SAFETY TRIP REPORT

ON US-JAPAN EXCHANGE PROGRAM

(FuY 2009)

CONTENTS

Report on the 13th Meeting of the Joint Working Group of the U.S-Japan Coordinating Committee of Fusion Energy on Safety in Inter-Institutional Collaborations (U.S.-Japan Safety Monitoring Program) February 22-25, 2010

PURPOSE

The purpose of the 13th meeting of the U.S.-Japan Safety Monitor Joint Working Group was to informally evaluate the programmatic aspects of environmental, health and safety (ESH) programs in U.S. fusion research facilities by touring laboratory areas and meeting with researchers and safety professionals. Based in these interactions, the U.S.-Japan delegation was able to share information and provide suggestions in an effort to reduce the likelihood of bodily injury and/or property damage. In addition, good approaches and practices developed at different institutions should be utilized to improve environmental, health and safety programs at other institutions.

EXECUTIVE SUMMARY

The Japanese delegation to the 13th meeting of the U.S.-Japan Safety Monitor Joint Working Group consisted of the following individuals:

Kiyohiko Nishimura	Director, Safety & Environmental Research Center	NIFS
Yuichi Takase	Professor, Graduate School of Frontier Sciences	Univ. of Tokyo
Atsuhiko M. Sukegawa	Manager, JT-60 Safety Assessment Group	JAEA
Tetsuo Seki	Associate Professor, LHD project	NIFS

The main U.S. Participants were:
Keith Rule, Senior Program Engineer, Princeton Plasma Physics Lab
Richard Savercool, Safety Engineer, General Atomics

Three members (Professor Nishimura of NIFS, Associate Professor Seki of NIFS, and Dr. Sukegawa of JAEA) of the Japanese delegation participated for the first time in the Japan-US Safety Monitoring Joint Working Group. The Japanese delegation was greatly impressed by high attention to the ES&H and established safety organization. At most institutions, ES&H policies are based on the concept of Integrated Safety Management (ISM). DOE provides the basic guidelines of ISM, but its implementation is performed by discretion of each institution. Each institution has a comprehensive training program which has been useful in deepening the awareness of hazards and reducing the number of accidents/incidents. At many institutions ES&H related information is readily available electronically, and it is possible to make an application for training program online. In some institutions, a personal attendance history of a necessary training program is managed online, and suitable measures such as prohibition of entrance are taken automatically for a person who does not take necessary lectures. The overall evaluation of the 2009 site visits by the JWG is highly satisfactory. In particular, understanding of differences in safety culture between the two countries and between the different states in USA is worthy of note. At institutes with many visiting scientists or workers from the outside, it is extremely important for everyone to have knowledge of safety. Therefore, Japanese visitors were able to recognize the importance of safety education based on a difference in safety standards in various countries.

SITES VISITED

General Atomics (GA) - Monday, February 22, 2010

Personal contacted:

Rick Savercool	Safety Engineer
Mark Foster	DOE Field Program Manager / Site Representative at GA
Peter Petersen	DIII-D Assistant Program Manager
Bill Cary	Manager, Electrical Systems Engineering
Peter Taylor	Manager, Radiation Safety & Measurement
Randy Kuhn	Assistant Fusion Safety Manager
Rick Lee	Chief Operator, DIII-D Operations Manager, Fusion Education
Jessica Mann	

・Peter Petersen : DIII-D Program Overview
・Bill Cary : Heating & Current Drive Activities focused on Safety
・Peter Taylor : Radiation Management, Safety and Past Levels
・Rick Lee : Fusion Education Program w/demos
・Jessica Mann :Corporate Safety Program and Support
・Rick Savercool : Fusion Safety Program -Rick Savercool
・Tour of DIII-D

Issues called to the attention to the lab staff :

The accumulated dose limits for workers in GA and for site boundary have been eased in January 2010. There was no information the dose limit for living space (non restricted area)

in GA. The DIII-D has been operated within the allowed limit neutron emissions until now. (A.S.)
Totally, radiation seems to be well controlled.

The JT-60 had the interlock system related to the amount of the neutron emission. Although DIII-D doesn't have such interlock system, total amount of the neutron is controlled by the operation of the NB injector (input). (A.S.)

Near the Li-Pellets diagnostics system in the restricted area, a worker is working without a mask. Please consider wearing a mask during work in the restricted area to prevent internal exposure by the radioactive dusts (Fig. 1). (A.S.)

Monitoring system by the warning light (the difference of the color) is good (Fig. 2). (A.S., K.N.)

Wiring in the Gyrotron room is good. We could not find wiring without support. Most of cables were wired in the space under the floor. It is very good design from the view points of safety and handling (Fig. 3). (T.S.)

Fig. 1. Worker near the Li-Pellets diagnostics.

Fig. 2. Colored warning lights.

Fig. 3. Gyrotron room.

The entrance of the room in which the high voltage is used is restricted severely and the information for this room condition is displayed in front of the room (Fig. 4). (T.S.)

Entering the experimental hall is controlled by the key control system (KIRK Key) (Fig. 5). (T.S.)

Fig. 4. Warning light.

Fig. 5. KIRK Key.

The security of the computer system is still under consideration, due to considerations for ease of use and the safety control. They have paid special attention to the arc-flash during the handling of the high voltage, for example, wearing proper eye protection. Totally, we felt the careful attention to the safety. (T.S.)

Fig. 6. Capacitors without termination.

The capacitors were placed near the wall. Some terminals were grounded, and the others were not grounded. To prevent an electric shock, capacitor terminal should be terminated when not in use (Fig. 6). (K.N.)

The indication of “EXIT” on the floor is a good idea. If it was made by the fluorescent material, it can be seen during a power failure (Fig. 7). (K.N.)

Fig. 7 “EXIT” sign on the floor.

<u>Massachusetts Institute for Technology (MIT) - Tuesday, February 23, 2010</u>

Personal contacted:

Richard Temkin,	PSFC Associate Director
Matthew Fulton	Facilities & Safety Manager
Catherine Fiore	Head, PSFC Office of ES&H
Andrew Kalil,	MIT EHS

・Catherine Fiore : The PSFC and the PSFC Environmental, Health and Safety Program

・Catherine Fiore and Andrew Kalil : The MIT Environmental, Health and Safety Program-

・Facility Tour

・Closing Comments and Discussion

Issues called to the attention to the lab staff :

"Roles and Responsibilities for EHS", "Design of the EHS system for Alcator C-Mod and the PSFC" and "PSFC ES&H program" are helpful for us to improve the ES&H system in Japan. (A.S)

Since there are many earthquakes in Japan, Japanese regulation does not allow stacking heavy things on a tall shelf without measures to prevent a falling accident. In MIT, their regulation does not forbid to stack heavy equipment on a tall shelf. Such difference is base on a safety standard between Japan and the east coast in Unite States. (A.S., K.N.)

Fig. 8. A stepladder and a gas cylinder on a carrier are kept on a passage.

A stepladder and a gas cylinder on a carrier were in the passage way and could prevent safety walking. They should be kept at prescribed places (Fig. 8). (T.S.)

Fig. 9. An electric saw.

The electric saw has some emergency stop equipment such as "SAW STOP" (Fig. 9). This is good for the worker's safety. (T.S.)

Fig. 10. Current terminals without protecting cover.

Fig. 11. A block of lead without coating on the floor.

The current terminals of high voltage or high current should be coved with protecting cover to prevent an accident of electric shock (Fig. 10). (K.N.)

A block of lead was put on the floor without any coatings. Powder of lead and lead oxide give damage to the health. To keep lead without coating is forbidden in Japan (Fig. 11). (K.N.)

Local air exhauster was set in the machining area. This is good for worker’s S&H (Fig. 12). (K.N.)

Fig. 12. An air exhauster in the machine-shop.

Each user can search the information of hazards, their positions and their seriousness, and required protections on the web site. PSFC in MIT is carrying out the safety training and keeping safety activity according to the S&E program. Each work has many training terms. Personal data of completed training programs is controlled on the web site. People can find on the web the kinds of hazards and requested trainings. People can request the training on the web.

<u>Princeton Plasma Physics Laboratory (PPPL) - Wednesday, February 24, 2010</u>

Personal contacted:

Keith Rule	Senior Project Engineer
Adam Cohen	Deputy Lab Director for Operations
Stewart Prager	Director
A. vonHalle	NSTX Engineering Head
J. Levine	Head, ES&H
P. Efthimion	Head, Plasma Science & Technology
M. Williams	Head, PPPL Engineering

・Stewart Prager : PPPL Overview – Current & Future Research –

・A. vonHalle : NSTX Overview – Plans for Upgrade –

・J. Levine : PPPL Safety Program

・K. Nishimura : Safety Management in NIFS

・A.M. Sukegawa : Safety Administration and activities at JAEA

・P. Efthimion : tour of PPPL research and operations
– Lab Wing, LTX, MRX –

・M. Williams, A. vonHalle : tour of PPPL research and operations
– NSTX, MOCK-UP, NB AREAS, TFTR Test Cell –

Issues called to the attention to the lab staff :

Since there are many earthquakes in Japan, gas cylinder must be fixed by two binders with non flammable wires. It is understood as the difference of safety standards between Japan and the east coast in United States. However, the cause of falling down of cylinder is not only by earthquake. For example, accidental hard hit of carrying cart may cause falling down. Especially, one loose binding is dangerous. Most cylinders in the laboratories are fixed by one binding and some bindings are loose (Fig. 13). (T.S. & K.N.) It is better to fix cylinder at two positions.

Fig. 13. Gas cylinders with one loose binding.

Fig. 14. Cablings on the floor.

Fig. 15. Sign of “KEEP AREA CLEAN” on the floor.

Cablings on the floor should be limited the temporary usage (Fig. 14). (T.S. & K.N.) If it needs to keep them permanently, it must be protected with suitable coverings.

The indication of “KEEP AREA CLEAN” on the floor is good idea. If it was made by the fluorescent material, it can be seen during a power failure (Fig. 15). (K.N.)

TFTR

The vinyl curtain is set in front of the big door of TFTR Hall to prevent pollution (Fig. 16). (A.S.) This is very good.

Fig. 16. The vinyl curtain at the entrance of TFTR Hall.

The experimental hall of TFTR is still a restricted area. Indication of “Restricted Area” is posted on the entrance door. The entrance in the hall is controlled by keys (Fig. 17).

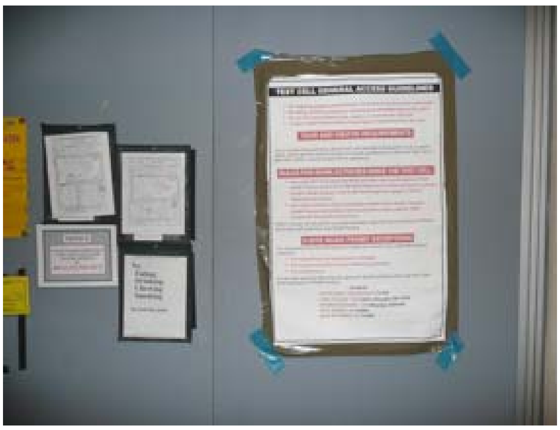

Fig. 17. Entrance of the TFTR Hall (door keys and a notice.

In the large projects such as TFTR and NSTX, safety program is working effectively. PPPL has own safety program. However, PPPL keeps contact with Princeton University and DOE, and renews information frequently. (T.S.)

<u>University of Wisconsin (WI) - Thursday, February 25, 2010</u>

Personal contacted:

J.A. Goetz	Senior Scientist
P.J. Weix	Senior instrument Specialist
David T. Anderson	Electrical & Computer Engineering Director
B. Kujak-Ford	Research Specialist

・J. Goetz : overview of MST program and safety
・P. Weix and J. Goetz : tour of MST facility, discussion
・D. Anderson : overview of HSX program and tour
・B. Kujak-Ford: overview of Pegasus program
・tour of Pegasus
・discussion

Issues called to the attention to the lab staff:

MST

Door access is controlled by using the various keys and it is linked to the interlock system (Fig. 18). It is simple and effective. (A.S., T.S. & K.N.)

Information of hazard by colored warning light is convenient and effective. Similar system is applied in GA and NIFS (Fig. 19). (A.S. & K.N.)

Fig. 18. Keys for door interlock.

Fig. 19. Information of warning lights.

Partitioning off the front area of the power supply board by taping is effective to keep clean there. If the tape was made by the fluorescent material, it can be seen during a power failure (Fig. 20). (T.S. & K.N.)

Tools, grounded rod, safety equipment and medical equipment are provided near the entrance of the gate (Fig. 21). (T.S. & K.N.)

Fig. 20. Partitioning off the front area of the power supply board.

Fig. 21. Tools, grounded rod, safety equipment and medical equipment near the entrance gate.

Switching of the current terminals is controlled by the keys (Fig. 22). Key system is very good, but the terminals should be covered completely to prevent the electric shock. (T.S. & K.N.)

Fig. 22. Switching of the current terminal is controlled by the key.

Most cylinders in the laboratories are fixed by one binding (Fig. 23). (T.S. & K.N.) Such things have been seen in the laboratories in the East side of the US. It is understood as the difference of safety standards between Japan and the east coast in Unite States. Since there are many earthquakes in Japan, gas cylinder must be fixed by two binders with non flammable wires. However, the cause of falling down of cylinder is not only by earthquake. For example, accidental hard hit of carrying cart may cause falling down. Especially, one loose binding is dangerous. It is better to fix cylinder at two positions.

Fig. 23. Gas cylinders with one binding.

The protruding of tie wires may wound eyes of workers. They should be cut (Fig. 24). (K.N.)

The edge of stage at the capacitor bank area has no toe-boards (Fig. 25). (T.S.) Please consider installing them to prevent the accidental falls of equipment.

Fig. 25. Stage at the capacitor bank area.

Fig. 24. The rest parts of bundling wires.

Pathway in the capacitor bank area is narrow. To prevent an accidental electric shock in case of emergency, the terminals of capacitors should be covered (Fig. 26). (T.S.)

Blocks of lead were put on the stage without any coatings. Powder of lead and lead oxide may give damage to the health. To keep lead without coating is forbid in Japan (Fig. 27). (K.N.)

Fig. 26. Narrow passage in the capacitor bank area.

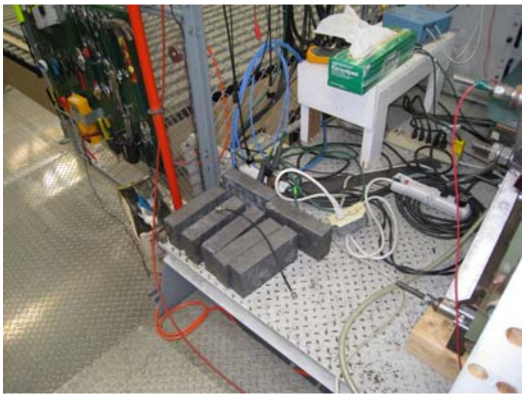

Fig. 27. Blocks of lead on stage without coating.

HSX

Door access is controlled by using the keys and it is linked to the interlock system (Fig. 28). It is simple and effective. (K.N.)

Information of machine status by colored lights is convenient and effective. Similar system is used in GA and NIFS (Fig. 29). (A.S., T.S. & K.N.)

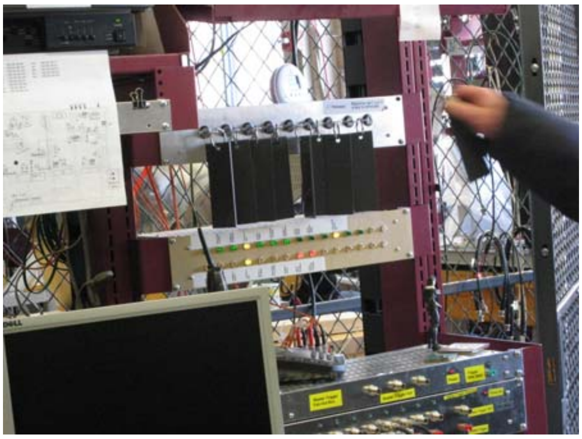

Fig. 28. Keys for door interlock.

Fig. 29. Information of machine status by colored lights.

Please note potential for injury of researcher by projecting items around the machine, and projecting item itself may cause serious damage by accidental hit (Fig.30). (A.S. & K.N.) Especially damage to eye by the excess part of the bundling wire is serious. (K.N.)

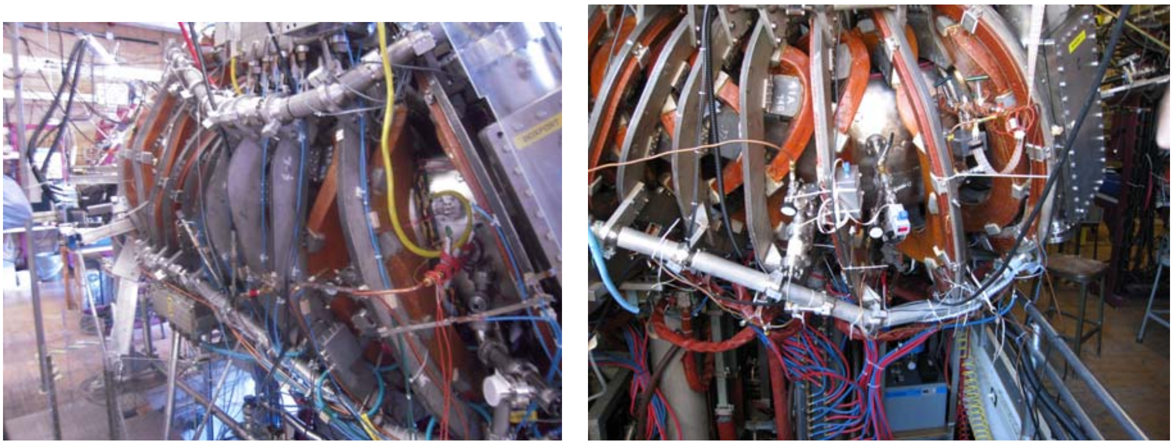

Fig. 30. Projecting things around the machine.

Please consider installing additional toe-boards at the periphery of underground pit (Fig. 31). (T.S.) It is useful to prevent the injury by the accidental falls of equipment. (K.N.)

Blocks of lead were put on the stage without any coatings. Powder of lead and lead oxide may give damage to the health. To keep lead without coating is forbid in Japan (Fig. 32). (T.S. & K.N.)

Fig. 31. Periphery of underground pit without toe-boards.

Fig. 32. Blocks of lead on stage without coating.

Pegasus

A knockdown fence, a stepladder and a broom are stood against a wall (Fig. 33). Since there are many earthquakes in Japan, most equipment must be fastened to prevent from falling down. However, the cause of falling down of equipment is not only by earthquake. For example, accidental hard hit of carrying cart may cause falling down. Such falling down may give the secondary damage to the other equipment or a co-worker. From the view point of preventing falling down, stacking goods at high position needs to special attention (Fig. 34). (A.S. & K.N.)

Fig. 33. A knockdown fence, a stepladder and a bloom are stood against a wall.

Fig. 34. Stacked goods on a shelf.

Although Japanese participants can understand that such difference of safety standards between Japan and the east coast in United States is based on a geographical environment, we recommend to the US safety staff consider the things mentioned above. (A.S. & K.N.)

Information of machine status by colored lights is convenient and effective (Fig. 35). (T.S.)

Door access is controlled by using the keys and it is linked to the interlock system (Fig. 36). It is simple and effective.

Fig. 35. Information of machine status by colored lights.

Fig. 36. Keys for door interlock.

Partitioning off the front area of the power supply board by taping is effective to keep area clear. If the tape was made by the fluorescent material, it can be seen during a power failure (Fig. 37). (T.S. & K.N.)

The excess parts of bundling wires may wound eyes of workers. They should be cut (Fig. 38). (K.N.)

Fig. 37. Partitioning off the front area of the power supply board.

Fig. 38. The rest parts of bundling wires.

The current terminals of power line should be coved with protecting cover to prevent an accident of electric shock (Fig. 39). (K.N.)

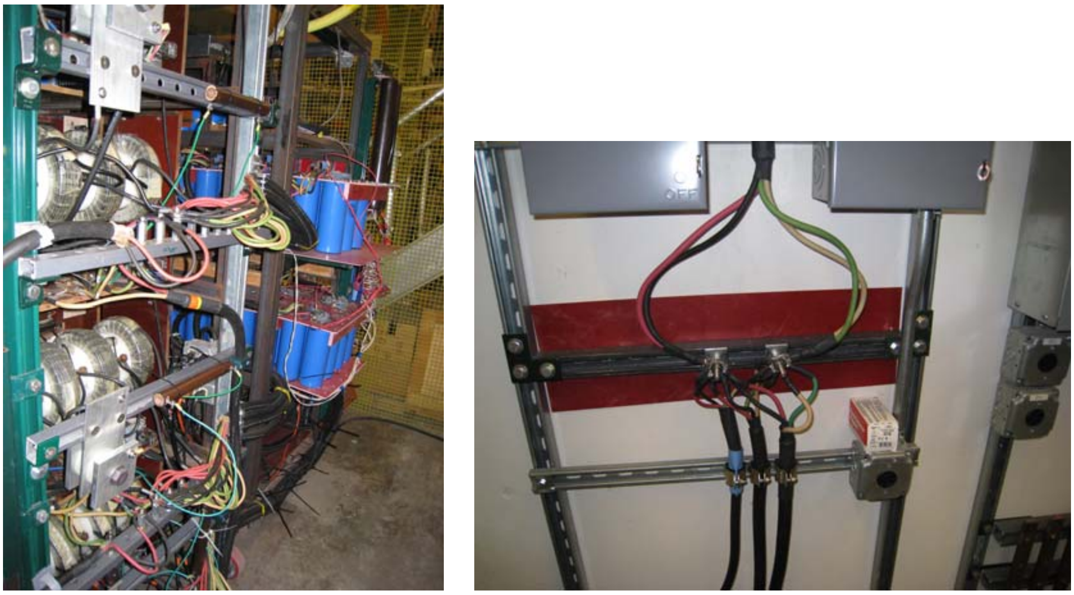

Fig. 39. Power line terminals without protecting cover.

In University of Wisconsin, the safety measures for the individual machines as well as the general safety measurements and the required trainings are performed.　It is common to the sites where we visited in this program.

ACKNOWLEDGEMENTS

The US-Japan Safety Monitor Joint Working Group members would like to thank all the individuals who participated in the facility tours.　The Japanese delegation is grateful to the hosting institutions for sharing their experience and for their gracious hospitality, and to Keith Rule of PPPL for making detailed arrangements and for his generous hospitality throughout the trip.

APPENDIX

Itinerary and Meeting Agenda for 2010 Site Visits of the US-Japan Safety Monitoring Joint Working Group February 22-25, 2010

__Sunday, February 21, 2010__

Japanese delegates arrive in U.S.

GA - Monday, February 22, 2010

0830 Depart hotel with luggage

0845 Arrive DIII-D reception area and receive badges

0900 Agenda review and changes if necessary - Rick Savercool

0905 Welcome to GA and the Fusion Group - Mark Foster

0910 DIII-D Program Overview - Peter Petersen

0930 Heating & Current Drive Activities focused on Safety - Bill Cary

0950 Radiation Management, Safety and Past Levels - Peter Taylor

1015 Break - Randy Kuhn

1025 Fusion Education Program w/demos - Rick Lee

1045 Corporate Safety Program and Support - Jessica Mann

1100 Fusion Safety Program - Rick Savercool

1130 Discussion

1145 Depart for private Cafeteria for lunch

1200 Lunch

1315 Tour of DIII-D

1400 Close-out meeting and final discussion

1500 Depart for Hotel

1945 Arrive San Diego Airport

2145 Depart San Diego for Boston

MIT - Tuesday, February 23, 2010

0830 Continental Breakfast

0900 Welcome - Dr. Richard Temkin, PSFC Associate Director

0915 The PSFC and the PSFC Environmental, Health and Safety Program
-- Dr. Catherine Fiore, Head, PSFC Office of ES&H

1015 Break

1030 The MIT Environmental, Health and Safety Program - Catherine Fiore and Andrew Kalil, MIT EHS

1115 Facility Tour

1230 Lunch

1330 Closing Comments and Discussion

1400 Close

PPPL - Wednesday, February 24, 2010

0845 Welcome – Adam Cohen (Deputy Lab Director for Operations)

0905 PPPL Overview – Current & Future Research – Stewart Prager (Director)

0935 NSTX Overview – Plans for Upgrade – A. vonHalle (NSTX Eng. Head)

1005 Break

1015 PPPL Safety Program – J. Levine

1045 Safety Management in NIFS – K. Nishimura

1100 Safety Administration and activities at JAEA – A.M. Sukegawa

1115 Tour of PPPL research and operations – Lab Wing, LTX, MRX, – P. Efthimion

1200 Lunch

1300 Tour of PPPL research and operations – NSTX, MOCK-UP, NB AREAS, TFTR Test Cell, – M. Williams, A. vonHalle

1400 Discussion

1430 Departure

Univ. of Wisconsin - Thursday, February 25, 2010

0900	depart hotel for Chamberlin Hall	
0930	overview of MST program and safety	[J. Goetz]
1000	tour of MST facility, discussion	[P. Weix, J. Goetz]
1130	lunch break (Memorial Union)	
1300	overview of HSX program and tour	[D. Anderson]
1430	overview of Pegasus program and tour	[B. Kujak-Ford]
1600	discussion	
1700	Departure	

Friday, February 26, 2010

Japanese delegates depart U.S.