

Economic and Policy Requirements for Wider Applications of SMR in Newcomer Countries

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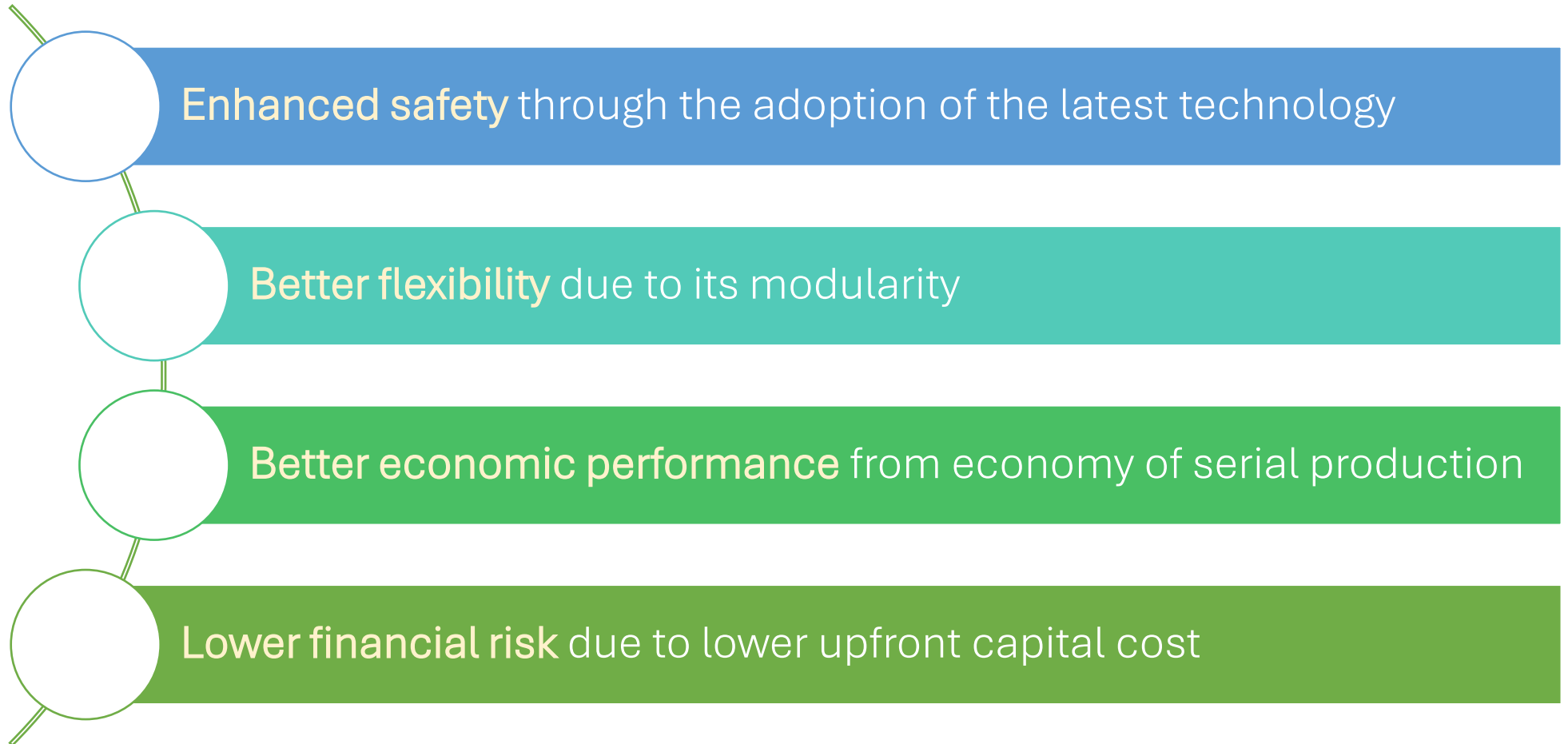
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Narrative of SMR in Southeast Asia



SMR Claims



Narrative of SMR in Thailand

นับหนึ่ง 'โรงไฟฟ้านิวเคลียร์' วางกรอบ พ.ย. 67 ค่าไฟลดฮวบ 50%

วันที่ 13 พฤศจิกายน 2567 - 07:42 น.



กฟผ.เร่งศึกษาโรงไฟฟ้านิวเคลียร์ SMR ลด ต้นทุนค่าไฟ-บริหารสภาพคล่อง

วันที่ 4 พฤศจิกายน 2567 - 11:14 น.



SMR พลังไฟฟ้าหลัก ยกศักยภาพเศรษฐกิจ ไทย?

By [บรรณานุกรม] | © 19 ต.ค. 2025 เวลา 7:00 น.



SMR Claims

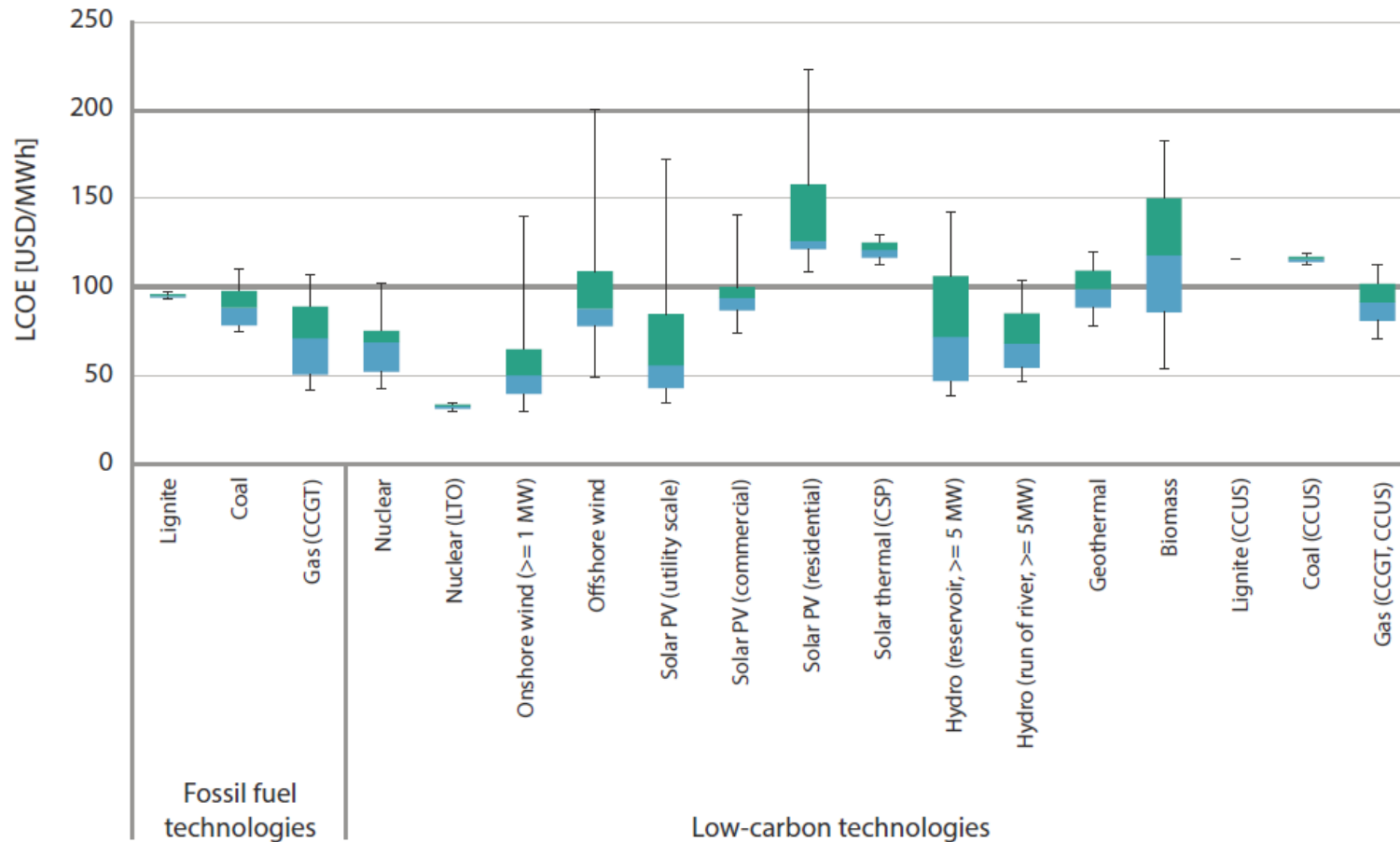
- Lower levelized cost of electricity (LCOE)
- Lower financial risk

Questions to be Answered

- Is SMR a cheap or an expensive option?
- When is adoption of SMR (to replace fossil fuels) a viable choice?

LCOE of Nuclear Power

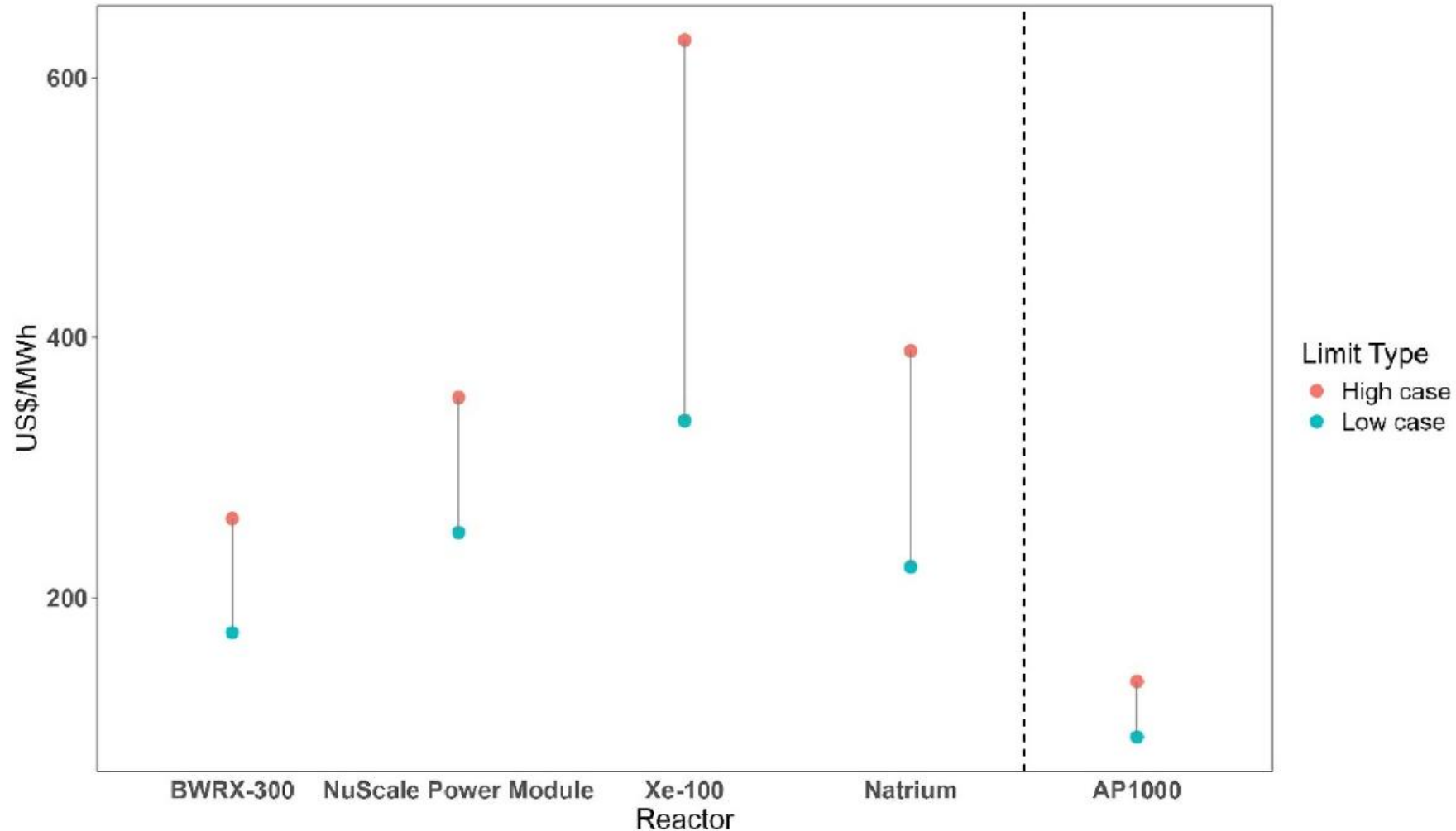
Figure ES1: LCOE by technology



LCOE of nuclear power is significantly lower than other sources, when it is represented by large nuclear power plants.

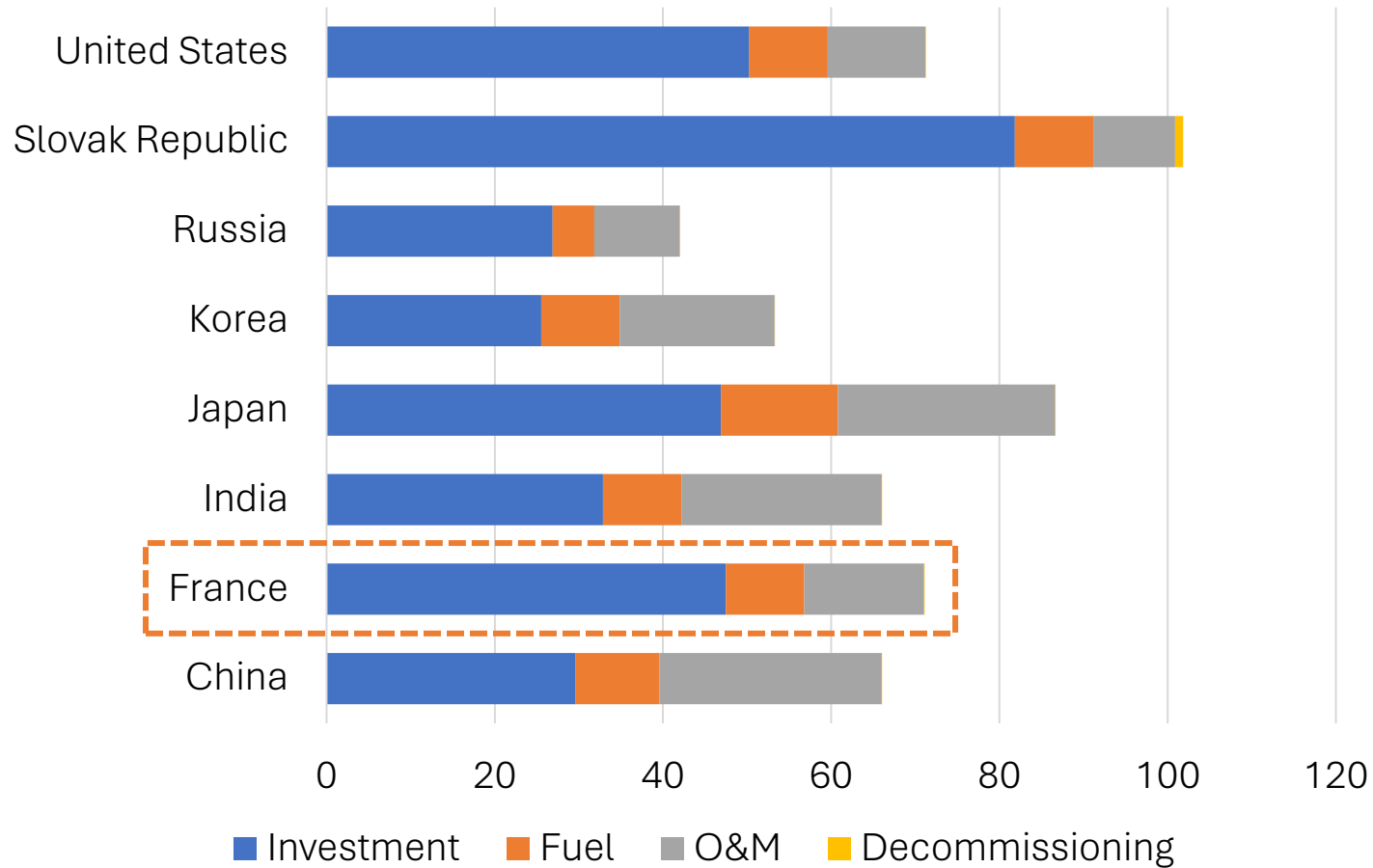
Note: Values at 7% discount rate. Box plots indicate maximum, median and minimum values. The boxes indicate the central 50% of values, i.e. the second and the third quartile.

LCOE of SMR



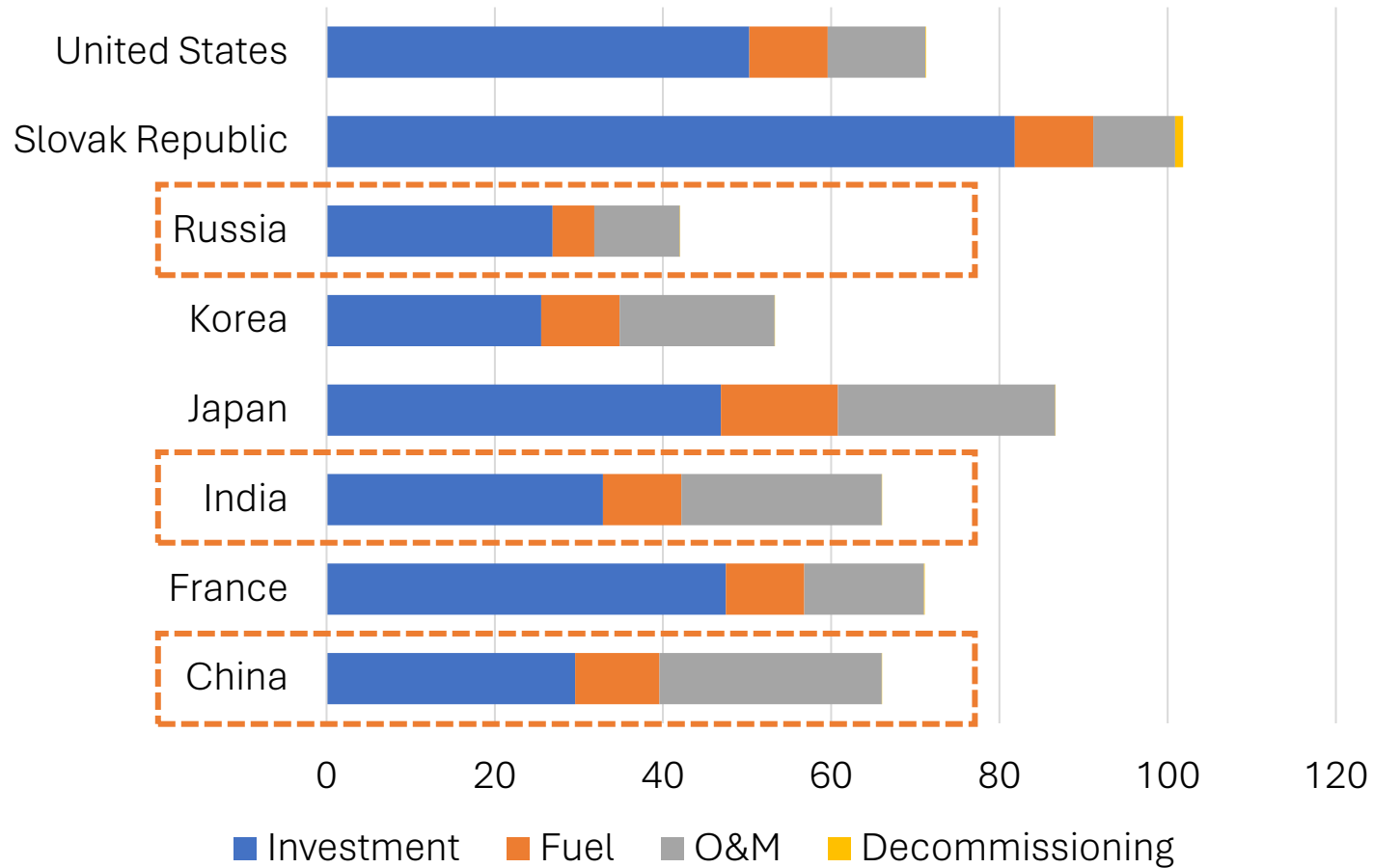
LCOE of SMR is expected to be significantly higher, but the vendors claim it to be much lower.

Some Thoughts based on Historical Data



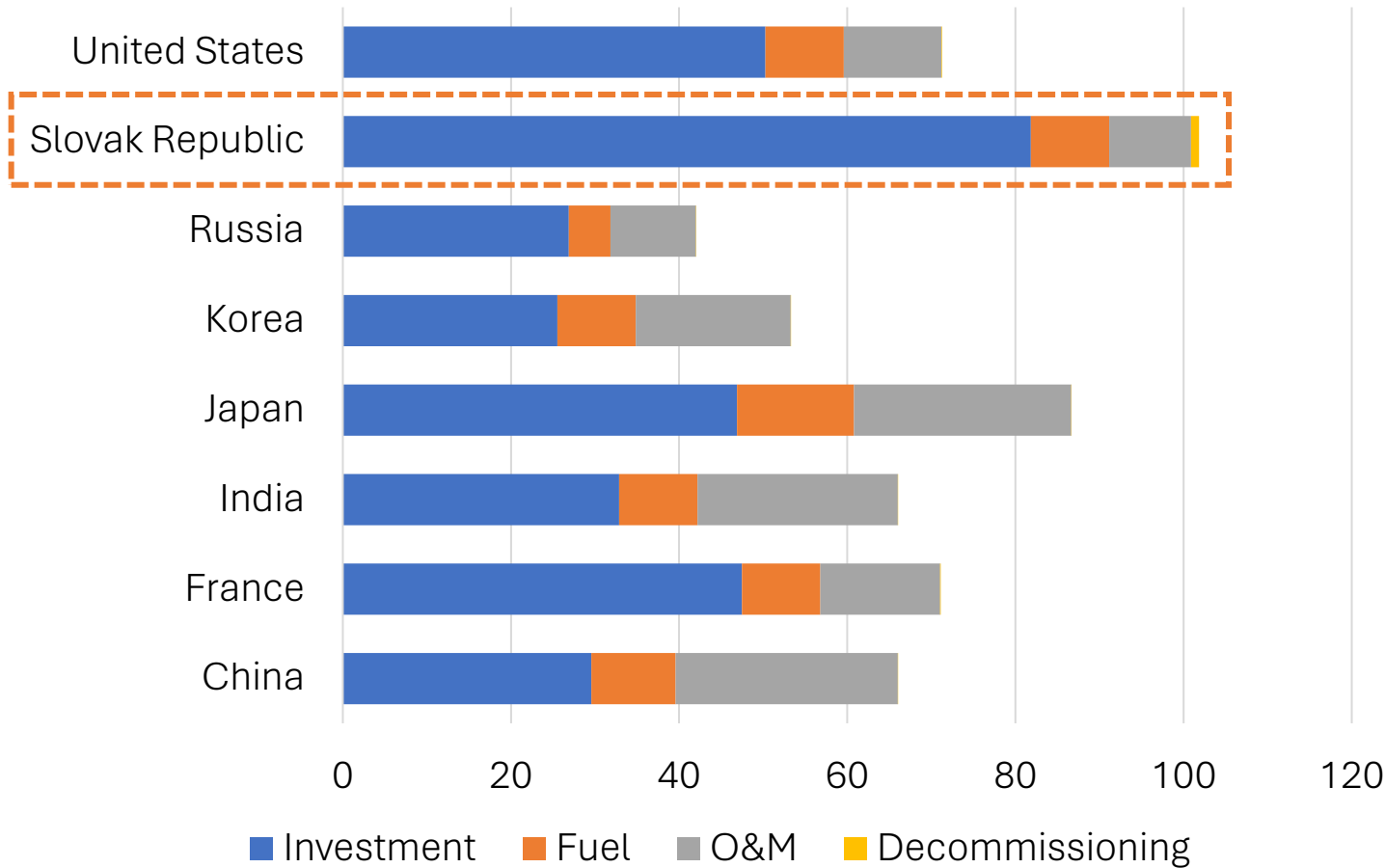
A first-of-a-kind (FOAK) reactor tends to have a longer construction period and undergo longer inspections, resulting in a significantly higher LCOE.

Some Thoughts based on Historical Data



While material and labor costs are generally lower in developing nations, the LCOE is not necessarily always low, depending on other circumstances.

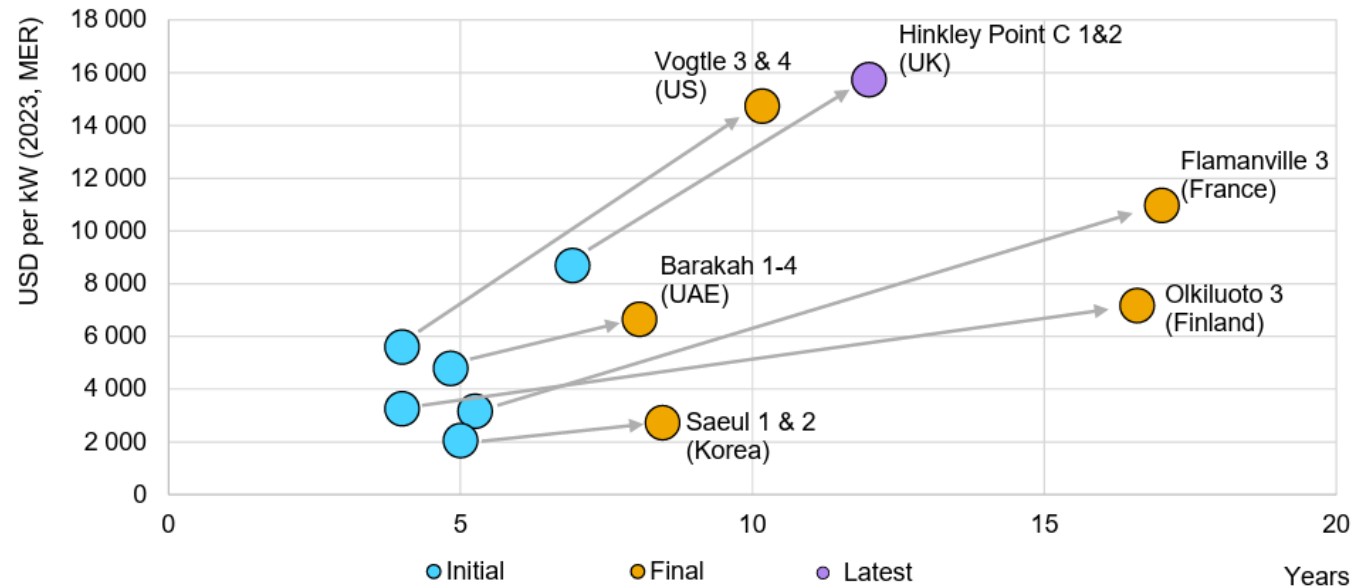
Some Thoughts based on Historical Data



Political stability is an important prerequisite for a lower LCOE while its impact is **difficult to quantify**.

Some Thoughts based on Historical Data

Figure 1.7 Initial and latest capital cost estimates and construction time for selected recent nuclear projects



IEA. CC BY 4.0.

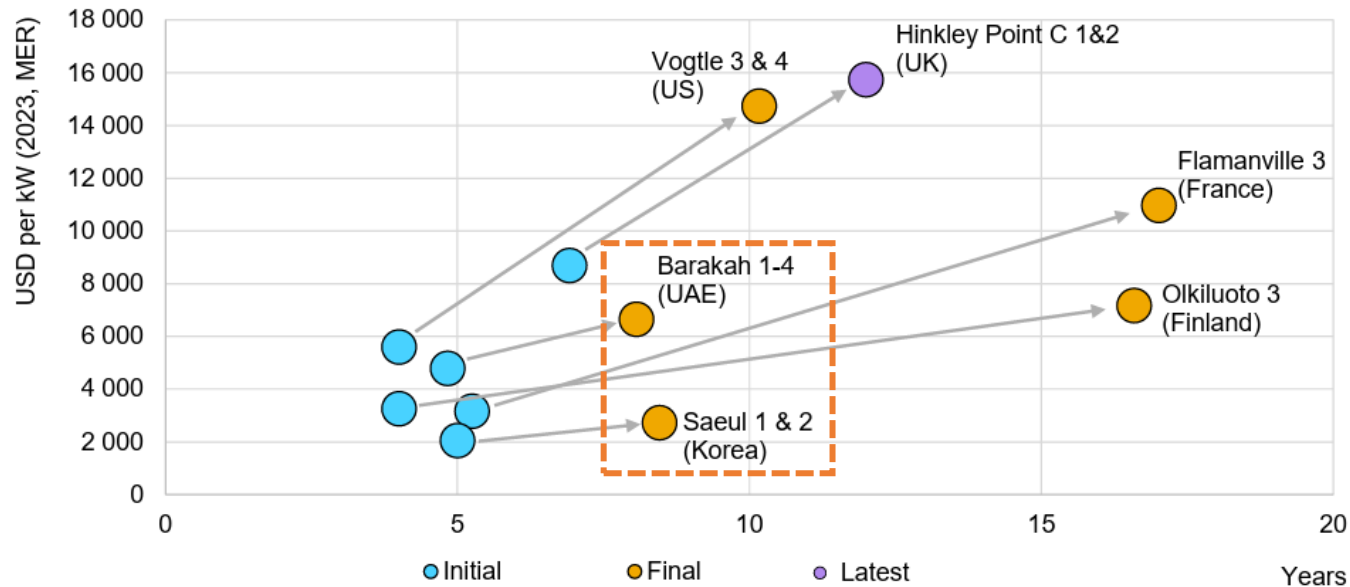
Notes: kW = kilowatt; MER = market exchange rate. The cost estimates do not include interest. Gross installed capacity is considered. Construction time refers to the time period between the start of the construction until grid connection. For plants shown here with multiple reactors, the average construction time is taken. The construction of Hinkley Point C is ongoing.

Source: IEA analysis based on publicly available sources. The latest cost estimates for Hinkley Point C considered in this analysis are based on EDF (2024), [Hinkley Point C Update](#).

Initial estimates of LCOE are always much lower than the actual LCOEs.

Some Thoughts based on Historical Data

Figure 1.7 Initial and latest capital cost estimates and construction time for selected recent nuclear projects



IEA. CC BY 4.0.

Notes: kW = kilowatt; MER = market exchange rate. The cost estimates do not include interest. Gross installed capacity is considered. Construction time refers to the time period between the start of the construction until grid connection. For plants shown here with multiple reactors, the average construction time is taken. The construction of Hinkley Point C is ongoing.

Source: IEA analysis based on publicly available sources. The latest cost estimates for Hinkley Point C considered in this analysis are based on EDF (2024), [Hinkley Point C Update](#).

SMRs in a newcomer country will always be more **expensive**, as it requires setting up legislative and regulatory frameworks and vendors will likely add **markups** to absorb their risks.

Globe and Mail (Canada)

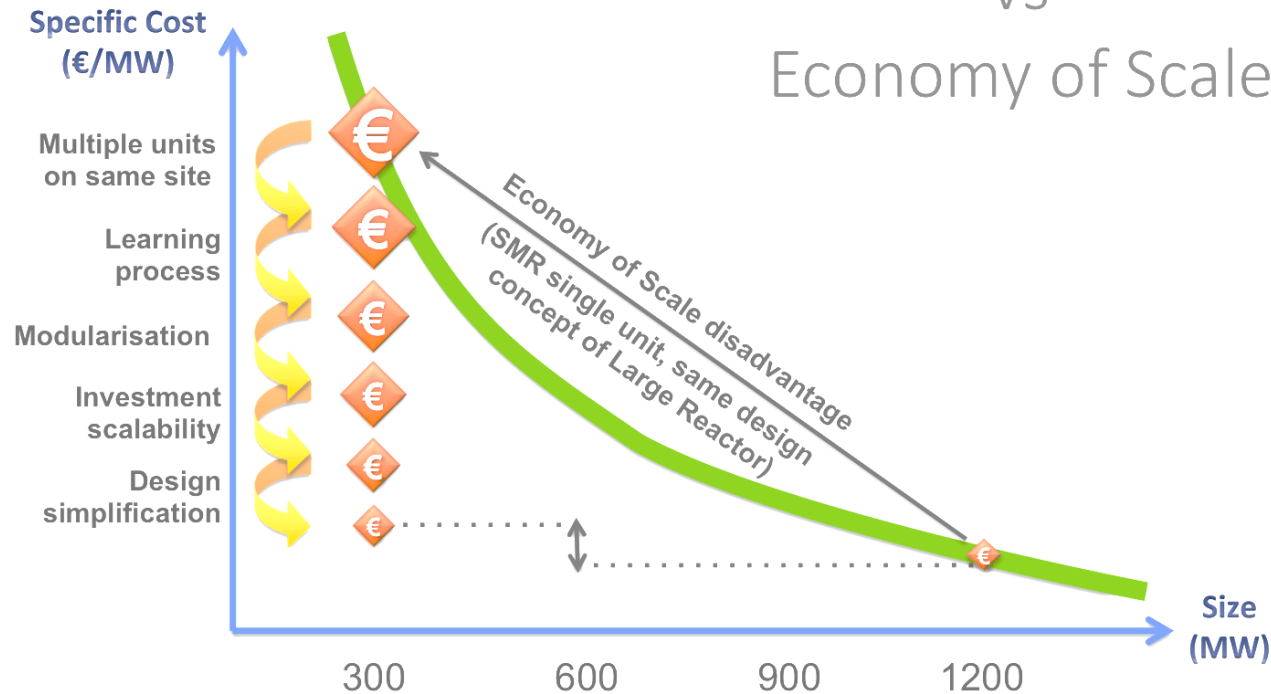
Ontario's Darlington SMR project to cost nearly \$21-billion, significantly higher than expected



The Ontario government approved Ontario Power Generation's plan to spend \$7.7-billion to construct the first small modular reactor in a G7 country – a price far greater than independent observers deem necessary to spark widespread adoption.

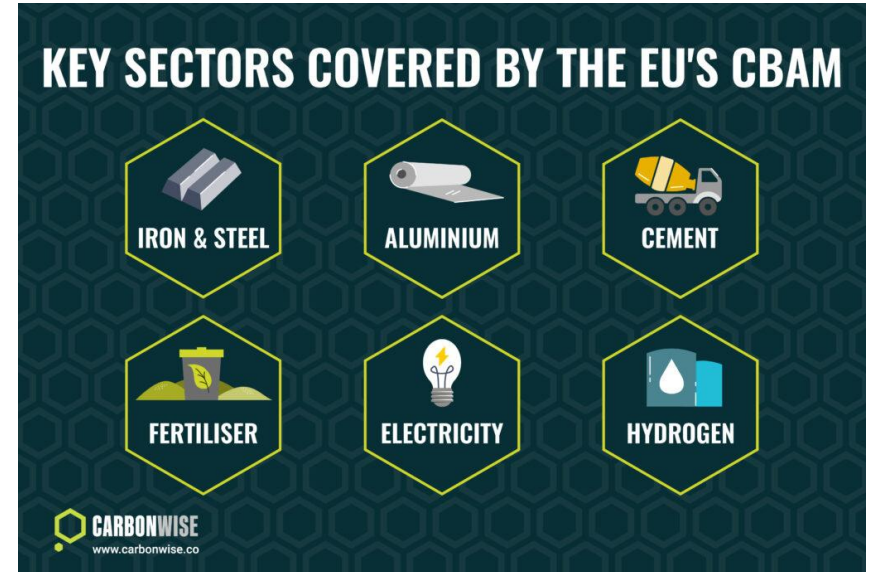
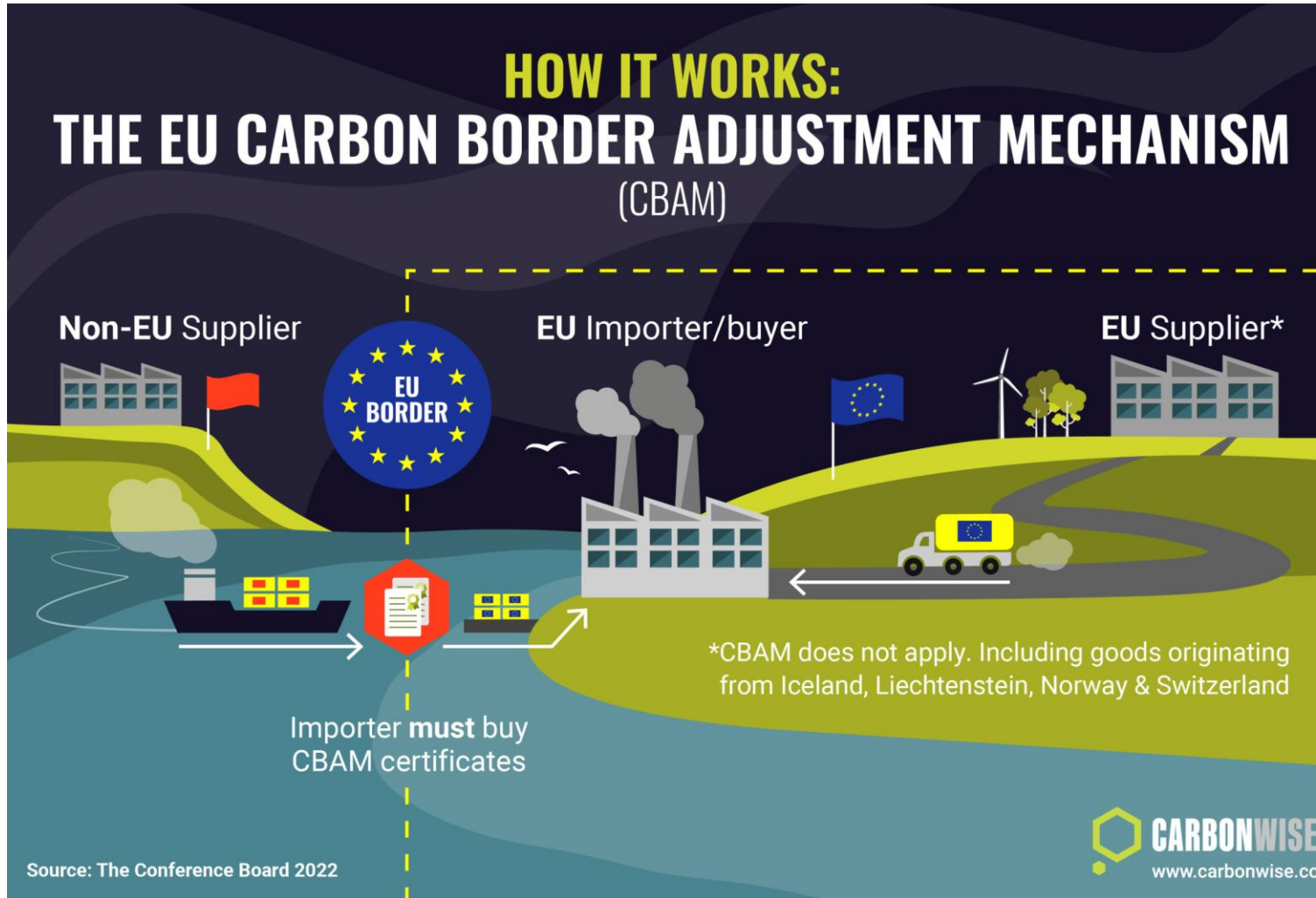
Expectation on Economy of Multiples

Economy of Multiples VS Economy of Scale



While SMRs are expected to benefit from **economy of multiples**, the number may not be enough to compete with LCOE of other clean energy sources.

CBAM as a Game Changer

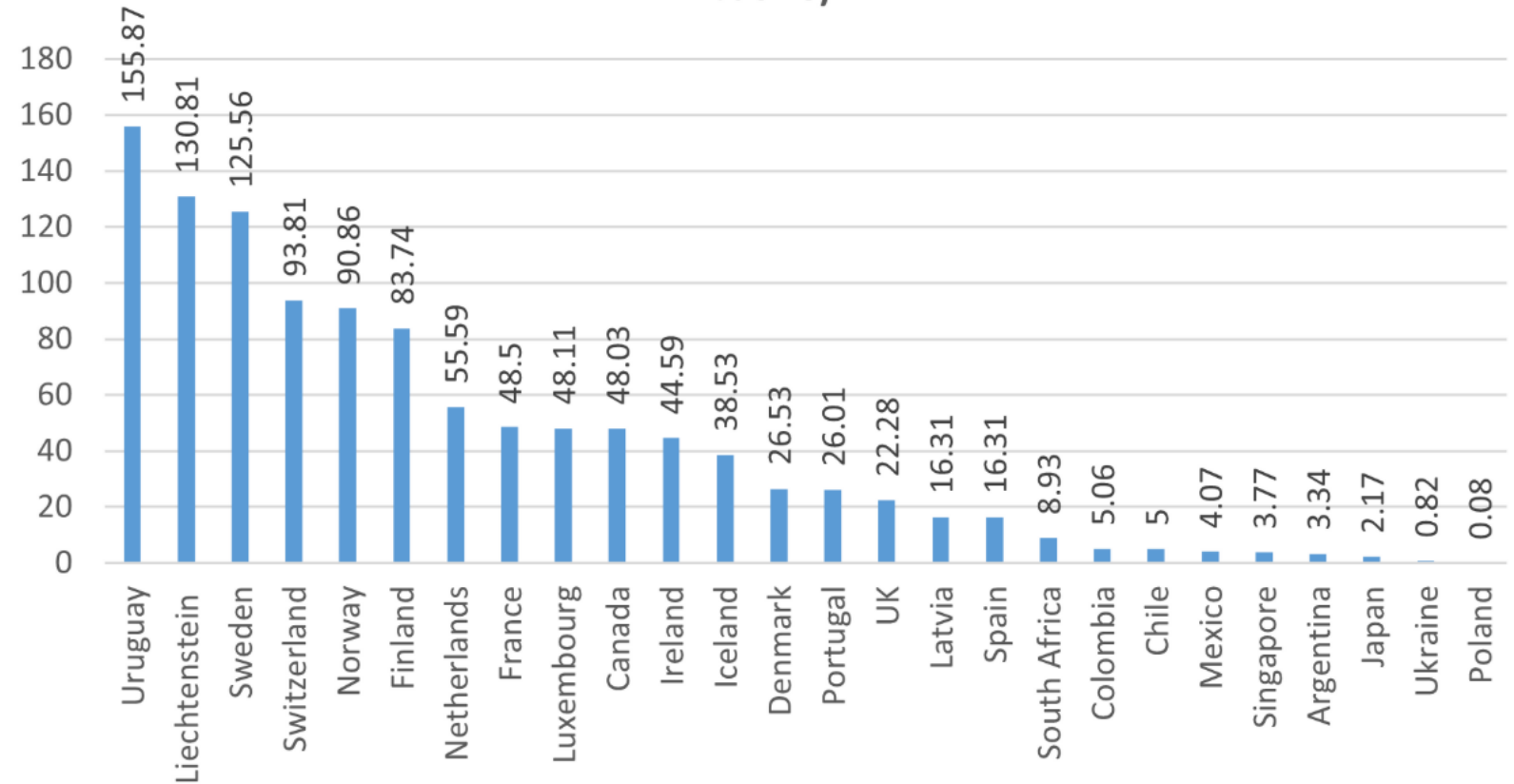


Industry relying on export to EU needs to significantly and urgently reduce emission while they need to continue their business.

Carbon Tax

Carbon tax can go up to **50 – 100 USD/MWh**. It can drastically increase the perceived **LCOE** of the industry.

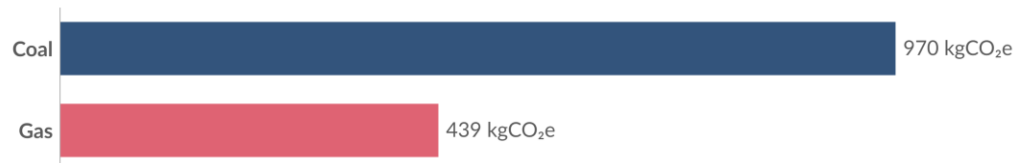
Carbon Tax Rates By Country as of March 2023 (Unit: USD Per tCO₂e)



Greenhouse gas emissions per unit of electricity

Our World in Data

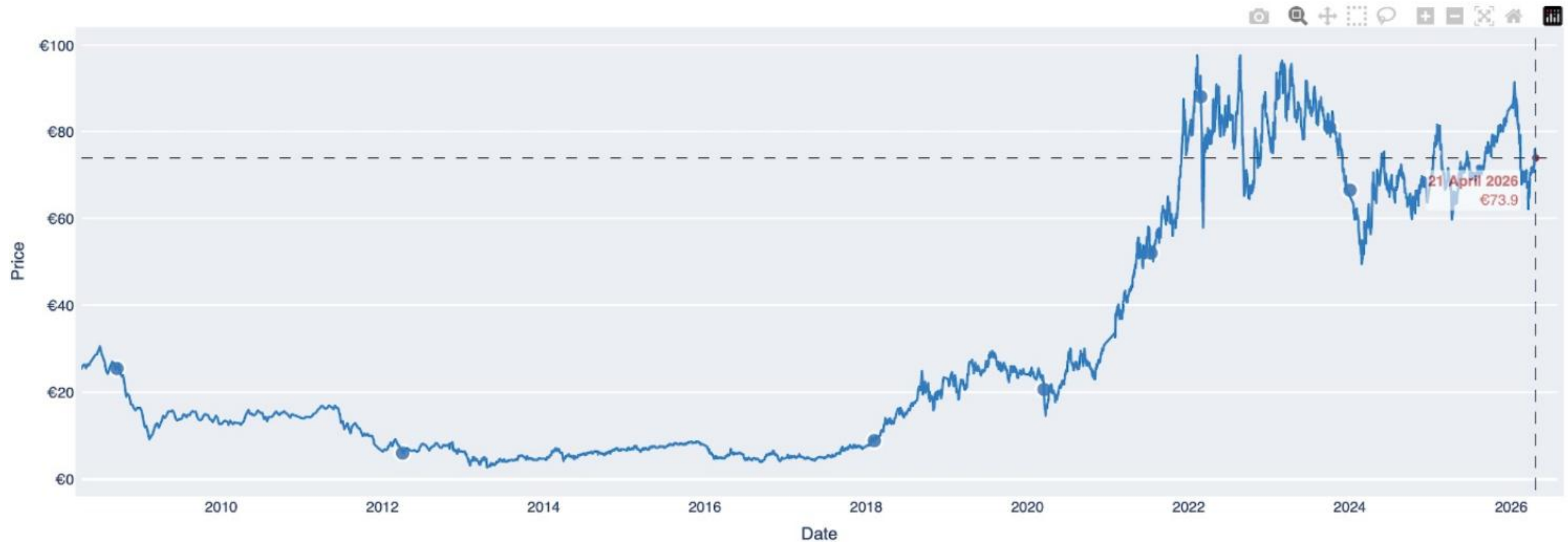
Lifecycle greenhouse gas emissions measure amount of total greenhouse gases emitted over a technology's full supply chain. This includes emissions from the burning of fuels, in addition to those generated through the mining of materials, and production of energy technologies. This is measured per megawatt-hour of electricity.



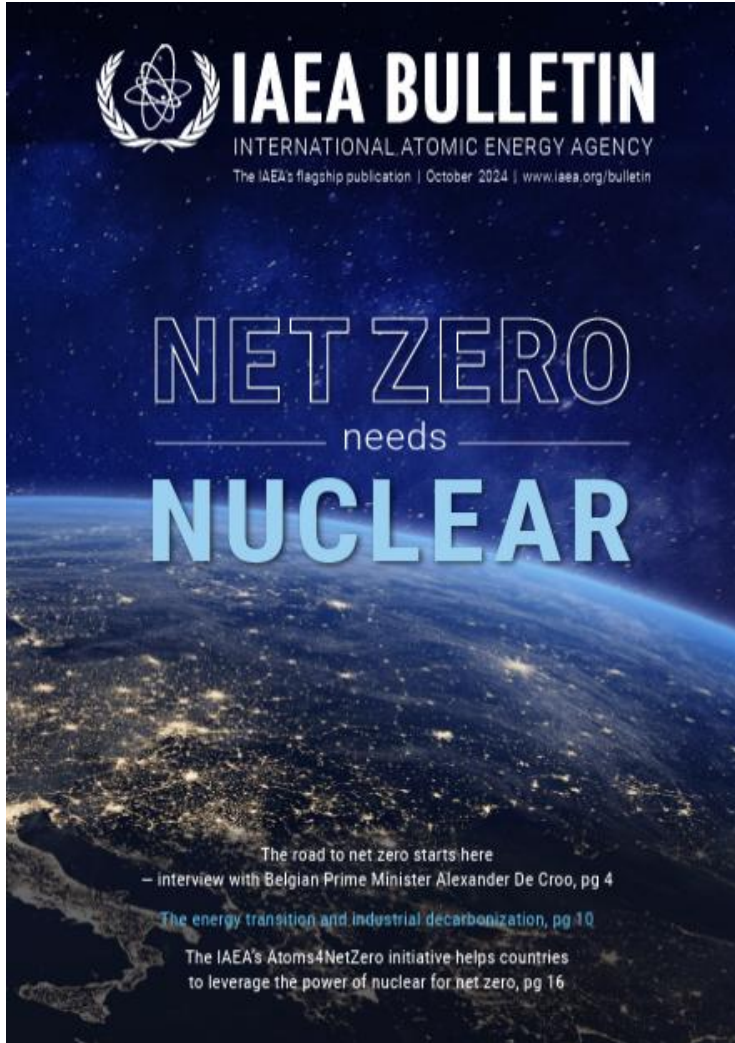
Carbon Price

This remains true with the
Emission Trading Scheme (ETS).

Last updated: Apr 2026



SMR and Data Centers and AI



With the electricity consumption of **data centers, artificial intelligence (AI) and cryptocurrencies** set to grow in the coming years, major tech companies are actively looking to advanced nuclear technologies such as **small modular reactors (SMRs) to provide clean, reliable and flexible power**. This could result in a new pathway for the commercialization of SMRs and other advanced reactors in markets where they are yet to emerge.

Data centers (which house the servers and computing equipment needed to store digital information), AI and cryptocurrencies are driving an increase in electricity demand in several regions. **Together, they accounted for 2% of global electricity consumption in 2022, a figure that may double by 2026**, according to the IEA.

Big Tech Companies and Nuclear Power

Big Tech contracts inject life into new nuclear

By Neil Ford

February 19, 2025 11:55 PM GMT+7 • Updated February 20, 2025



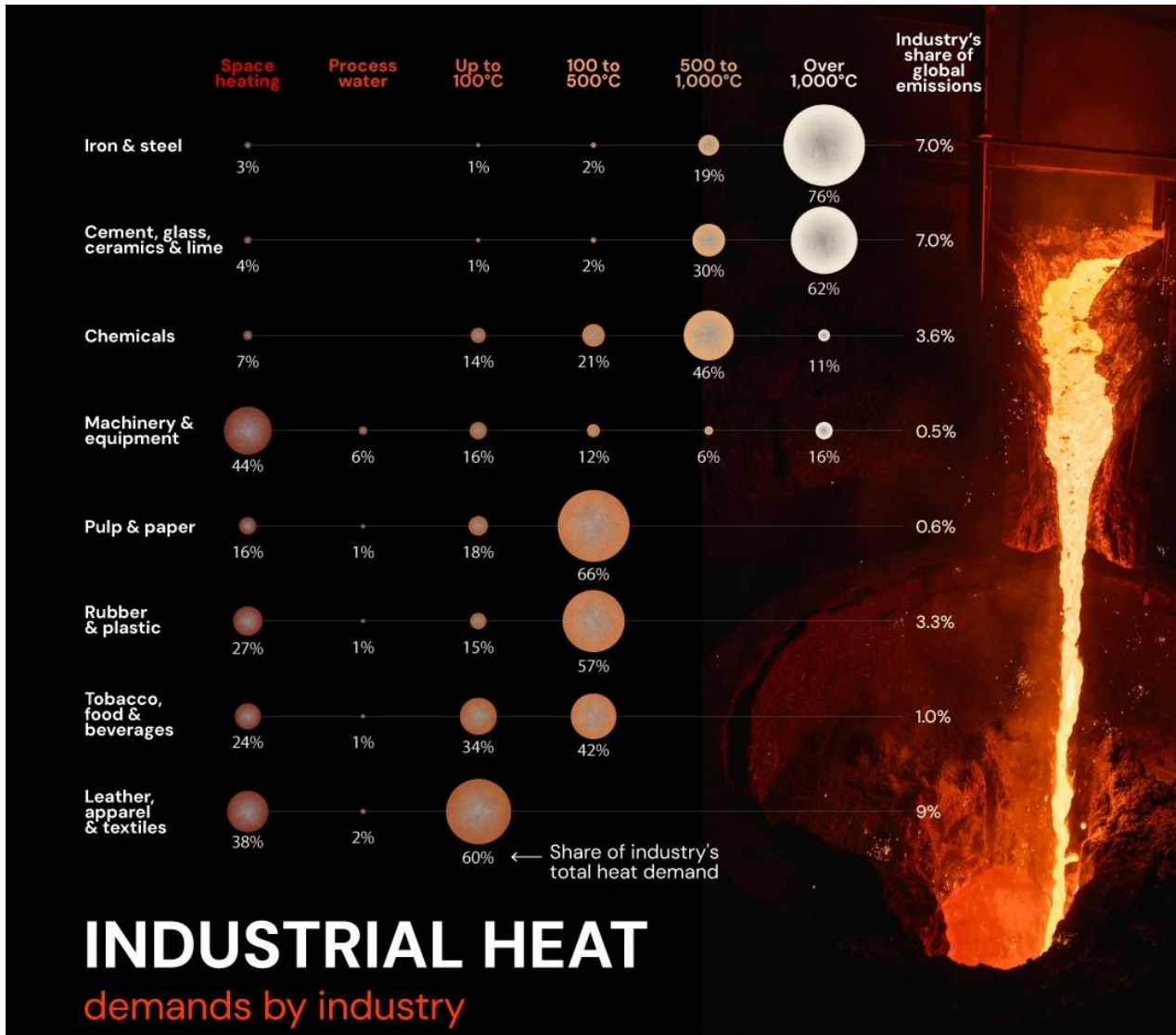
| Industry Insight from Reuters Events, a part of Thomson Reuters.



Image: REUTERS/Rebecca Lewington Purchase Licensing Rights

- Nuclear developers are benefitting from **long-term PPAs with Big Tech** companies racing to secure 24/7 clean energy supply for large data centers.
- Constellation Energy plans to **restart the 837 MW Three Mile Island Unit 1**, which had been idle for five years, to support a 20-year PPA with **Microsoft** announced in September to supply **data centers in the mid-Atlantic region**.
- **Amazon** Web Services and Talen Energy Corporation signed a 10-year PPA in March 2024 to take power in 120 MW increments from the latter's **2.5 GW Susquehanna nuclear plant** in Pennsylvania to supply a planned **960 MW data center campus**.

Issue with Clean Industrial Heat



High-Temperature Technologies

- Electric resistance heating
- Induction heating
- Electric arc furnaces
- Green hydrogen combustion
- Biomass gasification

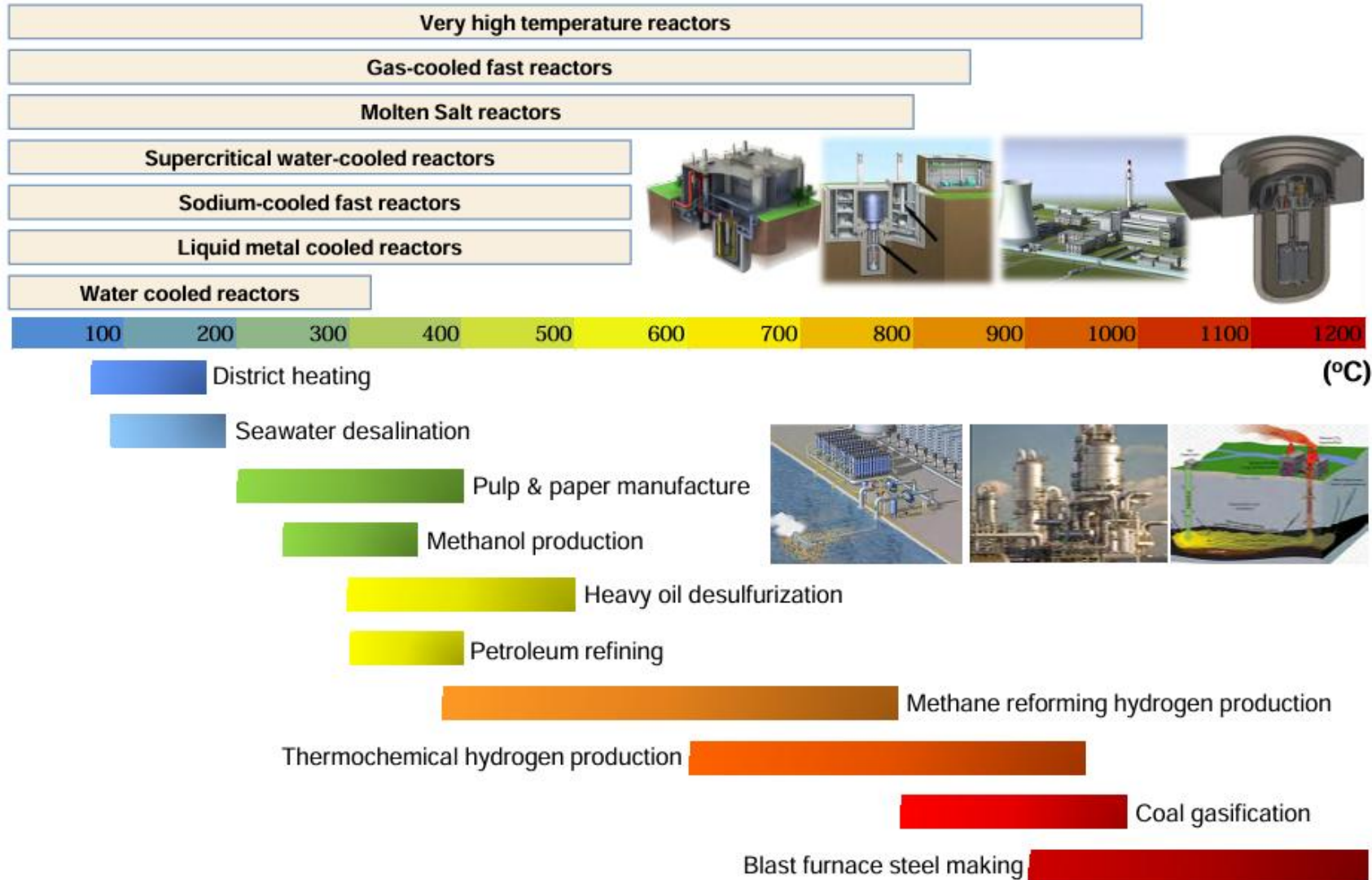
These are not always cheap.

Price of VRE-based Green Hydrogen



1 kg of hydrogen contains 33.33 kWh of usable energy

Other Applications of SMR



There is room for other applications of SMR. Yet, it is important to identify **correct market**, and have **appropriate policy support**.

Factors deteriorating SMR competitiveness:

- FOAK (long construction period and long inspection period)
- Political stability
- Estimated LCOE VS actual LCOE
- Markups for SMR export
- Insufficient economy of multiples

Factors supporting SMR competitiveness:

- Carbon accounting
- Need for high-quality industrial heat
- Need for hydrogen, fresh water, etc.

When is adoption of SMR a viable choice?

- When you identify **correct market**.
- When you have **appropriate strategies**.
- When there is **sufficient policy support**, e.g., carbon tax and carbon accounting.
- When the **infrastructure** is ready.

Thank You for Your Attention

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