SECRET

[redacted]

9 JUL 82

NORTH KOREA: Nuclear Reactor

[redacted] *a new nuclear research reactor being built at the southern edge of North Korea's Yongbyon Nuclear Research Center.//* [redacted]

[redacted] // [redacted] the new facility is similar to North Korea's only other reactor--a Soviet-supplied 2-megawatt thermal research reactor--built at the center during the 1960s. [redacted]

//North Korea's nuclear physicists are trained by the Soviets and have the theoretical and technical skill to build a small reactor of this type. If the Soviets are involved, the reactor probably will be declared to the International Atomic Energy Agency for safeguarding, as was the first reactor at Moscow's insistence.// [redacted]

//If the North Koreans are building a copy of the first reactor without Soviet involvement and want to avoid declaring the reactor to the IAEA, [redacted] The reactor, which will not be completed for several years, is not designed to produce the quantities of plutonium needed for a nuclear weapons program.// [redacted]

SECRET

SUB

SECRET

OCR/DB
OUTGOING

/48/

PRIORITY

FRP: . . . . . .

STAFF

[redacted]

OUTGOING MESSAGE

84 3956785 ASP

PAGE 001
TOT: 200723Z APR 84

[redacted]

OUTGOING MESSAGE

[redacted]

EAST ASIA BRIEF [redacted] FOR 20 APRIL 1984.

FROM: DDI/O[redacted]

CONTENTS

1. NORTH KOREA: NUCLEAR REACTOR UNDER CONSTRUCTION

[redacted]

OUTGOING MESSAGE

1. NORTH KOREA: NUCLEAR REACTOR UNDER CONSTRUCTION

//NORTH KOREA IS CONSTRUCTING A NUCLEAR REACTOR [redacted]

[redacted] A NUCLEAR REACTOR AT A CONSTRUCTION SITE PREVIOUSLY IDENTIFIED AS A SMALL RESEARCH REACTOR. [redacted]

SECRET

2

[redacted]

[redacted] A COOLING TOWER HAS BEEN CONSTRUCTED.//

[redacted] THE REACTOR PROBABLY WILL BE GRAPHITE-MODERATED AND USE NATURAL URANIUM FOR FUEL. [redacted] THE NORTH KOREANS WILL REQUIRE AT LEAST THREE MORE YEARS TO COMPLETE THE REACTOR.// [redacted] ALTHOUGH THE PROCEDURES ARE WITHIN NORTH KOREA'S SCIENTIFIC CAPABILITIES, P'YONGYANG WOULD NEED TO DEVELOP ADVANCED ENGINEERING TECHNIQUES TO MASTER THE REMOTE CONTROL OPERATIONS THAT ARE NECESSARY FOR HANDLING HIGHLY RADIOACTIVE MATERIALS.// [redacted]

//THE NORTH KOREANS PROBABLY ARE TECHNICALLY CAPABLE OF BUILDING THE REACTOR WITHOUT FOREIGN ASSISTANCE. NORTH KOREA HAS NOT SIGNED THE NUCLEAR NON-PROLIFERATION TREATY; AND IT IS UNLIKELY TO PUT THE REACTOR UNDER IAEA SAFEGUARDS.// [redacted]

[redacted]

[redacted]

SECRET

/ /

SECRET
PRIORITY

OCR/DB
OUTGOING

FRP: . . . . . .

STAFF

[redacted]

OUTGOING MESSAGE

85 9424524 ASP

PAGE 001
TOT: 270707Z DEC 85

[redacted]

OUTGOING MESSAGE

SUBJECT: EAST ASIA BRIEF [redacted] FOR 27 DECEMBER 1985.

FROM: DDI/O [redacted]

THERE WAS NO [redacted]

CONTENTS

[redacted]

2. IN BRIEF

[redacted]

OUTGOING MESSAGE

SECRET

SECRET

85 9424524 ASP

PAGE 002
TOT: 270707Z DEC 85

[redacted]

2. IN BRIEF

[redacted]

EAST ASIA

--//TASS REPORTS MOSCOW TO HELP NORTH KOREA BUILD NUCLEAR POWER PLANT . . . SOVIETS PROBABLY AGREED TO GET NORTH KOREAN ACCESSION TO NON-PROLIFERATION TREATY . .

[redacted]

OUTGOING MESSAGE

OUTGOING MESSAGE

OUTGOING MESSAGE

SECRET

SECRET NOFORN NOCONTRACT ORCON

(N)

~~OIR~~

Central Intelligence Agency

[redacted]

Washington, D.C. 20505

DIRECTORATE OF INTELLIGENCE

4 MAY 1987

28 April 1987

North Korea's Nuclear Efforts [redacted]

Summary

North Korea appears to be progressing toward helping improve its energy-short economy with the capacity to generate nuclear energy. [redacted] an indigenous nuclear reactor may be under way, although P'yongyang has yet to acknowledge the existence of the reactor or enter into a safeguards agreement as required by its December 1985 accession to the Nuclear Non-Proliferation Treaty (NPT).. With the June 1987 deadline for entering into a safeguards agreement approaching, we are uncertain why P'yongyang has delayed. [redacted]

[redacted]

[redacted]

WARNING NOTICE--INTELLIGENCE SOURCES OR METHODS INVOLVED

SECRET NOFORN NOCONTRACT ORCON

P'yongyang's Nuclear Efforts

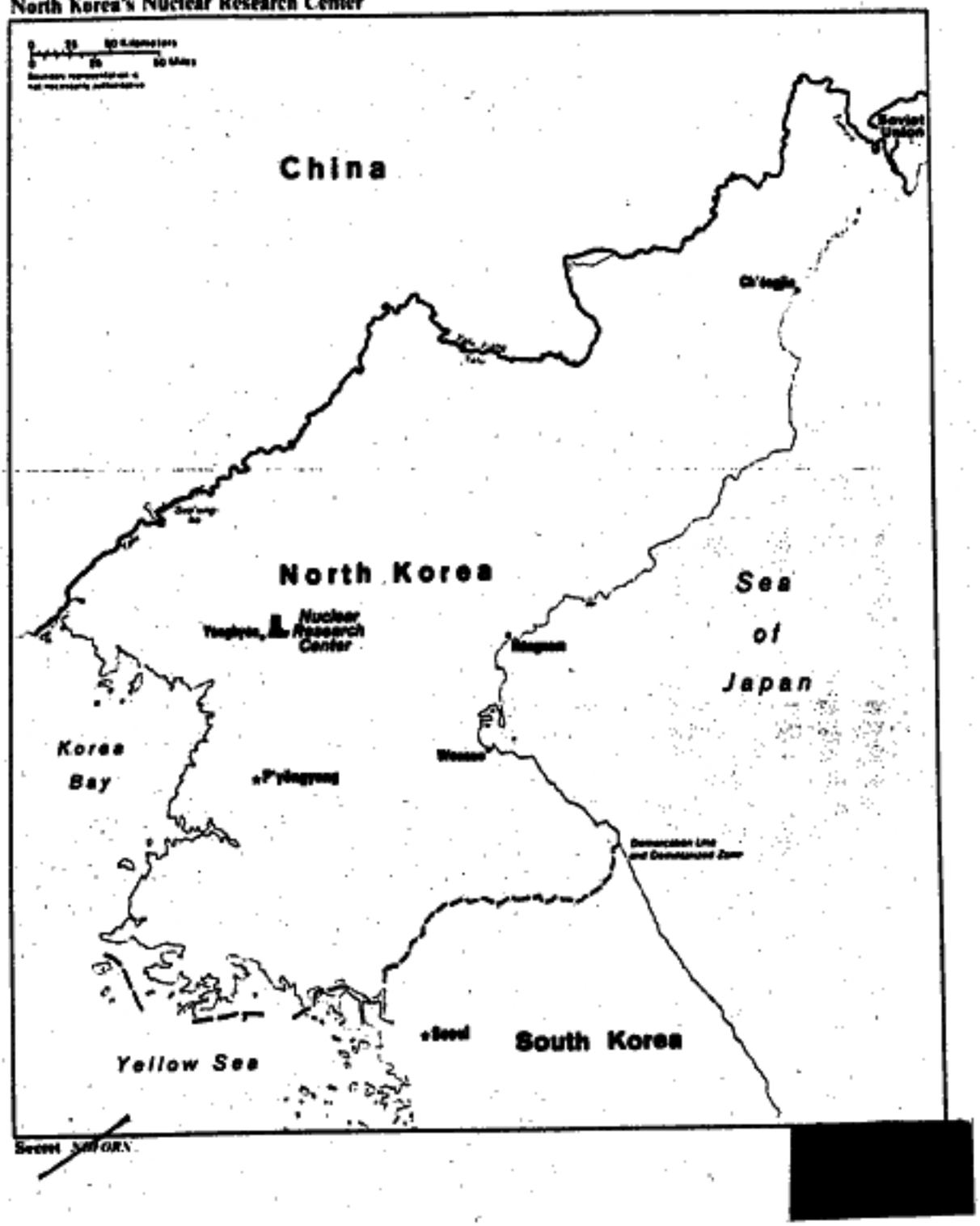
P'yongyang's interest in nuclear power stems from its need for additional sources of energy as well as a desire to increase its international prestige. [redacted]

The Yongbyon Nuclear Research Center, the home of the North's research efforts, was established with Soviet assistance in the 1960s. [redacted] Until the early 1980s, the Center consisted of an operations area with a small, 4-megawatt (MW) research reactor under IAEA safeguards and a large support area. Since an expansion program began in 1980, a 30-MW reactor and support buildings have been added. The reactor, which is graphite moderated, gas-cooled, and fueled with natural uranium, was completed in 1986 [redacted]

In our opinion, the new reactor could be a training facility to support P'yongyang's nuclear efforts or it could be used to augment an existing isotope-production capability. Generation of electric power is another possibility, [redacted] In our opinion, the reactor also could produce weapons-grade plutonium- [redacted] In addition to constructing a new reactor facility, we believe that P'yongyang probably has developed portions of the front end of the nuclear fuel cycle--uranium mining, milling, conversion, and fuel fabrication--to provide fuel for the reactor. [redacted]

[redacted]

Figure 1
North Korea's Nuclear Research Center



Secret NOFORN

Pages: 2 pages

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

The New Reactor, the NPT, and the Soviets

The North's need for additional help to advance its nuclear effort appears to underlie its accession to the NPT. In our opinion, Moscow was instrumental in inducing P'yongyang to sign the NPT in December 1985. The Soviets have been involved in North Korea's nuclear power program since at least 1956. In addition to providing technical assistance, Moscow has supplied a 4-MW research reactor and assisted in the construction of the Yongbyon Nuclear Research Center. Most recently the Soviets, apparently in response to P'yongyang's accession to the NPT, agreed to build at least one power plant that could be composed of as many as four 440-MW reactors. Neither side has announced the project's location, but the Soviet press [redacted] indicate this nuclear power plant will be built before 1993.

Notwithstanding the Soviets' influence, the North's reluctance to publicly acknowledge the existence of its new reactor and bring it promptly under the NPT's safeguard provisions is a matter of concern. In accordance with the NPT, the North should enter into a safeguards agreement with the International Atomic Energy Agency (IAEA) within 18 months of accession, including assenting to on-site inspection of its declared nuclear facilities. [redacted]

The North's expanded nuclear program could include an effort to develop nuclear weapons. [redacted]

Outlook

In our judgment, P'yongyang could be waiting for an opportunity to announce the reactor's existence in a way that would gain maximum propaganda value. P'yongyang's declaration of its indigenous nuclear reactor would give the North an opportunity to project itself as a nation with technological prowess. Further, the North can point to its domestic nuclear efforts as proof of its national self-reliance and still accept further nuclear assistance from the Soviets. Given Moscow's role

in the North's nuclear power program and its decision to become a party to the NPT, [redacted]

The North Koreans' penchant for secrecy could explain in part P'yongyang's foot-dragging in implementing NPT provisions. But whatever their peculiarities, we believe there is good reason to closely scrutinize the implications of the delay in declaring the existence of the new reactor. [redacted]

SECRET

[redacted]

28 MAY 87

NORTH KOREA: Delaying Safeguards Agreement

North Korea has been slow in complying with provisions of the Non-Proliferation Treaty that require a country to enter into a safeguards agreement with the International Atomic Energy Agency within 18 months after signing the document. The North Koreans signed the treaty in late 1985 at Moscow's urging.

[redacted]

There is no indication that North Korea has an active nuclear weapons program, but P'yongyang's failure to establish full safeguards is certain to trouble Seoul. Other countries have exceeded the treaty's 18-month deadline provision.

[redacted]

SECRET

SECRET NOFORN NOCONTRACT ORCON

Central Intelligence Agency

Washington D C 20505

[redacted]

DIRECTORATE OF INTELLIGENCE

03 May 1988

North Korea's Expending Nuclear Efforts [redacted]

Summary

[redacted]

P'yongyang's accession to the Nuclear Nonproliferation Treaty (NPT) in December 1985 obligates it to bring all of its nuclear facilities under full-scope International Atomic Energy Agency safeguards, but it has yet to enter into the required safeguards agreement or acknowledge new nuclear-related facilities. These failures have raised South Korean concerns about the North's nuclear intentions, with Seoul publicly stating that P'yongyang could have nuclear weapons in a few years. North Korea suffers from chronic energy shortages, and the Soviets have agreed to help build a nuclear power plant, suggesting at least part

[redacted]

WARNING NOTICE--INTELLIGENCE SOURCES OR METHODS INVOLVED

SECRET NOFORN NOCONTRACT ORCON

of P'yongyang's nuclear program is aimed at developing a new energy source. We have no evidence that North Korea is pursuing a nuclear weapon option, but we cannot rule out that possibility. [redacted]

P'yongyang's Nuclear Efforts...

The Yongbyon Nuclear Research Center, the focal point of the North's nuclear efforts, was established with Soviet assistance in the 1980s (see figures 1 and 2). Until the early 1980s, the center consisted of an operations area with a 4-megawatt (MW) research reactor, supplied by the Soviets under IAEA safeguards, and a large support area. Since the North began an expansion program in 1980, it has constructed more support buildings and a 10- to 30-MW graphite-moderated, gas-cooled reactor fueled with natural uranium.[1] [redacted] The new reactor has been in regular operation since October 1987. [redacted]

In our view, at least part of North Korea's nuclear program is aimed at developing a new energy source. [redacted] P'yongyang has initiated a major hydroelectric power project at Kumgangsan in southwestern North Korea and is constructing thermal power plants throughout the country. The Soviets have agreed to help build a nuclear power plant, and the North may well hope this will be the beginning of a series of nuclear projects that will help its energy-short economy. [redacted]

Nonetheless, the new 10- to 30-MW reactor raises some questions. The reactor could be used for power generation, [redacted] and its limited estimated electric output would do little to ease P'yongyang's energy shortages. [redacted]

[1] We believe P'yongyang probably has also developed portions of the front end of the nuclear fuel cycle--uranium mining, milling, and fuel fabrication--to provide fuel for its nuclear activities. [redacted]

...And Nonproliferation Performance

The issue of the purpose for the 10- to 30-MW reactor--along with the North's unwillingness to acknowledge its existence--highlights P'yongyang's failure to follow up on its accession to the Nuclear Nonproliferation Treaty (NPT) in December 1985. In accordance with the NPT, the North should have entered into a safeguards agreement--including declaration and on-site inspection of its nuclear facilities--with the International Atomic Energy Agency (IAEA) within 18 months. On 2 June 1987--days before its target date--the North Koreans rejected the proposed IAEA safeguards agreement, claiming it infringed on their national sovereignty because it was more restrictive than the model NPT Safeguards Agreement.

[redacted]

In our view, implementation of a full-scope safeguards agreement is, at best, many months away.

The Soviet Connection

We believe Moscow played a large role in encouraging P'yongyang to sign the NPT in December 1985. The Soviets have been involved in North Korea's nuclear program since at least 1956. In addition to providing technical assistance, Moscow has supplied a 4-MW research reactor and assisted in the construction of the Yongbyon Nuclear Research Center.

North Korea deposited its instrument of accession with the Soviets and the Soviet press announced P'yongyang's decision to join the NPT. The North Korean press, on the other hand, was silent. Moscow, apparently in response to P'yongyang's accession to the NPT, agreed to build at least one power plant that could be composed of as many as four 440-MW reactors. Neither side has announced the project's location, but the Soviet press [redacted] indicate the plant will be built before 1993.

Outlook

[redacted] Nonetheless, the possibility that P'yongyang is developing a reprocessing capability and its footdragging on implementing NPT provisions, suggest close scrutiny of the North's nuclear effort is in order. The South Koreans are clearly pursuing that course. [redacted] South Korean believes P'yongyang is developing a nuclear weapon capability--a concern that Seoul has raised publicly-

[redacted]

SECRET NOFORN NOCONTRACT ORCON

Central Intelligence Agency

Washington D.C. 20505

[redacted]

DIRECTORATE OF INTELLIGENCE

26 May 1988

North Korea's Expanding Nuclear Efforts [redacted]

Summary

[redacted]

P'yongyang's accession to the Nuclear Nonproliferation Treaty (NPT) in December 1985 obligates it to bring all of its nuclear facilities under full-scope International Atomic Energy Agency safeguards, but it has yet to enter into the required safeguards agreement or acknowledge new nuclear-related facilities. These failures have raised South Korean concerns about the North's nuclear intentions, with Seoul publicly stating that P'yongyang could have nuclear weapons in a few years. North Korea suffers from chronic energy shortages, and the Soviets have agreed to help build a nuclear power plant, suggesting at least part of P'yongyang's nuclear program is aimed at developing a new energy

[redacted]

WARNING NOTICE - INTELLIGENCE SOURCES OR METHODS INVOLVED

source. We have no evidence that North Korea is pursuing a nuclear weapon option, but we cannot rule out that possibility.

P'yongyang's Nuclear Efforts...

The Yongbyon Nuclear Research Center, the focal point of the North's nuclear efforts, was established with Soviet assistance in the 1960s. Until the early 1980s, the center consisted of an operations area with a 2-megawatt (MW) research reactor, supplied by the Soviets under IAEA safeguards, and a large support area. Since the North began an expansion program in 1980, it has constructed more support buildings and a 10- to 30-MW graphite-moderated, gas-cooled reactor fueled with natural uranium.[1]

In our view, at least part of North Korea's nuclear program is aimed at developing a new energy source.

P'yongyang has initiated a major hydroelectric power project at Kumgangsan in southwestern North Korea, and is constructing thermal power plants throughout the country. The Soviets have agreed to help build a nuclear power plant, and the North may well hope this will be the beginning of a series of nuclear projects that will help its energy-short economy.

Nonetheless, the new 10- to 30-MW reactor raises some questions. The reactor could be used for power generation, and its limited estimated electric output would do little to ease P'yongyang's energy shortages.

[1] We believe P'yongyang probably has also developed portions of the front end of the nuclear fuel cycle--uranium mining, milling, and fuel fabrication--to provide fuel for its nuclear activities.

...And Nonproliferation Performance

The issue of the purpose for the 10- to 30-MW reactor--along with the North's unwillingness to acknowledge its existence--highlights P'yongyang's failure to follow up on its accession to the Nuclear Nonproliferation Treaty (NPT) in December 1985. In accordance with the NPT, the North should have entered into a safeguards agreement--including declaration and on-site inspection of its nuclear facilities--with the International Atomic Energy Agency (IAEA) within 18 months. On 2 June 1987--days before its target date--the North Koreans rejected the proposed IAEA safeguards agreement, claiming it infringed on their national sovereignty because it was more restrictive than the model NPT Safeguards Agreement. [redacted] In our view, implementation of a full-scope safeguards agreement is, at best, many months away. [redacted]

The Soviet Connection

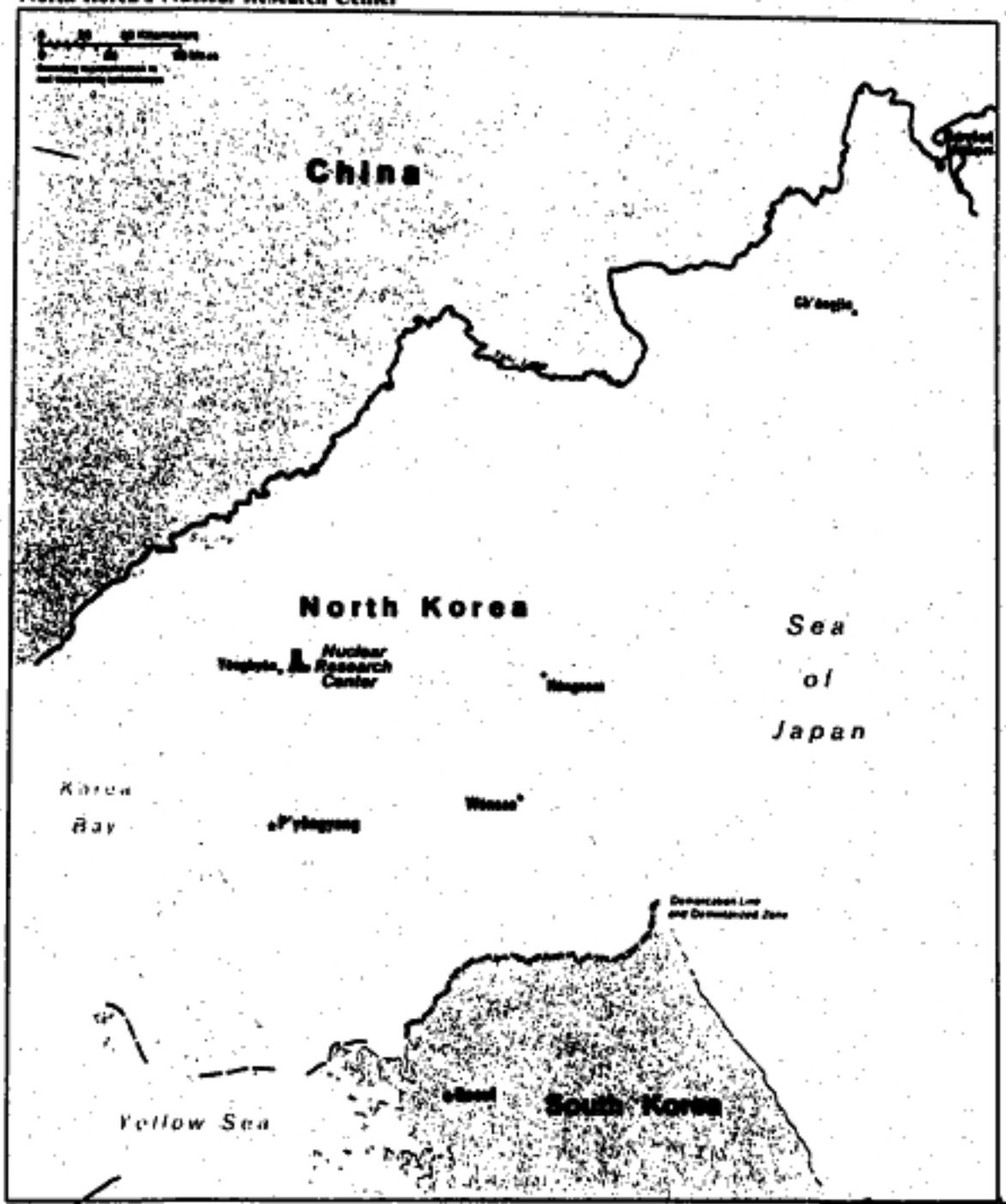
We believe Moscow played a large role in encouraging P'yongyang to sign the NPT in December 1985. The Soviets have been involved in North Korea's nuclear program since at least 1956. In addition to providing technical assistance, Moscow has supplied a 4-MW research reactor and assisted in the construction of the Yongbyon Nuclear Research Center. [redacted]

North Korea deposited its instrument of accession with the Soviets and the Soviet press announced P'yongyang's decision to join the NPT. The North Korean press, on the other hand, was silent. Moscow, apparently in response to P'yongyang's accession to the NPT, agreed to build at least one power plant that could be composed of as many as four 440-MW reactors. Neither side has announced the project's location, but the Soviet press [redacted] indicate the plant will be built before 1993. [redacted]

Outlook

[redacted] Nonetheless, the possibility that P'yongyang is developing a reprocessing capability and its footdragging on implementing NPT provisions, suggest close scrutiny of the North's nuclear effort is in order. The South Koreans are clearly pursuing that course. [redacted] the South Korean [redacted] believes P'yongyang is developing a nuclear weapon capability--a concern that Seoul has raised publicly- [redacted]

Figure 1
North Korea's Nuclear Research Center



Secret NOFORN

Pages: 4 pages

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

SECRET [redacted]

22 MAR 89

Special Analysis

NORTH KOREA: Nuclear Program of Proliferation Concern

North Korea is rapidly expanding its nuclear-related activities.

[redacted]

The Yongbyon Nuclear Research Center, about 90 kilometers north of P'yongyang, is the focal point of North Korea's nuclear program.

[redacted]

North Korea, despite severe economic constraints, has expanded activities at Yongbyon over the past decade. It operates a 4-megawatt-thermal (MWt) research reactor, supplied by the Soviets in mid-1964, an indigenously designed 30-MWt research reactor modeled after 1950s British plutonium production reactors.

[redacted]

The Program's Goal

The North suffers chronic energy shortages, and the new plants at Yongbyon may be part of a civilian power-generation program. [redacted] the 30-MWt reactor [redacted] can generate electrical power.

[redacted]

continued

North Korea and the IAEA: The Next Round

P'yongyang has assured Soviet and IAEA officials that it will open formal safeguards negotiations with the IAEA this month. [redacted]

The North has repeatedly missed target dates for such talks, and the IAEA is concerned that P'yongyang may find new pretexts to postpone any talks. [redacted]

Even if negotiations are successful, there are loopholes in the standard safeguards agreement that would allow the North to delay implementation indefinitely or to limit coverage to select facilities:

- North Korea must officially notify the IAEA that an agreement meets all internal statutory requirements before it can enter into force. There is no explicit time limit for this step.
- Once an agreement takes effect, P'yongyang has 60 days to declare all facilities that contain nuclear materials subject to safeguards. [redacted]

Lengthy delays in implementation or incomplete declarations to the IAEA would increase international concern that the North's activities at Yongbyon are not strictly peaceful.

Secret
NOFORN ORCON

[redacted]

North Korea acceded to the Nuclear Non-Proliferation Treaty in 1985 but has not entered into a safeguards agreement. Only the Soviet-supplied research reactor is under IAEA safeguards. [redacted]

North Korea may be willing to risk the international censure that a nuclear weapons program would bring in order to maintain a decided military advantage over the South, the keystone of the North's national security policy. P'yongyang may believe that nuclear weapons are crucial to preserving that edge. [redacted]

Directorate of Intelligence

[redacted] Secret

[redacted]

A 10-Year Projection of Possible Events of Nuclear Proliferation Concern [redacted]

A Reference Aid

28

Secret
[redacted]
May 1983
Copy 167

Directorate of
Intelligence

Secret [redacted]

A 10-Year Projection of Possible Events of Nuclear Proliferation Concern [redacted]

A Reference Aid

[redacted]

Secret [redacted]
May 1983

A 10-Year Projection of Possible Events of Nuclear Proliferation Concern [redacted]

Introduction

Information available as of 21 December 1982 was used in this report.

Nuclear proliferation involves capability and intent; that is, the ability to construct a nuclear explosive and the motivation to do so. Capability largely comprises physical facilities and know-how. Intent is mainly a political question and involves a country's own balancing of factors affecting its security, prestige, and other interests.

The proliferation equation is affected by a variety of events, both political and technical. Relevant political events include leadership changes or emergence of new governments, establishment of cooperation among governments, and negotiation of contractual arrangements or agreements between governments. Relevant technical events include such occurrences as startup or acquisition of new facilities.

This paper is intended to give a concise overview of possible future events that could bear on nuclear proliferation. It is intended as a reference aid for nonproliferation policymakers to help prepare them to deal with such events, should they occur.

The main thrust of this paper is to project an integrated chronology of possible political and technical events over the next 10 years. The paper is organized by geographic regions and, within regions, by major countries of proliferation concern. Both supplier nations and countries viewed as potential proliferators are considered. A chronology of possible events is projected for each country and for key international nuclear organizations. This chronology is preceded by a pictogram that summarizes the near-term nuclear capabilities of countries of major proliferation concern.

The technical events are heavily concentrated on the startup of two types of sensitive fuel-cycle facilities: reprocessing and enrichment plants. Fast breeder reactors also are included, to the extent plans for such reactors can be anticipated. Other reactors are included only where they would have particular proliferation significance. Likewise, other fuel-cycle facilities are mentioned (for example, fuel fabrication plants) if they will materially aid a country in reaching nuclear independence.

For ease of reference, events concerning sensitive facilities—enrichment and reprocessing plants—are also presented chronologically in a separate appendix, grouped by type of facility and by geographic area.

This paper is an update of an earlier research paper published in July 1979.

[redacted]

Pages: V. - 4

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

[redacted]

North Korea has sought assistance [redacted] to build a nuclear power plant. Although these efforts have failed for financial and political reasons, we expect North Korea to continue to pursue its aim of acquiring a nuclear power reactor during the 1980s. We have no basis for believing that the North Koreans have either the facilities or materials necessary to develop and test nuclear weapons [redacted]

[redacted]

North Korea. North Korea has a small nuclear research program that includes the use of a 4-MW modified IRT-type research reactor supplied by the Soviets. This reactor was constructed during the 1960s at the Yongbyun nuclear research center [redacted]

Pages: 6-23

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

[redacted]

Directorate of Intelligence

Top Secret (N)

[redacted]

North Korea: Potential for Nuclear Weapon Development [redacted]

An Intelligence Assessment

Top Secret

[redacted]

September 1986

Copy

276

43

[redacted]

Directorate of Intelligence

Top Secret [redacted]

North Korea: Potential for Nuclear Weapon Development [redacted]

An Intelligence Assessment

[redacted]

Reverse Blank

Top Secret [redacted]

September 1986

[redacted]

North Korea: Potential for Nuclear Weapon Development [redacted]

Key Judgments

Information available as of 9 April 1986 was used in this report.

[redacted]

- In December 1985, at the urging of the USSR, North Korea acceded to the nuclear Non-Proliferation Treaty (NPT), renouncing acquisition of nuclear explosives and accepting safeguards on its nuclear activities.
- North Korea's penchant for military secrecy makes it unlikely that it would locate a primarily military reactor at a known research center or agree, as it has with NPT adherence, to open it to international inspection.
- The Soviet role in extracting the NPT pledge and subsequently selling North Korea a nuclear power reactor puts Moscow's prestige on the line in guaranteeing a peaceful program, with renewed economic and military aid the lever to enforce it.

[redacted]

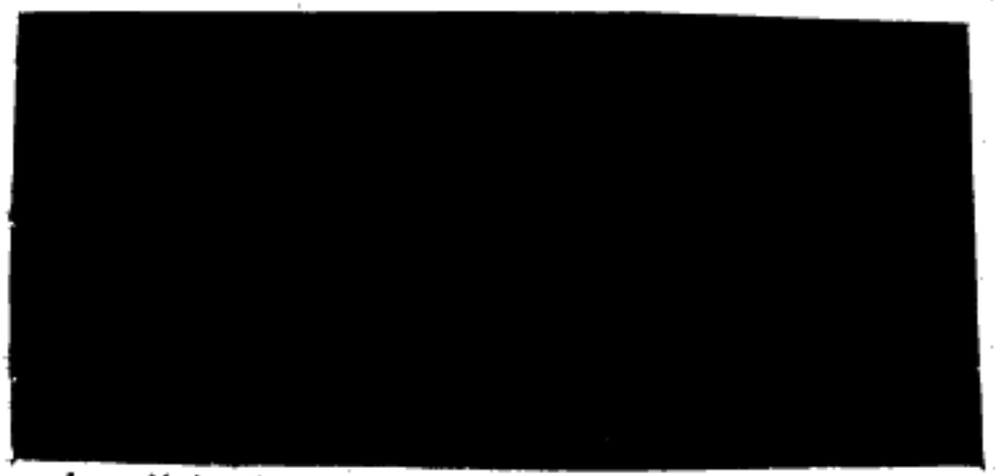
[redacted]

[redacted]

We have little information on North Korea's ability to conduct the nonnuclear research, particularly that involving high explosives, required for a nuclear weapons research program. [redacted] The North Koreans already have a suitable nuclear delivery system in the MIG-23 fighter [redacted]

Pages: V

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



In considering whether to embark on a venture as costly, hazardous, and politically sensitive as a nuclear weapons program, P'yongyang would face a complex calculation of benefits versus costs, as well as considerable uncertainty regarding the effect of such a program on its ultimate goal of reunifying the peninsula on its own terms. It might see nuclear weapons as a means of forcing political concessions from Seoul, as a hedge against possible South Korean development of a nuclear weapons capability, as leverage to gain a freer hand in paramilitary operations without provoking a military response, as deterring a US nuclear response to an attack on the South, or as a means of carrying out offensive operations in an all-out attack.[redacted]

P'yongyang would also see disadvantages, particularly if it recognized the difficulty of concealing such a program. Exposure could lead South Korea—with its superior nuclear technology—to develop nuclear weapons as a response. P'yongyang would also have to weigh the effect on the US commitment to Seoul under such an increased threat. Moreover, the North would have to calculate the less tangible, but still significant, impact on the diplomacy it has pursued for over two years aimed in large part at encouraging the eventual withdrawal of US forces. P'yongyang would also consider the likelihood that a weapons program would complicate its improved relations with Moscow.[redacted]

Contents

North Korea: Potential for Nuclear Weapon Development [redacted]

Introduction

Until 1984 the North Korean nuclear program was not viewed as a serious proliferation concern. Up to that time, available evidence had painted a picture of a rudimentary program incapable of very advanced research. [redacted] This paper presents that reassessment, which is based on subsequently developed information and a reinterpretation of information available in 1984. It addresses the extent of North Korean nuclear development, the reasons for it, and the potential for using it in the construction of nuclear weapons. [redacted]

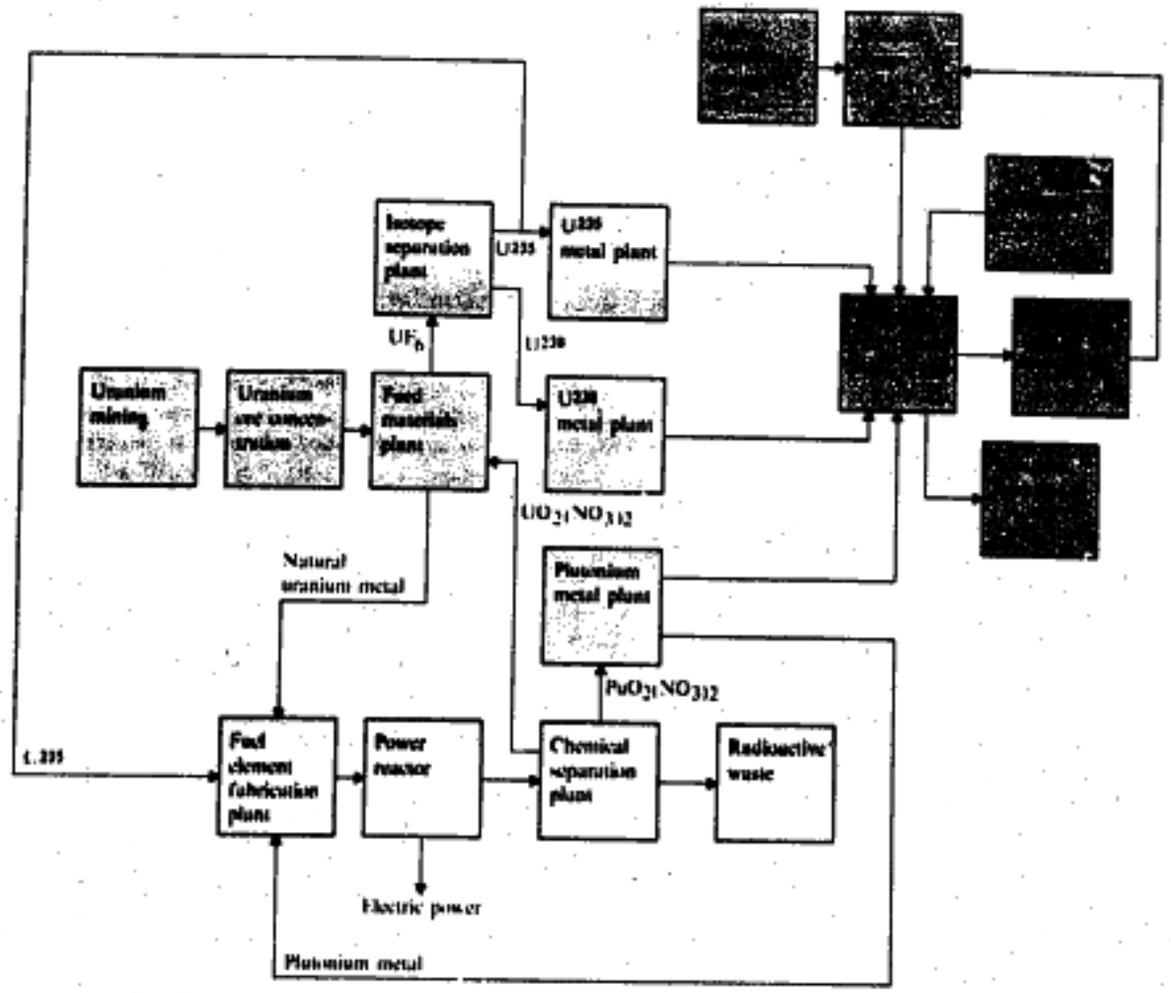
A Nuclear Weapons Capability—How Soon?

The development of the capability to build nuclear weapons involves a variety of technological steps. These steps consist of a combination of some activities that are also necessary for the peaceful uses of nuclear energy and of some specific activities uniquely related to weapons. Figure 2 shows the way in which these various steps fit together. The pacing element (for all but the most technologically advanced states) is typically the production of fissile material (that is, plutonium or highly enriched uranium). The construction and operation of both a reactor and a spent-fuel reprocessing plant are necessary for plutonium acquisition. (A weapons cycle using enriched uranium can bypass these steps, but only with the generally visible construction of an enrichment plant.) Both of these items can be involved in strictly peaceful endeavors. Although these facilities have physical observables (and can be detected through a variety of collection means), this potential for dual purpose complicates our analysis of intended purpose. (S NF)

[redacted]

[1] This and other technical terms used in this paper are defined in the glossary (appendix D[redacted]

Figure 2
Production of Fissionable Materials and Nuclear Weapons



assured of surviving the stockpile-to-target sequence. However, such requirements are very flexible; nuclear weapons were used against Japan three weeks after the concept of a nuclear explosive was proved.

Background

The largest research facility is the Yongbyon Nuclear Research Center (figure 3). Construction began in the early 1960s with Soviet assistance. The Soviets also supplied a 2-MW IRT research reactor

It is subject to IAEA safeguards under a 1977 agreement.

The nuclear device design and development and high-explosive testing that are required would probably occur in parallel with production of the necessary fissile material and are unlikely to be pacing factors.

Once the raw materials and device design are available, it might take several months to assemble a nuclear device. Suitable delivery systems are already available, and crude versions of the necessary non-nuclear components could be adapted from them. Another year might be required to weaponize a device so that it could be mated to the delivery system and be

Pages: 4-7

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

[redacted]

The scope of any North Korean reprocessing requirement would depend on the type of fuel cladding used, the type of spent-fuel storage, and how fast the North Koreans want the plutonium. Whether the North Koreans intend to reprocess the spent fuel to recover the plutonium, they would probably have to reprocess a magnesium-clad fuel (or arrange for another party to reprocess it) to avoid a radiological hazard. This would not be the case for an aluminum- or zirconium-clad fuel.

[redacted]

[redacted]

Delivery Systems

North Korea has a variety of missiles and aircraft that could deliver a nuclear weapon to most major targets in South Kore[redacted]

Nonnuclear Aspects of Weapons Development

A capability to develop nuclear weapons clearly involves more than just the production of nuclear material. The ability to develop and test the nonnuclear components, particularly the high-explosive system, is required, both for device development and weaponization. A suitable delivery system must also be available[redacted]

P'yongyang's new MIG-23 fighter, with minor modifications, would probably be the preferred delivery aircraft. It has sufficient range to reach the more important targets in the northern part of South Korea[redacted]

High-Explosive and Component Development and Testing

[redacted]

Other delivery systems available to North Korea would be less desirable[redacted]

Pages: 10 - 11

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

[redacted]

Nevertheless, NPT adherence itself does not provide ironclad assurances against nuclear weapons development.

[redacted]

The NPT also contains a clause allowing a country to withdraw on 90 days' notice under special conditions.

[redacted]

P'yongyang, moreover, must now negotiate the necessary safeguards agreements and actually open indigenous facilities to IAEA inspectors. These arrangements should lead to greater foreign access to North Korean nuclear facilities, more openness in the North Korean nuclear program, and improved estimates of North Korean capabilities. Safeguards shou'd provide a timely indicator of any North Korean construction of a reprocessing plant or any attempt to divert plutonium or spent fuel to a weapons program. If North Korea intends to pursue a nuclear weapons program, it has made its job much more difficult by signing the NPT.

Motivation for Nuclear Development

NPT Accession

On 12 December 1985, North Korea deposited with the USSR its instrument of accession to the NPT. In acceding to the treaty, P'yongyang foreswore the manufacture or acquisition of nuclear weapons and agreed to IAEA safeguards on all its peaceful nuclear activities.

[redacted]

The military will almost certainly object to revelation of any projects in which it might be involved, even peripherally. We also expect P'yongyang to preclude access to its facilities by IAEA inspectors from most Western countries, a right it would have under standard IAEA inspection procedures.

[redacted]

[redacted] by the end of the 1980s [redacted]

North Korea has a civilian nuclear power program that Yongbyon probably can support in any case. In March 1981, P'yongyang announced that, as part of the goal of expanded electricity production adopted by the 1980 Party Congress, it would have nuclear power

Pages: 14

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

[redacted]

Whether the current nuclear developments in North Korea reflect a nuclear weapons program, they represent a considerable developing capability.

[redacted]

Pages: 16

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

Appendix A

Background of North Korean Nuclear Program

The Beginning

North Korea's nuclear program dates at least from its participation in the founding in 1956 of the Joint Institute for Nuclear Research at Dubna, outside Moscow. Through 1981, according to a Soviet press statement, 120 North Koreans had studied there, and we judge that about another 30 have done so since. In September 1959, North Korea and the Soviet Union concluded a nuclear cooperation agreement, probably as a direct result of the US–South Korean agreement signed in July of that year.

the USSR subsequently supplied North Korea with a 2-megawatt (MW) IRT-type (that is, pool type, light-water moderated, and enriched-uranium fueled) research reactor and assistance in the construction of the Yongbyon Nuclear Research Center.

The IRT reactor was originally supplied without IAEA safeguards. However, according to published IAEA documents, the reactor, the critical assembly, and all associated fuel are now subject to safeguards under an agreement negotiated in 1977.

Pages: 18

Exemptions: (6)(1), (6)(3)

[redacted]

The USSR reversed itself, however, during the visit of North Korean Premier Kang Song-san to Moscow in December 1985. According to official press accounts, the two countries signed an agreement on supply of a nuclear power plant. North Korea's accession to the Non-Proliferation Treaty (NPT) was announced almost simultaneously, meaning the reactor—and all other North Korean nuclear activities—would be subject to safeguards [redacted]

Pages: 21-31

Exemptions: (5)(1), (6)(3)

Appendix D

Glossary

Term	Definition
Burnup	A measure of reactor fuel consumption. For example, the percentage of fuel atoms that have undergone fission, or the amount of energy produced per unit weight of fuel in the reactor.
Cladding	The outer jacket of nuclear fuel elements. It prevents corrosion of the fuel and the release of fission products into the coolant. Aluminum or its alloys, stainless steel, magnesium alloys, and zirconium alloys are common cladding materials.
Control rod drive mechanism	Mechanism used to actuate the movement of control rods in a nuclear reactor
Control rod	A rod, plate, or tube containing a material that readily absorbs neutrons (hafnium, boron, and so forth), used to control the power of a nuclear reactor. By absorbing neutrons, a control rod prevents the neutrons from causing further fission.
Safety control rod	A standby control rod used to shut down a nuclear reactor rapidly in emergencies.
Shim control rod	A reactor control rod used in making infrequent coarse adjustments in reactivity, as in startup or shutdown.
Coolant	A substance circulated through a nuclear reactor to remove or transfer heat. Common coolants are water, air, carbon dioxide, helium, and liquid sodium.
Core	The central portion of a nuclear reactor, containing the fuel elements and usually the moderator but not the reflector.
Critical assembly	An assembly of sufficient fissionable material and moderator to sustain a fission chain reaction at a very low power level.
Criticality	The state of a nuclear reactor when it is sustaining a chain reaction.
Cyclotron	A particle accelerator in which charged particles receive repeated synchronized accelerations by electrical fields as the particles spiral outward from their source. The particles are kept in the spiral by a powerful magnetic field.
Dual use	Having more than one application (that is, nuclear and nonnuclear).

Enriched uranium	Material in which the percentage of a given isotope present in a material has been artificially increased, so that it is higher than the percentage of that isotope naturally found in the material. Enriched uranium contains more of fissionable isotope uranium-235 than the naturally occurring percentage of 0.7.
Fast neutron	A neutron with energy greater than approximately 100,000 electron volts.
Thermal neutron	A neutron in thermal equilibrium with its surrounding medium. Thermal neutrons are those 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.
Fissile material	While sometimes used as a synonym for fissionable material, this term has also acquired a more restricted meaning, namely, any material fissionable by neutrons of all energies, including (and especially) thermal (slow) neutrons as well as fast neutrons; for example, uranium-235 and plutonium-239.
Fuel	Fissionable material used or usable to produce energy in a reactor. Also applied to a mixture such as natural uranium, in which only part of the atoms are readily fissionable, if the mixture can be made to sustain a chain reaction.
Fresh fuel	Fuel which has not been irradiated (that is, has not been placed into a reactor).
Spent fuel	Nuclear reactor fuel that has been irradiated (used) and permanently removed from the reactor.
Fuel cycle	The series of steps involved in supplying fuel for nuclear power reactors.
Front end (of nuclear fuel cycle)	The series of steps including uranium mining, concentration, conversion, enrichment, and fuel element fabrication.
Back end (of nuclear fuel cycle)	Steps of the nuclear fuel cycle including handling of discharged fuel elements from reactor, chemical reprocessing, recycling of recovered fissile and fertile material, and disposing of radioactive waste.
Heavy water	Water containing significantly more than the natural proportion (one in 6,500) of heavy hydrogen (deuterium) atoms to ordinary hydrogen atoms. Heavy water is used as a moderator in some reactors because it slows down neutrons effectively and also has a low cross section for absorption of neutrons.
Light water	Ordinary water.
Ion exchange	A chemical process involving the reversible interchange of various ions between a solution and a solid material, usually a plastic or a resin. It is used to separate and purify chemicals such as fission products, rare earths, and so forth, in solutions.

IAEA	The International Atomic Energy Agency, a Vienna-based UN-affiliated organization with over 110 members, founded in 1957. Its purpose is to foster peaceful applications of nuclear energy and carry out a program of on-site inspections, audits, and inventory controls known collectively as safeguards.
IAEA Safeguards	The basic purpose of IAEA safeguards is to deter the diversion of nuclear materials from peaceful uses to military or explosive purposes by timely detection. The agency monitors the flow of nuclear materials at nuclear installations by auditing plant records and conducting physical inventories. Seals and cameras are used to ensure that materials are not diverted while IAEA inspectors are not present.
Leaching, acid and carbonate	Process by which uranium ore is subjected to a process to separate the pure uranium from other waste materials. Both acids, such as sulfuric acid, and alkalines, such as sodium carbonate, can be used.
Moderator	A material, such as ordinary water, heavy water, or graphite, used in a reactor to slow down high-velocity neutrons, thus increasing the likelihood of further fission.
Natural uranium	Uranium as found in nature, containing 0.7 percent of U^{235}, 99.3 percent of U^{238}, and a trace of U^{234}. It is also called normal uranium.
Neutron flux	A measure of the intensity of neutron radiation. It is the number of neutrons passing through 1 square centimeter of a given target in one second.
Non-Proliferation Treaty (NPT)	The treaty opened for signature in 1968, entered into force in 1970, and now has over 130 parties. The treaty binds nuclear weapons-holding signatories not to transfer nuclear weapons to any other countries and requires them to pursue nuclear disarmament. It commits non-weapons-holding parties not to manufacture or otherwise acquire them and to subject all peaceful nuclear activities to IAEA safeguards. It commits all parties to foster nuclear technology transfer but to transfer material and equipment only under safeguards.
Nuclear-grade graphite	Graphite of high purity used as a moderator in reactors. Reactor-grade graphite is made artificially (since naturally occurring graphite is relatively impure) by graphitization of petroleum coke.
Postirradiation examination	The process of subjecting materials (frequently reactor fuel) to a variety of mechanical and chemical tests to determine the effects of irradiation.
Radiation detectors	Devices that detect and record the characteristics of ionizing radiation. For example, Geiger counter or dosimeter.
Radiation dosimetry	The measurement of the amount of radiation delivered to a specific place or the amount of radiation that was absorbed there. For example, dosimeter or ionization chamber.

Radioisotope	A radioactive isotope. An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation.
Radiopharmaceutical	A radioactive isotope used for medical purposes.
Radionuclide	A radioactive nuclide.
Reactor	A device in which a fission chain reaction can be initiated, maintained, and controlled.
Reactor-grade plutonium	Plutonium that has a high Pu^{240} content, currently in the range of 15 to 25 percent. It could be substituted for weapons Plutonium in some weapons applications, but with decreased yield.
Reflector	A layer of material immediately surrounding a reactor core that scatters back or reflects into the core many neutrons that would otherwise escape. The returned neutrons can then cause more fissions and improve the neutron economy of the reactor. Common reflector materials are graphite, beryllium, and natural uranium.
Reprocessing	The processing of reactor fuel to recover the produced and unused fissionable materials.
Aqueous phase	The chemical stream in a reprocessing plant containing nitric acid and dissolved uranium, plutonium, and fission products.
Organic phase	The chemical stream in a reprocessing plant that contains an organic solvent designed to extract plutonium and uranium from the aqueous phase when brought into contact.
Phase-mixing separation	The aqueous and organic phases are mixed to allow the organic solvent to combine with the uranium and plutonium. The phases must then be separated to allow the fission products remaining in the aqueous phase to go to waste and the fissile material to go to further recovery. Equipment used includes mixer-settlers, pulse column extractors, and centrifugal contactors.
Spent-fuel storage pond	Storage pools constructed as part of the power plant complex for discharged fuel elements.
Uranium conversion	The chemical and metallurgical operations involved in purifying and converting virgin or recycled uranium to forms suitable for use in the fabrication of reactor fuel elements or as feed to uranium enrichment facilities. The principal product forms are uranium hexafluoride, uranium metal, and uranium dioxide.

Uranium ore processing and concentration The process of taking uranium ore, typically less than 0.2 percent uranium, grinding and sorting it and chemically concentrating it into U_3O_8, commonly called yellowcake, of between 75 percent and 90 percent purity.

Weapons-grade plutonium The plutonium used in weapons applications, commonly considered to contain 6.5 percent or less Pu^{240}.

Yellowcake Certain uranium concentrates produced by uranium mills; while technically those concentrates in which uranium is mainly in the form of ammonium diuranate or sodium diuranate, it has also come to include U_3O_8.

[redacted]

SECRET [redacted]

[redacted]

22 OCT 86

KEY JUDGMENTS: NORTH KOREA: POTENTIAL FOR NUCLEAR WEAPON DEVELOPMENT [redacted]

The following Key Judgments are reprinted from a recently published Intelligence Assessment produced by the Office of Scientific and Weapons Research. [redacted]

A copy of the complete report [redacted] Top Secret [redacted] is available from CPAS. [redacted]

[redacted]

-- In December 1985, at the urging of the USSR, North Korea acceded to the Nuclear Non-Proliferation Treaty (NPT), renouncing acquisition of nuclear explosives and accepting safeguards on its nuclear activities.

-- North Korea's penchant for military secrecy makes it unlikely that it would locate a primarily military reactor at a known research center or agree, as it has with NPT adherence, to open it to international inspection.

-- The Soviet role in extracting the NPT pledge and subsequently selling North Korea a nuclear power reactor puts Moscow's prestige on the line in guaranteeing a peaceful program, with renewed economic and military aid the lever to enforce it.

[redacted]

[redacted]

We have little information on North Korea's ability to conduct the non-nuclear research, particularly that involving high explosives, required for a nuclear weapons research program.

[redacted] The North Koreans already have a suitable nuclear delivery system in the MiG-23 fighter

[redacted]

In considering whether to embark on a venture as costly, hazardous, and politically sensitive as a nuclear weapons program, P'yongyang would face a complex calculation of benefits versus costs as well as considerable uncertainty regarding the effect of such a program on its ultimate goal of reunifying the peninsula on its own terms. It might see nuclear weapons as a means of forcing political concessions from Seoul, as a hedge against possible South Korean development of a nuclear weapons capability, as leverage to gain a freer hand in paramilitary operations without provoking a military response, as deterring a US nuclear response to an attack on the South, or as a means of carrying out offensive operations in an all-out attack. [redacted]

P'yongyang would also see disadvantages, particularly if it recognized the difficulty of concealing such a program. Exposure could lead South Korea--with its superior nuclear technology--to develop nuclear weapons as a response. P'yongyang also would have to weigh the effect on the US commitment to Seoul under such an increased threat. Moreover, the North would have to calculate the less tangible, but still significant, impact on the diplomacy it has pursued for over two years aimed in large part at encouraging the eventual withdrawal of US forces. P'yongyang would also consider the likelihood that a weapons program would complicate its improved relations with Moscow. [redacted]

4

Directorate of Intelligence

Secret (H)

[redacted]

Nuclear Proliferation Survey: The Next Generation [redacted]

An Intelligence Assessment

Secret [redacted]

Copy 227

5

32

Directorate of
Intelligence

Secret [redacted]

Nuclear Proliferation Survey: The Next Generation [redacted]

An Intelligence Assessment

Secret

November 1978

Pages: iii

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

[redacted]

— *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.

[redacted]

Pages: V

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

Contents

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.*

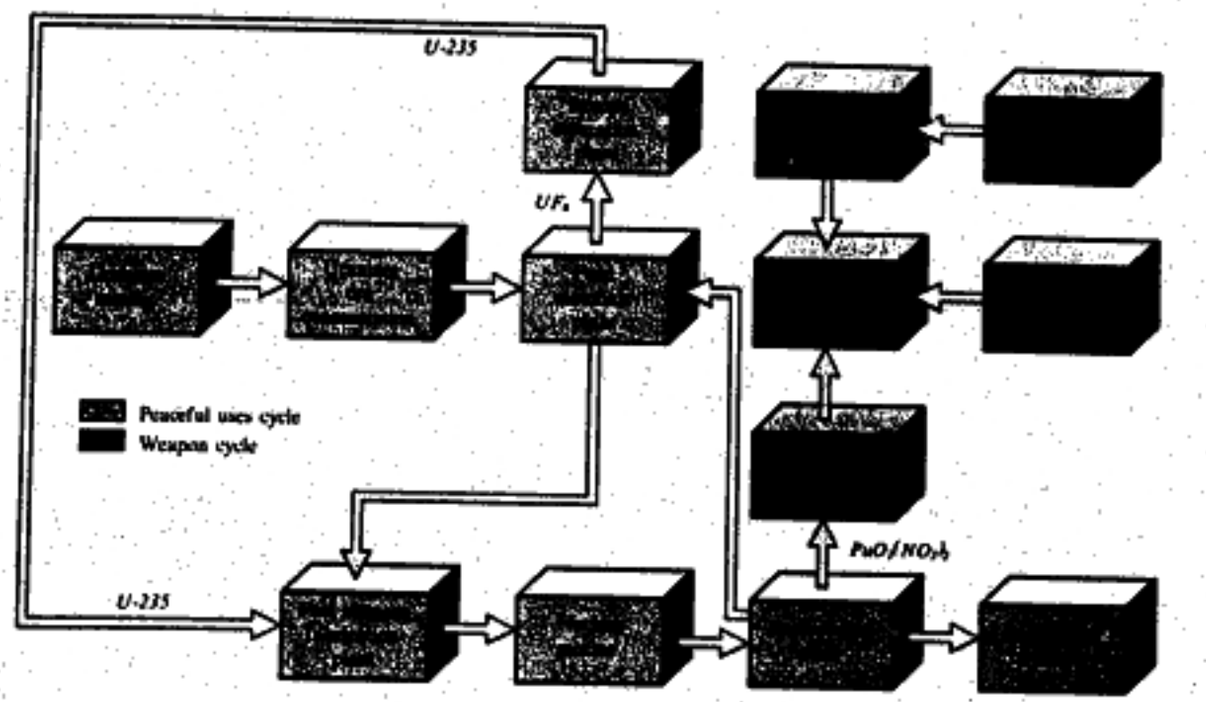
Reactor grade plutonium. *Plutonium that has a high Pu-240 content—currently about 15 to 25 percent:*

- 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.*

Figure 1
Nuclear Fuel Cycle



Pages: 4-11

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

[redacted]

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. [redacted]

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. [redacted]

North Korea

Country at a glance:

Non-Proliferation Treaty signatory: Yes

[redacted]

Delivery system available: Yes (aircraft; missile system)

Status Summary

North Korea has a small nuclear program with [redacted] 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.

[redacted]

Pages: 13-23 & ADDENDA

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