


The Future of Nuclear Energy: The Next Steps

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The NEA: 34 Countries Seeking Excellence in Nuclear Safety, Technology, and Policy

- The premier international platform for cooperation in nuclear technology, policy, regulation, research, and education.
- 34 member countries + strategic partners (e.g., China and UAE).
- More than 3500 experts from countries all over the world are participating in NEA activities.
- Global relationships with industry and universities.

 Argentina	 Australia	 Austria	 Belgium
 Bulgaria	 Canada	 Czech Republic	 Denmark
 Finland	 France	 Germany	 Greece
 Hungary	 Iceland	 Ireland	 Italy
 Japan	 Korea	 Luxembourg	 Mexico
 Netherlands	 Norway	 Poland	 Portugal
 Romania	 Russia (suspended)	 Slovak Republic	 Slovenia
 Spain	 Sweden	 Switzerland	 Turkey
 United Kingdom	 United States		

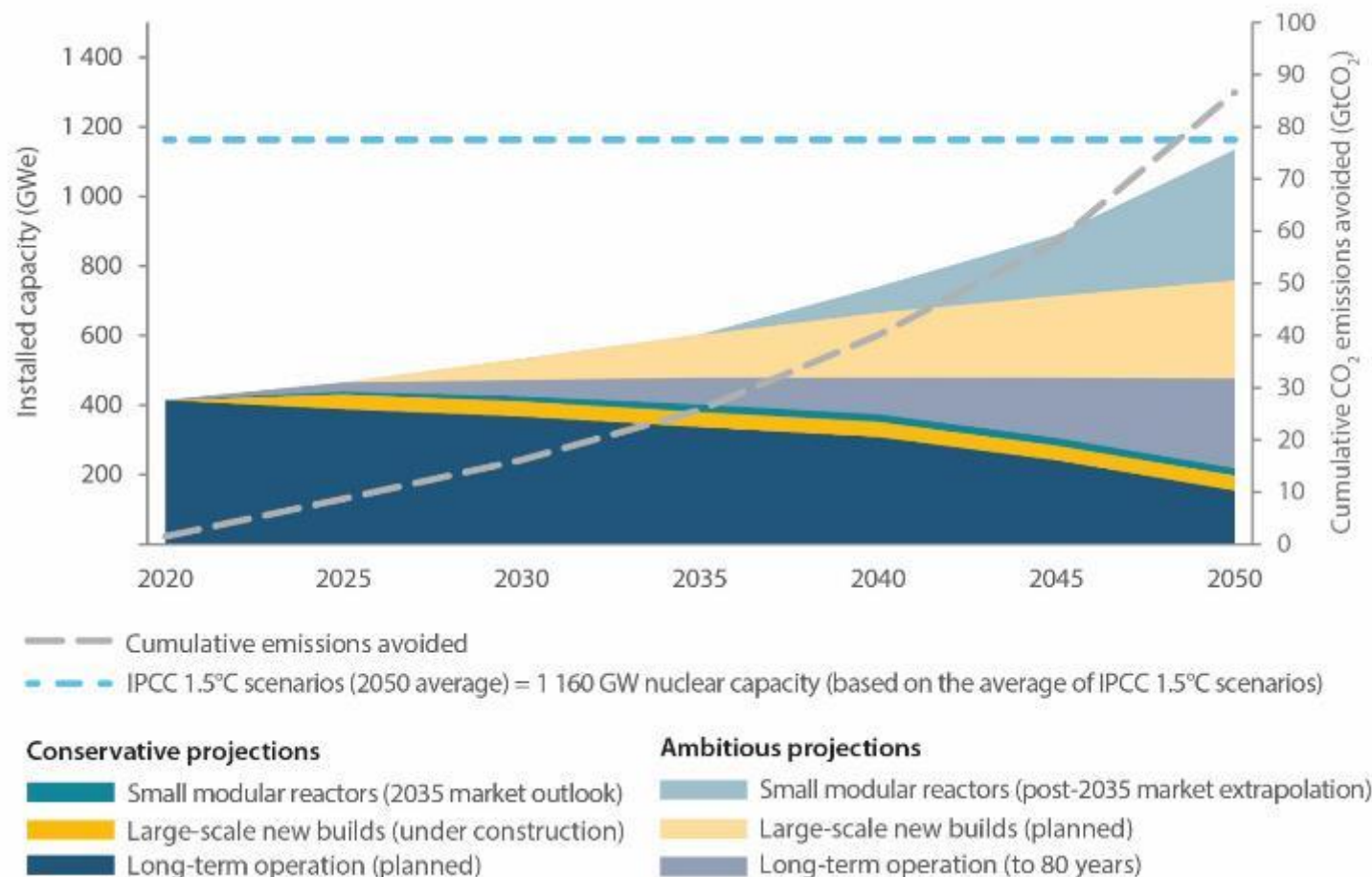
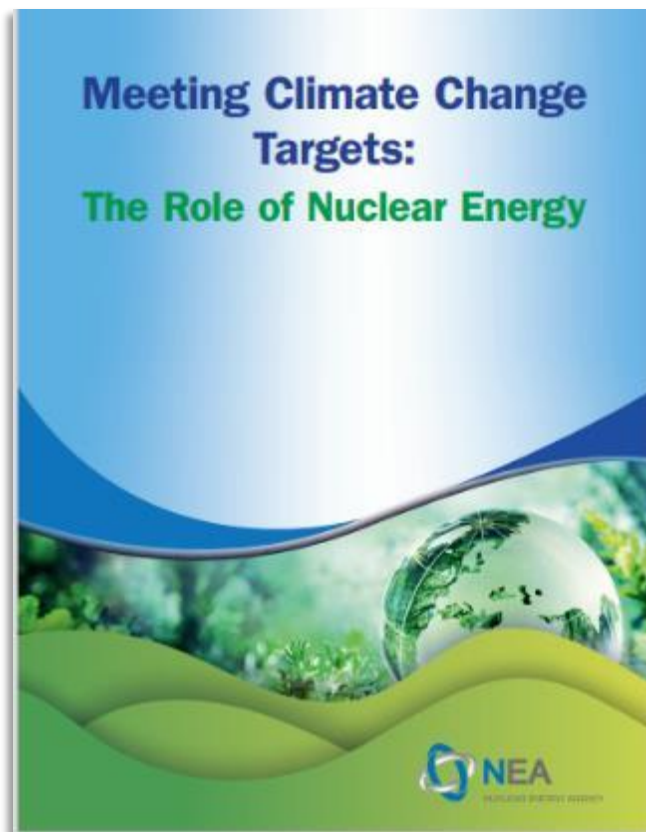
**NEA countries operate about 82%
of the world's installed nuclear capacity**

Key Strategic Priorities for NEA Member Countries

- **Energy security is now the driving issue in many capitals** with electricity prices very high in many countries and projected demand expected to double, recent geopolitical events highlight the vulnerability of fossil fuel supply chains
- **Setting a realistic path to reduce CO₂ emissions requires a comprehensive, “all of the above”** approach, which for many countries will include a significant role for nuclear energy for on-grid and off-grid electricity production and provision of process heat.
- **Addressing both key strategic priorities will be very challenging**, but can be accomplished with the right policies, effective international collaboration, and quick effort to address challenges to rapid and economic deployment of new nuclear generation.



Net Zero by 2050 requires Global Nuclear Energy to Triple



The Energy Landscape in Japan

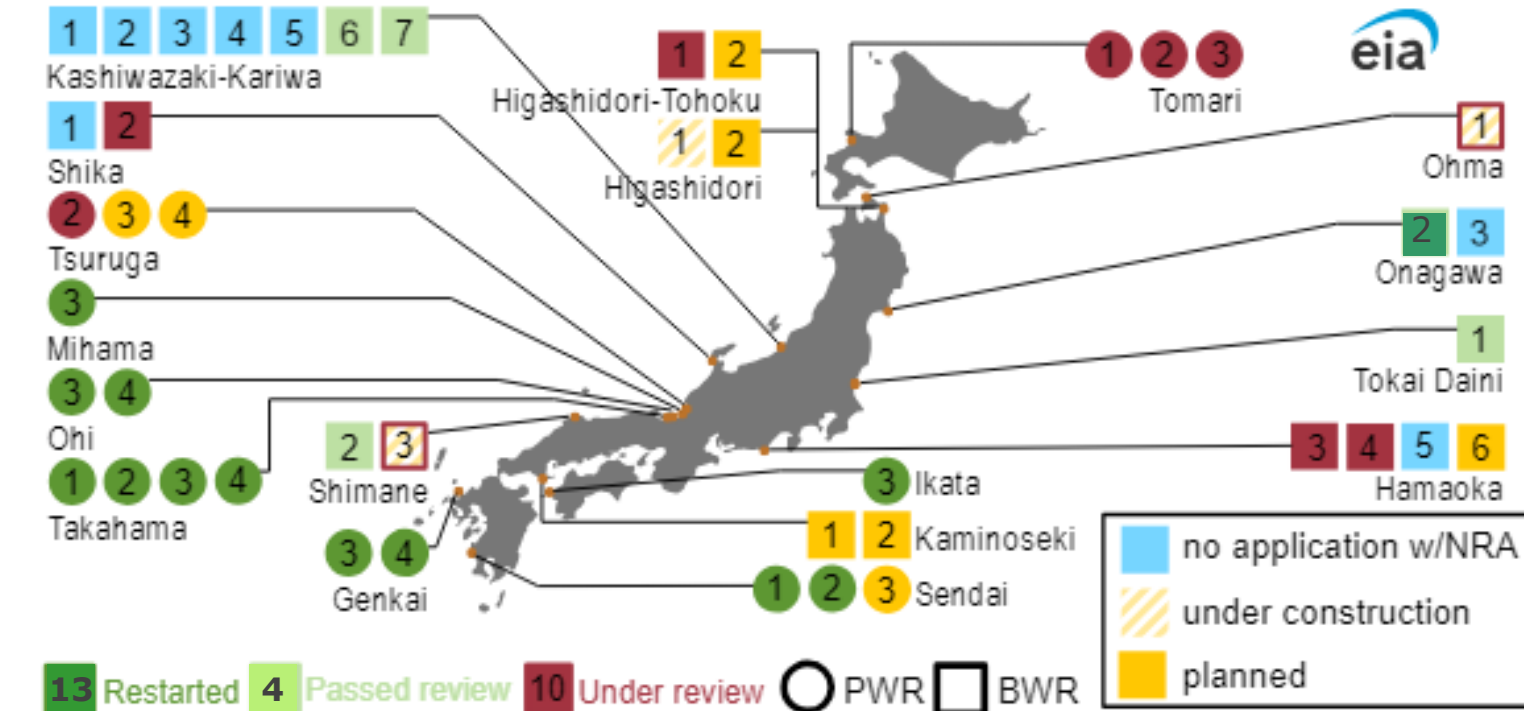
- Japan has long been a major industrial power, with a high demand for energy to power industries, transportation, buildings and homes.
- After 3/11, Japan dramatically increased its reliance on imports to meet demand. More than 60% of Japan's electricity is derived from imported fossil fuels
- While Japan has significantly increased its use of variable renewable sources—particularly solar—to about 10% of electric generation, energy prices are relatively high and emissions of carbon have increased.
- With considerable investment and tenacious work, Japan's nuclear plants have slowly returned to service.



Japanese Nuclear Energy is Back

- Nuclear energy provided **8.5% of Japan's electricity in 2023**
- Japan has **33 operable reactors, totalling nearly 32 GWe, of which 13 reactors, around 11 GWe, are approved for operations**
- **21 operable reactors, including those of the largest nuclear plant in the world at Kashiwazaki-Kariwa, are awaiting final approval to restart operations**

Status of Japan's nuclear reactor fleet, as of December 2023



Source: Institute of Energy Economics Japan, International Atomic Energy Agency, United Nations
 Note: PWR=pressurized boiling water reactor, BWR=boiling water reactor, NRA=Nuclear Regulatory Authority Japan

Japanese Nuclear Energy is Back

- **Lessons learnt from 3/11 have been fully incorporated into Japan's nuclear plants, reflecting high standards for safety.**
- **Japan's operators are embracing high safety culture practices and understanding. (NEA's CSSCF Japan was a major success.)**
- **The Nuclear Regulation Authority is rebuilding public confidence in the safety of nuclear energy in Japan.**



Japanese Nuclear Energy is Back

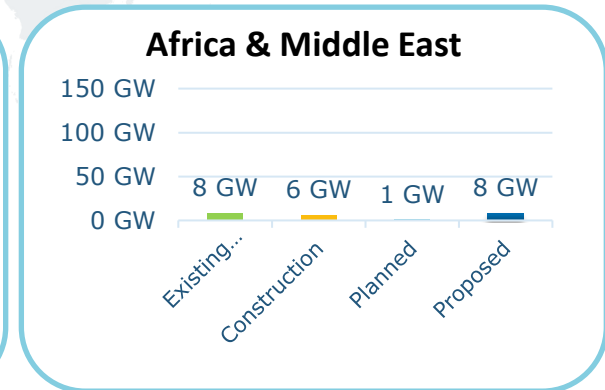
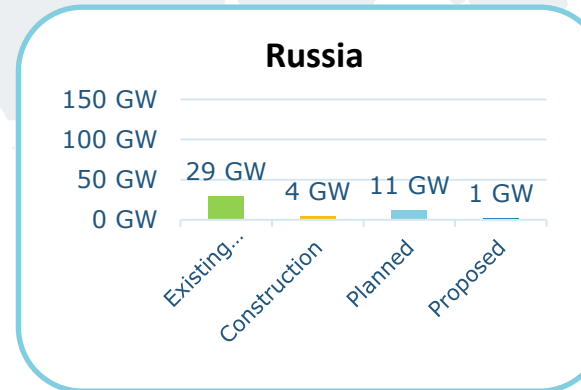
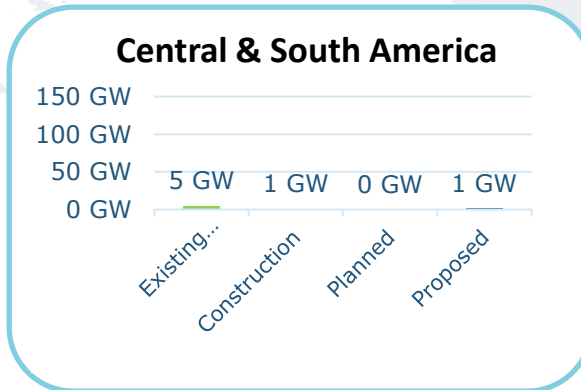
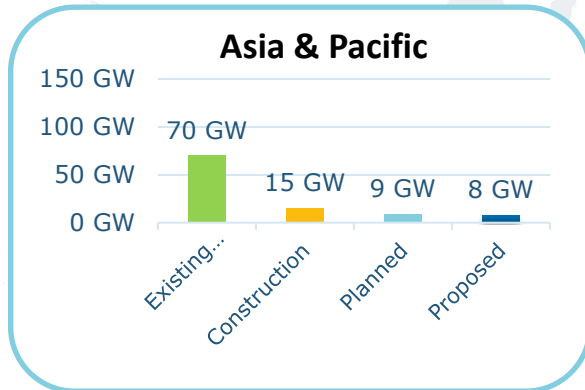
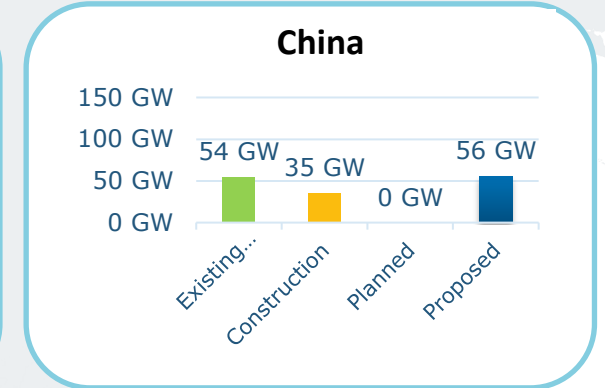
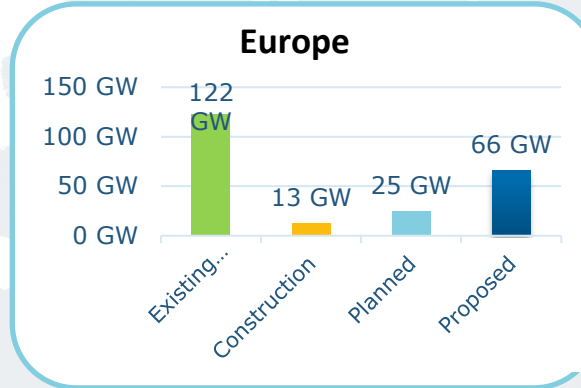
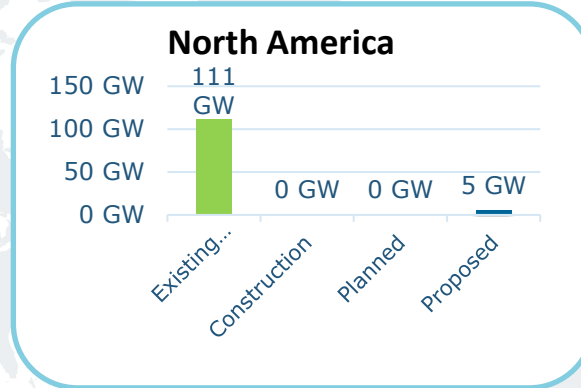
- **The progress has been vital and impactful, but like many other countries, Japan has much work to do to meet its carbon reduction goals.**
- **Japan's reinvigorated exploration of Small Modular Reactors and Generation IV technologies such as high-temperature gas reactors is very welcome.**
- **It is clear that additional measures will be needed to assure energy security and lower carbon emissions.**

On 29 October 2024, Tohoku Electric Power Company's Onagawa-2 became the first BWR in Japan to return to operations since 3/11.



Tripling Nuclear requires Building 20-30 GWe/year (which was accomplished in the 1970s and 1980s)...

...But the world is not nearly on track to meet this goal



- **Existing capacity:** Nuclear power plants in operation
- **Construction:** Nuclear new build projects are considered 'under construction' after construction has started on site and before the plant is commissioned.
- **Planned:** Nuclear new build projects are considered as 'planned' once the decision has been taken by either the government or the utility, including selection of the site and the reactor technology.
- **Proposed:** Nuclear new build projects are considered as 'proposed' based on policy or industry statements of intention.

Roadmaps to New Nuclear Ministerial Conference 2024

19-20 September 2024

- On 19-20th September, the NEA organized **Roadmaps to New Nuclear Ministerial 2024** which was co-chaired by Sweden's Deputy Prime Minister, Ebba Busch.
- The conference convened **26 countries plus the European Union** to discuss plans to build new nuclear capacity sourced from supply chains in OECD member countries **with a focus on FINANCING, SUPPLY CHAIN READINESS and WORKFORCE DEVELOPMENT.**
- These three driving issues are central to the NEA's efforts to support member's efforts to **deploy new nuclear plants on a schedule and at a scale** to address the key strategic priorities.



Priority 1: Unlocking Access to International Financing

- **Financing of nuclear energy projects was identified by the participants in Roadmaps to New Nuclear 2023 as the most important issue to address.**
- **Limitations in the availability of reasonably-priced financing to support new nuclear projects will make scale up of nuclear capacity very difficult if not impossible.**
- **There are many factors to consider:**
 - The track record for new construction in recent years does not provide private funding sources with confidence
 - First-of-a-kind projects are particularly challenging
 - Guidelines on state aid for private sector projects
 - Impact of International Financial Institution policies on the broader sector

Priority 1: Unlocking Access to International Financing

- **Roadmaps to New Nuclear 2024 included the participation of 3 multilateral development banks (World Bank Group, European Investment Bank, and European Bank for Reconstruction and Development) and broad private finance representation (including Citi, Ghuggenheim and BNP Paribas).**
- **Discussions (and debates) during the conference highlighted the cascading impacts that the World Bank Group policy to exclude nuclear energy from its lists of eligible projects has on international development finance and private lending more broadly.**



Priority 1: Unlocking access to international financing

Considerations for Japan

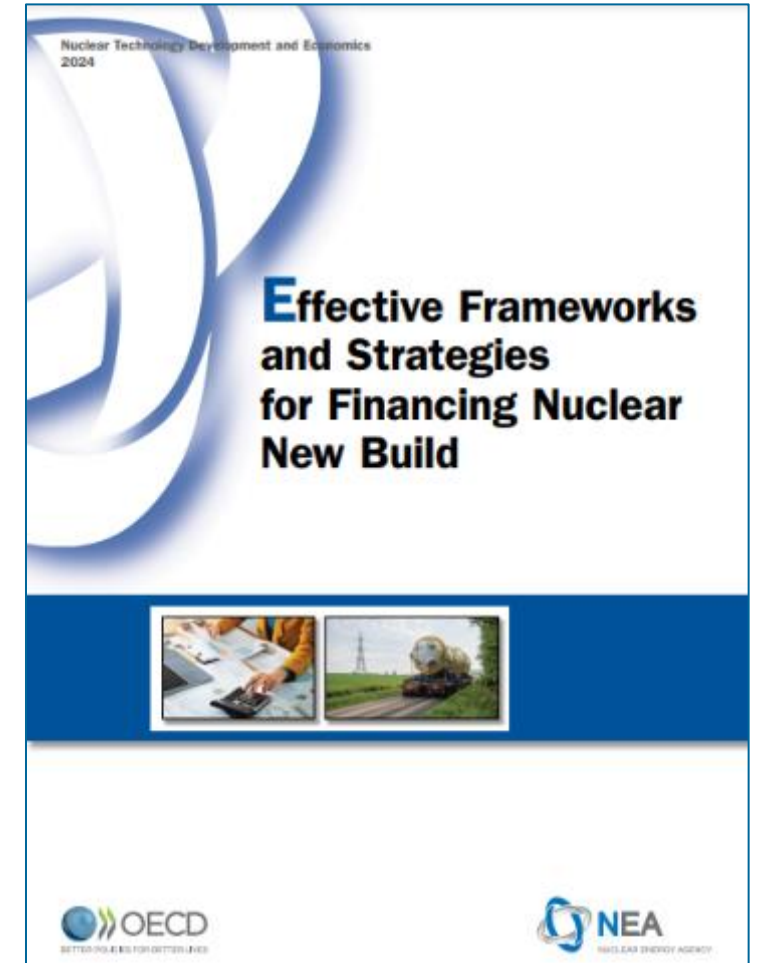
- **The Government of Japan is a major financier of projects around the world, including in the Global South; but it is not active in nuclear energy projects.**
- **Japan is one of the most important members of the World Bank and can have considerable influence in encouraging a review of the Groups's policy regarding nuclear energy.**
- **Japan's leadership in this area is very important to removing financial barriers to expanded nuclear projects to meet global net zero targets.**



Priority 1: Unlocking Access to International Financing

A New NEA Study is Now Available

- ***Effective Frameworks and Strategies for Financing Nuclear New Build*** offers a comprehensive review of global financing strategies, aiming to establish a common vocabulary and basis for comparative analysis to identify and discuss key lessons learnt about the relative merits of different strategies to finance nuclear projects.
- While there are no simple solutions for financing new nuclear projects, this report helps identify the “building blocks” that policymakers and private sector decision makers can leverage to help finance a tripling of nuclear energy by 2050.



Read the report:



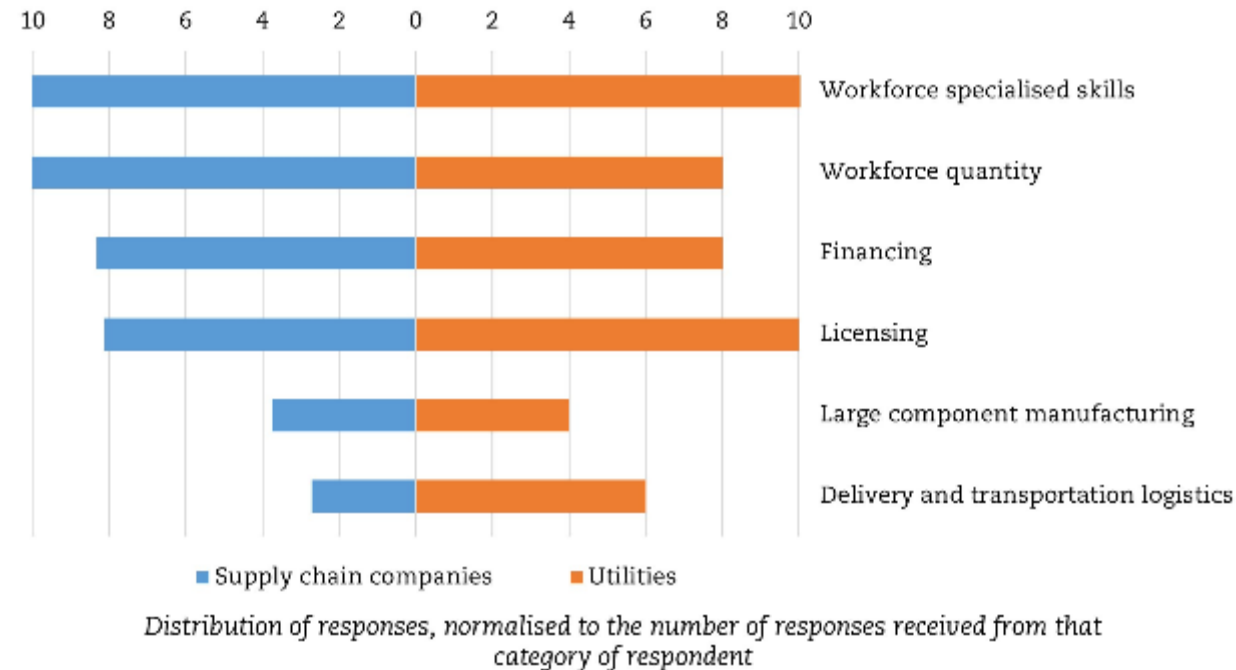
Priority 2: Assuring Industrial Supply Chain Readiness

- **In contrast to the expansive global nuclear industry supply chain of past decades, capacity in most OECD countries is very thin, very fragile and largely untested.**
- **These issues have been a significant contributor to the problems faced by new nuclear build projects in several OECD countries in recent decades.**
- **Suppliers are awaiting clear market signals to make needed investments, and previous experience has taught them to be very conservative.**
- **These concerns present significant uncertainties for future projects:**
 - Will there be capacity to support a significant increase in nuclear construction?
 - Can quality of components—including meeting applicable standards and regulations—be assured?
 - In the special case of nuclear fuel supply, will there be sufficient capacity of LEU and HALUE to meet future needs?

Priority 2: Assuring Industrial Supply Chain Readiness

- The NEA carried out the first global survey of nuclear supply chain readiness for nuclear new build in OECD countries.
- Working with 17 industry associations the NEA surveyed utilities and supply chain companies across more than 20 countries.
- The survey focuses on various aspects of the nuclear supply chain, such as confidence, bottlenecks and challenges to nuclear new build, priority areas for collaboration, as well as conditions for investment.

Key domestic bottlenecks to nuclear new build projects according to utilities and supply chain companies

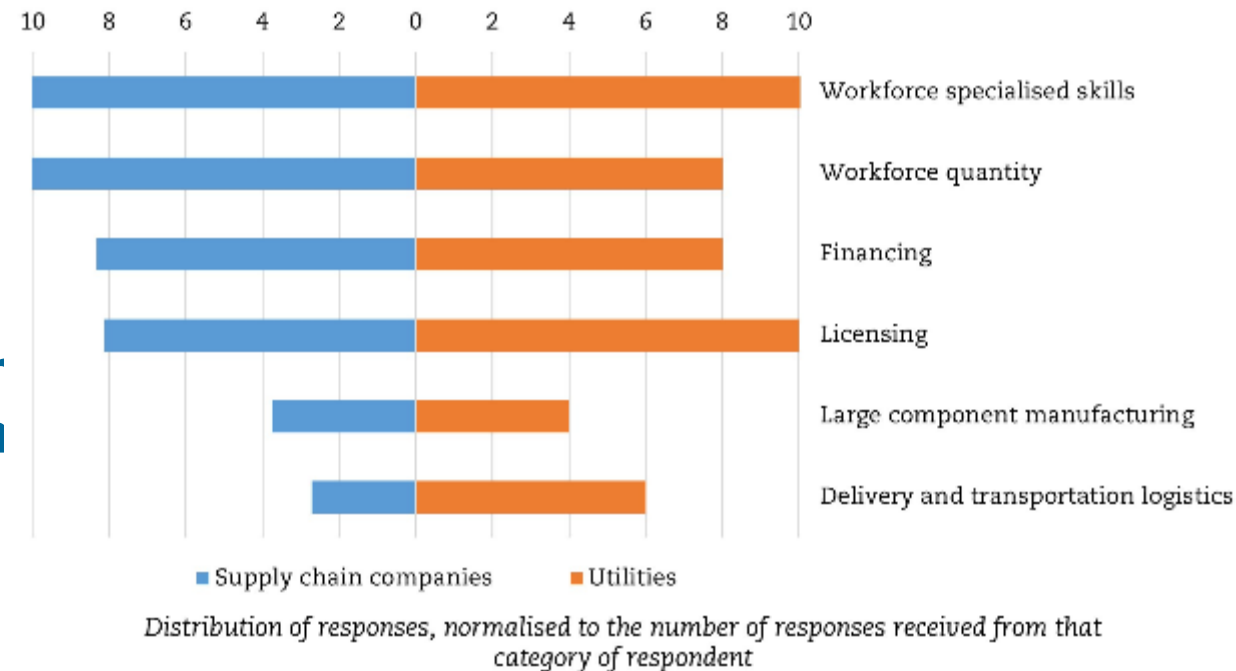


Priority 2: Assuring Industrial Supply Chain Readiness

Considerations for Japan

- Japan is viewed globally as a high-quality, high-reliability source of major nuclear components and technology.
- However, even Japan's capacity will not satisfy the potential demand. New investment is needed.
- The French President's announcement that his country will build at least 6 new EPRs has galvanized investment in the French industry; Japan has no such driver at this time.
- Further, Japan is not active in the overseas nuclear plant market, further limiting the incentive for expansion.

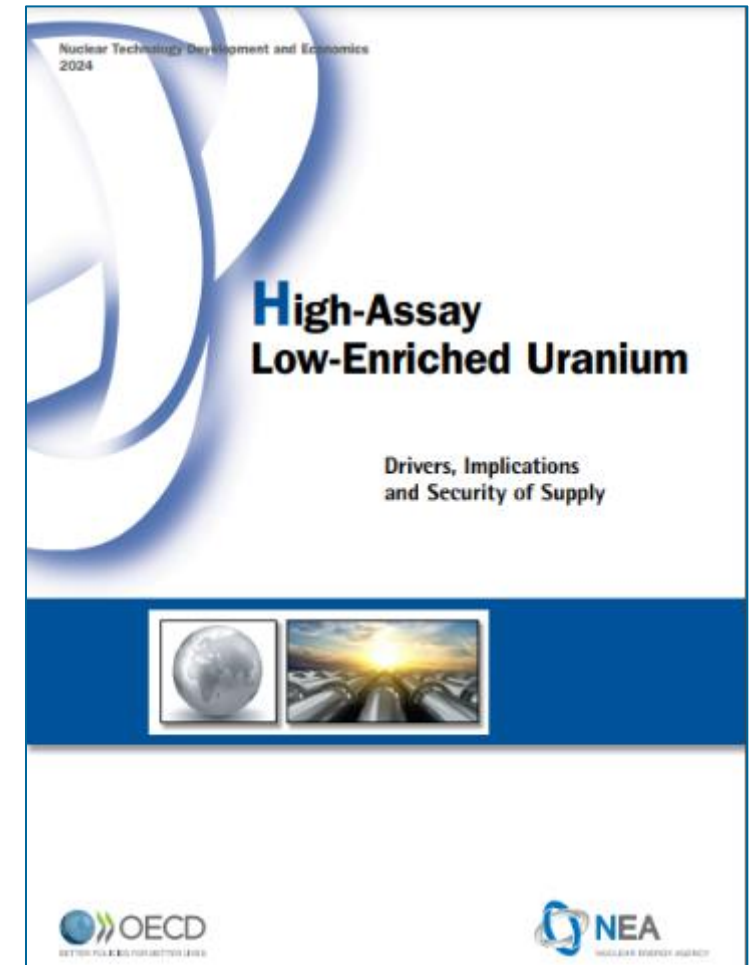
Key domestic bottlenecks to nuclear new build projects according to utilities and supply chain companies



Priority 2: Assuring Industrial Supply Chain Readiness

The Particular Matter of HALEU

- **Historically, the nuclear energy industry has operated with enrichment levels up to 5%, with the associated supply chain, legal, and regulatory frameworks designed accordingly.**
- **High-assay low-enriched uranium (HALEU) fuels, with enrichment levels between 5% and 20%, are expected to play a crucial role to support the deployment of various SMR technologies. However, commercial HALEU production in OECD countries is very limited.**
- **This publication explores the driving forces and implications of HALEU use, its role in achieving energy goals, optimising nuclear power operations, ensuring safety and security, and addressing natural resource utilisation.**



Read the report:



Priority 3: Developing the Workforce for the Future

- **Tripling of global nuclear energy will require a very significant increase in the nuclear sector workforce.**
- **OECD countries need more engineers and scientists as well as highly trained craftspeople such as welders and electrical workers**
- **In many OECD countries, a combination of factors have reduced the pipeline of talent flowing into the nuclear sector:**
 - Low birthrates that reduce the overall talent pool
 - High-visibility career options such as medicine and IT technology that attract many promising young people
 - Limited knowledge and distorted views about nuclear science and technology among teachers and advisors
 - Perceptions and practices that discourage many women from working in the nuclear field

Priority 3: Developing the Workforce for the Future

- During Roadmaps to New Nuclear 2024, the **NEA launched its new workforce development initiative, “Plan 2035”** designed to expand and build upon NEA education and skills development activities.
- This initiative supports the 2023 OECD Council Recommendation on Improving Gender Balance in the Nuclear Sector.
- **Plan 2035** will apply innovative approaches and platforms to support members’ efforts to build the needed nuclear workforce by **no later than 2035**.
- **Plan 2035** will support the pipeline from secondary school to young professionals (such as those who participated in the ministerial conference)



Priority 3: Developing the Workforce for the Future

Considerations for Japan

- Japan is well known to have long-term workforce challenges; **the risks to the nuclear sector require special attention** as negative perceptions about nuclear persist.
- Japan's government and organisations have been excellent collaborators with the NEA in this area:
 - Developed and implemented annual international mentoring workshops
 - Conducted the first Global Forum Nuclear Education National Workshop
 - Strong support and participation in gender balance activities
- In 2025, NEA will organize National Workshops in several countries to develop workforce roadmaps to meet national goals. **Japan could consider such an effort.**

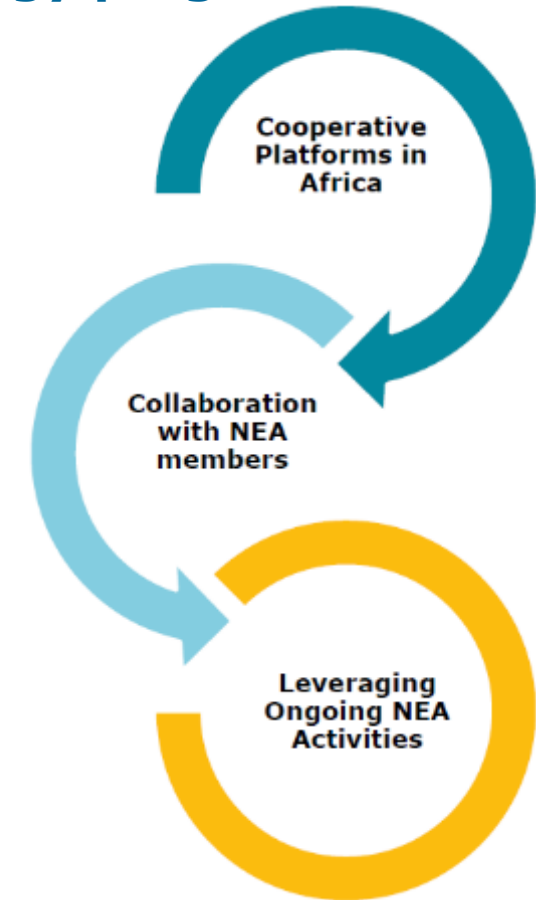
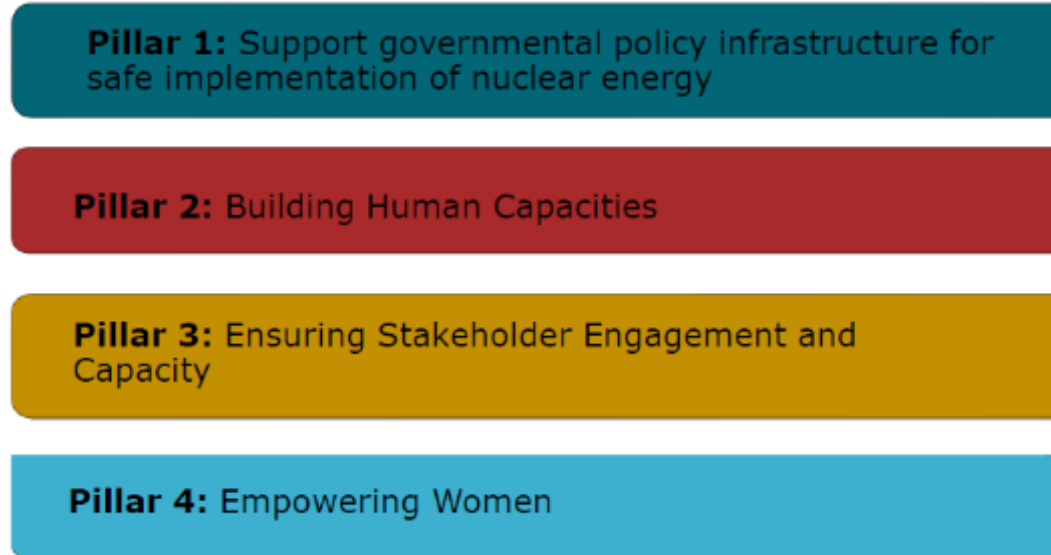


An Additional Consideration for Japan

NEA's "Common Journey" Initiative on Africa

- **The NEA and the OECD Development Centre (DEV) have developed a framework to support efforts in Africa to develop safe and sustainable nuclear energy programmes**

- Focused on using NEA methodologies to support development of co-operative frameworks among ministries, universities and business
- Fully complementary with the IAEA Milestones Approach, which encourages international collaboration to share best practices, expertise, and resources



- **NEA plans to begin work in 2025**
- **Japan's participation could have tremendous impact**

7th Basic Energy Plan

- **We look forward to Japan's 7th Basic Energy Plan and appreciate the role this document has played in setting clear national goals.**
- **Questions that we hope will be addressed:**
 - **Exactly what role should nuclear energy play in meeting Japan's energy security and environmental goals?**
 - **What policies, resources and strategies will be needed to realize this Plan?**
 - **Will Japan view its nuclear sector as a part of the global sector and expand its engagement with overseas activities and projects?**
 - **How can the international community help Japan meet its goals?**

Concluding Thoughts

- **Japan is a respected global leader in nuclear policy and technology and additional engagement in overseas nuclear programs would enhance its leadership.**
- **Based on the proposal recently issued by the Keidanren, it appears that Japan's nuclear industry is prepared increase its contribution to national goals.**
- **Like other NEA countries, Japan can consider additional steps to optimize financing of domestic and overseas projects; enhance the industrial supply chain, and assure that the country will have the workforce needed to support national goals.**
- **The NEA remains committed to support Japan in meeting its policy goals.**



**Thank you for
your attention**