

A photograph of four large, cylindrical concrete cooling towers at a nuclear power plant. The towers are arranged in a row, with the central two being taller than the outer two. Each tower is emitting a thick plume of white steam that rises into a clear blue sky. The towers have a textured, ribbed surface and a red-and-white striped top edge. In the foreground, there is a green field with some low-lying vegetation. The image is partially obscured by a white, curved graphic element on the right side, which contains the title and date. There are also several horizontal, wavy blue lines overlaid on the lower half of the image.

Bulatom Nuclear Energy Discussion

June 2024

The Case for Nuclear

Why Nuclear?

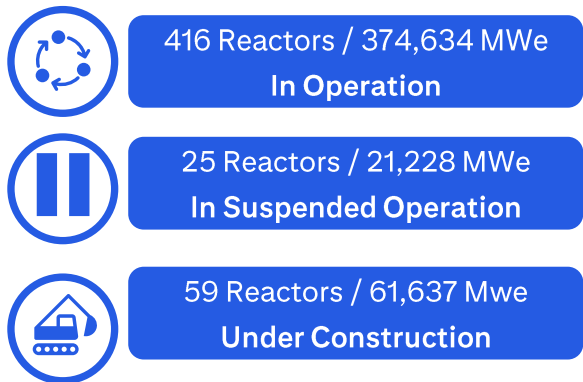
- **Climate Change, Energy Security, De-carbonization, Grid Stability / Resiliency**
- Nuclear plays a vital role in achieving net zero emissions by 2050 as a **carbon-free, base-load source of power**
 - Extending lifetimes of existing nuclear plants and introducing Gen IV nuclear technology will be critical to reach global NZ targets
- Advanced reactors could have **multiple end-use cases and applications** beyond baseload
 - New reactors can ramp power quickly to balance demand
 - SMRs can eventually be right-sized for demand, or to meet resiliency requirements

Why Now?

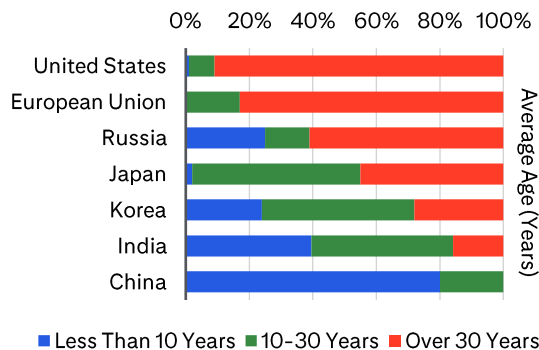
- **Unprecedented policy support through government cost-share, loan or tax programs**
 - USA Infrastructure Investment and Jobs Act. IRA and DOE programs
 - European Union Green Investment Taxonomy found nuclear energy does no more harm to human health or the environment than any other power-producing technology
 - RAB Framework for Nuclear buildout. Great British Nuclear Competition focus on SMR
- At COP28, 22 countries pledged to **triple their nuclear energy capacity by 2050**
- Nuclear is necessary to **supplement renewables / storage as baseload power**

Global Nuclear Landscape and Significant Growth Opportunity

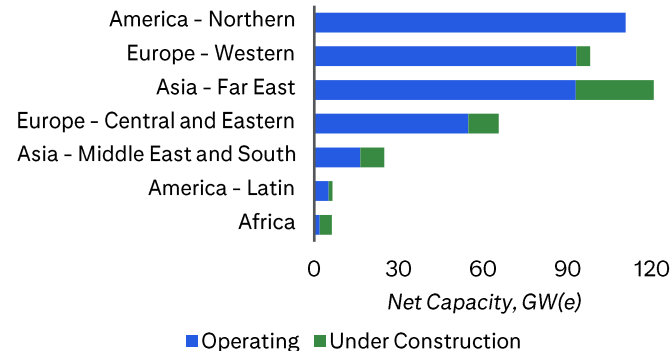
Current Status



Age Profile of Nuclear Power Capacity by Region



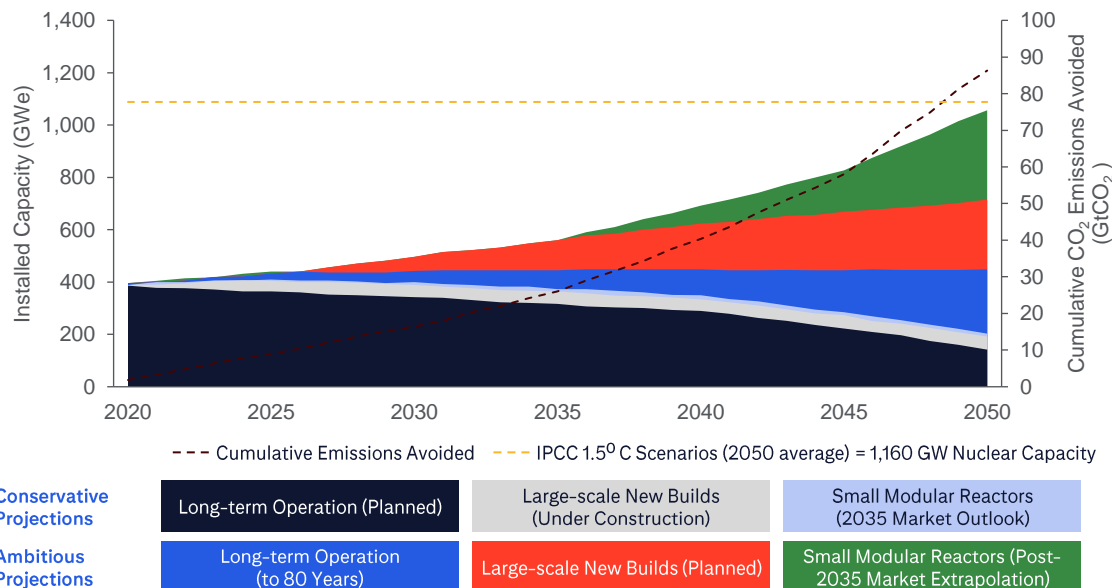
Regional Distribution of Nuclear Power Capacity



Nuclear Opportunity Poised for Significant Growth



Nuclear Installed Capacity Forecast



Sources: IAEA Power Reactor Information System (5/2024), World Nuclear Association, IEA (2019, Nuclear Power in a Clean Energy System), US DOE (2023, Pathways to Commercial Liftoff: Advanced Nuclear), Wood Mackenzie (2024), NEA (2023, The NEA Small Modular Reactor Dashboard), IEA (2022, Nuclear Power and Secure Energy Transition). Notes: (1) Estimated cost of extending the operational life of 1GW of nuclear capacity for at least 10 years ranges from \$500mm to over \$1bn depending on condition of the site.

Common Challenges to financing new NPPs

01 Political and policy support

02 Nuclear licensing and other regulatory processes

03 Nuclear liability and insurance

04 Construction and supply chain risk

05 Electricity market conditions and regulation

06 Plant operating performance

07 Nuclear fuel supply

08 Management of spent fuel/waste and decommissioning

09 Technology maturity

Various mechanisms to mitigate risks

- Risks can be mitigated through a range of financing options and other mechanisms, including a mix of incentives, government support and guarantees, and contract provisions

Financing and ownership options

- In regulated and deregulated markets there are two main ownership models: **government** and **corporate** (with project financing model being only partially used so far), which substantially influences the specifics of debt and equity financing

Potential Financing Sources

Government Financing

- More common in regulated markets
- Financed directly from the government budget or national borrowings
- Indirect financing includes sovereign loan guarantees, accumulated reserves and cash flow from wholly or partially state-owned companies
- Sovereign credit enhancement can be crucial to build a new NPP project

Government-to-Government

- Intergovernmental loan
- Borrower gains access to foreign funding and vendor experience in the nuclear sector
- Usually goes beyond a specific project, with aim being establishing / improving long term bilateral relationships
- Type of financing provided by China to Pakistan, and by the Russian Federation to a number of countries

Vendor Financing

- Corporate financing via equity or loans provided from the balance sheet of the NPP vendor
- Since vendor companies are often state-owned enterprises (e.g., Rosatom, CNNC, EDF, China General Nuclear Power Group CGN), vendor financing can also be considered a form of government financing / guarantee

Project Financing

- Nuclear not suitable for “pure” project financing at the moment
- Many of the NPP projects are first of a kind due to constantly changing technology design and construction risks being hardly controllable
- Rethinking risk allocation matrix, Government protections and electricity price / revenue predictability (RAB, PPAs, CfDs) required to enable funding

Export Credit Agencies

- Industry dominated by limited number of players with projects containing very high levels of imported content
- ECAs are able to support the very long repayment periods required for the financing of nuclear projects
- ECA financing terms continue to be competitive for project sponsors and Governments looking to undertake projects

Corporate Financing

- Not suitable for new build projects
- More suitable for operating companies with positive cash flows
- Corporate financings can fund working capital, liquidity buffers, design/planning of new projects, portion of refurbishment Capex, etc

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