Pacific Northwest National Laboratory
Department of Energy Voluntary Protection Program Review
June 8-11, 2009

Background:

Located in Richland, Washington, the Pacific Northwest National Laboratory (PNNL) is one of the Department of Energy's (DOE) 10 National Laboratories managed by DOE's Office of Science. PNNL performs scientific and technological research for other DOE offices, as well as Government Agencies, universities, and industry. PNNL provides the facilities, unique scientific equipment, and world-renowned scientists/engineers who work to (1) deliver breakthrough science and technology to meet today's key national needs; (2) strengthen U.S. scientific foundations for fundamental research and innovation; (3) prevent and counteract terrorism through applied research in information analysis, cyber security, and the nonproliferation of weapons of mass destruction;
(4) increase U.S. energy capacity and reduce dependence on imported oil through research of hydrogen and biomass-based fuels; and (5) reduce the effects of energy generation and use on the environment. Battelle Memorial Institute is the prime contractor for management and operation of the Laboratory. Battelle has operated PNNL for DOE and its predecessors since 1965. The DOE Pacific Northwest Site Office provides oversight of Battelle.

PNNL was originally admitted into the DOE Voluntary Protection Program (VPP) at the Star level in 2001 and recertified in 2004. In October 2007 during the required triennial review, the review team concluded that even though the laboratory operations were conducted safely, the laboratory's leadership in pursuit of excellence in safety was not consistently obvious and varied across PNNL Directorates, ranging from especially strong at the Facilities and Operations (F&O) Directorate to needing improvements at several Research and Development (R&D) Directorates. Based on these observations, the onsite review team recommended that PNNL be placed in a Conditional Star status, allowing the Laboratory to take the necessary steps toward improving the Management Leadership tenet of DOE-VPP. Opportunities for improvement were also identified in the other four tenets. Per the DOE-VPP process, Conditional status required a review by the Office of Health, Safety and Security to determine progress on the identified improvements and make a recommendation regarding PNNL's continued participation in DOE-VPP. At the time of the 2007 review, it was also clear that even though upper management had already recognized the need for improving the safety culture across the Laboratory, additional time was necessary to instill the requisite commitment at various levels of management within the R&D Directorates.

A followup review was scheduled and conducted during June 8-11, 2009. The team focused on the required improvements identified by the 2007 assessment by conducting interviews with senior managers, as well as scientists and workers, and performing walkthroughs of laboratory and shop areas. This report documents the results of the followup review.

Results

To address the needed improvements, PNNL has developed and implemented a comprehensive action plan. PNNL grouped the opportunities for improvement identified by the DOE-VPP team into eight conditions. Corrective actions were then targeted at those eight conditions. These corrective actions were developed to address the essential elements of the 2007 review team's concerns that (1) management leadership and support for safety excellence and improvements identified in the PNNL annual self-assessments were not visible at the working level, primarily within the research directorates; and (2) researchers were only marginally involved or unaware of safety improvement efforts.

Since 2007, actions taken by the Laboratory leadership have demonstrably improved those conditions. Most noticeably, the implementation of Directorate Zero Accident Councils (DZAC) and the Laboratory Zero Accident Council (LZAC) is considered and were cited by Laboratory managers as the most profound improvement. Although some Directorates are still in the formation phase, these councils are proving effective at improving communication within and across directorates, sharing ideas, and addressing common issues not previously recognized. Senior managers regularly participate in the DZAC meetings, along with a variety of other laboratory personnel. The DZAC meetings are providing a forum where issues and ideas are raised and discussed by all council members as peers.

Another significant improvement since 2007 is the establishment of a Chief Operating Officer within each directorate. This change was being planned in 2007, and has since been used to great effect. The Chief Operating Officers are primarily responsible for the day-to-day management of their directorates, allowing the Associate Laboratory Directors to focus on the strategic missions. This structure has allowed for greater "felt leadership" in the laboratories, as well as better management awareness of potential operational conditions and problems. Additionally, the Chief Operating Officers belong to the newly formed Research Operations Council (ROC) that meets regularly to coordinate activities and resources, and promote the "one laboratory" philosophy.

Within a positive environment of leadership interest and engagement, continuing challenges remain. Senior managers recognize that they have not yet been fully successful in pushing the degree of awareness existing at the councils through the divisions and into the laboratory benches. Communication from the committees to include DZACs and the LZAC has not yet been fully effective in reaching the majority of the staff. The Laboratory is actively engaged in providing information to all employees onsite, but relies on the employees to make the effort to actively engage, read, and use this information. Based upon interviews conducted by the review team, some employees do not seek out this information or are unaware that it is available. Personnel interviewed in both the laboratory and operations settings have a keen awareness of the hazards of the processes and materials they use on a daily basis, but are less attentive to the general industrial hazards (such as slips from water on the floor, general laboratory safety practices, pinch points, and strains or sprains when lifting or moving equipment) not directly associated with their experiments. Leaders on the LZAC and DZACs routinely identify these issues and share ideas on how to "push it down" through the organization.

Continued attention by managers and council members is expected to promote site-wide success and sustainable culture improvements.

The use of activity observations by managers, beginning in 2007, has also significantly matured over the past 2 years. Initially, managers were required to perform a specific number of activity observations per month or quarter. Managers quickly discovered that quality of observations was far more important than quantity. In some cases, statistical data visualization and analysis tools are used to better determine where and when those observations are being performed to help managers better focus their efforts. Reports of activity observations were modified to focus managers on the important aspects of the observations. Managers were asked to answer four questions after completing an observation: "What did you learn?, what did you fix?, what did you prevent?, and what did you share?" Although PNNL eliminated the requirement to perform a specific number of activity observations, managers continue to perform them recognizing the value of the observations and their presence in the work areas.

Several different recognition programs were identified during the assessment. The Safety Sleuth was introduced, along with the existing Rapid Recognition and VPP incentive awards. However, staff interviewed about the methods used to recognize personnel were unsure or unaware of the Safety Sleuth program. They did recognize the Rapid Recognition program, but could not provide the specific feedback on how widely it was used. Since both recognition programs are implemented and in use, Battelle needs to better inform personnel about these programs, the methods to recognize, and the desired actions that would warrant the recognition and how to initiate the process.

PNNL is expanding efforts to apply Human Performance Improvement (HPI) principles into the Laboratory. In 2007, PNNL was providing HPI training to personnel in the F&O Directorate, but had not expanded this effort into the R&D Directorates. Since then, PNNL has initiated efforts to work with other Battelle-managed laboratories to identify effective means of applying HPI principles in the R&D environment. For additional implementation of the HPI principles, PNNL may find greater benefit by finding opportunities to develop and use more active methods of learning (hands-on participation, active observations, application of principles during incident review, etc.) rather than relying on passive means (reading material, videos, etc.) for continued implementation.

In 2007, lack of resources had been cited for 2 consecutive years by the annual VPP self-assessment. Since then, PNNL has committed significant resources towards safety improvement initiatives. In contrast to 2007, no personnel cited availability of resources as limiting for safety improvement initiatives. For example, the 331G "Racetrack" facility has received significant attention and investment. The team visited the 331G facility as a followup to the previous VPP assessment 2 years ago. The 331G facility is utilized for testing of detectors for radioactive material at ports of entry. They typically place sources in containers on trucks and drive them through the detector system to evaluate detector efficiency and applicability. Since 2007, the facility manager and the cognizant space manager have instituted many improvements pertaining to physical hazards. The enhancements to the parking area for workers clearly reduced the opportunity for accidents and incidents. The parking area was expanded and gravel added to improve a previously unacceptable condition. The facility added an electronic

status sign over the entrance to the facility to alert personnel to the activities currently in progress at the site. Upon entry to the facility, a hazard awareness and safety briefing is conducted. The team viewed this as a very positive improvement. Site personnel are trained to facility hazards, and this information is institutionalized in the Hazard Awareness Summary and other site-specific documentation. Inside the building, all wiring is now confined to cable trays elevated above the workspaces. The water cooler is no longer positioned behind electronic racks. Electronic racks no longer store reams of paper next to power supplies and energized equipment. The facility has implemented a flashing light system to alert personnel to the hazard of moving vehicles that are testing detectors should they exit the building. Improvements outside the building include clearly defined areas for personnel to walk with barriers separating them from moving vehicles. Gravel and cable covers now protect workers from tripping hazards that were prevalent during the last visit. Road barriers now prevent moving vehicles from straying outside the designated roadway. Access to the roof is now controlled by the facility manager and required training is verified before allowing access. Since the facility does not have restrooms and personnel must cross the roadway used for truck-testing traffic to get to the adjacent building, designated walkways have been added and railings used for doorways that open toward the truck pathways. These improvements clearly indicate that a strong safety culture has taken root at 331G, and a continuing emphasis for improvements is solicited and endorsed by managers.

Another significant investment at PNNL related to the use of fume hoods within the Laboratory. The Laboratory relies heavily on engineered controls across a large population of the research community. Almost every laboratory space has a fume hood to remove particulates, mists, and fumes. Recognizing the importance of the proper operation of the hoods, PNNL commissioned an American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) evaluation of the hoods at PNNL. The ASHRAE report had just been released at the onset of this review, and a strategy to address the identified issues was being developed.

The 2007 assessment identified some weaknesses in the rigor and detail in development of hazard analyses in laboratories. During this visit, Hazard Awareness Summaries were checked and in almost all cases were current. Selected Chemical Process Permits and Hazard Awareness Summaries were also reviewed. There remains a great diversity across the Laboratory for content and rigor of these documents. Samples reviewed by the team revealed a wide range of hazard analysis without a systematic approach to the information provided on the summary hazard analyses and in the permits. Observations and documents reviewed confirmed that some permits provided detailed analysis of the materials and chemicals used within the laboratory, the quantities used, the allowed applications, and the necessary controls required for a certain application of materials and/or chemicals. Others only referenced other regulatory material, and did not provide the necessary analysis. Since the last VPP visit, PNNL has assigned an individual to review hazard documentation to establish consistency and rigor in the development of these documents. Additional discussions with Industrial Hygiene personnel indicate that useful, concise, and appropriate discussion concerning workspace hazard identification, analysis, and selection of controls is expected. While the effort in this area is commendable, there remain hundreds of Hazard Awareness Summaries and Chemical Process Permits throughout the PNNL complex. Additional guidance and clearer

communication of expectations to personnel preparing and using these documents could help preparers achieve the desired end-product. This should include consideration of the level of knowledge expected of new employees in laboratory spaces, including maintenance personnel.

The 2007 assessment team indicated that PNNL should emphasize the use and applicability of Personal Protective Equipment (PPE) when required. If the environment did not require PPE, the applicability in the area should be adjusted commensurate with the hazard. In response to that recommendation, PNNL worked to clarify requirements for use of eye protection in both maintenance shops and laboratories. During this assessment, inconsistencies were still observed in the general use of PPE. This includes safety glasses, use of side shields, laboratory coats, goggles, and clothing allowed to be worn within the laboratories. When interviewed, personnel stated that certain PPE was required for conducting activities, but when these activities were not being conducted, certain PPE were not necessary. When asked about the personnel in close proximity to the work conducted with PPE, the employees were not sure whether hazards that might affect collocated workers necessitated those collocated workers to wear additional PPE. This method was dependent upon the individual and not a process that was outlined as a general practice by the laboratory. Additionally, some personnel were observed wearing shorts, t-shirts, and sandals in radiation laboratories with hazardous chemicals. As the higher expectations from managers for hazard analysis and safety awareness are pushed down to the working level, PNNL should ensure PPE and appropriate personal clothing requirements are clearly established that reflect those higher expectations.

As previously discussed, PNNL developed a corrective action plan to address the issues identified by the 2007 assessment. PNNL completed the identified actions, and verified those actions as complete. However, the closure of those actions did not identify mechanisms to ensure the underlying condition or causes were effectively corrected. PNNL can recognize additional improvement by revisiting the corrective action plan for the 2007 assessment in connection with its annual VPP self-assessment to determine whether the completed corrective actions were effective in achieving the desired results.

Conclusions

Since 2007, Battelle has made significant improvements in the Management Leadership tenet of VPP. Investment of resources, involvement of senior managers, and a consistent expectation for continuous improvement were all evident. Communication between directorates has significantly improved, and there is clearly a sense of “one laboratory” rather than several independent directorates. Opportunities to improve exist and are being pursued by Battelle. The commitment to make continual improvements across the organization is reflective of the expectations of a DOE-VPP Star site. As a result, the team recommends that PNNL be restored to Star status in DOE-VPP without condition.