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**NUCLEAR
NONPROLIFERATION**

**Heavy Fuel Oil Delivered to
North Korea Under the
Agreed Framework**

Statement of Ms. Gary L. Jones, Associate Director,
Resources, Community, and Economic Development
Division



Mr. Chairman and Members of the Committee:

We are here today to provide information on the status of heavy fuel oil delivered to North Korea under the October 1994 U.S./North Korean Agreed Framework.¹ Reports have alleged that North Korea has diverted some of this heavy fuel oil for purposes not specified in the Agreed Framework, including resale abroad. Our statement, which is based on our recent report on this topic for the Committee,² summarizes (1) the status of heavy fuel oil funding and deliveries to North Korea and (2) the controls in place to detect the diversion of heavy fuel oil from heating and electricity generation to other purposes not specified in the Agreed Framework and any limitations in these controls that would allow North Korea to divert heavy fuel oil for unintended uses.

In summary, Mr. Chairman:

- As of July 31, 1999, 1.9 million metric tons of heavy fuel oil had been delivered to North Korea at an approximate cost of \$222 million. For the first 3 years of the Agreed Framework's implementation, shipments to North Korea were not regular and predictable because the Korean Peninsula Energy Development Organization (KEDO)—the organization that has arranged and paid for the majority of the heavy fuel oil shipments—did not always have sufficient funding to pay for heavy fuel oil deliveries. For the past 2 years, shipments of heavy fuel oil to North Korea have been made more regularly because of increased contributions from the organization's members and decreasing commodity and freight prices. However, a recent rise in oil and freight prices caused the organization to seek additional funding from the United States in order to pay for this year's remaining scheduled heavy fuel oil deliveries.
- The State Department and KEDO, with the cooperation of North Korea, have implemented a monitoring system at the seven North Korean heating and electricity-generating plants that are authorized to use KEDO-supplied heavy fuel oil. The purpose of this system is to ensure that North Korea uses the heavy fuel oil only for heating and electricity generation at the facilities. KEDO's portion of the monitoring system consists of meters that measure the flow of fuel to oil-fired boilers at the plants, recorders that

¹"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.

²Nuclear Nonproliferation: Status of Heavy Fuel Oil Delivered to North Korea Under the Agreed Framework (GAO/RCED-99-276, Sept. 30, 1999). We are also planning to issue a classified version of this report.

compile daily and cumulative information on flow rates, and periodic monitoring visits to each plant. Power outages and the poor quality of the electrical power available to the plants have affected the operation of the monitoring equipment. KEDO's monitoring system by itself is not designed to provide complete assurance that the heavy fuel oil delivered to North Korea is being used as prescribed by the Agreed Framework. For example, neither the U.S. government nor KEDO has arrangements with North Korea for monitoring the large quantities of heavy fuel oil in storage or in transit to the plants consuming the heavy fuel oil. However, the U.S. government supplements KEDO's monitoring system with national technical means to provide additional confidence that the heavy fuel oil is being used for heating and electricity generation. State Department officials have acknowledged that there is some evidence that North Korea has used perhaps 5 percent (or 75,000 metric tons) of the heavy fuel oil for unauthorized purposes.³ According to State, no clear evidence has emerged of any significant diversion of the deliveries of heavy fuel oil to North Korea to unauthorized purposes.

Background

In implementing the Agreed Framework, KEDO will purchase and supply North Korea with two light-water nuclear power reactors with a combined total generating capacity of approximately 2,000 megawatts of electrical power. In exchange, North Korea agreed to freeze the construction and operation of its existing nuclear reactors and related facilities, to eventually dismantle this equipment, and to comply with the international Treaty on the Non-Proliferation of Nuclear Weapons. Until the first reactor is complete, the United States pledged to arrange to provide alternative energy to North Korea for heating and electricity generation. At present, the schedule for delivering the first reactor has not been concluded. The alternative energy is in the form of 500,000 metric tons of heavy, or residual, fuel oil delivered annually.⁴ This type of oil is used for thermal heating, in power generation facilities, and as fuel for ships. According to Department of Defense officials, the quantities of other lighter forms of petroleum, such as gasoline, diesel fuel, or kerosene, that can be extracted from heavy fuel oil are very small compared with the quantities that can be extracted from crude oil or refined petroleum products. Through agreement with North Korea, heavy fuel oil supplied by the organization is

³At the time of this estimate, 1.5 million metric tons of heavy fuel oil had been delivered to North Korea.

⁴A KEDO consultant (Management Strategies, Inc.) estimates that in 1996, 500,000 metric tons represented 45 percent of North Korea's total annual heavy fuel oil needs.

being consumed in seven of the country's heating and electrical facilities (see app. I).

Status of Heavy Fuel Oil Funding and Deliveries to North Korea

As of July 31, 1999, 1.9 million metric tons of heavy fuel oil had been delivered to North Korea at a cost of \$222 million. The United States paid \$5.5 million for an initial shipment of 50,000 metric tons in 1995 and has since contributed \$133 million to KEDO for heavy fuel oil purchases and \$15 million for KEDO's administrative expenses. Contributions to KEDO by the European Atomic Energy Community—an organization of the European Union, Australia, and 21 other countries and loans made to finance heavy fuel oil purchases paid for the remaining \$74.5 million in heavy fuel oil costs (see app. II).

In the first 3 years of the Agreed Framework's implementation, shipments to North Korea did not occur on a regular and predictable schedule because KEDO did not always have sufficient funding to pay for deliveries. However, in the past 2 years, shipments have become more regular as the organization's financial condition has improved, with increased contributions from its members and decreased costs to purchase and ship the heavy fuel oil. Because of sharp rises in heavy fuel oil prices since February 1999 (see app. III), KEDO received an additional \$18.1 million contribution from the United States on September 29, 1999, in order to complete this year's 500,000-metric-ton allocation and to begin next year's deliveries.

Controls in Place to Detect Diversion of Heavy Fuel Oil to Purposes Not Prescribed in the Agreed Framework

To provide assurance that the heavy fuel oil supplied by KEDO is being used for heating and electricity generation as provided in the Agreed Framework, the organization, on the basis of agreements it reached with the State Department, established a heavy fuel oil monitoring system beginning in mid-1995. This monitoring system consists of flow meters and data recorders installed at each of the seven sites that consume heavy fuel oil. This equipment, which is supplied and paid for by the organization, measures and records the daily and cumulative flow of oil at each facility. KEDO and its contractor—Fluor Daniel, Inc.—also conduct periodic monitoring visits to North Korea to maintain the flow meter system and retrieve the data stored in the data recorders.

KEDO has experienced recurring problems with its heavy fuel oil monitoring system. Monitoring equipment installed at each of the seven sites consuming KEDO-supplied heavy fuel oil has been subject to outages

at various times since the system was installed. In 1998, for example, at the Pyongyang Thermal Power Plant, which consumed 16 percent of the total 1998 heavy fuel oil deliveries, monitoring equipment was inoperative for nearly half the year. Neither KEDO nor Fluor Daniel has found evidence of tampering with the equipment that could have caused these outages. Rather, both organizations have attributed these problems to the poor quality of the electrical power (i.e., a widely fluctuating electrical frequency) available at the facilities. Power-conditioning equipment that was initially installed to compensate for the frequency fluctuations did not completely alleviate the problem. This equipment has since been replaced by more advanced equipment that KEDO hopes will allow the monitoring system to operate continuously.

In addition, there are no arrangements with North Korea for monitoring the large quantities of KEDO-supplied heavy fuel oil in storage or in transit to the facilities where it will be consumed.⁵ According to a State Department report, North Korea has acknowledged storing a large quantity of KEDO-supplied heavy fuel oil in response to the irregularity of heavy fuel oil deliveries. Data derived from consumption statistics reported by North Korea indicate that about 110,000 metric tons of heavy fuel oil was being stored as of the end of June 1999 (see app. IV). According to KEDO officials, the heavy fuel oil is being stored in a large number of storage tanks and excavated open storage pits at the delivery ports and at the plants where the heavy fuel oil is being consumed. In addition, there is no agreement stipulating that North Korea segregate KEDO-supplied heavy fuel oil from the heavy fuel oil North Korea obtains from other suppliers. Similarly, monitoring equipment is not installed on the numerous railcars and pipelines used to transport the heavy fuel oil from the delivery ports to storage and from storage to the plants where the heavy fuel oil is to be consumed. KEDO is thus unable to track the heavy fuel oil from the time it is unloaded from delivery vessels at the North Korean ports to the time it passes through the flow meters at the plants where it is eventually consumed. KEDO officials, during their monitoring visits, have observed storage facilities at the seven plants; however, they cannot confirm that these are the only facilities where KEDO-supplied heavy fuel oil is being stored.

A January-April 1999 outage of KEDO's monitoring equipment at the Sonbong Thermal Power Plant—a facility that, according to KEDO, has

⁵According to State Department officials, when the monitoring system was designed, monitoring of storage facilities was considered but rejected as impractical because it would require dedicated storage tanks for KEDO-supplied heavy fuel oil and would add little to the capability of the monitoring system.

consumed over half of the heavy fuel oil supplied by the organization—illustrates the problems with KEDO's monitoring system. During this outage of over 3 months, the only available data showing the consumption of heavy fuel oil at Sonbong were provided by North Korea. These data were based on the levels of heavy fuel oil in the plant's storage facilities. However, since KEDO has no monitoring equipment installed at these storage facilities, it could not verify North Korea's reported statistics. During this period, North Korea reported that heavy fuel oil was being consumed at levels substantially exceeding those historically recorded at Sonbong (see app. V). When the monitoring system was repaired at the end of April, North Korea's reported consumption returned to normal levels. When KEDO officials inquired about this increase in reported consumption during the outage and the sudden return to normal consumption, North Korean officials responded that a lack of hydropower during the winter months required increased consumption of heavy fuel oil to generate electricity. However, the failure of KEDO's monitoring equipment leaves no way for the organization to verify this. Consumption during the winters of 1996, 1997, and 1998 did not show a similar large increase. In addition, North Korean officials reported that some of the heavy fuel oil leaked out of an open storage pit. Since North Korean consumption data are based on storage levels, leakage from the facilities would cause errors in consumption data, according to the North Korean officials responding to KEDO's inquiry. However, with no monitoring equipment in place to determine the amount of oil in these storage facilities, KEDO could not confirm that this leakage had contributed to the discrepancy. According to State Department officials, U.S. and KEDO officials plan to pursue this questionable consumption through talks with their North Korean counterparts.

KEDO's system alone is not designed to provide complete assurance that North Korea is using the heavy fuel oil delivered by KEDO as prescribed by the Agreed Framework. Although KEDO's monitoring system has experienced problems, the U.S. government uses national technical means to supplement KEDO's equipment to ensure that the heavy fuel oil is being used for heating and electricity generation. The State Department reported to the Congress in March 1999 that KEDO's monitoring arrangements, along with these national technical means, give the Department confidence that the heavy fuel oil supplied by the organization has largely been used in the manner prescribed by the Agreed Framework. State Department officials have acknowledged that there is some evidence that perhaps 5 percent (or 75,000 metric tons) of the heavy fuel oil has been used for unauthorized purposes. According to State, there is no clear evidence of any significant

diversion to unauthorized purposes of the 500,000 metric tons of heavy fuel oil delivered annually to North Korea.

State Department officials believe that the current level of monitoring using KEDO's equipment and the U.S. government's national technical means is sufficient to ensure that heavy fuel oil delivered to North Korea is not diverted to military uses or sold abroad. These officials emphasize that heavy fuel oil is not useful for purposes other than heating and electricity generation. While they admit that it is theoretically possible to extract other types of fuel from this oil, State Department officials believe that the process would be so inefficient (i.e., would produce such a small amount of more useful fuel) that there would be little incentive to do so. In their opinion, the current monitoring regime serves as a good tool to ensure that North Korea is abiding by its commitments to the United States.

This concludes my formal statement. If you or other members of the Committee have any questions, we will be pleased to respond to them.

Contact and Acknowledgment

For future contacts regarding this testimony, please contact Ms. Gary L. Jones at (202) 512-3841. Individuals making key contributions to this testimony included Gene Aloise, Ryan T. Coles, and Victor J. Sgobba.

North Korean Ports Receiving and Facilities Consuming KEDO-Supplied Heavy Fuel Oil



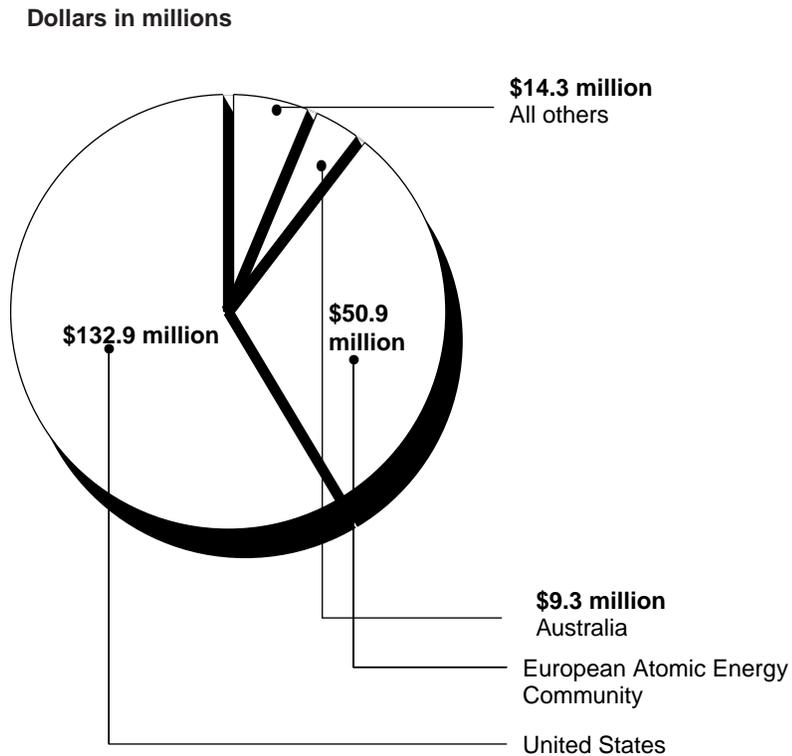
(Figure notes on next page)

Appendix I
North Korean Ports Receiving and Facilities
Consuming KEDO-Supplied Heavy Fuel Oil

Notes: 1. Since Oct. 1994, of the 1.9 million metric tons of heavy fuel oil delivered to North Korea, 1.2 million metric tons have been delivered to the port at Sonbong and 700,000 metric tons have been delivered to the ports of Nampo and Songrim.

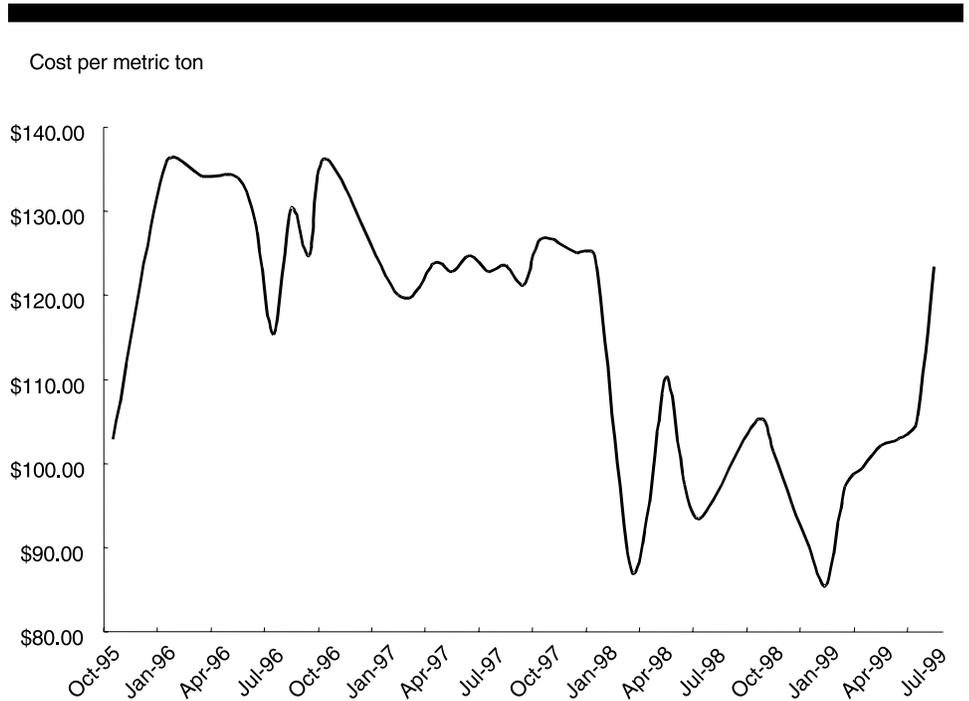
2. The Sonbong and Chongjin thermal power plants are supplied with heavy fuel oil from the port at Sonbong. Nampo/Songrim supplies the East Pyongyang, Pukchang, and Suncheon thermal power plants and the Nyongbyon Thermal Plant. From Jan. through July 1996, the Pyongyang Thermal Power Plant was supplied with heavy fuel oil from the port at Sonbong. Since that time, Pyongyang has been supplied from Nampo/Songrim.

Contributions to KEDO Available for Heavy Fuel Oil Purchases as of July 31, 1999



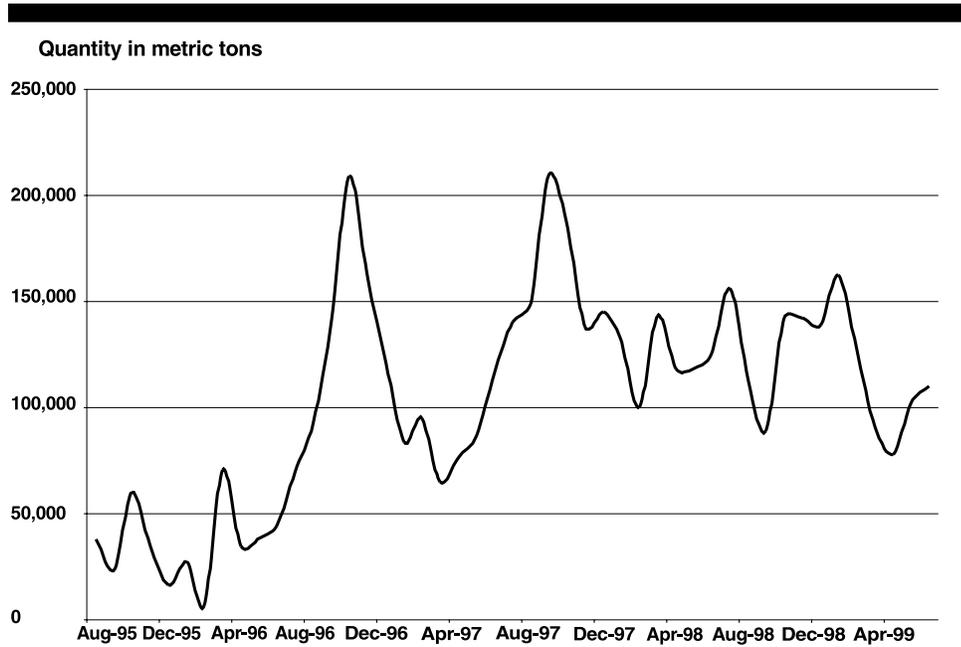
- Notes: 1. Total contributions to KEDO available for heavy fuel oil purchases equal \$207.4 million.
2. Japan's contribution of \$19 million to KEDO—in the form of a collateral fund to be used as needed to pay for financing KEDO's expenses in case of a liquidity shortfall—is not included in the contributions above. This fund has been used to support loans made to finance heavy fuel oil purchases.
3. The United States' contribution does not include the \$5.5 million paid for heavy fuel oil deliveries before KEDO was created in Mar. 1995 or the \$15.1 million contributed to KEDO for its administrative expenses.
- Source: GAO's analysis of data from KEDO.

Commodity and Freight Cost Per Metric Ton of Heavy Fuel Oil, October 1995-August 1999



Source: GAO's analysis of data from KEDO.

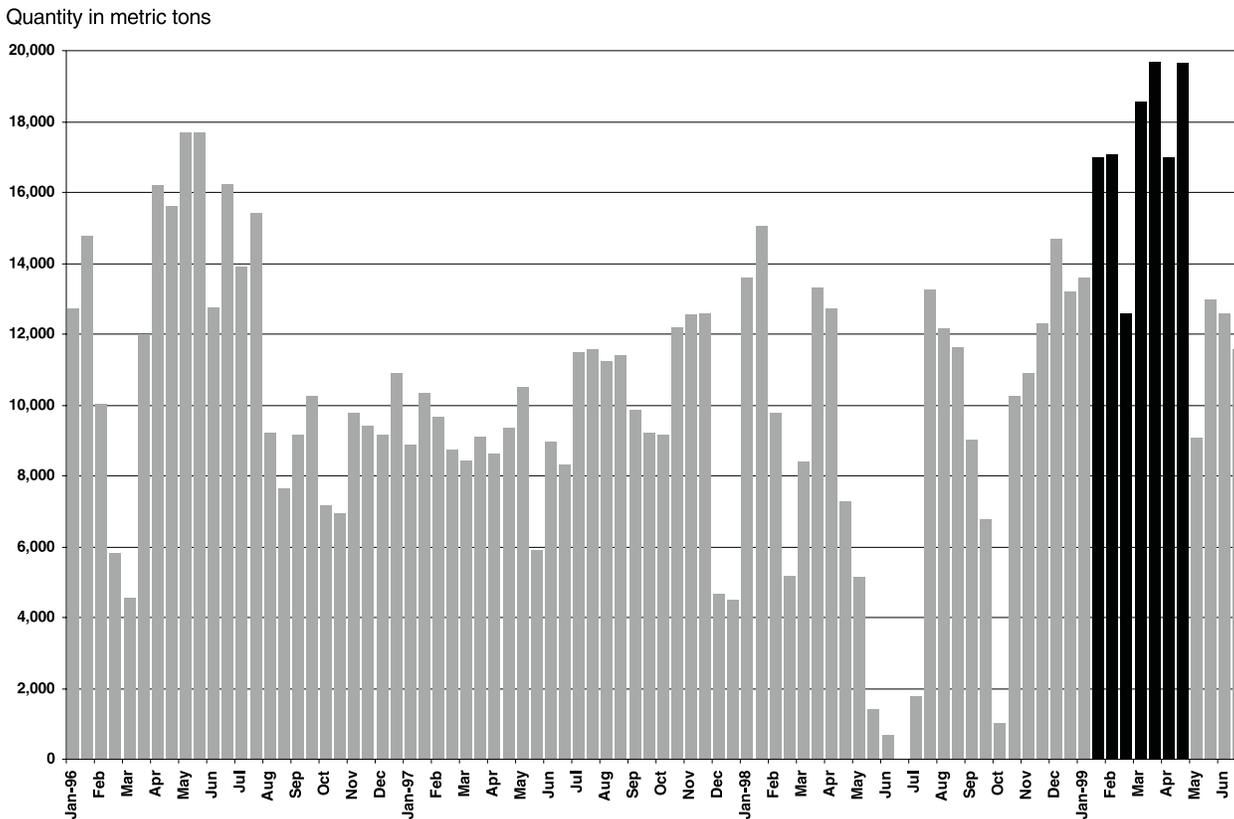
KEDO-Supplied Heavy Fuel Oil in Storage, August 1995-June 1999



Note: The quantity of heavy fuel oil in storage is estimated by subtracting North Korea's reported consumption from the quantity of heavy fuel oil delivered.

Source: GAO's analysis of data from KEDO.

North Korea's Reported Biweekly Consumption of Heavy Fuel Oil at Sonbong Thermal Power Plant, January 1996-June 1999



Notes: 1. North Korea's reported consumption during the Jan. 18-Apr. 26, 1999, period when KEDO's monitoring equipment was inoperative is shown in black.

2. A similar period of reported high consumption, from Apr.-July 1996, occurred before KEDO had installed data recorders at the Sonbong facility. Verifying these consumption data would involve detailed analysis of flow meter printouts from the period. These printouts did not have the time or date stamped by the equipment. To date, neither KEDO nor Fluor Daniel has performed this analysis.

Source: GAO's analysis of data from KEDO.

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