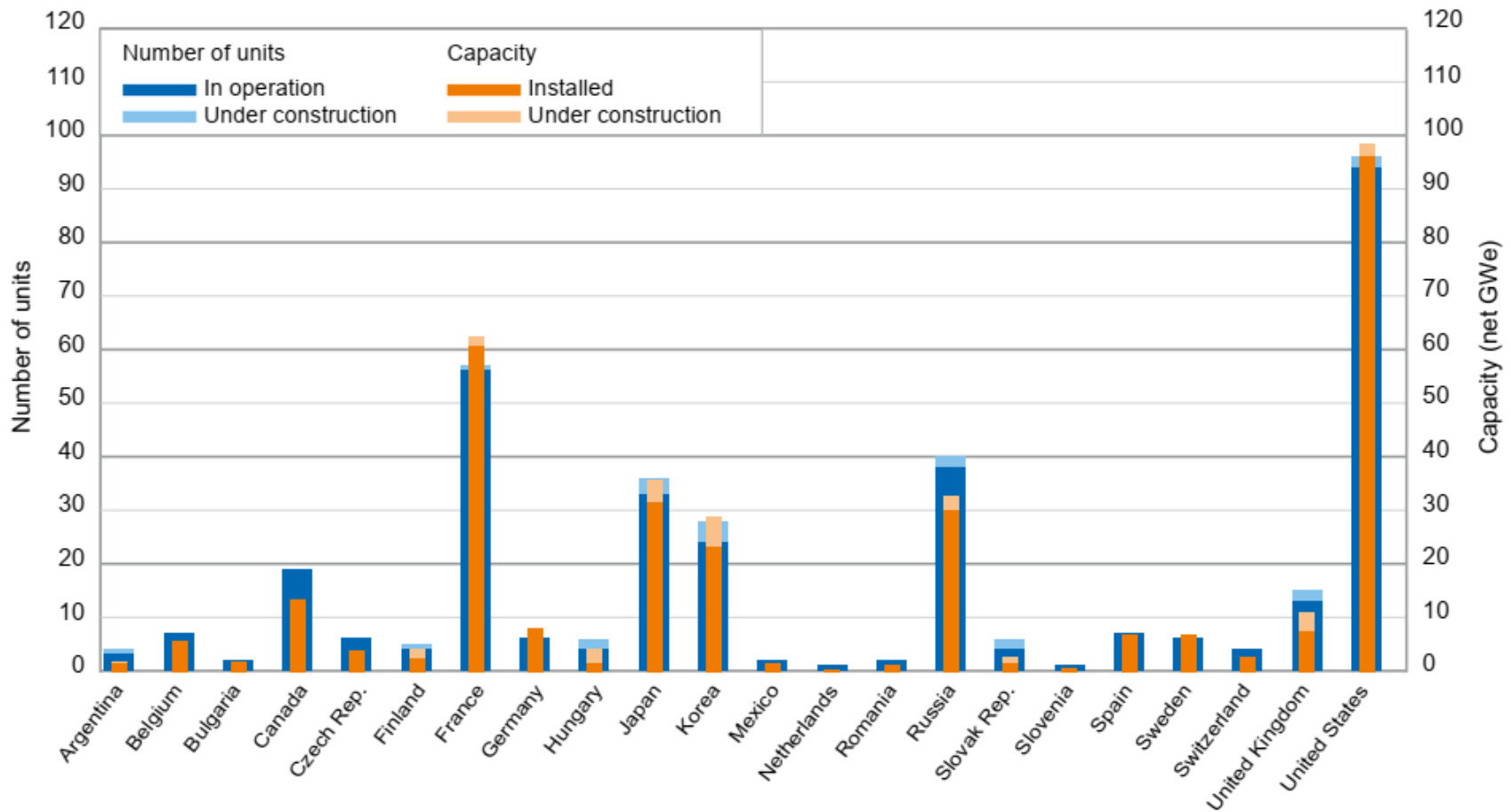
Nuclear is relatively more important in Europe

Nuclear share of total electricity generation (% , 2021)



Non-OECD-NEA:
Brazil: 3%
China: 3%
India: 3%

Quite a lot of new construction in Europe



Most European nuclear countries are planning or building more reactors

Country	Nuclear share of electricity generation (%)	Policy status
France	77	One EPR under construction; at least eight more planned
Ukraine	54	New plants planned
Slovak Republic	54	New plants under construction; more planned
Hungary	48	New plants proposed
Belgium	47	Stable – no new stations planned; phase out originally in 2025 now put back to 2035
Switzerland	38	Stable – no new stations planned
Czech Republic	37	New plants proposed
Slovenia	36	New plant under consideration
Finland	35	Stable – one EPR close to finish; additional Russian reactor order now cancelled
Bulgaria	34	New plant proposed
Sweden	30	Stable – no new stations planned
Spain	20	Stable – no new stations planned
Romania	19	New plants planned
UK	17	Major expansion/replacement planned; one station under construction
Germany	12	Planned phase out nearly complete
Netherlands	3	New plant under consideration
Poland	0	New plant contracted
Turkey	0	New plant under construction

Issues affecting decisions

1. Safety is not a major barrier (apart from Germany)

Issues affecting decisions

1. Safety is not a major barrier (apart from Germany)
2. But costs are

The troubled EPR (European Pressurised Reactor)

Olkiluoto 3 – Finland

Original scheduled operation – 2009

Original cost – €3.2 bn

Latest estimate - €8.5 bn

Expected operation – 2022



Flamanville 3 - France

Original scheduled operation – 2012

Original cost - €3.6 bn

Latest estimate €12.7 bn

Expected operation – 2024

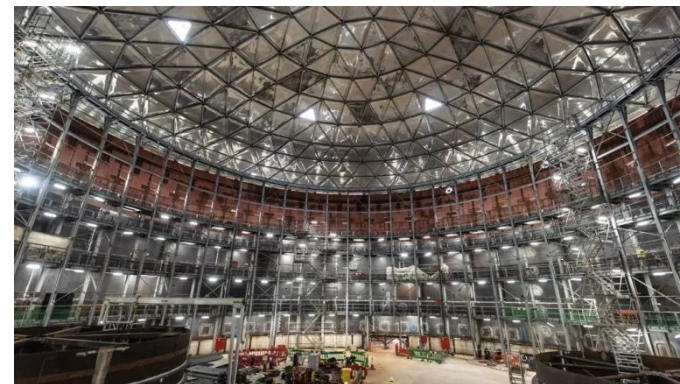


Hinkley Point C – UK

Unit 1 original scheduled operation – 2026

Original cost - £18 bn

Latest estimate £25-26 bn



Hopes for Sizewell C

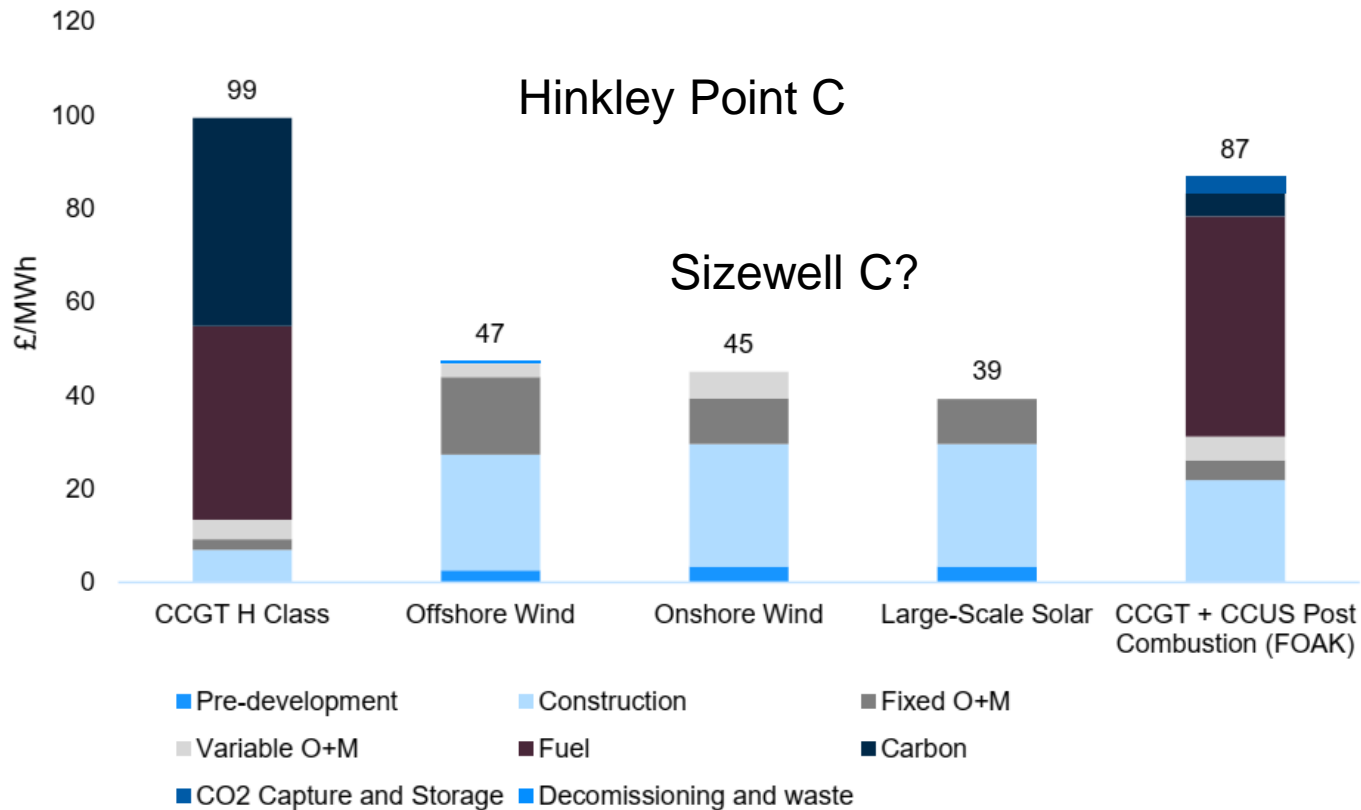
Construction cost saving over Hinkley Point C of at least 20%

Lower cost of capital (3.5% real weighted average cost of capital)



Can nuclear compete on cost?

Chart 4.5: Levelised Cost Estimates for Projects Commissioning in 2030, £/MWh, in real 2018 prices



Issues affecting decisions

1. Safety is not a major barrier (apart from Germany)
2. But costs are
3. ESG considerations

ESG: is nuclear “green”?

EU taxonomy for sustainable activities

What the EU is doing to create an EU-wide classification system for sustainable activities

PAGE CONTENTS

Why do we need an EU taxonomy?

What is the EU taxonomy?

Taxonomy Regulation and delegated acts

Taxonomy compass

Further development: the Platform on sustainable finance

Preparatory work: Final report of the TEG

Frequently asked questions

Documents

Related links

Why do we need an EU taxonomy?

In order to meet the EU's climate and energy targets for 2030 and reach the objectives of the [European green deal](#), it is vital that we direct investments towards sustainable projects and activities. The current COVID-19 pandemic has reinforced the need to redirect money towards sustainable projects in order to make our economies, businesses and societies – in particular health systems, more resilient against climate and environmental shocks.

To achieve this, a common language and a clear definition of what is 'sustainable' is needed. This is why the [action plan on financing sustainable growth](#) called for the creation of a common classification system for sustainable economic activities, or an "EU taxonomy".

What is the EU taxonomy?

The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It could play an important role helping the EU scale up sustainable investment and implement the European green deal. The EU taxonomy would provide companies, investors and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable. In this way, it should create security for investors, protect private investors from greenwashing, help companies to become more climate-friendly, mitigate market fragmentation and help shift investments where they are most needed.

Climate Bond Initiative won't certify nuclear as green

Energy

ELECTRICITY & HEAT PRODUCTION

	Asset type	Asset specifics	Paris Agreement compliant	Screening indicator	Certifiable
MARINE RENEWABLES	Infrastructure	Dedicated transmission infrastructure	●		●
		Dedicated supporting facilities, such as transmission terminus and transformers, grid connections, dedicated facilities for supporting vessels, equipment storage and onshore assembly	●		●
FOSSIL FUELS	Generation facilities	Coal or oil power without carbon capture and storage (CCS)	●		
		Coal or oil with carbon capture & storage (CCS)	●	CCS must capture 100% of GHG emissions	
		Coal or oil powered combine heat and power (CHP)	●		
		Waste heat recovery from coal or oil fuelled power generation	●		
		Gas power without carbon capture & storage (CCS)	●		
		Gas power with carbon capture & storage (CCS)	●		
		Gas powered combine heat and power (CHP)	●		
	Waste heat recovery from gas fuelled power generation	●			
	Mining and extraction	Coal mining or oil extraction, refining, processing or production and associated supply chain infrastructure	●		
Gas extraction, refining, processing or production and associated supply chain infrastructure		●			
NUCLEAR	Generation facilities	Power plants	●		
		Dedicated supporting infrastructure	●		
	Mining facilities	Uranium mining	●		
OTHER	Generation facilities (heat)	Heat pumps using soil or air gradients	●		
	Advanced alternative fuel power plants	Alternative fuel power plants	●		
		Supporting infrastructure	●		

But a nuclear green bond has been approved by another certifier



°CICERO
Shades of
Green

[Public Reviews](#)

[Green Bonds](#)

[Company Assessments
Newsletter](#)

[SLBs
About](#)

[News
Home](#)

CICERO Shades of Green with Second Opinion for a nuclear power company

CICERO Shades of Green recently provided a Second Opinion for a green bond issued by **Bruce Power**, a Canadian nuclear power company. The Shades of Green methodology, grounded in climate science, provides transparency on climate risk while also shedding light on other environmental risks.

18 November 2021

While this should not be considered an open door for all nuclear green bonds, the specific conditions of Bruce Power's green bond framework resulted in a favorable opinion from us. The use of proceeds will be to extend the lifetime of existing nuclear power units with no direct greenhouse gas emissions, under Canadian regulations, sourcing Uranium with safeguards in place to mitigate environmental and social risk in their supply chain. Bruce Power is not responsible for the storage of spent nuclear fuel. We note that a Deep Geological Repository (DGR) is the scientifically accepted method for long-term storage of such waste approved in Canada, however a host site has yet to be selected.

Life extension of nuclear reactors is a climate friendly power source with a low land use footprint that will make it easier to achieve the target in the Paris agreement of limiting global warming to well below 2°C. While nuclear energy may not be necessary to achieve the Paris targets, without it, other technologies in the low carbon energy mix such as carbon capture and storage need to be developed to scale and deployed rapidly. In the IPCC's special report on 1.5 degrees, the majority of pathways assessed to limit global warming to 1.5 degrees with no or limited overshoot include a strong increase in nuclear energy.

However, concerns remain regarding the lack of a solution for final waste disposal, the potential for weapon proliferation, and maximum credible accidental radiation which can have devastating regional consequences.

The EU Taxonomy classification system ("EU Taxonomy") of environmentally sustainable economic activities for investment purposes does not currently include nuclear energy in the activities that substantially contribute to climate mitigation. However, the European Commission's Joint Research Centre (JRC) was tasked with assessing whether nuclear energy could be considered to 'do no significant harm' on the other environmental objectives of the EU Taxonomy. The JRC assessment, which has also received some criticism, concluded that

"all potentially harmful impacts of the various nuclear energy lifecycle phases on human health and the environment can be duly prevented or avoided. The nuclear energy-based electricity production and the associated activities in the whole nuclear fuel cycle (e.g., uranium mining, nuclear fuel fabrication, etc.) do not represent significant harm to any of the TEG (Technical Expert Group on Sustainable Finance, editors note) objectives, provided that all specific industrial

Issues affecting decisions

1. Safety is not a major barrier (apart from Germany)
2. But costs are
3. ESG considerations
4. Energy security

Effects of the Ukraine invasion: too soon to say

BELGIUM

Nuclear energy: Belgium postpones phase-out by 10 years due to Ukraine war COMMENTS

By Euronews with AFP • Updated: 19/03/2022



Steam billows from a nuclear power plant behind houses in the village of Doel, Belgium, Monday, Oct. 11, 2021.

Steam billows from a nuclear power plant behind houses in the village of Doel, Belgium, Monday, Oct. 11, 2021. - Copyright: AP Photo/Virginia Mayo, File

SHARE THIS ARTICLE



Belgium has decided to postpone its nuclear phase-out scheduled for 2025 by 10 years, worried about soaring energy prices due to the Russian invasion of Ukraine.

Conclusion

Nuclear clearly has a future in Europe

Ukraine war likely to strengthen case for new nuclear

SMRs: lots of cautious enthusiasm but let's wait and see



UNIVERSITY OF
CAMBRIDGE
Judge Business School

s.taylor@jbs.cam.ac.uk