July 15, 2005

MEMORANDUM TO: John T. Larkins, Executive Director
ACRS/ACNW

FROM: Michael T. Ryan, Chairman */RA/*
ACNW

Neil M. Coleman, Senior Staff Scientist */RA/*
ACNW

SUBJECT: TRIP REPORT: ACNW TRAVEL TO JAPAN FOR A ONE-WEEK TECHNICAL EXCHANGE ON WASTE MANAGEMENT AND FUEL CYCLE PRACTICES

During May 14-21, three ACNW members and one staff scientist traveled to Japan for a technical exchange. The trip was led by Chairman Michael T. Ryan, who was accompanied by Vice-Chairman Allen G. Croff, Member James H. Clarke, and staff scientist Neil M. Coleman. In the course of five days we met with the five-member Nuclear Safety Commission of Japan (NSC), visited the high-level nuclear waste demonstration research project at Horonobe, and participated in meetings and facility tours at the nuclear complexes of Rokkasho-Mura and Tokai-mura. An annotated itinerary is provided as Attachment 1. The four ACNW travelers gave technical presentations at the NSC meeting in Tokyo and, at the request of our hosts, repeated several of these talks at other localities we visited. The ACNW talks are summarized below and provided as Attachment 2:

Overview of the U.S. Nuclear Waste Regulatory Framework and the Role of the Advisory Committee on Nuclear Waste - Michael T. Ryan, ACNW Chairman

Review of U.S. High-Level Waste Processing - Allen G. Croff, ACNW Vice-Chairman

ACNW Decommissioning Activities - 2005 and Beyond - James H. Clarke, ACNW Member

Geology and Engineered Barriers for the Proposed Yucca Mountain High-Level Waste Repository - Neil M. Coleman, ACNW Senior Staff Scientist

U. S. Experience and Practices in Low-Level Waste Management - Michael T. Ryan, ACNW Chairman

Our Japanese hosts gave four presentations at the NSC meeting in Tokyo. These are provided as Attachment 3, and included an overview of radioactive waste disposal regulations in Japan, policy on management and disposal of radioactive wastes, and several talks on the status and progress of the implementation phase of Japan's HLW disposal program. Additional information received during the technical exchange is listed in Attachment 4 and will be retained in an ACNW file record of this trip.

The meeting with the five NSC Commissioners in Tokyo focused on risk-informed regulation and the importance of keeping the public informed. The NSC appears committed to using a risk-informed approach to regulation and is intuitively approaching many issues on this basis. However, the Commissioners indicated they have not been able to clearly articulate a unifying philosophy, framework, and implementation process for risk-based regulation, especially regarding definitions for various waste categories. The NRC may be able to assist the NSC in this regard by providing key policy-level documents and expertise related to risk-informed regulation. We have sent them a series of papers and reports related to risk-informed analyses, including the NRC's white paper on risk-informed, performance-based regulation, several conference papers by ACNW's previous Chairman John Garrick, and a report sponsored by NMSS that illustrates how to quantitatively risk-inform a major project (i.e., Yucca Mountain). We also provided a CD containing ACNW letters that relate to high-level waste and low-level waste.

Photo taken during the May 16th meeting at the NSC offices in Tokyo. From left to right: NSC Commissioner Higashi Kunio, ACNW Vice-Chairman Allen G. Croff, NSC Commissioner Soda Kunihisa, NSC Commissioner Kusumi Shizuyo, NSC Chairman Matsuura Shojiro, ACNW Chairman Michael T. Ryan, ACNW member James H. Clarke, and NSC Deputy Chairman Suzuki Atsuyuki.

In discussions with the NSC, Chairman Ryan presented insights concerning relative risk in dose

calculations. In particular, performance assessments for disposal sites show that highly mobile, long-lived radionuclides such as Iodine-129 appear to be important in predicted dose over long time periods. However, I-129 is unlikely to produce significant future dose because it will be highly diluted by the pool of stable iodine in the diet. This condition also generally applies to Carbon-14. This insight appeared to be new and useful information for our Japanese hosts. We have sent them a recent paper co-authored by Chairman Ryan that discusses this issue in more detail. Chairman Ryan also discussed this issue of radionuclide dilution and estimated dose during meetings at Rokkasho and Tokai.

The NSC Commissioners asked how the ACNW interacts with the Commissioners at NRC. Chairman Ryan described how ACNW prepares a detailed Action Plan of proposed activities over two years. The Commission reviews and then comments on the Action Plan. The Action Plan is then finalized and posted on ACNW's website. Chairman Ryan gave copies of the ACNW Action Plan to the NSC.

Additional ACNW Observations from the Technical Exchange

- *Closed Fuel Cycle*: Japan is committed to implementing a closed fuel cycle within its borders and will soon implement all of the facilities and capabilities that are needed.

- *HLW Disposal*: Japan is committed to identifying one or more candidate repository sites by soliciting volunteer municipalities in Japan. Efforts in this regard have been underway since 2002. No candidate sites have been identified to date, in spite of an education effort and general solicitation made to over 3239 municipalities. Also, guarantees that the Horonobe site would not be a candidate for a HLW repository had to be provided before the usage of the site as an underground laboratory was agreed to by the community.

  Japan is clearly committed to a systematic approach to siting, designing, licensing, constructing, and operating a geologic repository for disposal of HLW. The ongoing program includes R&D activities concerning the regulatory, analytical, and experimental aspects of a repository including the construction of two underground research laboratories in sedimentary and crystalline rocks. The objective of the ongoing program is to develop the physical, computational, and human capabilities required to establish a repository. Current activities are not focused on characterizing a candidate repository site. As a consequence, many ongoing activities are similar to those that have been conducted in other countries. Continued collaboration with Japan to extend rather than replicate the state-of-the-art in repository science would be helpful.

  Japan has established impressive R&D facilities at Tokai (e.g., ENTRY and QUALITY) and is developing underground research laboratories (URLs) in Horonobe (northern Hokkaido) and Mizunami (central Honshu). These efforts provide an excellent basis for the development of the capabilities needed to evaluate candidate sites for a HLW repository.

- *LLW Disposal*: Japan has a clear strategy for disposal of various types of "low level waste" ranging from clearance (a recent law provides authority although detailed criteria have not yet been established), to near surface disposal of "very low level wastes" at Tokai (without engineered barriers), to near-surface disposal (with engineered barriers) of "higher activity" low level wastes at Rokkasho, to the potential for intermediate depth

disposal of “relatively high activity” LLW at Rokkasho.

- *Waste Classification*: The definition of HLW in Japan is based on the source of the waste as it is in the U.S. However, in Japan the source-based definition of HLW is not presently projected to be an issue because the waste resulting from reprocessing contains high concentrations of highly radioactive and long-lived radionuclides. This situation could change if the projected HLW were to be further processed for purposes such as partitioning and transmutation. Other waste types (e.g., LLW, TRU waste) do not appear to be defined in law and seem to be amenable to disposition based on their radionuclide content.

  As in the U.S., Japan separates the regulation of nuclear fuel cycle (NRC authority in the U.S.) and non-fuel cycle (state authority in the U.S.) activities. It appears that Japan may be on a course to regulate disposal of radioactive wastes based more on site-specific waste acceptance criteria (WAC) (much like DOE) as opposed to generic waste classifications and associated siting/waste form criteria.

- *Rokkasho Site*: Development at the Rokkasho site is impressive. It now includes capabilites for fuel fabrication, uranium enrichment, SNF storage, LLW disposal, SNF reprocessing (plant currently being tested with depleted uranium), and HLW vitrification and storage. Projected capabilities include fabrication of MOX fuels and intermediate-depth (50-100 m) subsurface disposal of relatively high activity LLW.

- *Intermediate Depth Disposal of Relatively High Activity LLW*: An intermediate depth test program is underway with a cavern-type facility under construction and testing at Rokkasho. This concept is aimed at higher activity LLW wastes so that an intruder scenario would be less likely and of lower consequence. At this early stage the NSC has determined the basic policy and differences between intermediate-depth disposal and deep geologic disposal. However, specific details remain to be clarified.

- The Japanese have conducted criticality research at state-of-the-art facilities. We toured two secure test facilities built within vaults. The Transient Experiment Critical Facility (TRACY) was designed to evaluate scenarios involving enriched uranium solutions. This facility has been used to investigate reactivity accidents like the one that occurred at Tokai-mura in 1999. The Static Experiment Critical Facility (STACY) is used to test criticality involving fuel that consists of uranyl nitrate and plutonium nitrate solutions and uranium dioxide rods.

Rokkasho Visitors Center

- *Informing the public*: We were impressed by the visitor centers that the Japanese have developed at Rokkasho and Tokai to help inform the public

about site activities. The visitor centers provide tours, educational facilities, literature, and animated films. The presentations use language and format such that even children can understand the purposes of the nuclear facilities and the importance given to safety issues. Approximately 100,000 people visited Rokkasho last year.

The visitor center at Tokai has created an interactive theater for visitors showing the conceptual development and future operation of a high-level nuclear waste repository.

- *General comment*: The ACNW travelers were accorded the utmost courtesy and support in our visit, most especially regarding Drs. Yoshio Murao and Yasumasa Ando (both are Technical Counselors with the NSC staff) who accompanied us for the trips within Japan and whose coordination of the detailed itinerary made it possible to visit many locations in a few days. We also appreciated the assistance provided by Mr. Shinichi Murata of NISA, who worked at NRC during 2004 on a staff exchange.

ACNW Recommendation

This trip provided a valuable exchange of technical and regulatory information concerning fuel cycle and waste disposal issues. Given the pace of program advancement in Japan, we recommend and encourage similar NRC exchanges in the future, with venues both here in the U. S. and in Japan.

Attachments:
1. Annotated itinerary for Japan trip
2. ACNW Presentations, May 16, 2005
3. NSC Presentations, May 16, 2005
4. Bibliography of additional information received during and after the Technical Exchange

cc: SECY
ADMIN
L. A. Reyes (EDO)
J. D. Lee (OIP)
J. R. Strosnider (NMSS)
C. W. Reamer (HLWRS)
L. W. Camper (DWMEP)

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DATE	07/06/05		07/11 /2005		07/14/2005		07/15/2005		07/15/2005	

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Attachment 1

ANNOTATED ITINERARY FOR THE MAY 2005 ACNW TRIP TO JAPAN

General

- Throughout the meetings and tours at all sites the travelers were accompanied by Drs. Yoshio Murao and Yasumasa Ando who are both NSC staff members. There presence was very helpful and is greatly appreciated.
- The Japanese very graciously conducted all meetings in English.
- There was very active Q&A in all meetings and tours.

Monday, May 16: Nuclear Safety Commission

- NSC Chairman Mr. Shojiro Matsuura's overview presentation
- Emphasized importance of US-Japan cooperation in nuclear regulatory matters
- Talked primarily from a pamphlet on the NSC entitled "Nuclear Safety Commission Actions for Safety"
- Summarized Japanese "double check" system of regulation in which NSC has top-level oversight of the Ministry of Economy, Trade, and Industry (METI) and the Ministry of Education, Culture, Sports, Science, and Technology (MEXT), which perform day-to-day regulatory functions.
- NSC has over 200 supporting specialists
- A new law concerning decommissioning and clearance was passed on May 13. We have requested a translation of this law but it is not yet available.

- NSC Deputy Chairman Dr. Atsuyuki Suzuki's presentation on Status of Radioactive Waste Management in Japan
- METI regulates power production and nuclear fuel cycle activities
- MEXT regulates nuclear activities at research institutes, universities, hospitals, and industrial applications
- Outlined a planned hierarchy of disposal technologies to be used in Japan and the characteristics of the boundary defining what is acceptable for disposal using that technology

DISPOSAL TECHNOLOGY	UPPER BOUNDARY
Near-surface without radiological control	Clearance level
Near-surface with radiological control but without engineered barriers for very low-level waste	No need for control after 50y
Near-surface with radiological control and engineered barriers for low-level waste	No need for control after 300y
Intermediate-depth (50-100m deep) for relatively highly radioactive LLW	No need for deep geological disposal
Deep geological disposal for HLW	No upper boundary

The boundaries will be in the form of site-specific waste acceptance criteria, not generic waste classes. They are now working on a clearance level and the boundary between intermediate-depth disposal (IDD) and deep geologic disposal (DGD). The primary impetus for IDD is economics. However, the regulatory framework shown by Dr. Suzuki (Attachment 3, Suzuki slide 11) has identical considerations for IDD and DGD, and upon questioning he stated they did not yet know how to differentiate the two concepts nor did they know what should constitute a "stylized" human intrusion approach.

- The NSC is contemplating a risk profile (probability vs consequences) that incorporates additional conservatism beyond that incorporated for reactors to account for a number of uncertainties (Attachment 3, Suzuki slide 16)
- The NSC does not have oversight of hazardous chemicals or that component of mixed wastes. However, they were uncertain whether this would be a significant issue in Japan.
- The Japanese definition of HLW is source-based just as in the U.S., although the official definition has apparently not been translated to English. However, they do not anticipate issues such as waste incidental to reprocessing (WIR) arising in Japan in the foreseeable future. They did acknowledge the issue would arise if they were to pursue partitioning-transmutation approaches. It appeared that there was no specific definition for other waste types.
- In June 2004 the NSC issued a report: "A Commonly Important Issue for the Safety Regulations of Radioactive Waste Disposal" (Attachment 3, Suzuki slide 9) and provided the ACNW an English version of same. This document sets forth a policy of using a compliance time extending to peak dose for all waste disposal technologies. This document also calls for a risk-informed approach but the Japanese seemed uncertain as to how to go about it. The ACNW has sent policy-level NRC documents that might help in this regard.
- The NSC is relying on IAEA guidance to establish clearance levels, apparently either IAEA TECDOC-855 or RS-G-1.7 are acceptable.

- The travelers gave presentations to the attendees from various Japanese organizations (see attachment 2).

- Director of the METI/NISA Radioactive Waste Regulation Division (Mr. Youichi Ito) on Radioactive Waste Management and Disposal Policy

- Mr. Ito described the classification and method of disposal for radioactive wastes. The categories of low-level waste are presented below with respect to origin, classification, and method of disposal.

GENERATING FACILITY	WASTE CLASS	DISPOSAL TECHNOLOGY
Reprocessing plant	HLW	Geological disposal >300 m
Mox fuel fabrication plant	TRU	Concrete pit disposal, intermediate disposal, or geological disposal
Power station	Relatively high LLW	IDD at 50-100 m
	LLW large	Near-surface concrete vaults in pits at Rokkasho
	Very LLW	Near-surface trench at JAERI Tokai

U enrichment plant and fuel fabrication plant	Uranium waste	Any of the above depending on radionuclide concentrations
Hospitals, research labs, etc.	Unclear	As LLW above (being managed as waste or waste packages stabilized by cement or melting [vitrifying], etc.)
Decommissioning sites	Not rad waste; below clearance levels	Recycle or industrial landfill

- The Japanese waste classification structure apparently includes TRU waste and uranium wastes from the fuel cycle as subclassifications of LLW.
- When a nuclear power plant (NPP) is decommissioned the plan is to re-use the site for another NPP. However, this has not yet occurred. Additionally, it may not be followed for government sites.
- The Japanese were asked about the position of their steel industry concerning recycle steel from decommissioning into open commerce. It appears this question has not yet been asked.

• Director of NUMO Safety Affairs in the Science and Technology Department (Dr. Mitsuo Takeuchi) on "Current Status of NUMO Activities"

- Japan has established a stepwise approach to site selection: Soliciting candidate sites (acceptance based on literature search), preliminary investigation (surface-based studies), detailed investigation (underground research laboratory), selection of repository site (by 2023-2027), construction and licensing, and startup (by 2033-2037).
- The site selection approach relies solely on finding a volunteer community. Information packages were sent to all 3239 Japanese municipalities in December 2002. No volunteers so far. The Horonobe URL on Hokkaido will not become a candidate site by prior agreement.

• Chief Senior Scientist of the Nuclear Fuel Cycle Backend Division, JNC (Dr. Hiroyuki Umeki) "The Role and Progress of JNC's R&Ds in the Implementation Phase of Japan's HLW Disposal Program"

- Summarized the contents of the H12 report (Project to Establish the Scientific and Technical Basis for HLW Disposal in Japan – Second Progress Report on R&D for Geological Disposal of HLW in Japan). This report describes the technical approach for disposal and the engineered barrier system for HLW as a basis for site identification. An English summary was provided.

• Closing Remarks – Secretariat of NSC

Tuesday, May 17: Horonobe Underground Research Laboratory (URL) on Hokkaido

• Morning: Travel by plane from Tokyo to Wakkanai on the island of Hokkaido and then by van to visit the HLW research project at Horonobe.

- The URL is being developed by the Japan Nuclear Cycle Development Institute (JNC).
- We first met in the Horonobe town hall with Seietsu Takeda (Director), Tatsuo

Fukushima (Deputy Director), and Kazuhiro Aoki (General Manager). Mr Aoki gave an excellent overview presentation on the project planning, progress, and results to date. The Japanese hosts were very specific in describing their agreements with the town of Horonobe. The demonstration project must never become a waste storage facility, and when the work is completed the surface facilities will be returned to the ownership of the town and the tunnels will be refilled. The population in northern Hokkaido is strongly opposed to any nuclear waste disposal in the region but was willing to conditionally host a research facility.

- Eleven deep boreholes ranging in depth from 500-1000 m have been drilled into formations of Tertiary age. The project has installed a multi-level packer system of U.S. design in the boreholes to monitor hydraulic pressures (heads) and to collect groundwater samples from discrete horizons over the depth of the boreholes. Hydraulic testing was also done on the boreholes such that hydraulic conductivities can be plotted on a graph vs. hole depths. As expected, conductivity tends to decrease with depth as formation pressure increases.
- The project had intended to drill all of the holes with water but found it necessary to use drilling mud mixtures to achieve holes greater than 300 m deep. The groundwater at this location is relatively saline, which is attributed to fossil seawater that was retained within the marine muds that formed the rock formations.
- After Mr. Aoki's talk and discussions with attending JNC managers and staff, we traveled to the site of HDB-11, which is the final borehole of the Phase 1 testing. The hole is currently more than 900 m deep and, like the other boreholes, is being continuously cored to maintain a complete record of the geology. A freshly acquired core barrel was being hoisted out of the hole during our visit. We observed several sections of drill core that had been laid out for our inspection. The drilling operations are significantly ahead of schedule despite two problems – natural gas in the formations and severe weather. For safety purposes the wells are outfitted with blowout preventers in the event pressurized gas pockets may be encountered by the drilling. Because of high winds and cold temperatures, the drilling rig itself is fully encased in tarps to protect workers and equipment. Even during our trip in mid-May, snow remained in local hollows. Large windmills on this coast of Hokkaido have been erected as part of a wind power program.
- We then traveled from the well site to a location several kilometers away where the foundations were being completed for research labs and offices for the project. Mr. Aoki then showed us the nearby surveyed locations for the three vertical shafts for the URL. The original design for underground access had called for a spiral ramp leading down to two underground testing levels. The new design calls for 3 vertical shafts, one of which would become a dedicated ventilation shaft. That shaft will be the first one constructed later this year. Research drifts are to be established at the 250m and 500m levels in the Koetoi (diatomaceous mudstone) and Wakkanai (hard shale) formations, respectively.
- We returned to downtown Horonobe and to the temporary office facilities of JNC. Chairman Ryan described the role of ACNW in providing independent advice to the NRC. Neil Coleman of the ACNW staff gave a presentation on Yucca Mountain to JNC managers and staff. The Japanese hosts were especially interested in aspects of retrievability, tunnel stability, and questions related to time of compliance in HLW regulations. The ACNW position on TOC was described, which involves review of past committee reports, review of new concepts, and the intent to review a new draft EPA standard as soon as it is available.
- In the evening we continued to meet with the JNC managers and with Drs. Murao and Ando. We further discussed the role of advisory committees at the NRC and various technical questions related to site characterization. For example, the geology at the Horonobe site was expected to represent porous medium flow. In reality the rocks are sufficiently consolidated and fractured that the flow medium more closely resembles a fracture-flow medium.

Wednesday, May 18: Travel to Tokyo

- The plane schedules to Wakkanai (one plane each day in the early afternoon) resulted in the entire day being required to return to Tokyo.

Thursday, May 19: Rokkasho

- This day involved plane travel to and from Misawa airport followed by an approximate 45 minute van ride to the site.
- Manager of Planning Group, Radioactive Waste Disposal Department, Japan Nuclear Fuel Limited (Mr. Teruyuki Hirai) "Operational Experience of the Rokkasho Low-Level Radioactive Waste Disposal Center"

- The Rokkasho site contains LLW disposal, the IDD test facility, uranium enrichment (centrifuge), MOX fuel fabrication (planned), reprocessing (plant currently undergoing shakedown using depleted uranium), HLW vitrification and storage, and SNF storage. Our visit did not include significant discussion of the enrichment or reprocessing facilities although waste management in the reprocessing facility was discussed. We had an opportunity to observe the central control room in operation, and visited the storage facility for returned vitrified waste.

Central Control Room of the Rokkasho Reprocessing Plant (JNFL)

- The LLW disposal site is 3.6 km^2 and presently contains two LLW disposal sites. Site 1 opened in 1992 and contains about 40,000 m^3 of resin and liquid waste incorporated into cement, bitumen, or plastic). Site 2 opened in 2000 and contains about 40,000 m^3 of dry wastes (primarily compacted metals) solidified with mortar. The ultimate capacity of the site is estimated to be 600,000 m^3.
- All LLW and SNF is transported by sea and on a private access road on the Rokkasho site. All LLW is received in standard packages each containing 8 drums of waste. The packages are reused. The spent fuel pool presently contains about 1350 MT.
- JNFL receives HLW for storage and disposal from the UK but both HLW and associated LLW for storage and disposal from France. Japan is no longer sending HLW to the UK or France. In future they intend to reprocess HLW in the facility at Rokkasho.
- LLW disposal is accomplished by thoroughly inspecting the drums and then emplacing them in concrete vaults. The interstitial space is filled with a thin mortar followed by pouring a concrete cap on the vault. The mortar is surrounded by a layer of porous grout that is designed to conduct any water to a drain system that empties into an inspection tunnel. Eventually the array of vaults will be covered and surrounded (except on the bottom) by a mixture of bentonite clay and sand with a 4m cap on the top.
- The IDD is sited in a layer of pumice-rich tuff. Testing with SNF is expected to start late this year if authorities approve. There are not yet any WAC but a tentative generic "national consensus" limit of 27 nCi/g was mentioned. It remains to be determined which wastes would

be permitted to go into the IDD.

- The all-pathways (mainly air) dose rate from the reprocessing plant was stated to be 32 microSv/yr. Liquid wastes from reprocessing are discharged from a seabottom diffuser 3km from shore. We were shown the control room for the SNF storage-reprocessing-vitrification-HLW storage complex which is in a building separate from all the other facilities.

• Tours

- The travelers and escorts then went on a tour of the receiving and inspection facility, the two burial sites, the central control room of the reprocessing plant, and the IDD research facility.
- The receiving and inspection building was impressive. Drums are handled automatically and eight at a time. The drums are throughly inspected, including being photographed from all sides. The facility is over a decade old but looks new. It contains emergency waste treatment capabilities but these have never been used.
- The two operating disposal sites for LLW were as described above with both containing many closed vaults. None of the surrounding bentonite/sand has been emplaced. The dominant dose pathway was stated to be skyshine. The dominant ingestion nuclide is ^{14}C.
- The IDD facility is about 100m underground and is accessed by driving a vehicle down a sloping tunnel (7m wide by 5m tall) for about 1 km at which point it opens into a test cavern (square with rounded corners, ~18m on a side). The test cavern was being actively excavated during our visit and was nearing completion. Small monitoring tunnels are being established on the sides of and above the test cavern to allow cross-tunnel experiments. The tunnel has been built in rock of Tertiary age ~15 million years old. The sedimentary rock is relatively soft, with a compressive strength of ~3MPa. Groundwater influx to the test chamber occurs at a rate of 30 liters/minute.
- There were no PA results available for this facility presumably because test data is needed to provide input. A written test plan was not mentioned but apparently call for testing engineered barriers and geological studies. Engineered barrier concepts appear to involve concrete vaults in the tunnel containing waste drums with mortar in the interstices. This would be surrounded by bentonite clay and backfill to fill the lined tunnel. However, this design is not at all final pending results from testing and analysis.
- We toured the SNF storage pool which is fairly standard.
- We toured the HLW storage building in which HLW canisters are placed in vertical wells (9 per well) beneath a floor with a shield plug. Japanese HLW canisters are shorter than those in the U.S., on the order of 1m tall.

Friday, May 20: Tokai

• This day involved subway and train travel to and from Katsuta followed by a short van ride to the Tokai site. Drs. Murao and Ando of NSC accompanied us so we were able to continue regulatory discussions of mutual interest.

• Deputy Director General, JAERI Tokai (Dr. Zenko Yoshida)

- JAERI is supporting the government's efforts to establish a philosophy, framework, and implementation approach for waste disposal. They appear to be struggling but continue to work to resolve these issues.
- The philosophy of performance-based inspection was discussed. As an example we used radiography, which is an occupational area that historically has had elevated numbers of overexposures. Performance-based inspection is especially effective in this area because inspectors can directly observe how the work is done. This method is far more effective in evaluating performance than review of dose, training, and equipment calibration records.

- Director, Nuclear Cycle Backend Division, JNC (Mr. Hirohisa Ishikawa) "Overview of JNC HLW R&D Program"

- JNC plans to issue another major-milestone progress report designated H17 in September 2005. This will integrate results from the ongoing 5-year program including results from the URLs.
- In October 2005 JNC and JAERI will be integrated into a single organization, provisionally called the Japan Atomic Energy Agency.
- The Tokai vitrification facility has reprocessed 1100 MT of SNF. Its main cell is 13m x 25m with equipment built on removable racks.

- Deputy Director, Barrier Performance Research Group (Dr. Mikazu Yui) "Status of Research Activities for HLW disposal in JNC-Tokai"

- Dr. Yui described the ENgineering-scale Test & Research FacilitY (ENTRY) and activities therein. This is a facility designed to do non-radioactive work on colloids, backfill (bentonite), geochemistry, flow and mass transport, and materials degradation. It contains numerous research labs each of which has a descriptive English acronym.
- Dr. Yui described the QUantitative Assessment radionuclide migration experiment faciLITY (QUALITY) and the activities therein. This facility uses radionuclides in experiments including minor actinides but not U or Pu. Activities in QUALITY include glass corrosion research, radionuclide solubility and sorption, water diffusion in bentonite clay, and the behavior of colloids and organic matter under conditions relevant to sedimentary (Horonobe URL) and granitic (Tono URL; see below) rocks.
- Dr. Yui described international collaborative activities with Canada (tunnel sealing experiments in a Canadian URL), Nagra (in situ experiments on colloid migration in a Swiss URL), and the PNNL in the U.S. (development of solubility models for actinides).

- Group Leader, Geoscience Research Integration and Dissemination Group, Tono Geoscience Center, JNC (Mr. Naotaka Shigeta) "Current status of R&D activities at Tono Geoscience Center"

- Described the planned URL in granite at the Tono/Mizunami site in central Honshu (the main Japanese island). The facility will be used to develop models for detecting crustal magma, prediction of future topography, regional hydrology, and to perform cross-hole tomography and hydraulic tests.
- Test drifts will be at the 500m and 1000m levels in unfractured Toki Granite.
- Construction of the two vertical shafts is underway.

- Tour of ENTRY and QUALITY

- The travelers were taken on a whirlwind tour of both facilities. These are large, modern, well equipped facilities that were truly impressive.

- Mr. Coleman again gave his presentation on Yucca Mountain to the assembled technical staff.

Saturday, May 21: Return to the U.S.

Attachment 2

ACNW Presentations

"Overview of the U.S. Nuclear Waste Regulatory Framework and the Role of the Advisory Committee on Nuclear Waste" - Michael T. Ryan (ACNW Chairman)

"Review of U.S. High-Level Waste Processing" - Allen G. Croff (ACNW Vice-Chairman)

"ACNW Decommissioning Activities - 2005 and Beyond" - James H. Clarke (ACNW Member)

"Geology and Engineered Barriers for the Proposed Yucca Mountain High-Level Waste Repository" - Neil M. Coleman (ACNW Senior Staff Scientist)

"U. S. Experience and Practices in Low-Level Waste Management" - Michael T. Ryan (ACNW Chairman)

Attachment 3

NSC Presentations

“An Overview on Radioactive Waste Disposal Regulations in Japan” - by Atsuyuki Suzuki (Deputy Chair, NSC)

“Policy on Management and Disposal of Radioactive Waste in Japan” - by Yoichi Ito (Director, Radioactive Waste Regulation Division, NISA)

“Current Status of NUMO Activities” - Mitsuo Takeuchi (NUMO)

“The Role and Progress of JNC’s R&Ds in the Implementation Phase of Japanese HLW Disposal Program” - Hiroyuki Umeki (JNC)

Attachment 4

Bibliography of Additional Information Received During and After the Technical Exchange

Agenda, participant list, and seating chart for the meeting at the Nuclear Safety Commission in Tokyo, Japan on May 16, 2005

The 2004 White Paper on Nuclear Safety (Summary - provisional translation)," by the Nuclear Safety Commission of Japan (NSC), May 2005 (27 p.)

Report: "A Commonly Important Issue for the Safety Regulations of Radioactive Waste Disposal," by the NSC, June 10, 2004 (18 p.) [review of safety assessment scenarios after the period of active controls, plus an overview of international radiation protection standards]

Handout titled "Relation between NSC and Regulatory Authorities," (2 p.)

Pamphlet titled "Nuclear Safety Commission - Actions for Nuclear Safety," by the NSC, Cabinet Office (20 p.)

Pamphlet on the role and research projects of the Japan Atomic Energy Research Institute (JAERI) (30 p.)

Pamphlet on JAERI's Nuclear Fuel Cycle Safety Research Facility (NUCEF) in Tokai (14 p.)

Pamphlet on the Tokai Works, published by the Japan Nuclear Cycle Development Institute (JNC) (16 p.)

Pamphlet titled "H12: Project to Establish the Scientific and Technical Basis for HLW Disposal in Japan - Second Progress Report on Research and Development for the Geological Disposal of HLW in Japan," by JNC (15 p.)

Pamphlet on the role and responsibilities of the Nuclear and Industrial Safety Agency (NISA) (15 p.)

Pamphlet titled "Pursuing the Effective Use of Uranium Resources," which discusses the management and R&D activities of JNC (30 p.)

Pamphlet titled "JNFL Rokkasho Reprocessing Plant" produced by the Reprocessing Business Division of Japan Nuclear Fuel Limited (JNFL) (26 p.)

Pamphlet titled "Rokkasho Low-Level Radioactive Waste (LLW) Disposal Center," which provides an overview of the center and discusses its safety, by JNFL (16 p.)

Pamphlet titled "Tokai Vitrification Facility (TVF)," by the Power Reactor and Nuclear Fuel Development Corporation, Tokai Works (7 p.)

Pamphlet titled "Corporate Profile for Japan Nuclear Fuel Limited," by JNFL (17 p.)

Presentation slides titled: “Current status of R&D activities at the Tono Geoscience Center,” by Naotaka Shigeta (JNC) (25 slides)

Presentation slides titled: “Current status of the Horonobe URL project,” by JNC (46 slides)

Presentation slides titled: “Present Status on Waste Management in JNFL Rokkasho Reprocessing Plant,” by Noriyasu Morita (JNFL) (13 slides)

Presentation slides titled: “Operational Experience of the Rokkasho Low-Level Radioactive Waste Disposal Center” by Teruyuki Hirai (JNFL) (17 slides)

Presentation slides titled: “Current status of the site investigation for the Rokkasho-3 project,” by T. Sasaki (JNFL) (14 slides)

Presentation slides titled: “Overview of JNC HLW R&D program,” by Hirohisa Ishikawa (JNC) (8 slides)

Presentation slides titled: “Status of Research Activities for HLW Disposal in JNC-Tokai - ENTRY, QUALITY Project and International Collaboration,” by JNC (33 slides)

Presentation slides titled: “Waste Management R&Ds in JAERI” by Shinichi Nakayama, Dept. of Fuel Cycle Safety Research, JAERI (10 slides)

Presentation slides titled: “On the assurance of safety in operating nuclear power facilities - Lesson learned from falsification case in electric power companies - Meaning and object of this open forum,” Nuclear Safety Commission (10 p.)

Status Report by the Nuclear and Industrial Safety Agency: Countermeasures Against Falsification Related to Inspections at Nuclear Power Stations, December 10, 2002 (10 p.)

Status report titled: “Horonobe Underground Research Laboratory Project Plans for Surface-based Investigations (Phase 1),” by the Horonobe Underground Research Center, Japan Nuclear Cycle Development Institute, JNC TN5510 2003-002, October 2003 (18 p.)

Status report titled: “Horonobe Underground Research Laboratory Project Plan of the Investigation Program for the 2004 Fiscal year (2004/2005),” by the Horonobe Underground Research Center, Japan Nuclear Cycle Development Institute, JNC TN5510 2005-001, April 2004 (23 p. with foldouts)

Paper reprint: R. Tsukui, T. Niizato, K. Aoki, and T. Fukushima, “Developing a remote monitoring system using ACROSS in the Horonobe Underground Research Laboratory,” Paper S1-P02, The Proceedings of IWAM04, Mizunami, Japan (7 p.)

Information summary for the Rokkasho LLW Disposal Center (2 p.)

Color map showing the locations of nuclear fuel cycle facilities at the Rokkasho nuclear complex (labeled in English and Japanese)