Plutonium in Russia: A Brief Overview

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Separated plutonium stocks
Plutonium in Russia

189 TONNES

-~60 tonnes

-~15 tonnes post-1997

Available for weapons 32.8%
Not available for military uses 13.2%
Civilian, no safeguards 32.3%
Available for weapons 32.8%
In weapons 9.5%
In retired weapons 4.2%
Military-origin, under monitoring 7.9%
Civilian, no safeguards 32.3%
Plutonium as an asset

• ~60 tonnes of civilian plutonium
  • Most of it reactor-grade (high-background)

• Closed fuel cycle
  • Reprocessing
  • Fast neutron reactors
    • BN-350, BN-600
    • BN-800, (BN-1200), (Brest-300)
  • No MOX in light-water reactors
Key plutonium facilities

Mayak, Ozersk
Siberian Chemical Combine, Seversk
Mining and Chemical Combine, Zheleznogorsk
Plutonium facilities: Ozersk
Mayak, Ozersk

• **RT-1 reprocessing plant**
  • Nominal capacity 400 MTHM/y
  • Operated at ~100 MTHM/y, VVER-440 fuel, naval and research reactors

• **RT-1 expansion**
  • VVER-1000 fuel
  • Damaged RBMK fuel, research reactor fuel
  • 200 MTHM in 2015? Up to 500 MTHM/y?
Plutonium facilities: Zheleznogorsk
Mining and Chemical Combine, Zheleznogorsk

• Spent fuel storage
  • Wet storage: VVER-1000
  • Dry storage
    • VVER-1000 (~11,000 MT)
    • RBMK (~26,000 MT)

• Reprocessing: Pilot Demonstration Center
  • Projected capacity: 250 MTHM/y
  • VVER-1000 fuel
  • First line: 2018, ~5 MTHM/y
  • Second line: 2020, “industrial capacity”?
Mining and Chemical Combine, Zheleznogorsk

• Fuel fabrication
  • MOX fuel for BN-8oo reactor
  • High-background (reactor-grade) and low-background (WgPu)
  • Was built to handle PMDA plutonium

• BN-800 fuel
  • First loads – mostly HEU, 16-20% Pu
  • Mostly low-background Pu (from the civilian stock)
  • Full MOX core in the future
Plutonium Management and Disposition Agreement

• Signed in 2000, amended by a protocol in 2010

• Disposition of 34 MT of plutonium
  • 25 MT – weapon-origin metal in Mayak Fissile Material Storage Facility
  • 9 MT – post-1997 weapon-grade Pu oxide in Zheleznogorsk
    • The total of ~15 MT in Zheleznogorsk

• Disposition in BN-600 and BN-800
  • Limits on blanket, reprocessing, IAEA monitoring

• Abandoned by the US, suspended by Russia in 2016
Plutonium facilities: Seversk
Siberian Chemical Combine, Seversk

- Brest-300 reactor
  - Fast neutron reactor, lead coolant
  - Construction to start in summer 2019?

- Integrated center
  - Reactor + reprocessing + fuel fabrication
  - U-Pu nitride fuel
Other activities

• REMIX fuel
  • U+Pu plus LEU
  • Fuel for light water reactors

• Fast neutron reactors in China
  • HEU fuel for CEFR
  • HEU fuel for CFR-600
  • MOX in the future?

• Molten salt reactor?
  • Zheleznogorsk

• New projects?
United States

SEPARATED PLUTONIUM IN THE UNITED STATES
87.8 TONNES

- Civilian, no safeguards: 5.9%
- In weapons: 17.7%
- In retired weapons: 11.8%
- Available for weapons: 15.8%
- Not available for military uses: 48.8%

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United Kingdom

SEPARATED PLUTONIUM IN THE UNITED KINGDOM
120.2 TONNES

- In weapons: 0.6%
- In retired weapons: 0.1%
- Available for weapons: 2.0%
- Under safeguards: 97.3%
France

SEPARATED PLUTONIUM IN FRANCE
75 TONNES

- Under safeguards: 92.0%
- Available for weapons: 6.4%
- In weapons: 1.6%