

Consolidation of weapon materials in Russia's nuclear complex

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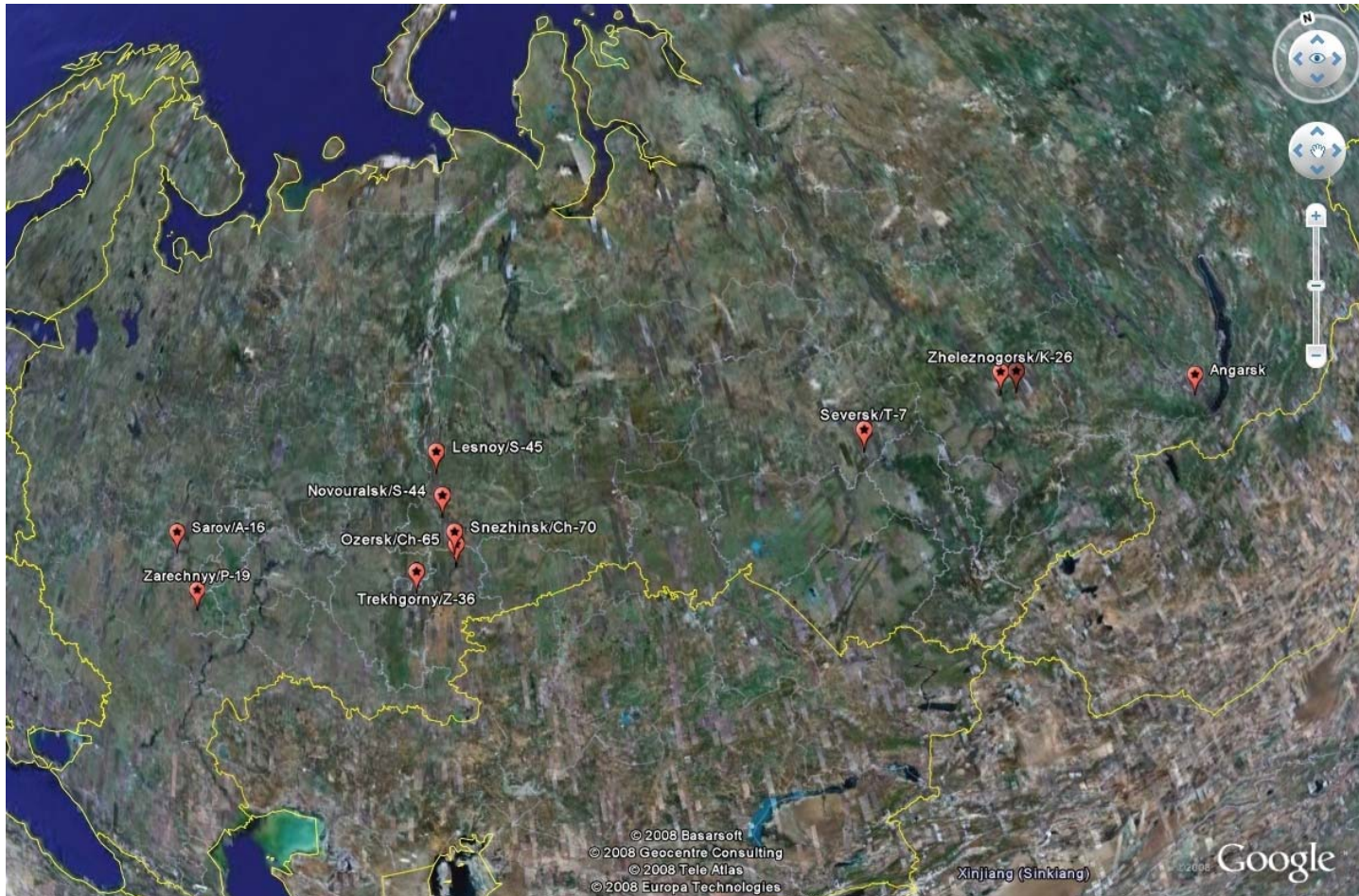
Material balance: an estimate

	Pu	HEU
Produced	~145 MT	~1400 MT
In warheads	~50 MT	~500 MT
Removed from the stockpile		330 MT blended down
Awaiting disposal	(50 MT declared excess)	(170 MT to be blended down)
In Rosatom storage	~100 MT	~600 MT

Geography of fissile materials

- Nuclear weapons production complex
 - 10 closed cities
- Research reactors, critical assemblies
 - 20 sites in Russia
 - 17 sites abroad
- Fast reactors
- Naval reactors
 - Submarines, icebreakers
- HEU fuel fabrication
 - Naval reactors, research reactors, Pu production, fast reactors

Rosatom closed cities



Weapons development

- Sarov (Arzamas-16) - VNIIEF
 - Weapon development
 - Pit production (small scale)
 - Weapon material storage (tens of tonnes)

- Snezhinsk (Chelyabinsk-70)
 - Weapon development
 - Pit production (small scale)
 - Weapon material storage (tens of tonnes)

Weapons assembly

- Lesnoy (Sverdlovsk-45)
 - Production of fissile-material weapon components
 - Warhead assembly and disassembly
 - Weapon material and/or component storage
- Trekhgorny (Zlatoust-36)
 - Warhead assembly and disassembly
 - No component production?
- Sarov (Arzamas-16) – Avangard
- Zarechny (Penza-19)

Fissile material production

- Ozersk (Chelyabinsk-65)
 - Chemical and metallurgical plant – Pu and HEU for weapons
 - Pit production
 - WGPu and HEU storage
 - Tritium production (Ruslan and Lyudmila reactors, HEU fuel)
 - RT-1 reprocessing facility with reactor-grade Pu storage)
 - Fissile Material Storage Facility (WGPu and HEU) build with U.S. assistance
 - HUE-LEU program activities
 - Conversion of HEU metal into oxide

- Seversk (Tomsk-7)
 - Pu production reactor (shut down in 2008)
 - Weapon-grade plutonium (WGPu) reprocessing plant (to be shut down ca. 2010)
 - WGPuOx storage (subject to U.S. monitoring, 10 tonnes, to be moved to Zheleznogorsk)
 - Uranium enrichment - no HEU production
 - Conversion plants
 - WGPu and HEU storage
 - HEU-LEU program activities
 - Conversion of HEU metal into oxide, fluorination and down-blending

- Zheleznogorsk (Krasnoyarsk-26)
 - Pu production reactor (to shut down in 2010, uses some HEU fuel)
 - Reprocessing plant (to shut down ca. 2012)
 - WGPuOx storage (subject to U.S. monitoring, 8 tonnes)
 - WGPu and HEU storage [possible]

Uranium enrichment complex

- Seversk (Tomsk-7)
 - Uranium enrichment (no HEU)
 - HEU-LEU program activities
 - Conversion of HEU metal into oxide, fluorination and down-blending

- Zelenogorsk (Krasnoyarsk-45)
 - Enrichment facility (no HEU)
 - HEU-LEU program
 - Fluorination and down-blending

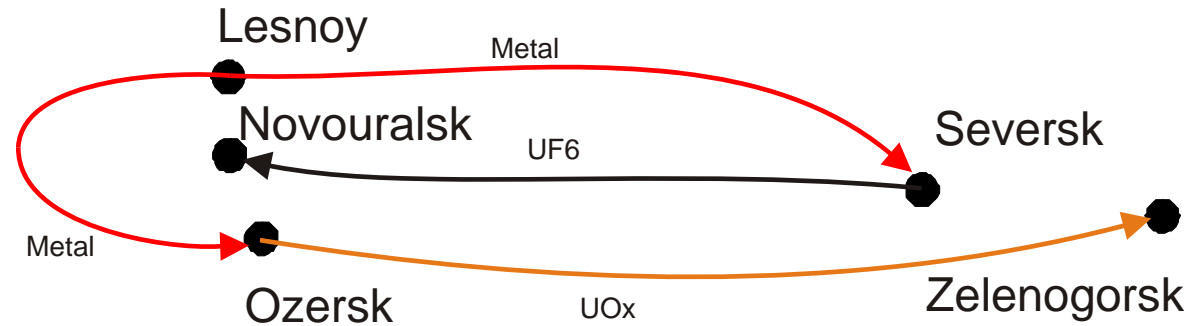
- Novouralsk (Sverdlovsk-44)
 - Enrichment facility (up to 30%)
 - HEU-LEU program
 - Down-blending

- Angarsk
 - Enrichment facility (no HEU)

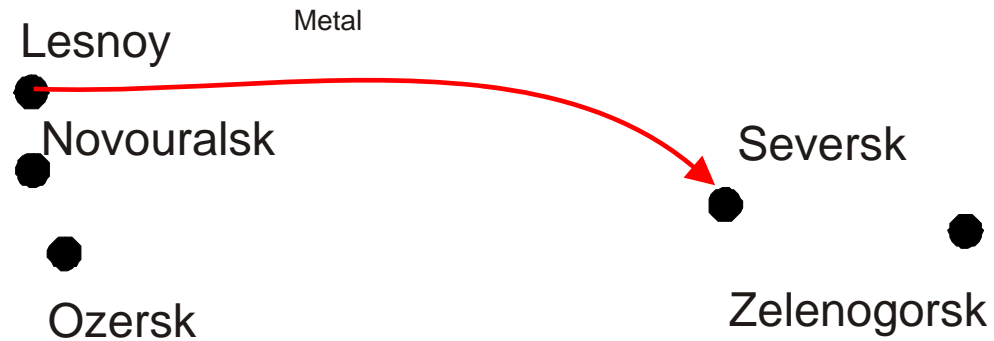
Weapon material storage sites

- Sarov/A-16
- Snezhinsk/Ch-70
- Ozersk/Ch-65/Mayak
- Seversk/T-7
- (Zheleznogorsk/K-26)

HEU-LEU deal: HEU flows

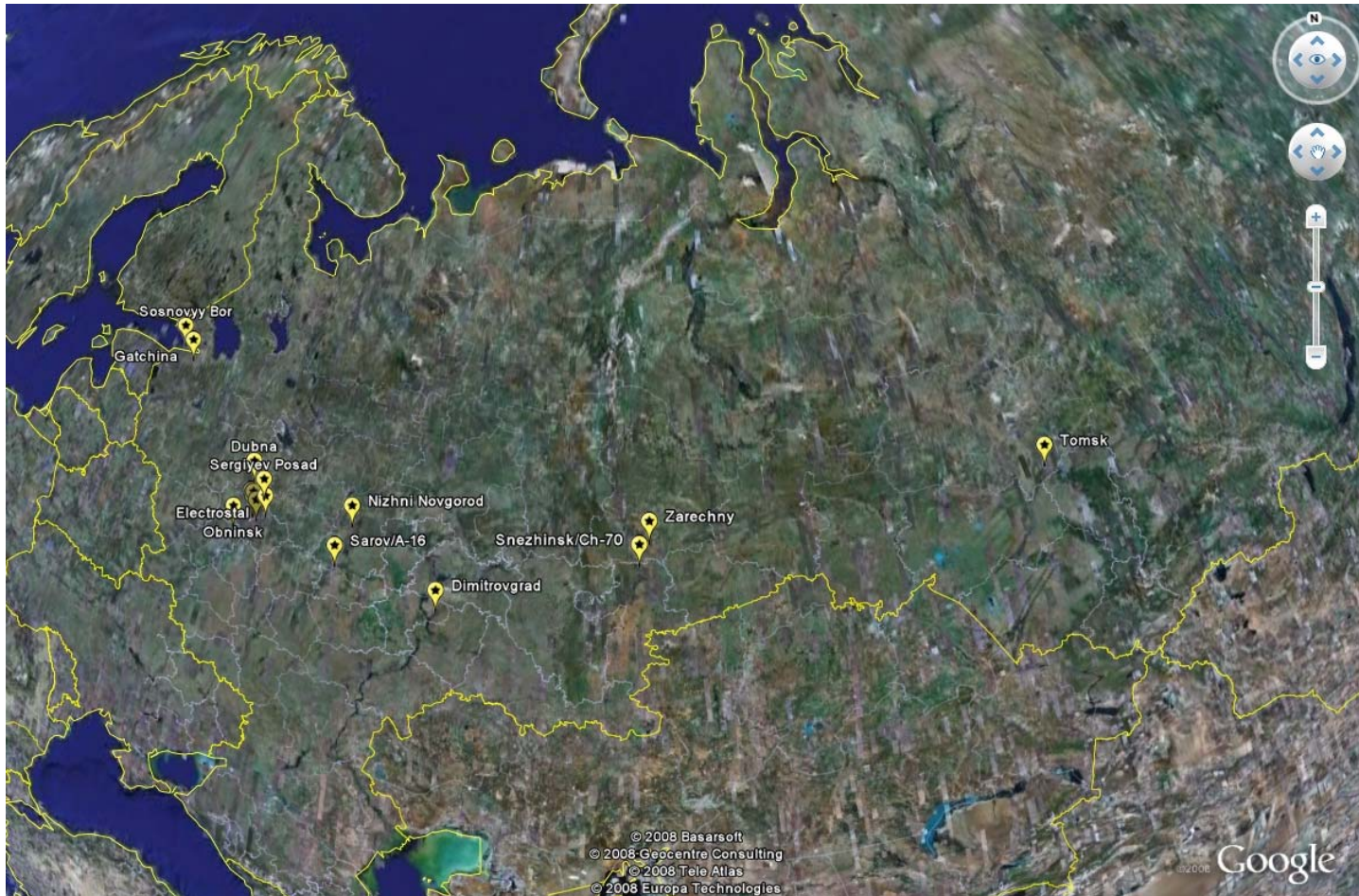


Current

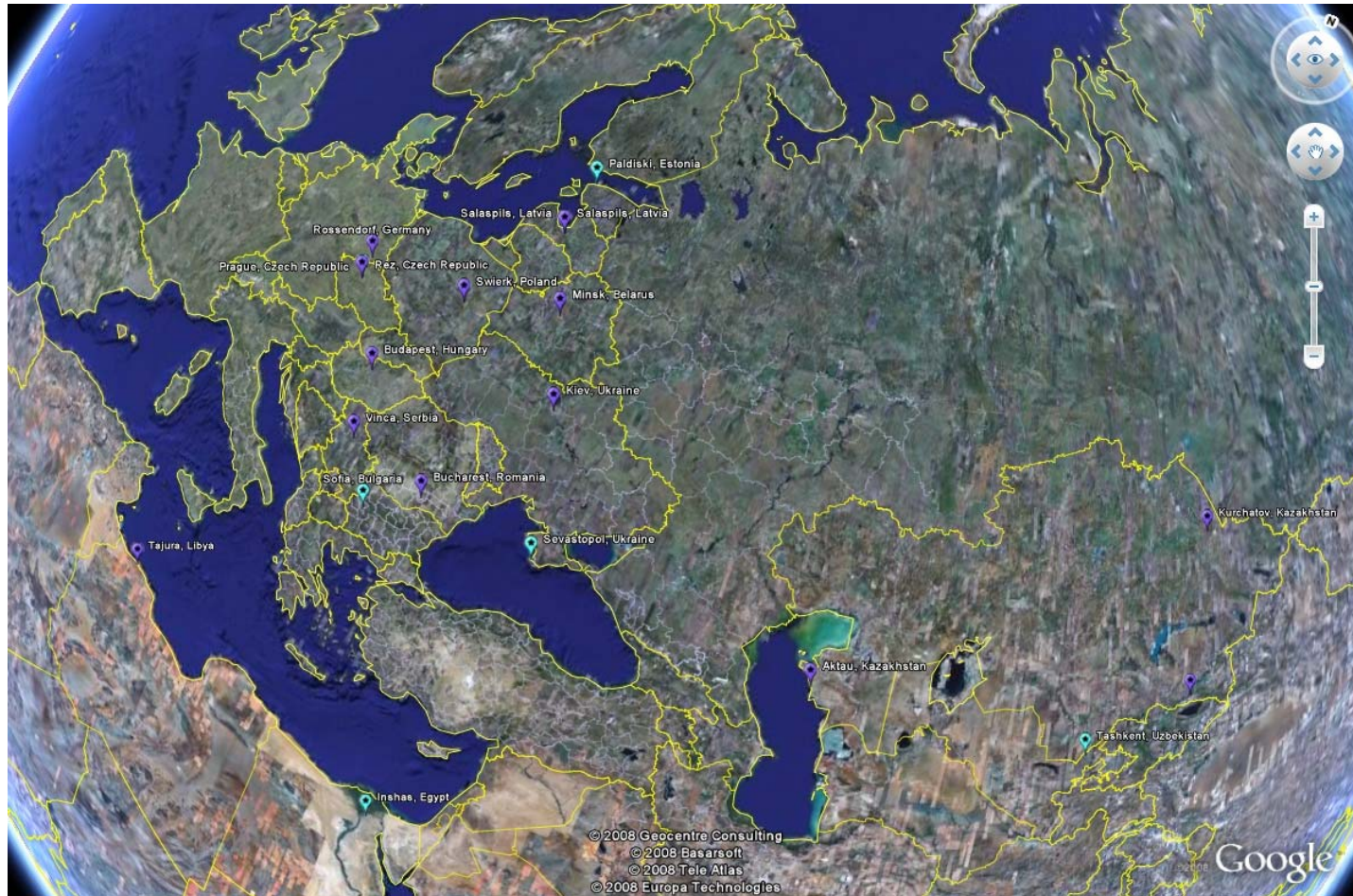


Suggested

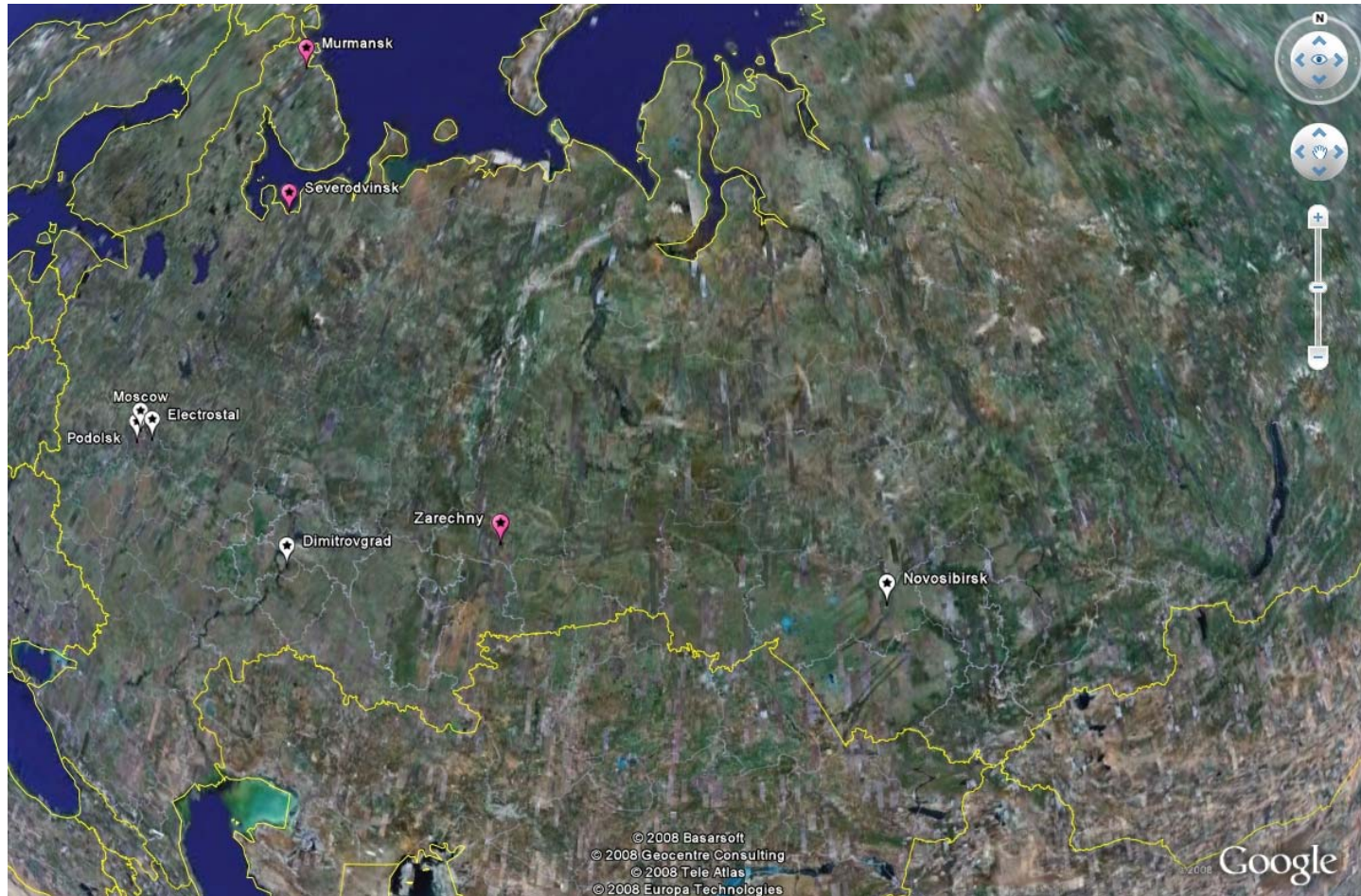
Research reactors in Russia



Russian reactors abroad



Other HEU-fueled reactors, fuel fabrication facilities



Other HEU-fueled reactors

- Fast reactors
 - BN-600: 17%, 21%, 26% HEU; some MOX fuel
 - BN-800 (under construction): MOX fuel
- Pu production reactors
 - Spike HEU fuel
 - Will be shut down in 2009-2010
- Tritium production reactors
- Naval reactors
 - Submarines, icebreakers

Fuel fabrication

- **Electrostal**
 - Oxide-based fuels (mostly LEU)
 - VVER-440, RBMK, EGP-6, and BN-600
 - Naval reactors (military and civilian)
 - Research reactors

- **Novosibirsk**
 - Oxide-based fuels (LEU)
 - VVER-440 and VVER-1000
 - Cermet fuels (LEU and HEU)
 - Spike fuel for Pu production reactors
 - Tritium production reactors
 - Research reactors

- **Fuel fabrication-related research**
 - VNIINM/Bochvar Institute/Moscow
 - NIIAR/Dimitrovgrad (MOX fuels)
 - Luch/Podolsk

Medium-term goal

- Weapon development – Sarov, Snezhinsk
- Assembly – Lesnoy
- Material processing – Ozersk
- Storage: Sarov, Snezhinsk, Ozersk, Seversk, (Zheleznogorsk)
- Research reactors – reduce to ~10 sites in Russia
- Naval reactors – convert icebreaker reactors
- Fuel fabrication – consolidate at the Electrostal Plant

Short-term priorities

- Secure weapon material storage sites
- Eliminate unnecessary transfers
- Research and naval reactor conversion
- Cleanout of civilian sites