Senate Committee on Foreign Relations Hearing on
"Visit to the Yongbyon Nuclear Scientific Research Center in North Korea"
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Mr. Chairman, distinguished members of the Committee, I am honored to share with you my report of a rather unexpected and extraordinary visit to the Yongbyon Nuclear Scientific Research Center in North Korea (the Democratic People's Republic of Korea). I will submit a written statement for the record and summarize my observations this morning.

Background

I visited the Democratic People's Republic of Korea (DPRK) and the Yongbyon Nuclear Scientific Research Center as part of an unofficial U.S. delegation led by Professor John W. Lewis of Stanford University. Professor Lewis is an Asian scholar at Stanford, specializing in China and North Korea. Professor Lewis' visit was part of his ongoing dialog with officials of the DPRK concerning the North's nuclear program. He has visited the DPRK ten times since he began this dialog in 1987. He last visited the DPRK just before the official six-party talks in Beijing last August. DPRK officials invited him to return. When they indicated that they may allow him to visit the nuclear facilities at the Yongbyon Nuclear Scientific Research Center, he contacted me to accompany him to provide scientific expertise. Since I work for the Los Alamos National Laboratory, which is operated by the University of California for the Department of Energy, I requested and received the necessary U.S. Government approvals for travel to China and the DPRK. I have known Prof. Lewis for approximately 15 years. We have collaborated on other global security issues.

Joining our delegation at Prof. Lewis' invitation was Charles L. (Jack) Pritchard, Visiting Scholar at the Brookings Institute and formerly the U.S. special envoy for DPRK negotiations. In addition, two Senate Foreign Relations Committee experts on Asian affairs, Mr. W. Keith Luse and Mr. Frank S. Januzzi, had separately planned a trip to the DPRK. They joined our delegation in the DPRK and participated in our visit to the Yongbyon Nuclear Scientific Research Center.

The host organization for our visit was the DPRK Ministry of Foreign Affairs. Ambassador Li Gun accompanied us during the entire visit. Vice Minister Kim Gye Gwan met with us on three separate occasions. In addition to the visit to the Nuclear Scientific Research Center, Prof. Lewis had arranged other meetings with DPRK officials to cover economic, military, and science issues. Mr. Luse and Mr. Jannuzi arranged some additional meetings on their own. I will restrict my written statement to the areas of my expertise, namely the nuclear issues. More specifically, I will focus on what we learned during the visit to the Yongbyon Nuclear Scientific Research Center.

DPRK statements and motivation to set the context for the visit

Vice Minister Kim [Gye Gwan] indicated that they were very interested in resuming the six-party talks. The DPRK made a proposal on Dec. 9, 2003 to freeze its nuclear activities and received no response from the United States. Vice Minister Kim indicated that they have just repeated this proposal and this time Secretary Powell responded positively. [The following quote from Secretary Powell appeared in AFP, January 7, 2004: "This is an interesting step on their part, a positive step, and we hope that it will allow us to move more rapidly to six-party framework talks. I am encouraged, I am encouraged by the statement the North Koreans made."]

Vice Minister Kim stated, "The most reasonable way [to proceed] is to have simultaneous action steps. …The U.S. says it will give us a security assurance if we dismantle our nuclear program. We say it differently. The first step would be a freeze of the present [DPRK] nuclear activities. You will see how important a freeze will be when you are at Yongbyon. This means there will be no manufacturing, no testing, and no transferring of nuclear weapons."

Vice Minister Kim stated, "We view the delegation's visit to Yongbyon as a way to help contribute to breaking the stalemate and opening up a bright future. We will not play games with you. We have invited you to go to Yongbyon. The primary reason for this is to ensure transparency. This will reduce the assumptions and errors. …This visit can have great symbolic significance."

"We want you to take an objective look, and we will leave the conclusions to your side. This is why the inclusion of Dr. Sig Hecker is so significant." Mr. Pritchard stated that we are unofficial and that we are not an inspection team. Kim continued, "Hecker's presence will allow us to tell you everything. This is an extraordinary approval by us. …We, too, emphasize that you are not making an inspection. But, because we are allowing this visit, we will provide you enough access to have good knowledge."

Vice Minister Kim indicated that based on the U.S. actions in November 2002, the DPRK decided that the Agreed Framework was no longer in its interest, so it terminated the IAEA [International Atomic Energy Agency] inspections and withdrew from the NPT. The DPRK decided to operate the 5MWe reactor and resume reprocessing of plutonium for peaceful nuclear activities. He stated, "It is the only way to keep the spent fuel rods safe." He added, "At the same time, the hostile U.S. policy had been intensified. So, we changed our purpose and informed the U.S. that the plutonium that was to have been used for peaceful purposes would now be used for weapons. Originally, we had wanted to keep the reprocessed plutonium in a way we could store it safely. Then, we changed the purpose in order to strengthen our deterrent."

Vice Minister Kim added that the DPRK wants a peaceful resolution of the nuclear crisis. They want a denuclearization of the Korean Peninsula. He emphasized that the DPRK has been very flexible and very patient, adding, "I should note that the time that has been lost [in dealing with us] has not been beneficial to the U.S. side. With an

additional lapse in time, our nuclear arsenal could grow in quality and quantity. The outcome has not been a success for the U.S."

I provide this political background to set the context for potential motivations for the DPRK decision to invite us to visit the Nuclear Scientific Research Center. They have publicly stated that they have reprocessed the fuel rods to extract plutonium and strengthen their "deterrent." It appears they were concerned that the United States (and perhaps others) did not believe them. So, they may have invited us to provide independent confirmation of their claims.

However, Vice Minister Kim also expressed a concern about their decision to invite us to Yongbyon. He stated: "If you go back to the United States and say that the North already has nuclear weapons, this may cause the U.S. to act against us." At a later meeting, he returned to this concern by stating, "We are concerned that the U.S. Government will use what you conclude [as a pretext] to attack us. The U.S. might claim that this visit proves that the DPRK has crossed a red line when it restarted the reactor. Can we be sure that the U.S. will refrain from action if it declares that we have gone beyond its red line – such as finishing of the reprocessing and the change in the purpose of the reprocessing [from peaceful safety-related reasons to making weapons]?"

So, I believe the DPRK wanted to show us the Yongbyon Nuclear Scientific Research Center to verify that they had taken significant actions since December 2002 and to impress us with their nuclear capabilities. The Center leadership and its specialists were very cooperative within the boundaries of what they were authorized to show us. Nevertheless, DPRK officials had reservations about our visit and they recognized the risks involved. They obviously decided the potential benefits of our visit justified taking the risks.

My motivations for going to the DPRK

I explained to our DPRK hosts my decision to accept Prof. Lewis' invitation to join him on this trip. I have been concerned about the ambiguities associated with the DPRK nuclear program. I realize that some of the ambiguities may be deliberate. However, ambiguities often lead to miscalculations, and in the case of nuclear weapons-related matters, such miscalculations could be disastrous. So, I had hoped that as a scientist I could help to bring some clarity to the DPRK nuclear situation by visiting the Yongbyon Nuclear Scientific Research Center.

I also stated that I believe the role of scientists (and I should add engineers) is very important to the diplomatic process. I see three important roles. First, to bring clarity to the issues so as to facilitate a diplomatic solution to the nuclear crisis. Second, if a diplomatic solution is found, scientists must help to implement any solution such as a freeze or eventual denuclearization. Third, scientists will be crucial to help verify any such solution. So, it is my hope that my visit might be a small step in this direction.

Logistics of the visit to the Yongbyon Nuclear Scientific Research Center

On Thursday, January 8, 2004, all five members of our delegation visited the Center, which is near the town of Yongbyon, roughly 100 km north of the DPRK capital of

Pyongyang. We were accompanied by Ambassador Li Gun, an official from the General Bureau of Atomic Energy and a security escort. We were greeted by Professor Dr. Ri Hong Sop, Director of the Nuclear Scientific Research Center. The Center reports to the General Bureau of Atomic Energy. Also present at our introductory briefing were Choi Kil Man, Assistant Director of the Center, Li Yong ho, Safeguards Section Head, Kim Haik Soon, Senior Center Researcher, Pak Chang Su, Center Researcher.

At the Yongbyon Nuclear Scientific Research Center, Director Ri [Hong Sop] toured us through the following facilities:

- The Experimental Nuclear Power Plant (the DPRK name for what we call the 5 MWe [5 megawatt electric] reactor). We were toured through the control room and the observation area for the reactor hall. This facility is inside the first security area of the Yongbyon facility. Our guide was Chief Engineer of the facility, Li Song Hwan.
- The spent fuel storage pool building next to the 5 MWe reactor, also guided by Chief Engineer Li Song Hwan.
- Drive by (twice) of the 50 MWe reactor site. Inside the second high-security area of the Yongbyon facility.
- Radiochemical Laboratory – 3rd floor corridor that allowed for viewing of the hot cell operations through shielded glass windows and a conference room. (This facility is also inside the second high-security area). Our guide was Chief Engineer of the Radiochemical Laboratory, Li Yong Song.
- Guest House for introductory and wrap-up discussions with Center facility leadership.

Our hosts drove us from Pyongyang to the Yongbyon facility. We left the hotel at 8:30 a.m. and returned shortly before 7:00 p.m. We spent from 10:30 am to 5:15 p.m. at the facility.

Observations from the visit: What we were told and what we saw

I will present my observations for each facility. I will first summarize what we were told by the Center leadership *(shown in Italics)* and then summarize my observations (in regular font). The director and the two chief engineers each stated that it was U.S. actions that forced the DPRK to take steps to resume nuclear operations.

The 5 MWe reactor: *They stated that they have restarted only the Experimental Nuclear Power Plant (the 5 MWe reactor). The plant was restarted in February 2003. It now is operating smoothly at 100 % of its rated thermal power. They are producing electricity and heat from the reactor now for their town. The reactor is the main source of heat for the town now that the 10,000 metric tons (tonnes) of heavy fuel oil supplied annually to their region (as part of the 500,000 tonnes agreed to in the Agreed Framework) has been cut off.*

We confirmed that the 5 MWe reactor is operating now. We were shown the control room and the reactor hall. All indications from the display in the control room are that the reactor is operating smoothly now. The steam plume emanating from the cooling tower [visible both in the morning and afternoon] confirmed operation. However, we have no way of assessing independently how well the reactor has operated during the past year.

The length of time the reactor is expected to operate with the current load of fuel depends on how the situation with the United States develops. They do not have safety concerns about running the reactor for a long time [implying years]. They stated that some of the operational problems experienced previously have been corrected. However, they are prepared to reprocess the current fuel at any time.

We commented to our hosts that in addition to producing electricity and heat the reactor is also producing new plutonium. Best estimates are that under current reactor operations approximately 6 kg of plutonium is produced annually in the spent fuel.[1] The reactor may currently contain approximately 6 kg of plutonium in the spent fuel rods, and it will continue to produce an additional 6 kg each year assuming the reactor operates efficiently.

They stated that have one more charge of fuel for the reactor fabricated now. The fuel fabrication facility is partially operational and partially under maintenance. They are in no hurry to fabricate more fuel since the two bigger reactors under construction are not close to operation.

We did not have the opportunity to visit the fuel fabrication facility. However, these comments are consistent with previous U.S. estimates. In previous years, the fuel fabrication complex was reported to be making fuel elements containing about 100 tonnes per year of uranium. The complex is believed to have produced enough fuel for the initial loading of the core for the 50 MWe reactor under construction. Moreover, the nominal capacity was appreciably larger.[1]

50 MWe reactor. *They told us that construction stopped in 1994. They stated that at that time it was within one year of completion. Nothing has been done since. They are currently evaluating what to do with the reactor.*

We drove past the 50 MWe reactor site twice. We confirmed that there is no construction activity at this site. There were no construction cranes on site. The reactor building looks in a terrible state of repair. The concrete building structure showed cracks. The steel exhaust tower was heavily corroded, as was other steel equipment on the site. The building was not closed up and resembled a deserted structure. The NSC director expressed his great dismay about the deterioration of the facility because of the eight-year freeze. This reactor is much more than one year from completion now. It is not clear how much of the current structure can be salvaged.

200 MWe reactor at Tacheon (this reactor site is 20 km from Yongbyon). *They stated that construction also stopped in 1994. They are also evaluating what to do with the reactor.*

[1] David Albright, Kevin O'Neill, editors. *"Solving the North Korean Nuclear Puzzle,"* ISIS Reports, The Institute for Science and International Security, Washington, D.C., 2000.

This reactor location is at a different site. We were not able to assess the current situation.

Spent fuel storage building. *They stated that they removed all 8000 fuel rods from the spent fuel storage pool and shipped them to the Radiochemical Laboratory (plutonium reprocessing facility) and reprocessed them [to extract the plutonium]. The fuel rods were taken out of the pool in Korean containers (metal baskets) and placed in specially shielded shipping casks. During the removal of the fuel rods they found that about half of the U.S. canisters had leaked during storage. But they claimed not to have experienced major problems getting the spent fuel rods out of the pool and transporting them in special casks by truck daily to the Radiochemical Laboratory for reprocessing.*

These are the spent fuel rods that the DPRK had removed from the 5 MWe reactor after it ceased operation in 1994 as part of the Agreed Framework. In 1995, a few months after the Agreed Framework was signed, preparations for the canning began. The process turned out to be quite involved and was not finished until June 2000. During this time, the United States Department of State and Department of Energy (supported by the Pacific Northwest National Laboratory and the Nuclear Assurance Corporation) worked jointly with the DPRK to package these rods in 400 U.S. supplied stainless steel canisters to store safely (with dry inert gas inside the canisters) in a deep pool of water (for radiation shielding) to allow the radioactivity level of the rods to decrease with time. This facility was fitted with various devices and seals by IAEA inspectors to ensure that the fuel rods would not be tampered with. However, the IAEA inspectors were dismissed by the DPRK in December 2002. Only DPRK personnel have had access to the Nuclear Scientific Research Center since that time.

Our initial look into the spent fuel pool showed that the locking plates and associated structures that the U.S. Spent Fuel Team had put in place after the canisters (loaded with the 8000 fuel rods) were inserted into the pool were gone. We immediately confirmed the fact that all fuel rods were no longer in the pool because many of the canisters were missing and many were open. The building was not heated and we found a thin sheet of ice on the pool surface. When I expressed concern that some of the canisters were still closed, they took the extraordinary step of allowing me to pick one at random and open it [all done under water in the pool] to demonstrate that there are no fuel rods remaining, even in the closed canisters. The randomly selected canister did not contain any fuel rods (it initially contained 20). This and other observations convinced me that the spent fuel pool is empty; the fuel rods are gone. It is possible that they moved the 8000 fuel rods to a different storage location. However, such storage would represent a serious health and safety hazard. [During the tour of the Radiochemical Laboratory, I asked if we could visit the Dry Storage Building, which serves as the port of entry for the fuel rods into that laboratory, they said that it was not available for a tour because their was no activity and there were no workers in the building.]

Radiochemical Laboratory. *They stated that they reprocessed all 8000 spent fuel rods in the Radiochemical Laboratory in one continuous campaign, starting in mid-January 2003 and finishing by the end of June 2003. They stated that their capacity in the*

Radiochemical Laboratory is 375 kg uranium per day (they said they worked four 6-hr shifts around the clock). They later added that the reprocessing capacity of the facility under normal operating conditions is 110 tonnes of spent uranium fuel per year. Therefore, they were able to finish the current campaign of 50 tonnes of spent fuel rods in less than six months. They told us that we would tour the corridor next to the hot cells in which the reprocessing occurs. The campaign is complete; the facility is not operating now. Everything has been cleaned up and there is no radiation hazard in the corridor.

At the Radiochemical Laboratory we confirmed that they possessed an industrial-scale reprocessing facility. The facility appeared in good repair. They demonstrated the requisite facilities, equipment, and technical expertise required for reprocessing plutonium at the scale in question. They use the standard PUREX (plutonium uranium extraction) process for separating plutonium from the fission products and uranium fuel. They answered all our technical questions about the reprocessing chemistry very competently. We were not able to see the glove boxes used for the final plutonium purification and production. They indicated that these were downstairs and not part of today's tour. In his book, Albright stated that five glove boxes were used during this process to produce plutonium dioxide product. He also reported that one or two glove boxes may have been removed before inspectors were permitted on site.[2] These boxes could presumably have been used to process plutonium dioxide [the typical plutonium product from the reprocessing operation] into metal and to cast or shape plutonium metal. Based on our tour we are not able to confirm or deny that the facility operated during the first half of 2003.

They stated that the Radiochemical Laboratory was built through their own efforts. They began construction in 1986 and the main parts were completed by 1990. At that time they ran a "hot test" of the facility with 80 fuel rods and natural uranium rods to extract 60 grams of plutonium.

Albright reported that the hot test involved 86 fuel rods irradiated in the 5 MWe reactor combined with 172 fresh fuel rods. He also reported that in 1992 the DPRK presented plutonium oxide containing about 62 grams of plutonium to the IAEA inspectors. However, the total amount of plutonium actually processed by the DPRK before IAEA inspections began in 1992 is still strongly disputed.[2]

When asked about the disposition of the waste stream, they stated that the waste from the most recent reprocessing campaign was mixed in with the waste from the "hot test" of the 80 fuel rods processed in spring of 1990.

We were not able to visit the waste facilities and, hence, cannot confirm this statement. Even if we had toured the facility, we could not make a judgment without sophisticated sampling and measurements of the nuclear wastes. However, this type of information is important for tracing the reprocessing history of the facility.

[2] See D. Albright and K. O'Neill, Reference 1.

They stated that they initially intended to run the fuel cycle for civilian purposes (which means they would have stored the plutonium product as plutonium dioxide) but because of the hostile U.S. actions, they reprocessed the entire campaign to plutonium metal. They stated that this processing was done in the Radiochemical Laboratory by installing some glove boxes that were not present during IAEA inspections. It took them three months to install the equipment and prepare it for the plutonium metal processing step.

We were not able to see the glove boxes for the final plutonium operations. However, their comments indicated that they had glove boxes for plutonium metal production ready to go. This indicates that they had experience making plutonium metal before the IAEA inspections began in 1992. Albright[3] estimated that the 8000 spent fuel rods in question could yield between 25 and 30 kg of plutonium metal.

Although we could not see the plutonium glove box operations, they took the extraordinary step of showing us the "product" from what they claimed to be their most recent reprocessing campaign. In a conference room following the tour, they brought a metal case that contained a wooden box with a glass jar they said contained 150 grams of plutonium oxalate powder and a glass jar they said contained 200 grams of plutonium metal for us to inspect.

The glass jars were fitted with a screw-on metal lid and were tightly taped with transparent tape. (The plutonium's alpha-radiation is easily stopped by the glass jar). The green color of the plutonium oxalate powder is consistent with plutonium oxalate that has been stored in air for some time. The plutonium metal was a thin-walled (approximately 1/8-inch thick) funnel (approximately 2-inch diameter at the base and 1-inch diameter at the top, approximately 1 ½ inches high) that they claimed to have been scrap from a casting from this reprocessing campaign. When asked about its density, they responded, "between 15 and 16 g/cubic centimeter and that it was alloyed [a practice common in plutonium metallurgy to retain the δ-phase of plutonium which makes it easier to cast and shape]. The metal surface and color were consistent with moderately oxidized plutonium metal from a casting (I believe it could not have been in the jar for a period of many weeks because it did not show any loose oxide powder). I tried to get a feel for the density and heat content of the alleged plutonium metal by holding the glass jar in a gloved hand. The glass jar (very thick walled) was reasonably heavy and slightly warm (importantly, however, it was definitely not cold as was everything else in this building). The bottom line is that with the rather primitive tools at hand I was not able to definitively identify the purported metal and the powder as plutonium. It was radioactive, however, because a radiation probe (which appeared to be a Geiger counter [Geiger-Müller detector]) registered a count when turned on near the wooden box containing the glass jars. With a few relatively simple tests, we would be able to positively identify the product as plutonium metal, but that was not possible to do during this visit.

Furthermore, even if we could confirm that the product we were shown is plutonium, we would not have been able to confirm that it came from the most recent campaign

[3] See D. Albright and K. O'Neill, Reference 1.

without additional, more sophisticated isotopic measurements that would let us identify the age of the plutonium. The director of the NSC confirmed this by stating, *"you would have to measure the americium to plutonium-241 ratio to determine its age."* He was correct.

When asked about the isotopic content of the plutonium, specifically its Pu-240 content, they stated, "the plutonium-240 content from this campaign is low, but we are not authorized to tell you. The IAEA knows, you can ask them." We were in no position to assess the isotopic content of the plutonium produced or that shown to us.

They also stated that the plutonium metal was alloyed, but they were not authorized to tell us what alloying element was used [they did add, you know what it is, and we do it the same]. We were in no position to tell whether or not the plutonium metal shown to us was alloyed. However, the fact that it was not cracked and that their specialists claimed that the plutonium had a density between 15 and 16 grams/cubic centimeter is consistent with plutonium alloyed with approximately 1 weight percent of gallium or aluminum. A calculation of the rough dimensions and weight is also consistent with these values. However, the uncertainty in my observations is very large.

Mr. Luse asked about a concern of yours Mr. Chairman; that is, the security of their nuclear materials. Director Ri responded, *"Be at ease with this problem. I am not authorized to give you an explanation on this, but we feel certain that the protection and safety – the security – are good."*

We were also told that the effects of another freeze or decision to denuclearize would have devastating effects on the work force. Director Ri indicated that all of his people, including he, would have to look for new jobs.

Other observations and comments related to the nuclear issues

The DPRK "deterrent." During follow-up discussions with Ambassador Li and Vice Minister Kim in Pyongyang, they stressed that the DPRK now has a nuclear deterrent and that U.S. actions have caused them to strengthen their deterrent – both in quality and in quantity. Ambassador Li inquired if what I had seen at Yongbyon convinced me that they had this deterrent.

I explained to both of them that there is nothing that we saw at the Yongbyon Nuclear Scientific Research Center that would allow me to assess whether or not the DPRK possessed a nuclear deterrent if that meant a nuclear device or nuclear weapon. We found that both in our visit and in previous declarations by the government of the DPRK that the term "deterrent" was used in a very ambiguous manner.

I explained that I view a "deterrent" to have at least three components: 1) The ability to make plutonium metal, 2) the ability to design and build a nuclear device, and 3) the ability to integrate the nuclear device into a delivery system. What we saw at Yongbyon was that they apparently have the capability to do the first. However, I saw nothing and talked to no one that allowed me to assess whether or not they have the ability to design a

nuclear device. And, of course, we were not able to assess the integration into a delivery vehicle. Moreover, during additional discussions I cautioned that "deterrence" might have worked between the United States and the Soviet Union, two equally armed nuclear superpowers under rather predictable circumstances. The concept of nuclear deterrence may have little meaning for the U.S. – DPRK situation. I asked Ambassador Li in the late morning of the last day of our visit if I could meet individuals who could talk to me in some detail about their "deterrent" in the spirit that I had just described. He said he would try, but that evening told me that the time was insufficient to make such arrangements.

Highly-enriched uranium issue. In the Foreign Ministry, we discussed the contentious issue of DPRK's supposed admission on October 4, 2002, to having a clandestine highly enriched uranium (HEU) program in violation of the letter and spirit of the 1994 Agreed Framework. There is a controversy about whether the DPRK admitted to having such a program at a meeting with U.S. officials. The disagreement concerns a difference between what DPRK officials believe they said and what U.S. officials believe they heard. DPRK officials provided us with a copy of the Korean text of what Vice Foreign Minister Kang Sok-ju said at the meeting. Regardless of how this issue is eventually clarified, one will still have to deal with the facts.

During our meeting, Mr. Pritchard stated, "The key issue is the intelligence that makes the United States believe that the DPRK has an HEU program. In the U.S., there is the widespread view that the complete, verifiable resolution of this HEU issue is now mandatory. This is a practical issue, and there must be a multilateral discussion to resolve it." In response, Vice Minister Kim Gye Gwan stated that the DPRK had no HEU program. Upon further questioning he stated that the DRPK had chosen the plutonium path to a deterrent. It had no facilities, equipment or scientists dedicated to an HEU program, adding, "We can be very serious when we talk about this. We are fully open to technical talks."

Concluding remarks

Mr. Chairman, I would like to summarize my observations based on our visit to the Yongbyon Nuclear Scientific Research Center and discussions in Pyongyang.

- The 5 MWe reactor has been restarted. It appears to be operating smoothly providing heat and electricity, while also accumulating approximately 6 kg of plutonium per year in its spent fuel rods.
- The 50 MWe reactor construction site appears to have seen no activity since the IAEA inspectors were instructed to leave in 2002. The reactor and the construction site look in a bad state of repair. It would require a major construction program to finish the reactor.
- The spent fuel pond is empty; the approximately 8000 fuel rods have been moved.
- The DPRK claimed to have reprocessed all 8000 fuel rods to extract plutonium metal during one continuous campaign between mid-January 2003 and end of June 2003. The 8000 fuel rods are estimated to contain up to 25 to 30 kg of plutonium metal. We could not definitively substantiate that claim. However, the Radiochemical Laboratory staff demonstrated that they had the requisite facility, equipment and technical expertise, and they appear to have the capacity to do so.

- It is possible that they moved the 8000 fuel rods to a different storage location. However, such storage would represent a serious health and safety hazard.
- We were shown what was claimed to be a sample of plutonium metal product. I was not able to definitively confirm that what we saw was actually plutonium metal, but all observations I was able to make are consistent with the sample being plutonium metal. However, even if the sample were plutonium metal, I would not have been able to substantiate that it was plutonium from the most recent reprocessing campaign. Such a determination requires more sophisticated measurements.
- In the foreseeable future, the DPRK can produce 6 kg of plutonium per year in its 5 MWe reactor. It easily has the capacity to reprocess the spent fuel at any time to extract the plutonium. It also has the capacity to reload the reactor with fresh fuel for a second and subsequent reloading. It is not, however, in a position to increase the rate of plutonium production much beyond 6 kg per year without a major construction project at the 50 MWe or 200 MWe reactor sites, something that would be difficult to do clandestinely.
- Officials of the DPRK Ministry of Foreign Affairs claimed that the DPRK had weapons of mass destruction. They believe that they provided us with evidence of their "deterrent." At Yongbyon, they demonstrated that they most likely had the capability to make plutonium metal. However, I saw nothing and spoke to no one who could convince me that they could build a nuclear device with that metal, and that they could weaponize such a device into a delivery vehicle. We were not able to arrange meetings with DPRK staff who may have such expertise or visit related facilities.
- Officials of the DPRK Ministry of Foreign Affairs also stated categorically that the DPRK has no program for enriching uranium. Moreover, they claim to have no equipment and no scientific expertise to do so. We were not able to substantiate these claims.

Let me close by stating that I shared these conclusions with our DPRK hosts before my departure. I told them that my observations still have uncertainties. I may be able to reduce some of the uncertainties through discussions with other U.S. specialists, with additional analysis, and through peer review. I intend to do so and write a more comprehensive technical report in the future. The response of the DRPK officials was quite positive although they had hoped that my conclusions would be more definitive. They asked me to report my observations as I presented them.

Finally, Mr. Chairman, I found the trip to be remarkable. Our DPRK hosts were most courteous and cooperative. I would like to acknowledge the Albright/O'Neill book on the Korean Nuclear Puzzle, the Report from the Department of State/Department of Energy Spent Fuel Canning Team, and discussions with several of my colleagues at Los Alamos, all of which helped me to prepare for this visit. I hope that our findings will contribute at least in some small way to a resolution of the current nuclear crisis and the eventual denuclearization of the Korean Peninsula. Thank you for giving me the opportunity to share our findings with you.