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Nuclear Deployment Supply Chain Analysis

Critical Minerals & Energy Innovation Report

Battelle Energy Alliance manages INL for the
U.S. Department of Energy's Office of Nuclear Energy

Idaho National Laboratory

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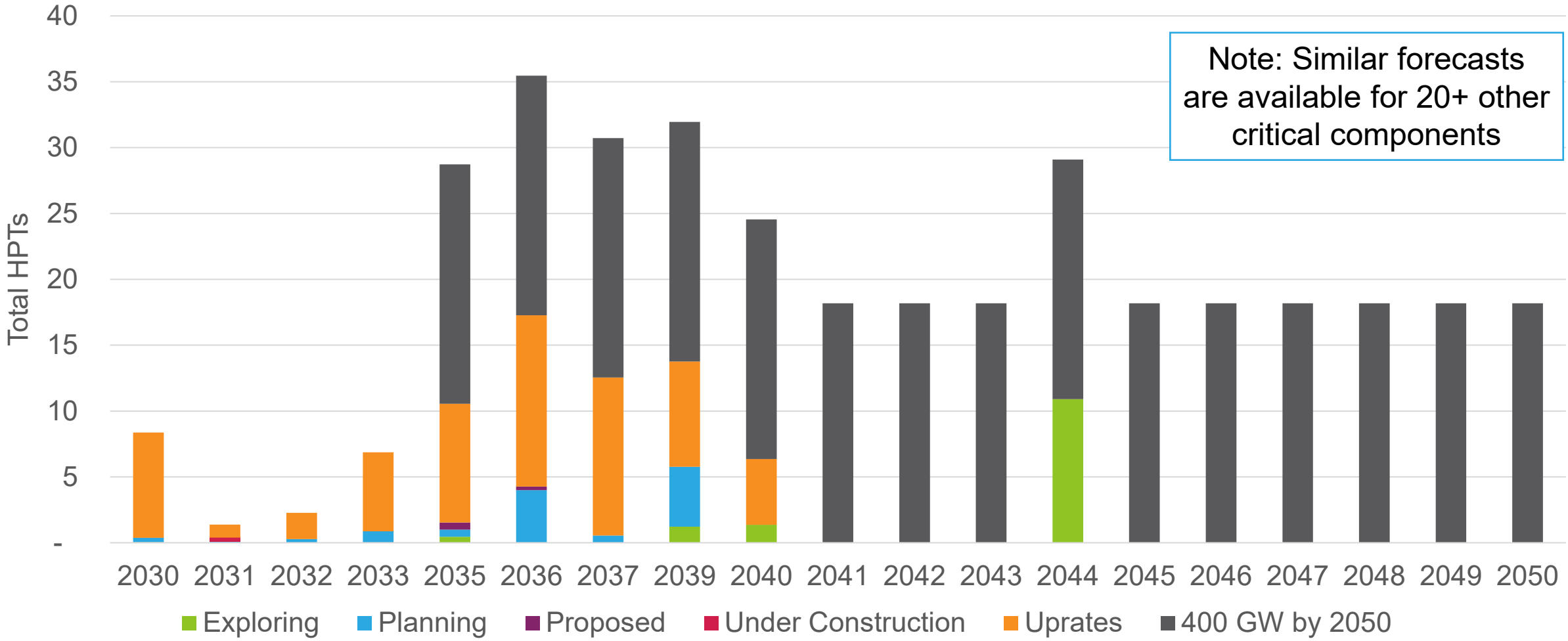
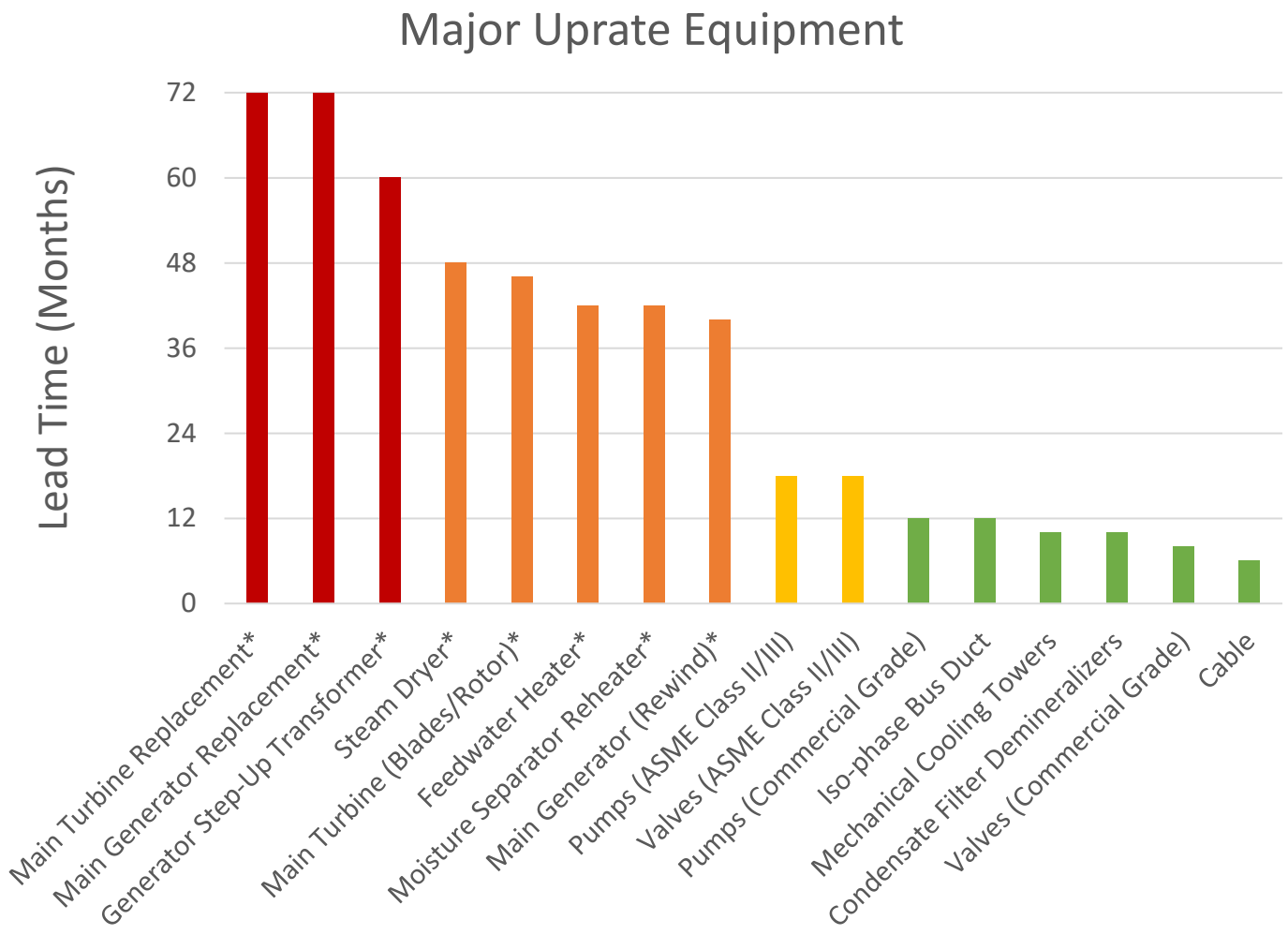
Demand Example: High Pressure Turbines – Uprates + Large Reactor Deployment



Lead Times



- Long Lead Time Components
  - Steam Dryers
  - Main Turbines
  - Main Generator
  - Generator Step-Up Transformer
  - MSRs
  - Feedwater Heaters
- Many critical components are expected to have 3+ year lead times

Source: (Sargent & Lundy 2026)

Shared Components Across Generator Types + Data Centers

Component / System	Nuclear	Coal	Natural Gas	Hydroelectric	Data Centers
Prime mover	Steam turbine	Steam turbine	Gas / Steam turbine (CC)	Water turbine	None
Electric generator	✓	✓	✓	✓	No
Heat source	Nuclear fission	Coal combustion	Gas combustion	Hydraulic head	IT equipment
Steam generation	✓ (steam generators)	✓ (boilers)	✓ (CC)	No	No
Condenser	✓	✓	✓ (CC)	No	No
Cooling system	✓	✓	✓	✓	✓
Cooling towers / heat rejection	✓	✓	✓	Sometimes	✓
Primary working fluid	Water/Steam	Water/Steam	Gas/Steam	Water	Air/Liquid
Feedwater system	✓	✓	✓ (CC)	No	No
Pumps	✓	✓	✓	✓	✓
Large rotating machinery	✓	✓	✓	✓	Limited
Transformers	✓	✓	✓	✓	Step-down/UPS
Switchyard / Substation	✓	✓	✓	✓	✓
Electrical distribution	✓	✓	✓	✓	✓
Emergency power	✓	✓	✓	✓	✓
Backup generators	Diesel	✓	✓	✓	✓
Energy storage	Limited	Limited	Limited	Limited	Batteries (UPS)
Control room / NOC	✓	✓	✓	✓	✓
Instrumentation & Control	✓	✓	✓	✓	✓
Protection systems	✓	✓	✓	✓	✓
Fire protection	✓	✓	✓	✓	✓
Water treatment	✓	✓	✓	Limited	Sometimes
Fuel handling	Nuclear fuel	Coal handling	Pipeline	None	None
Waste handling	Rad waste	Ash	Limited	Limited	E-waste
Cranes / heavy lifts	✓	✓	✓	✓	✓
Civil structures	✓	✓	✓	✓	✓

CC: Combined Cycle – Uses both gas and steam turbines

Overlap Areas

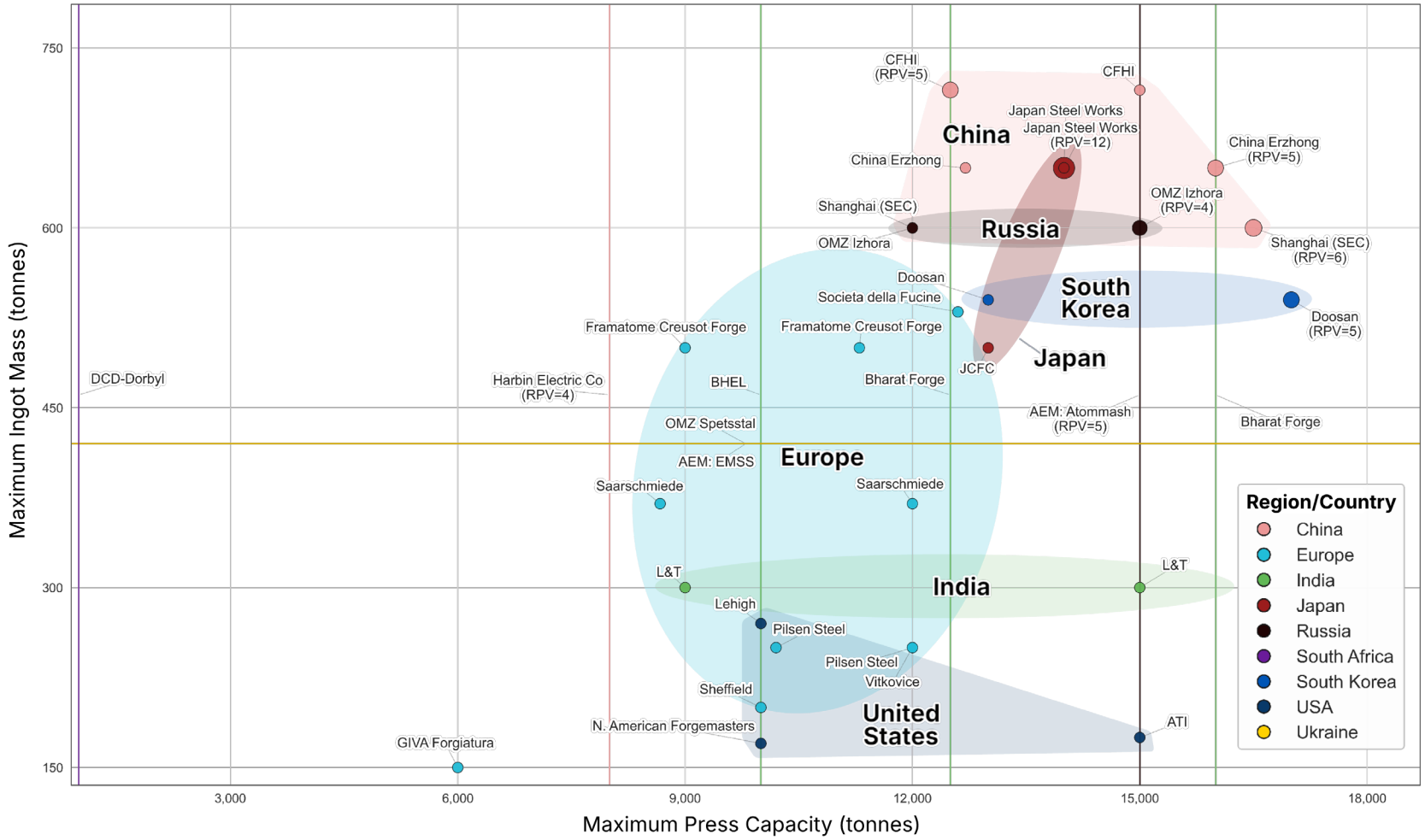
- Electrical infrastructure (transformers, switchgear, protection)
- Cooling and heat rejection
- Control, monitoring, and fault management
- Backup power and reliability engineering
- Fire suppression and safety systems

Large Forging Capabilities

- US vendors state they have the theoretical / physical capability to produce all but the AP1000 RPV top shells
  - However, theoretical capability ≠ experience with these specific complex components
  - The volume of required components to meet goals is immense
- Fabrication may pose as large of a bottleneck as forging

Global Heavy Forging Capability: Press Capacity vs. Maximum Ingot Mass

Nuclear reactor pressure vessel manufacturing capabilities by firm and region (2025)



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Source: World Nuclear Association - Heavy Manufacturing of Power Plants, 2025
Notes: Reactor pressure vessel production per year per company.
Colored vertical and horizontal reference lines denote facilities for which only maximum press capacity or maximum ingot mass, respectively, has been publicly reported.
Shaded regions are meant to assist with visual interpretation and are not based on statistical methods.
Forges shown represent the largest reported press and ingot capabilities in each region. All regions contain additional forging facilities with smaller presses and ingot sizes that are not represented.
Produced by: Haydn C. Bryan

Workforce forecasts from existing studies