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NUCLEAR NONPROLIFERATION

Difficulties in Accomplishing IAEA's Activities in North Korea

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Resources, Community, and
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The Honorable Frank H. Murkowski
Chairman, Committee on
Energy and Natural Resources
United States Senate

Dear Mr. Chairman:

North Korea is a party to the Treaty on the Non-Proliferation of Nuclear Weapons and, as required by the treaty, signed an agreement for safeguarding its nuclear materials with the International Atomic Energy Agency (IAEA). Inspections conducted by IAEA in 1992 and 1993 uncovered numerous discrepancies in North Korea's declaration of the amount of nuclear material in its possession. North Korea's refusal to resolve the discrepancies, its termination of IAEA's inspections, and its subsequent announcement that it intended to withdraw from the treaty raised widespread concern that North Korea may have diverted some of its nuclear material to produce nuclear weapons.

On October 21, 1994, the United States and North Korea concluded a separate, bilateral arrangement known as the Agreed Framework to address the North Korean nuclear issue.[1] Under the Agreed Framework, the United States is helping North Korea to acquire two light-water nuclear power reactors to produce electricity in exchange for, among other things, a "freeze" (stoppage) of operations and construction at North Korea's existing graphite-moderated reactors and related facilities and North Korea's commitment to eventually dismantle the facilities. While North Korea's safeguards agreement with IAEA remains in effect, the Agreed Framework defers certain IAEA safeguards activities, including the resolution of IAEA's questions about North Korea's past production of nuclear material.[2] In the meantime, North Korea must cooperate with IAEA in its conduct of other activities specified in the Agreed Framework.

[1]The agreement's full title is the "Agreed Framework Between the United States of America and the Democratic People's Republic of Korea." The Democratic People's Republic of Korea is commonly known as North Korea.

[2]According to U.S. administration sources, the light-water reactors are more proliferation-resistant than North Korea's existing graphite-moderated reactors.

This is our third report in response to your request that we review issues related to the Agreed Framework's implementation.[3] This report discusses the status of IAEA's activities under the Agreed Framework, including IAEA's (1) nuclear-freeze-monitoring activities, (2) inspections of facilities not subject to the freeze, and (3) plans to verify the accuracy and completeness of North Korea's 1992 declaration of the amount of nuclear material in its possession.

Results in Brief

The Agreed Framework requires North Korea to freeze operations and construction at five of its nuclear-related facilities and to permit IAEA to monitor the freeze. In accordance with the arrangements under the Agreed Framework, IAEA began monitoring the freeze at the five facilities in late November 1994—about 1 month after the agreement was concluded. The five facilities, collectively, have the potential to produce nuclear material for creating nuclear weapons. While IAEA is confident that operations and construction at these facilities have been frozen, IAEA identified several problems affecting its ability to determine whether North Korea is complying fully with other aspects of the nuclear freeze. For example, although activities affecting North Korea's reprocessing facility are prohibited, North Korea has not allowed IAEA to implement safeguards measures on the liquid nuclear waste tanks at the facility. According to IAEA, the measures are needed to ensure that the nuclear waste is not being removed or altered. This is particularly important because removing or altering the nuclear waste could damage critical evidence about the history of North Korea's nuclear program. North Korea says that it is cooperating fully with IAEA's freeze-monitoring measures because, in its view, issues such as IAEA's monitoring of the nuclear waste relate to IAEA's future verification of the accuracy and completeness of its 1992 nuclear declaration, which, under the terms of the Agreed Framework, need not be resolved until much later in the agreement's implementation.

The Agreed Framework allows North Korea to continue operating certain nuclear facilities not covered by the freeze. According to IAEA, these facilities are smaller and generally less significant to North Korea's nuclear program than the facilities under the freeze. IAEA resumed its inspections of these facilities in March 1996 and inspects most of them several times a year. According to IAEA, North Korea is cooperating with the inspections. For example, in contrast to the limitations placed by North Korea on IAEA

[3]Our two earlier reports are entitled Nuclear Nonproliferation: Implications of the U.S./North Korean Agreement on Nuclear Issues (GAO/RCED/NSIAD-97-8, Oct. 1, 1996) and Nuclear Nonproliferation: Implementation of the U.S./North Korean Agreed Framework on Nuclear Issues (GAO/RCED/NSIAD-97-165, June 2, 1997).

at the five facilities that are subject to the freeze, North Korea permits IAEA to take measurements of nuclear materials at facilities that were not placed under the freeze and has provided reports on the amount of nuclear material at the facilities for IAEA's examination. On the other hand, North Korea still refuses to accept activities, such as environmental sampling, at these facilities.

IAEA will need to perform a wide variety of complex and time-consuming activities to verify the accuracy and completeness of (1) North Korea's initial declaration of nuclear facilities and (2) the amount of nuclear material in its possession. These activities are linked in the Agreed Framework to certain stages in a reactor's construction; if the reactor project suffers delays, IAEA's activities could be correspondingly delayed. Since 1995, IAEA has repeatedly stressed that unless IAEA and North Korea reach an early agreement on (1) obtaining the information needed to verify the declaration and (2) the measures required to preserve such information, any future possibility of verifying North Korea's nuclear declaration "might be lost." According to IAEA, this issue is one of the most significant problems that it faces under the Agreed Framework. Nevertheless, North Korea has neither provided the information nor agreed to all of IAEA's proposed interim measures for preserving it because, in North Korea's view, IAEA's requirements are excessive and premature in relation to the time frames established in the Agreed Framework. The absence of an agreement on the timing of specific measures needed to address the preservation issue causes concern within IAEA that the necessary information may not be available later. This is particularly significant with respect to IAEA's determination of the operating history of a graphite-moderated reactor. IAEA believes that certain fuel rods discharged from the reactor before 1994 may hold critical evidence on the operating history of the reactor. As early as September 1995, IAEA reported that delaying measurements of these early discharged fuel rods over the next several years would result in some (unspecified) "limitations in accuracy." The situation is far worse now because the measurements are not likely to occur in the near future and, therefore, will be even more difficult and expensive to perform. IAEA is investigating methods for analyzing the early discharged fuel rods along with other evidence to permit the reconstruction of the reactor's operating history, which is part of the verification of the correctness and completeness of North Korea's initial declaration.

Background

North Korea has five nuclear facilities that, collectively, have the potential to produce nuclear material for creating nuclear weapons. The installations are (1) a graphite-moderated, 5-megawatt electric (MW(e)) power reactor, (2) a plutonium-reprocessing facility, (3) a fuel rod fabrication facility, and (4) two unfinished graphite-moderated reactors—a 50-MW(e) reactor and a 200-MW(e) reactor—that were under construction before the Agreed Framework was signed. Most of the facilities are located in Yongbyon, 60 miles north of Pyongyang.[4]

The Treaty on the Non-Proliferation of Nuclear Weapons prohibits nonnuclear weapons states from acquiring nuclear weapons. North Korea became a party to the treaty in 1985 and, in 1992, concluded an agreement with IAEA for safeguarding its nuclear material. The agreement with IAEA—the United Nations-affiliated organization responsible for implementing safeguards requirements under the treaty—requires North Korea to declare all of its nuclear material and to allow IAEA to perform inspections and other safeguards measures at North Korea's nuclear facilities. The purpose of these measures is to ensure that nuclear material is not diverted to nuclear weapons.

IAEA uses several measures to ensure compliance with its safeguards agreements. Material-accounting measures verify the quantity of nuclear material declared to IAEA and any changes in the quantity over time. Containment measures utilize physical barriers, such as walls and seals, to control the access to and movement of nuclear material, while surveillance and other monitoring devices detect the movements of nuclear materials and any tampering with IAEA's containment measures. Finally, IAEA uses on-site inspections, among other things, to help ensure that all of the material has been declared and placed under IAEA's control.

According to unverified public accounts, North Korea reported to IAEA in May 1992 that it had about 90 grams of plutonium subject to IAEA's safeguards from a one-time reprocessing of defective fuel rods. Shortly thereafter, IAEA began implementing safeguards, including inspections, to verify the accuracy and completeness of North Korea's declaration of the amount of nuclear material in its possession. The inspections identified discrepancies suggesting that North Korea had not declared all of its nuclear material. For example, contrary to North Korea's claim that it conducted a one-time reprocessing of damaged fuel rods, IAEA concluded that North Korea had reprocessed fuel on several occasions since 1989. North Korea refused to allow IAEA to resolve the discrepancies, limited

[4]The 200-MW(e) reactor was under construction in Taechon.

IAEA's inspections, refused the implementation of IAEA's "special inspections"[5] at two sites, and announced its intention to withdraw from the Treaty on the Non-Proliferation of Nuclear Weapons. These and other perceived provocations led to concerns about the possibility of war if North Korea continued to pursue its existing graphite-moderated nuclear program.

The Agreed Framework defused tensions on the Korean Peninsula and resulted in various trade-offs between North Korea and the United States. For its part, North Korea committed, among other things, to (1) remain a party to the treaty; (2) freeze the operation and construction of its graphite-moderated reactors and related facilities and, later, to dismantle them; (3) safely store and, at a later time, transfer its spent fuel from North Korea for ultimate disposal; and (4) resolve IAEA's questions about the accuracy and completeness of North Korea's 1992 nuclear declaration. In return, the United States agreed, among other things, to create an international consortium of member countries to replace North Korea's graphite-moderated reactors with two light-water reactors by a target date of 2003.[6] The resulting consortium—established in March 1995—is called the Korean Peninsula Energy Development Organization (KEDO). In August 1997, groundbreaking for the reactors occurred in the Kumho district of Sinpo—a port city on North Korea's east coast. (See fig. 1 for a map identifying Sinpo and other relevant North Korean sites.)

[5]IAEA's safeguards agreements with North Korea and others also authorize IAEA to perform special inspections to investigate undeclared nuclear materials and installations.

[6]According to State Department officials, North Korea must meet its commitments under the agreement before the export of the key nuclear components of the light-water reactors can take place.

Figure 1: Sinpo and Other Relevant North Korean Sites

While groundbreaking has occurred, no formal delivery schedule has been established for the reactor project. In the meantime, the Agreed Framework envisions specific functions for IAEA, notably that IAEA (1) monitor the freeze at five North Korean nuclear facilities and (2) resume inspections at other nuclear facilities not subject to the freeze. The Agreed Framework also calls upon North Korea to take "all steps that may be deemed necessary" for IAEA to verify the accuracy and completeness of North Korea's 1992 report on nuclear facilities and the amount of nuclear material in its possession.

Despite Problems, Freeze Is in Place

IAEA began monitoring the five North Korean nuclear facilities subject to the freeze in late November 1994—about 1 month after the Agreed Framework was concluded. While IAEA's monitoring activities provide assurance that operations and construction at these facilities have ceased, several monitoring problems affect IAEA's ability to ensure that North Korea is complying fully with certain aspects of the nuclear freeze. For example, although activities affecting North Korea's reprocessing facility are prohibited, North Korea has not allowed IAEA to implement required safeguards measures on the liquid nuclear waste tanks at the facility. According to IAEA, the measures are needed to ensure that the nuclear waste is not being removed or altered. This is particularly important because removing or altering the nuclear waste could damage critical evidence about the history of North Korea's nuclear program.

The Agreed Framework Requires North Korea to Freeze Operations and Construction at Five Nuclear Facilities

The Agreed Framework specifies that the freeze on North Korea's graphite-moderated reactors and related facilities was to be fully implemented within 1 month of the agreement's signing on October 21, 1994. According to IAEA's documents and the "supply agreement"—a document that sets forth the conditions for the delivery of the light-water reactors to North Korea under the Agreed Framework[7]—the freeze prohibits North Korea from (1) operating the 5-MW(e) reactor, the fuel rod fabrication plant, and the reprocessing plant and (2) continuing or beginning construction work on such existing facilities as the unfinished 50-MW(e) and 200-MW(e) reactors or on related facilities. Furthermore, the spent fuel from the 5-MW(e) reactor must be stored and disposed of in a manner that does not involve the fuel's reprocessing in North Korea. The Agreed Framework specifies that North Korea must provide "full cooperation" to IAEA in its monitoring of the freeze.

[7]The supply agreement, concluded on December 15, 1995, is between North Korea and KEDO.

IAEA is not a signatory to the Agreed Framework. However, in November 1994, the United Nations Security Council requested that IAEA take all steps deemed necessary to monitor the freeze. IAEA's Board of Governors approved the request. Shortly thereafter, IAEA and North Korea began negotiating arrangements for IAEA's monitoring of the freeze, which among other things, resulted in the identification of critical buildings at each facility site that would be subject to IAEA's monitoring measures. According to officials from the State Department and the Arms Control and Disarmament Agency (ACDA), IAEA and North Korea also reached an understanding on the definition of the freeze that, according to IAEA's documentation, provides that any movements of nuclear material or equipment within the facilities under the freeze, any maintenance work by the operator, and any transfers of nuclear materials out of the facilities must be carried out under IAEA's observation or under other IAEA arrangements. Finally, any nuclear equipment and components related to the freeze, including items manufactured for the two reactors under construction, must be monitored by IAEA.

IAEA Inspectors Perform Various Monitoring Activities

IAEA inspectors visited the North Korean facilities subject to the freeze from November 23 to November 28, 1994, and confirmed that the three operating facilities had been shut down and that construction on the two incomplete reactors had stopped. IAEA maintains a continuous presence in North Korea to monitor the facilities and to ensure that they remain under the freeze. According to IAEA, its monitoring activities provide assurance that operations and construction at the five facilities are frozen.

IAEA inspectors regularly monitor the 5-MW(e) reactor, the fuel fabrication plant, and the reprocessing plant. IAEA uses all technical means available to monitor the freeze at these facilities, such as using seals that can indicate instances of tampering, using video cameras, and making short-notice inspections.[8] The particular method(s) used depends on the circumstances at each of the three facilities. The primary monitoring method is the use and frequent verification of tamper-indicating seals on equipment and installations throughout the "frozen" nuclear facilities. Video cameras are also used for surveillance. Finally, short-notice inspections are used to monitor certain equipment and areas in the frozen facilities that have not been allowed to be sealed. IAEA inspectors also monitor activities related to the canning and storage of spent fuel from the 5-MW(e) reactor and

[8]Short-notice inspections involve advance notice of about 20 minutes to 1 hour.

have, through qualitative measurements of the fuel rods (spent fuel), verified whether the rods are, in fact, irradiated (spent) fuel rods.[9]

IAEA also monitors activities at the two unfinished reactors. As with the three other nuclear facilities under the freeze, IAEA established an initial photographic baseline to document the status of each facility's construction. Since then, IAEA inspectors have visited the 50-MW(e) graphite-moderated nuclear reactor in Yongbyon and the 200-MW(e) graphite-moderated nuclear reactor in Taechon a few times a year. During their visits, the inspectors observe the facilities, take updated pictures, and compare the photos to ensure that construction has not resumed at the facilities.

IAEA Identified Monitoring Problems

While IAEA is confident that operations and construction at the five nuclear facilities have ceased, IAEA identified several problems affecting its ability to determine if North Korea is complying fully with certain aspects of the nuclear freeze. First, despite repeated requests, North Korea has not provided IAEA with adequate information about the amount and location of nuclear equipment and components that it may have produced for its two unfinished reactors. As previously discussed, the nuclear equipment and components for the facilities under the freeze, such as the graphite blocks manufactured for the 50-MW(e) and the 200-MW(e) reactors under construction,[10] are subject to monitoring by IAEA. According to congressional testimony by the former Secretary of Defense in January 1995, North Korea's 50-MW(e) reactor was expected to be completed in 1995. Because of this schedule, all of the reactor's equipment and components, including the reactor's graphite blocks and fuel-handling machines, should have been available for inclusion in the reactor's building. Instead, North Korea informed IAEA that it had manufactured only about 50 percent of the graphite blocks needed for the 50-MW(e) reactor and none of the graphite blocks needed for the 200-MW(e) reactor, which, according to the former Secretary of Defense, was expected to be completed in 1996. According to IAEA, North Korea explained that there was no reason for it to continue manufacturing equipment and components for the two reactors after July 1993, since it had begun discussions with the United States about replacing the graphite-moderated reactors with light-water reactors. However, North Korea's explanation is

[9]As discussed later, North Korea has not yet permitted IAEA to measure the amount of plutonium in the spent fuel rods.

[10]The graphite blocks, which would surround the fuel rods in the two graphite-moderated reactors under construction, are used to facilitate a nuclear reaction.

insufficient for IAEA to rule out whether any additional nuclear equipment and components exist.

The second problem involves the "mixer settlers," which are part of a system that separates plutonium from uranium and fission products in the reprocessing facility. According to IAEA, North Korea informed IAEA that the mixers need to be maintained frequently to ensure that they operate in case the Agreed Framework collapses and North Korea chooses to resume its nuclear program. As a result, IAEA has not precluded access to the area or equipment and has allowed North Korea to operate the mixers for a brief time each month for maintenance purposes under inspectors' observation. While IAEA periodically performs short-notice inspections of the mixer area, IAEA cannot be sure that North Korea is operating the mixers within the permissible limit. IAEA wants to monitor the mixers on a continuous basis and, in January 1996, secured North Korea's agreement to demonstrate relevant equipment containing sensors that would detect instances when the mixers are operating.[11] The sensors would permit IAEA to determine whether North Korea's use of the mixers is compatible with both (1) the equipment's maintenance needs and (2) North Korea's commitment to operate the mixers for only a brief interval each month. IAEA expects to install the equipment in North Korea in mid-1998.

Third, IAEA has not been allowed to implement safeguards measures on the liquid nuclear waste tanks with instruments that would ensure that North Korea is not removing or altering the composition of the waste at the reprocessing facility. This issue is particularly important because, in addition to the monitoring issue, the tanks hold critical evidence about the history of North Korea's nuclear program. IAEA has asked North Korea for permission to install instruments for monitoring the volume and composition (level and density) of the liquid in the nuclear waste tanks.[12] According to an IAEA official, these safeguards measures are needed because seals and surveillance do not provide the required assurance—the tanks are connected to a complex and inaccessible piping system that, if operating, would permit the waste to be removed and/or altered. While North Korea maintains that the system's valves are closed, IAEA is concerned that the valves' status is not verifiable and that North Korea could be using these or other valves and pumps to tamper with the tanks' contents. Such an activity would change the composition of the waste (i.e., alter its nuclear "fingerprint" and affect its subsequent analysis), thus

[11]The sensors detect vibrations and magnetic signals given off by the motors that operate the mixers. The sensors and accompanying data collection equipment are called an Integrated Monitoring System.

[12]The instruments are called electromanometers.

violating the terms of the Agreed Framework. However, according to IAEA, whether this is occurring will not be known until North Korea agrees to allow the monitoring instruments to be installed. Thus far, North Korea has denied IAEA's repeated requests to install the instruments.[13] North Korea has also denied IAEA's request to take environmental "swipe" samples[14] at the facility and other types of analytical samples.

Last, although IAEA has access to all critical nuclear facilities under the freeze, it has experienced difficulties in gaining regular access to some technical buildings at the frozen facilities. IAEA—as a matter of normal practice in carrying out its safeguards inspections—wants to obtain periodic access to all the technical buildings to ensure that they are not being used for unauthorized purposes. According to State Department and ACDA officials, negotiations between IAEA and North Korea in late 1994 and early 1995 resulted in, among other things, the identification of technical buildings at a facility site that would be subject to IAEA's monitoring measures under the freeze. According to IAEA, the procedures agreed to with North Korea envision IAEA's periodic visits to technical support buildings for which North Korea has stated that the buildings' scope of operations has changed. IAEA stated that, without such visits, the monitoring of the freeze would be limited to only certain buildings where IAEA's safeguards measures, including inspections, are already applied. However, according to IAEA, North Korea now says that while it agreed to freeze technical buildings that are directly related to its nuclear program, it did not agree to freeze those that are indirectly related to the program. Therefore, North Korea will consider IAEA's access for visits by inspectors only on a case-by-case basis. According to IAEA, the issue remains unresolved.[15]

According to information supplied by the State Department, the United States is "deeply concerned" about the "continued lack" of North Korean cooperation with IAEA's freeze-monitoring activities, including IAEA's efforts to monitor the liquid nuclear waste tanks and to help ensure that other information about North Korea's nuclear program is preserved. State Department guidance in 1996, for example, instructed U.S. delegates to

[13]According to State Department and ACDA officials, the State Department continues to urge North Korea to allow IAEA to install the monitoring instruments.

[14]A swipe is a sampling technique using material, such as filter paper, that is wiped over a surface and analyzed to detect the presence of radioactive particles.

[15]According to State Department and ACDA officials, there is no evidence to suggest that the technical buildings are being used for unauthorized purposes. Instead, they said that IAEA is concerned that North Korea's access restrictions establish an undesirable precedent that could be used later to block IAEA's access to critical North Korean nuclear sites. According to the officials, the State Department has told North Korea that it shares IAEA's concern.

IAEA to remind North Korea that the Agreed Framework requires North Korea to cooperate fully with IAEA in monitoring the freeze and that, "by definition," full cooperation includes the preservation of information and data that might speak to the history of North Korea's nuclear program.

While the Agreed Framework requires North Korea to cooperate fully with IAEA's freeze-monitoring activities, neither the Agreed Framework nor its subsequent implementing agreements, including the agreement for supplying the reactors, "define" or otherwise discuss North Korea's cooperation with IAEA on activities related to the preservation of information during the monitoring phase. Officials from the State Department and ACDA concurred with our understanding of the agreement. They explained that the guidance reflected an understanding of what is "implicit" in the Agreed Framework—namely, that the preservation of information will be essential in demonstrating North Korea's compliance with its safeguards agreement with IAEA.

According to IAEA, the freeze-monitoring issues are unresolved, in part, because of a fundamental difference in view between IAEA and North Korea. Specifically, IAEA contends that its safeguards agreement with North Korea is valid and in effect and, as a result, that IAEA's activities in North Korea—including its monitoring activities—arise from its safeguards agreement with North Korea. According to IAEA, North Korea disagrees and says that its safeguards agreement with IAEA is currently invalid for the facilities subject to the freeze and, consequently, that its acceptance of IAEA's freeze-monitoring measures derives solely from the Agreed Framework. Furthermore, according to IAEA, North Korea asserts that it is cooperating fully with IAEA's freeze-monitoring measures because such outstanding issues as IAEA's monitoring of the liquid nuclear waste tanks relate to the verification of North Korea's 1992 nuclear declaration and, as a result, need not be resolved until much later in the Agreed Framework's implementation. (Activities related to IAEA's verification of North Korea's nuclear declaration and the timing of these activities are discussed in more detail later in this report.)

North Korea Is Generally Cooperating With IAEA's Inspections of Facilities Not Subject to the Freeze

As part of the Agreed Framework, North Korea agreed to allow IAEA to resume certain types of facility inspections upon the conclusion of the agreement for supplying the two light-water reactors.[16] IAEA had been inspecting North Korea's declared nuclear facilities in the years preceding the Agreed Framework. However, North Korea terminated the inspections after IAEA uncovered evidence suggesting that North Korea had not declared all of its nuclear material. Under the terms of the Agreed Framework, IAEA's inspections (as opposed to monitoring activities) need resume only at the facilities not subject to the freeze. The applicable facilities are (1) an experimental 8-megawatt thermal reactor (MW(t))—a research reactor for isotope production and research in Yongbyon, (2) a nuclear fuel rod storage facility in Yongbyon, (3) about 30 locations scattered throughout North Korea that have small quantities of nuclear material, and (4) two other facilities that were identified as a "critical assembly" for isotope production in Yongbyon and a "subcritical assembly" in Pyongyang. These facilities are smaller and generally less significant to North Korea's nuclear program than the facilities under the freeze.

Following the conclusion of the light-water reactor supply agreement in December 1995, IAEA continued inspections at facilities not subject to the freeze in March 1996 and resumed inspections at the locations with small quantities of nuclear material scattered throughout North Korea. IAEA inspects most of the facilities a few times a year. The fuel rod storage facility is inspected more frequently because the facility is of greater importance to North Korea's nuclear program. Finally, through the end of February 1998, IAEA had also inspected a number of the approximately 30 locations scattered throughout North Korea. State Department and ACDA officials described North Korea's agreement to resume IAEA's inspections at these facilities as a "significant symbolic move" because it represents the beginning of North Korea's gradual return to the international safeguards system.

According to IAEA, North Korea is cooperating with IAEA's inspection activities at facilities not subject to the freeze with some limitations. Specifically, North Korea has permitted IAEA to take measurements of nuclear material at these facilities and has provided reports on the amount

[16]The Agreed Framework refers to "ad hoc" and "routine" IAEA inspections. IAEA uses these inspections to, among other things, (1) verify information contained in a country's initial report on the amount of nuclear material in its possession, (2) determine whether the country's nuclear records are consistent with reports provided to IAEA, and (3) verify the location, identity, quantity, and composition of material subject to IAEA's safeguards. As discussed earlier, IAEA's safeguards agreements with North Korea also authorize IAEA to perform special inspections. However, the Agreed Framework does not require North Korea to accept special inspections at this time.

of nuclear material at them for IAEA's examination. But North Korea has not allowed IAEA to take environmental "swipe" samples, which is a routine safeguards measure applied at similar facilities throughout the world.

The Potential for Delay in Verifying North Korea's Nuclear Declaration Creates the Possibility of Future Problems

IAEA will need to perform a wide variety of complex and time-consuming activities to verify the accuracy and completeness of North Korea's 1992 declaration of the amount of nuclear material in North Korea's possession. Given the time frames established in the Agreed Framework and the absence of an agreed-upon reactor construction schedule, these activities could suffer delays. Since 1995, IAEA has repeatedly stressed that unless it and North Korea reach an early agreement on obtaining the information needed for verifying North Korea's declaration and on the measures required to preserve such information, any future possibility of verifying North Korea's nuclear declaration "might be lost." Thus far, North Korea has neither provided the information nor agreed to any of IAEA's proposed interim measures for preserving it, raising concern within IAEA that the necessary information may not be available later.

The Agreed Framework Provides for the Future Verification of North Korea's Nuclear Declaration

The Agreed Framework requires North Korea to resolve IAEA's questions about the accuracy and completeness of its 1992 nuclear declaration and thereby come into full compliance with both its safeguards agreement and the Treaty on the Non-Proliferation of Nuclear Weapons.[17] Under the terms of the Agreed Framework, this is to occur when a "significant portion" of the reactor project has been completed but before the delivery of the key nuclear components.[18] According to the agreement for supplying the reactors, a significant portion of the reactors will be completed when the first reactor's containment structure, turbine, and other auxiliary buildings have been completed—but before the reactor's major systems are introduced into the structure.[19]

[17]According to IAEA, North Korea will not be in full compliance with its safeguards agreement and the treaty until IAEA verifies North Korea's nuclear declaration and determines, with sufficient assurance, that North Korea has not diverted any of its nuclear material.

[18]According to the supply agreement, "key nuclear components" are those items that are controlled under the Export Trigger List of the Nuclear Suppliers Group. Such components include the nuclear steam supply system—the combination of equipment needed to produce the steam that drives a reactor's turbine generator for the production of electricity.

[19]Under the Agreed Framework, North Korea must take all the steps deemed necessary by IAEA to verify the accuracy and completeness of North Korea's nuclear declaration. The Agreed Framework does not specifically discuss "special inspections" to investigate undeclared nuclear materials and installations. However, according to senior U.S. administration officials, including the former Secretaries of State and Defense, North Korea must accept these inspections if IAEA considers them necessary.

The Agreed Framework does not specify definitive milestones for constructing the reactors because, according to the principal U.S. negotiator for the agreement, the United States did not want to commit itself to a specific schedule for delivering the reactors. However, shortly after the Agreed Framework was concluded, U.S. government officials estimated that IAEA's verification of the accuracy and completeness of North Korea's nuclear declaration would begin in about 1999—4 years before the reactors' projected delivery date in the agreement. Although site preparation work has begun, the full reactor delivery schedule will not be known until the conclusion of a contract between KEDO and the Korea Electric Power Corporation—the prime contractor for the reactor project—and a "delivery schedule protocol" soon to be negotiated between KEDO and North Korea. Consequently, the time when IAEA's verification activities may actually begin is uncertain.

The delay in IAEA's verification of North Korea's nuclear declaration has been the subject of considerable disagreement. At the time when the Agreed Framework was signed, for example, opponents of the Agreed Framework argued that delaying IAEA's verification activities created a disturbing precedent that not only undermined IAEA's credibility and authority but also rewarded North Korea for its treaty transgressions. Critics also expressed concern that the Agreed Framework essentially allowed North Korea to renegotiate its treaty obligations so that—unlike other treaty members—North Korea need not provide information about its past activities for many years. In addition, critics expressed concern that North Korea may exploit the ambiguities in the Agreed Framework, including the absence of specific time frames for IAEA's determination of the accuracy and completeness of North Korea's nuclear declaration.

However, according to official U.S. policy, as articulated by State Department and other U.S. government officials, the Agreed Framework did not undermine IAEA's credibility or authority. Instead, they said that the Agreed Framework demonstrates the United States' commitment to ensure that the issues identified by IAEA will be resolved. Furthermore, while U.S. government officials acknowledged that delaying IAEA's verification of North Korea's nuclear declaration was not preferable, they said that the trade-off was necessary because North Korea was intractable on this point during the negotiations on the Agreed Framework.[20] According to them, the United States negotiated the best deal possible, given the circumstances at that time. They explained that North Korea's

[20]According to U.S. officials familiar with the negotiations on the Agreed Framework, North Korea views the delay as leverage for ensuring that the United States will follow though on its commitments under the Agreed Framework.

commitments under the Agreed Framework go far beyond North Korea's obligations under the treaty.[21] Furthermore, they said that delaying IAEA's verification of North Korea's nuclear declaration did not compromise U.S. security interests because, according to them, the Agreed Framework ensures that the United States is not disadvantaged in any significant way if North Korea reneges on its commitments. For example, if North Korea backed out of the Agreed Framework in the early years, U.S. officials said that North Korea would have gained very little except modest amounts of heavy fuel oil[22] and some technical assistance related to the safe storage of its spent fuel. Furthermore, if it reneges on its commitment to provide IAEA with information, North Korea will be left with only the "empty shells" of two light-water reactors. In the meantime, the officials said that the United States will have benefitted because North Korea's nuclear program will have been frozen in the intervening years.

A Wide Variety of Activities Are Needed to Verify North Korea's Nuclear Declaration

IAEA will need to accomplish a wide variety of complex and time-consuming activities to verify the accuracy and completeness of North Korea's nuclear declaration. For example, IAEA needs to determine the operating history of the 5-MW(e) reactor, as well as the amount of plutonium in the irradiated (spent) fuel rods from the reactor and the composition of the liquid nuclear waste at the reprocessing plant. IAEA will also need to inspect certain waste sites, including waste sites where undeclared nuclear materials are suspected to be present, which were the subject of an IAEA request for special inspections in 1983. These inspections will be time-consuming because one of the suspect sites has been completely camouflaged with dirt and landscaping. Furthermore, IAEA will need to establish whether North Korea has additional nuclear equipment and components for the two incomplete reactors and, if so, where the items are located. Finally, IAEA will need to translate, analyze, and authenticate the documentation on North Korea's nuclear program and to investigate any leads that IAEA may obtain about the program.

[21]The treaty permits signatory states to build and operate any type of nuclear facility and to separate and stockpile plutonium under IAEA's safeguards. Under the Agreed Framework, however, North Korea agreed not to reprocess its spent fuel and to eventually dismantle its reprocessing facility. According to the U.S. officials, these and other North Korean commitments exceed the country's obligations under the treaty.

[22]In the Agreed Framework, the United States agreed to arrange for the delivery of heavy fuel oil to North Korea to offset the energy forgone as a result of the freeze of its graphite-moderated reactors and existing facilities, pending completion of the first light-water reactor.

Possible Delays in Verification Activities Raise Questions About Whether Needed Information Will Be Available

In September 1995, IAEA apprised North Korea of the information that IAEA must obtain to verify North Korea's 1992 nuclear declaration and thereby determine whether North Korea is in compliance with its safeguards agreement and the Treaty on the Non-Proliferation of Nuclear Weapons. Since 1995, IAEA has repeatedly stressed that unless the parties reach an early agreement on obtaining information about North Korea's nuclear program and on the measures required to preserve it, any future possibility of verifying North Korea's nuclear statement "might be lost." According to IAEA, this issue is one of the most significant problems that IAEA faces under the Agreed Framework. Nevertheless, in 1996, North Korea informed IAEA that it would not allow IAEA to begin its verification activities until a significant portion of the light-water reactor project is completed—an event whose timing depends on further negotiations.

North Korea's position is consistent with the time frames established in the Agreed Framework. In congressional hearings held shortly after the Agreed Framework's conclusion, senior administration officials, including the former Secretary of State, stressed that delaying IAEA's verification activities—while not preferable—did not jeopardize U.S. security interests. Unfortunately, North Korea has neither provided the information nor agreed to any of IAEA's proposed interim measures for preserving it, and as a result, IAEA has reported that it has no assurance that the necessary information will be available later. According to IAEA officials, North Korea views IAEA's preservation requirements as excessive and premature in relation to the time frames established in the Agreed Framework. Furthermore, according to the officials, North Korea says that since it intends to make the information available to IAEA when the time comes, it is cooperating with both IAEA and the terms of the Agreed Framework.[23]

A Delay in Determining the Reactor's Operating History Is a Major Preservation-Related Problem

A delay in determining the operating history of the 5-MW(e) reactor may be the most troublesome, complex, and costly preservation-related problem that IAEA faces under the Agreed Framework. As discussed, in the early 1990s, IAEA's inspections identified discrepancies suggesting, in IAEA's view, that North Korea had not declared all of its nuclear material. Specifically, contrary to North Korea's claim that it conducted a one-time reprocessing of damaged fuel rods, IAEA concluded that North Korea had reprocessed fuel on several occasions since 1989. Determining whether or not North Korea has diverted fuel from the reactor's core requires, among other things, measurements of (1) the total amount of plutonium in North

[23]According to IAEA officials, North Korea's statement that it will eventually provide the information is neither a sufficient nor an acceptable guarantee.

Korea's spent fuel and (2) certain fission products in the discharged fuel. According to Department of Energy (DOE) officials, the amount of plutonium can be determined whenever North Korea permits IAEA to measure the fuel. However, measurements of the fission products become increasingly difficult over time because of their short-lived nature. IAEA had envisioned taking these measurements when the spent fuel was transferred into canisters for storage.[24] However, according to IAEA, North Korea refused because, in its view, it was premature to perform the measurements.

According to IAEA, it lost valuable information about the reactor's core in May 1994. This occurred because, while discharging the reactor, North Korea failed to accept IAEA's proposals to select, segregate, and secure fuel rods for IAEA's later measurement.[25] Shortly thereafter, IAEA reported that the "situation resulting from the core discharge was irreversible and had seriously eroded" IAEA's ability to ascertain whether North Korea had declared all of its plutonium.

As early as September 1995, IAEA reported that delaying the measurements over the next several years would result in some (unspecified) "limitations in accuracy" and "significant additional cost" if the containers need to be opened. Furthermore, over time it will no longer be possible to determine the rods' operating (irradiation) history using nondestructive methods. This is because the radioactive isotopes needed for the analysis are "dying out." In addition, analyzing the aged and corroding fuel rods by "destructive" methods is far more complex and expensive than using nondestructive methods.[26]

IAEA is investigating a variety of methods that might be used to verify the accuracy and completeness of North Korea's nuclear declaration. State

[24]DOE, with North Korea's cooperation, has been transferring the spent fuel into canisters for storage since April 1996. According to DOE officials, about 95 percent of the fuel was stored by the end of January 1998. The remaining rods were expected to be stored by the spring of 1998.

[25]IAEA normally preselects rods to obtain a representative sample of rods from a reactor's core. The samples are then measured and used to estimate the amount of plutonium produced in the core.

[26]Nondestructive analytical methods involve less handling than destructive methods, since the sample or specimen is normally neither disassembled nor altered. Nondestructive analysis can be done remotely, reducing the cost and complexity of protecting workers from radiation and facilities from contamination. Destructive analytical methods, on the other hand, necessitate the disassembly and/or alteration of the sample and thus involve additional steps and increased handling of the item to be sampled. In the case of North Korea's spent fuel rods, destructive analytical methods would likely include removing the rods from storage, packing and shipping them out of North Korea, and unpacking, disassembling, and analyzing them. Each of these steps results in additional cost and complexities because of the necessity of safeguarding workers and facilities from radiation and contamination.

Department and ACDA officials stressed, however, that the accuracy and timeliness of any of these methods will depend critically on (1) North Korea's willingness to permit measurements and samples to be taken at relevant sites and (2) the amount of money that the United States and other interested parties are willing to spend to perform the work.

The United States Is Concerned About the Preservation Issue

According to information supplied by the State Department, the United States is "deeply concerned" about the absence of tangible North Korean steps to preserve information about the country's past nuclear activities. A December 1996 State Department cable, for example, expressed deep concern about whether North Korea will fulfill this critical component of the Agreed Framework. The cable instructs U.S. delegates to IAEA to remind North Korea that if the Agreed Framework is to be fully realized, North Korea must take appropriate steps to resolve IAEA's concerns in this area. Similarly, a March 1997 cable instructs U.S. delegates to remind North Korea that, although it will be several years before the key reactor components are expected to be delivered, North Korea must prepare now so that IAEA's verification work can proceed smoothly and expeditiously.[27] While the United States is concerned about the extent of North Korea's cooperation thus far, State Department officials stressed that North Korea will not receive the key nuclear components until it has complied fully with its safeguards agreement.

In November 1997, a senior State Department official told us that the United States and IAEA continually stress to North Korea the importance of the preservation issue. The official distinguished between the preservation issue and IAEA's work in monitoring the freeze. Specifically, according to the official, while North Korea's reluctance to cooperate on the preservation of historically relevant information poses a long-term problem for the project, in the short term, there is "no real problem" and "no alarming consequences" in monitoring the freeze. However, the official said that the United States has made clear to North Korea that its failure to preserve the needed information now may cause a work stoppage on the reactor project later.

Observations

The Agreed Framework commits the United States to facilitate the delivery of two light-water reactors to North Korea by a target date of 2003. The specific timing of interim milestones—such as the completion of

[27]Assuming the full implementation of the Agreed Framework, IAEA officials estimated that the key nuclear components would not be delivered for at least the next 4 years. The reactors cannot function without these components.

a significant portion of the first reactor's construction—is, by design, ambiguous and highly dependent on the actions of parties involved in implementing the Agreed Framework. The Agreed Framework's ambiguity about the timing of the project's interim milestones and its linkages to reciprocal actions by North Korea, creates the basis for North Korea's position that it is premature to resolve matters related to the preservation of vital information needed for IAEA's verification work.

When the Agreed Framework was signed, the United States estimated that IAEA's verification work would begin in about 1999. Although site preparation work has begun for the reactor project, the reactor's construction schedule awaits the negotiation of two important instruments—a contract between KEDO and its prime contractor and a "delivery schedule protocol" with North Korea. If the conclusion of these activities were delayed, then IAEA's verification activities could be correspondingly delayed. Schedule delays increase the cost and difficulty of verifying North Korea's nuclear declaration and lessen the likelihood that IAEA will be able to make a definitive assessment about the accuracy and completeness of North Korea's nuclear declaration. Any protracted delays are likely to exacerbate these problems and could eventually result in the collapse of the Agreed Framework if IAEA cannot verify, with sufficient assurance, North Korea's nuclear declaration.

Agency Comments and Our Evaluation

We provided the State Department, ACDA, DOE, and IAEA with a draft of this report for their review and comment. We met with State Department and ACDA officials, including representatives of the Department's Bureaus of East Asian and Pacific Affairs, Political and Military Affairs, and Intelligence and Research, and representatives of ACDA's Bureau of Nonproliferation and Regional Arms Control. While State Department and ACDA officials generally agreed with the report's conclusions, they provided detailed comments to emphasize and clarify various points in the report. For example, the officials acknowledged that IAEA has experienced problems associated with its monitoring of North Korea's nuclear freeze. However, they stressed that since North Korea's nuclear program remains frozen, the monitoring problems are not central to the implementation of the Agreed Framework and therefore have not jeopardized the agreement. Instead, the primary problem has been securing North Korea's cooperation in preserving information about its past nuclear activities. The State Department and ACDA agreed that verifying North Korea's initial nuclear declaration will be a difficult task. IAEA and DOE officials, including the Director of DOE's International Safeguards Division, also provided

comments to improve the technical accuracy of the report. We incorporated the agencies' comments, as appropriate.

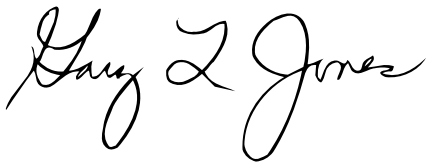
Scope and Methodology

To obtain information for this report, we reviewed and analyzed the provisions of the Agreed Framework and subsequent implementing agreements, congressional hearings, the safeguards agreement between IAEA and North Korea, and IAEA reports and other documentation describing the scope and status of IAEA's activities in North Korea. We also discussed IAEA's activities under the Agreed Framework with cognizant officials from IAEA and ACDA as well as the Departments of State and Energy. Finally, we reviewed State Department cables made available to us through November 1997. The State Department denied our access to eight cables because they either "contain[ed] details of intelligence sources and methods as well as information provided by third countries" or dealt with a "highly sensitive" matter that, at the time, was under "active negotiation." Furthermore, describing our request as "openended," on March 12, 1998, the State Department denied our December 8, 1997, request for monthly updates on the cables. Given our past difficulties in obtaining North Korea's views, we did not attempt to contact officials from North Korea. We conducted our review from July 1997 through March 1998 in accordance with generally accepted government auditing standards.

As agreed with your office, we plan no further distribution of this report until 5 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees, the Secretaries of State and Energy, the Director of ACDA, the Director General of IAEA, and other interested parties.

If you have any questions, please call me at (202) 512-3841. Major contributors to this report are listed in appendix I.

Sincerely yours,



(Ms.) Gary L. Jones
Associate Director,
Energy, Resources, and Science Issues

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Abbreviations

ACDA	Arms Control and Disarmament Agency
DOE	Department of Energy
IAEA	International Atomic Energy Agency
KEDO	Korean Peninsula Energy Development Organization

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.

Gene Aloise, Assistant Director
Kathleen Turner, Evaluator-in-Charge
Victor J. Sgobba, Senior Evaluator
Duane G. Fitzgerald, Nuclear Engineer

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