

4



Directorate of Intelligence

~~Secret~~

(M)

NOFORN NOCONTRICT
ORCON



Nuclear Proliferation Survey: The Next Generation

An Intelligence Assessment

~~Secret~~

November 1988
Copy 227

32



Directorate of
Intelligence

Secret

Nuclear Proliferation Survey: The Next Generation

An Intelligence Assessment

Reverse Blank

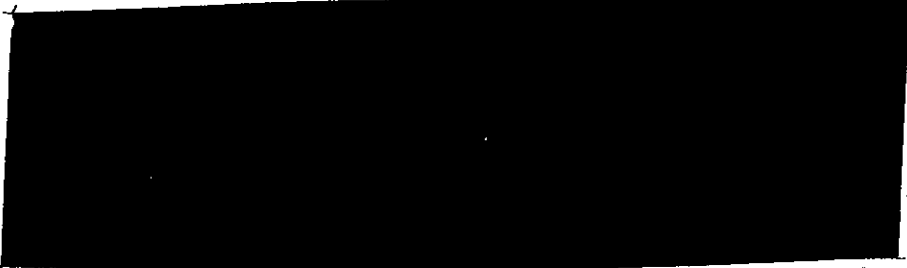
Secret

November 1982

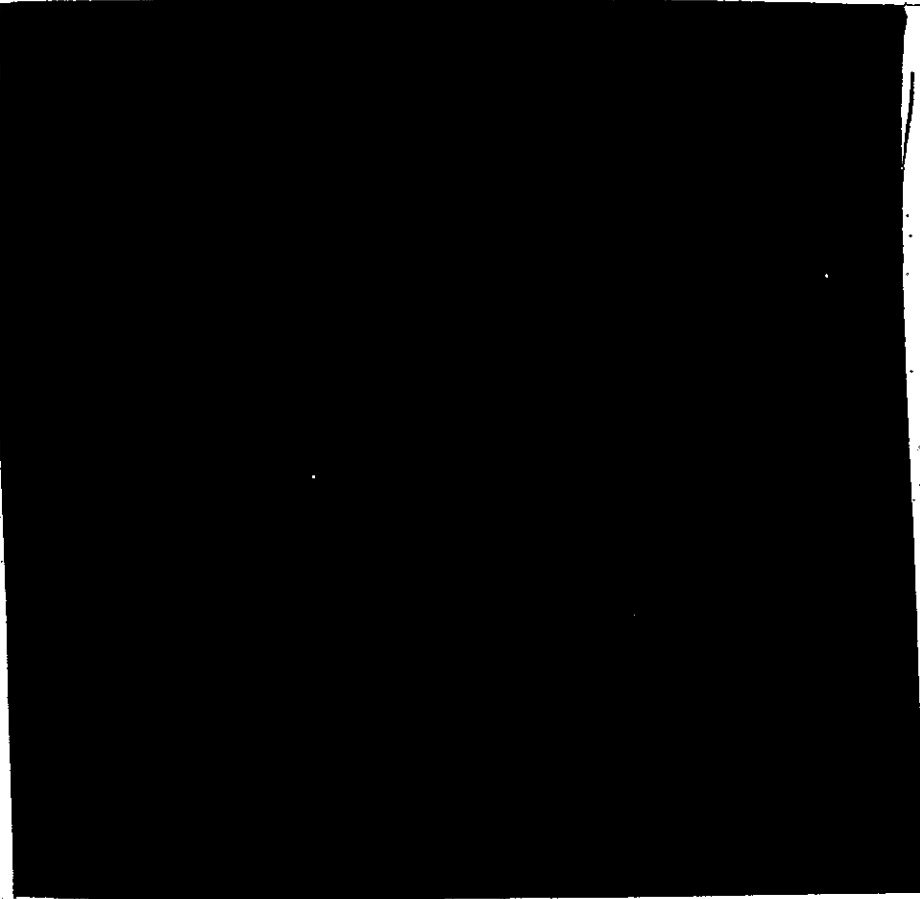
Pages: iii

Exemptions: (b)(1), (b)(3)

~~Secret~~
~~NOFORN-NOCONTRACT-~~
~~ORCON~~



— *North Korea*. Is developing a nuclear capability for undetermined final use (military, civilian, or a combination of both). Also, is foot-dragging on negotiations for safeguards on new construction that appears to have nuclear-related characteristics, which raises questions about the final application.



~~Secret~~

Pages: IV

Exemptions: (b)(1), (b)(3)

Contents

	<i>Page</i>
Key Judgments	iii
Introduction	1
	5
	5
	5
	5
	6
	6
	6
	6
	6
	7
	7
	7
	7
	7
	8
	8
	8
	8
	8
	9
	9
	9
	9
	9
	10
	10
	11
	11
	11
	11
	12
North Korea	12
Status Summary	12
Outlook	12

Pages: VIII - 1

Exemptions: (b)(1), (b)(3)

Nuclear Fuel Cycle Glossary

This glossary provides brief explanations of some key technical terms relating to the nuclear fuel cycle as used in this paper. The glossary is not intended to be definitive or comprehensive.

Nuclear fuel cycle. The series of steps from uranium mining, through fuel element fabrication and use, to waste disposal for nuclear power reactors, and, for nuclear weapons, continuing through reprocessing, fabrication, and testing of weapons.

Critical assembly. A nuclear assembly that has sufficient fissile material and moderator to sustain a chain reaction. A subcritical assembly is a nuclear assembly in which a self-sustaining chain reaction cannot be maintained.

Enriched uranium. Material in which the percentage of the fissionable isotope uranium-235 has been artificially increased so that it is higher than the percentage found naturally in the material. The naturally occurring percentage is 0.7 percent; low-enriched uranium (LEU) has less than 20 percent; highly enriched uranium (HEU) has more than 20 percent.

Fissile material. A material (for example, uranium-235 or plutonium-239) that is fissionable by neutrons of all energies, especially thermal (slow) neutrons:

- **Thermal neutrons.** Neutrons that have been slowed down by a moderator to an average speed of about 2,200 meters per second (at room temperature) from the much higher initial speeds they had when expelled by fission.

Moderator. A material, such as ordinary water, heavy water, or nuclear-grade graphite, used in a reactor to slow down high-velocity neutrons, thus increasing the likelihood of further fission:

- **Heavy water.** Water containing significantly more than the natural proportion (one part in 6,500) of heavy hydrogen (deuterium) atoms to ordinary hydrogen atoms.
- **Nuclear grade graphite.** High-purity graphite, which is made artificially from petroleum coke because naturally occurring graphite is relatively impure.

Reactor grade plutonium. Plutonium that has a high Pu-240 content—currently about 15 to 25 percent:

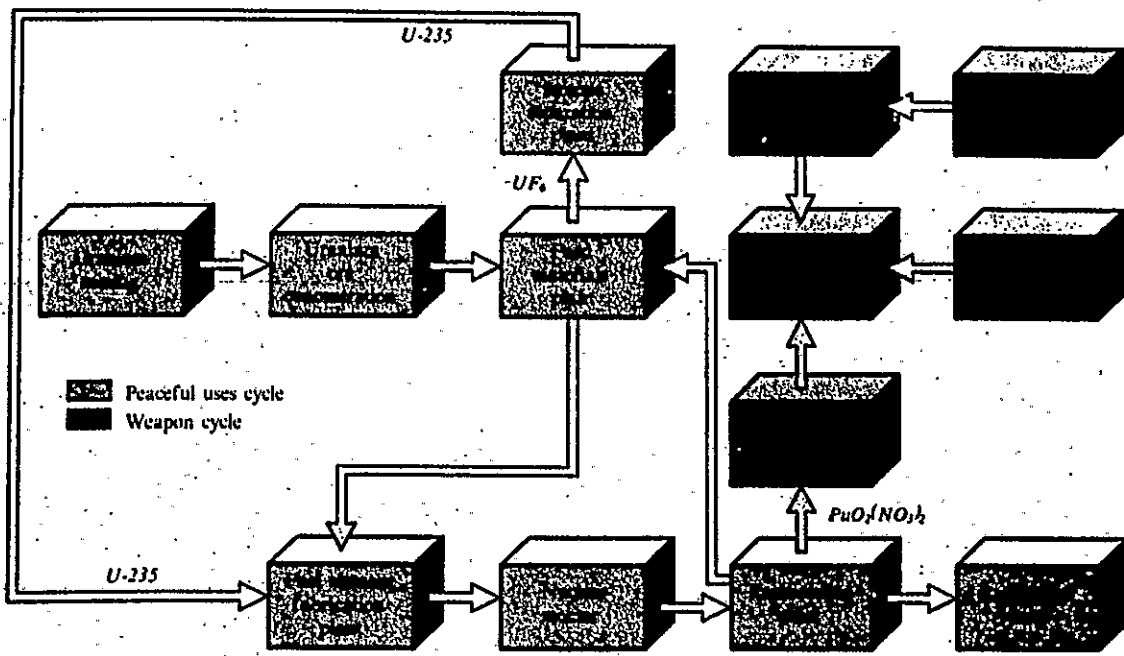
- **Weapons-grade plutonium.** Plutonium that, as now used in weapons applications, contains 6.5 percent or less Pu-240.

Reprocessing. The processing of spent nuclear reactor fuel to recover usable fissionable materials that have been produced.

Safeguards. The basic purpose of the International Atomic Energy Agency (IAEA) safeguards is to deter—through the risk of timely detection—the diversion of nuclear materials from peaceful uses to military or explosive purposes. IAEA monitors the flow of nuclear materials at nuclear installations by auditing plant records and conducting physical inventories. Seals and photography are used for ensuring that materials are not diverted while IAEA inspectors are not present.

~~Secret~~

Figure 1
Nuclear Fuel Cycle



~~Secret~~

Pages: 4-11

Exemptions: (b)(1), (b)(3)

~~Secret~~

North Korea formally acceded to the NPT in 1985 but has not ratified (or agreed to ratify) the required IAEA safeguards of its nuclear facilities; with successful implementation of the treaty, the North Koreans would qualify for aid and assistance.

North Korea can also be expected to press ahead with plans to build a nuclear power plant supplied by the Soviet Union, if satisfactory financial arrangements can be worked out.

North Korea

Country at a glance:

Non-Proliferation Treaty signatory: Yes

Delivery system available: Yes (aircraft; missile system)

Status Summary

North Korea has a small nuclear program with operating nuclear research reactors at the Yongbyon Nuclear Research Center. The first reactor, built in the 1960s, is a Soviet-style 4-megawatt (MW) modified IRT-2000 research reactor

~~Secret~~

Pages: 13-23 & ADDENDA

Exemptions: (b)(1), (b)(3)