“Advanced” US Reactors: New Foreign Policy-Security Concerns

A Joint Briefing by
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Questions to be answered

1. Why this briefing now?
2. What kinds of reactors are we talking about?
3. What are their advertised overseas uses and allied cooperative developmental premises?
4. What foreign policy security concerns do these uses and premises raise?
1. Why now?

**US officials have just contracted or proposed to**

- Deploy “advanced” reactors at overseas military bases
  Aaron Mehta, “Pentagon to Award Mobile Nuclear Reactor Contracts This Week,” *Defense News*, March 3, 2020

- Export US spent fuel for reprocessing in India, Japan, and France for advanced plutonium fuels

- Get Japan and South Korea to collaborate in US efforts to build a large “test” fast reactor

- Use a major portion of BUILD Act funds to support small reactor exports
  Rebecca Beitsch, Trump’s Push to Use Global Aid for Nuclear Projects Alarms Development Groups,” *The Hill*, May 6, 2020

**These have significant security & policy implications**
Executive Summary

Nuclear power is intrinsically tied to National Security.

- America has lost its competitive global position as the world leader in nuclear energy to state-owned enterprises, notably Russia and China, with other competitor nations also aggressively moving to surpass the United States (U.S.).

SUMMARY OF MEASURES

- Directly purchase uranium by establishing a Uranium Reserve
- End DOE's bartering of uranium and reevaluate DOE's Excess Uranium Inventory Management Policy
- Create a level playing field for all energy sources in power markets and encourage FERC action to improve competition in the wholesale energy markets
- Streamline regulatory reform and land access for uranium extraction
- Support Department of Commerce efforts to extend the Russian Suspension Agreement to protect against future uranium dumping in the U.S. market
- Enable NRC to deny imports of nuclear fuel fabricated in Russia or China for national security purposes
- Fund R&D for Accident Tolerant Fuels, fund R&D for High-Assay Low-Enriched Uranium (HALEU), complete HALEU enrichment demonstration program, and fund advanced water treatment technology for uranium mining and in-situ recovery
- Support the National Reactor Innovation Center and Versatile Test Reactor
- Fund R&D and support demonstration of U.S. advanced nuclear reactor technology
- Demonstrate the Use of Small Modular Reactors (SMRs) and micro-reactors to power federal facilities
- Designate a senior Administration position dedicated to leading nuclear export coordination and implementation
- Establish a Nuclear Industrial Base structure analogous to the Defense Industrial Base
- Fund the R&D for domestic origin commercial fuel replacements for international sale for use in foreign-origin reactors, including Accident Tolerant Fuel
- Increase efficiencies in the export processes and the adoption of 123 Agreements to open new markets for exports of U.S. civil nuclear technologies, materials, and fuel
- Add civil nuclear to the annual Select-USA Investment Summit
- Expand civil nuclear international cooperation programs, including regulatory technical exchanges and assisting in the development of foreign nuclear regulatory frameworks to accelerate foreign licensing of U.S. nuclear technologies with existing NRC licenses

Ensure U.S. financing institutions support civil nuclear industry to compete against foreign state financing

- Promote the reentry of U.S. vendors into the research reactor supply market
2. What kinds of reactors?

- Advanced Reactors
- Small Modular Reactors
- Micro reactors
ADVANCED REACTORS (any size but characterized as “next generation”)

- Use “Advanced” fuels (HALEU, HEU, Pu)
- Versatile Test Reactor or VTR
  - PRISM fast breeder reactor design to support fuel development (2026-30 start up)
  - Large, advanced reactors projected to come online as early as the 2030s
SMALL MODULAR REACTORS (10-500 MWe)

- SMR Modular (factory design; “plug-n-play”)
- LEU, HALEU, Pu-based fuels
- Designed to be “easy” to site
- Some projected operational by mid-2020s

NuScale
170 MWe

Rolls Royce
440 MWe

ThorCon USA
500 MWe
MICROREACTORS (1-10 MWe)

- For remote areas (e.g., no grid)
- Civilian or military
- “Plug-n-play” or mobile
- 10-yr core; refueled back at “factory”
- DoD projects testing by 2023, permanent military installation by 2027 (NEI 7-10 yrs)
3. Advertised overseas uses & allied developmental premises?

- **Advanced Reactors** -- to compete with China, Russia; collaborate with Japan, RoK, France (not to be sold to developing states)

- **Small Modular Reactors** -- for DoD bases, here and abroad but ultimately for commercial sale overseas.

- **Microreactors** – for DoD bases here and abroad; forward bases & emergencies
LARGE ADVANCED REACTORS to compete with PRC, Russia, collaborate with allies

ASSUMES:

- Japan, RoK would help pay for at least VTR development
- Japan, India, France might reprocess US spent fuel for Pu
- US must build major new enrichment capacity for HALEU
SMALL MODULAR REACTORS for military, commercial use here & abroad

ASSUMES:

- Reactors will be exported
- Possible licensing challenges may be relieved by military basing, and accelerated NRC licensing to meet national security deadlines
- Initial price competitiveness challenges may be relieved by DoD support, BUILD Act and other DoE supports to deal with RoK, Russian, Chinese state supported SMRs

”NuScale SMR to be considered for use in Jordan,” World Nuclear News, January 2019

“Viewpoint: Why the USA should partner with Africa to deploy advanced reactors,” World Nuclear News, January 11, 2019
MICROREACTORS, forward base & domestic deployments, emergencies

ASSUMES:

• US promotion of military reactors in US/bases abroad would not goad others to make same case (Turkey, Iran, S. Arabia?)
• Other states would welcome US bringing reactors into their sovereign territory
• Liability for accidents, military strikes and clean up would be clear
Specific HCFA Equities

VTR, fast reactor cooperation with Japan/Rok and reprocessing US spent fuel in Japan could

- with ‘21 Pyroprocessing Study, force a reopening of US-ROK 123 negotiations
- raise questions of safeguarding VTR for safeguarding PRC “peaceful” unsafeguarded fast reactor program, prompting clarification of US-PRC 123 safeguards provisions.

Reprocessing US spent fuel in India would

- reopen the US-India 123 to clarify subsidiary arrangements

Nuclear requests for $multi-billion BUILD Act allocations would

- prompt competing claims HCFA would have to adjudicate
General HCFA Equities

US and cooperative VTR, HALEU, Fast Reactor, Pu fuel projects and overseas reprocessing of US fuel would

- Make Gold Standard promotion harder with ROK, S. Arabia, others

Overseas basing of military reactors would

- Raise damage liability issues in case of accidents & attacks, which might have to be negotiated before foreign entry was allowed

Promotion of military reactors on US bases here and abroad might

- prompt others (e.g., Turkey, Iran, S. Arabia) to plead an IAEA paragraph 14 INFCIRC 153 exemption from safeguards for “a non-proscribed military activity” — i.e., for their own “military” reactors