TECHNOLOGY MATURATION PLAN FOR THE TANK FARM VAPORS MONITORING AND DETECTION SYSTEM (RPP-PLAN-59972-00 REV.0)

This Technology Maturation Plan (TMP) defines the technology elements of the Vapor Monitoring, Detection and Remediation Project (VMD&R) and identifies the development activities required to advance the maturity level of the technology. The Vapor Monitoring and Detection System (VMDS) provides a method of gathering and presenting meaningful environmental data (particularly with regard to potentially hazardous chemical vapors) at the Hanford Tank Farms to support safe Tank Farm operations. The VMDS consists of integrated monitoring and characterization equipment comprised of commercially available technologies adapted to the Hanford Tank Farms environment. The objective of this TMP is to advance the VMDS from technology development with system validation in a laboratory environment (calculated as Technology Readiness Level (TRL) 4) to technology demonstration with system validation in a relevant environment (calculated at TRL 6). The TMP was written to be consistent with the guidance given in the U.S. DOE Office of Environmental Management (EM), Technology Readiness Assessment (TRA) / Technology Maturation Plan (TMP) Process Implementation Guide (DOE G 413.3 4A), referred to as the "DOE Guide."

Technology Readiness Assessment (TRA) and Technology Maturation Planning (TMP)

The TRA is a systematic, metric-based assessment of how far technology maturation has progressed. The purpose of the TRA self-assessment is to:

- Identify the gaps in testing, demonstration, and knowledge of a technology's current readiness level and the information and steps needed to reach the readiness level required for successful inclusion in the project;
- Identify at-risk technologies that need increased management attention or additional resources for technology maturation; and
- Increase the transparency of management decisions by identifying key technologies that have been demonstrated to work or by highlighting immature or unproven technologies that might result in increased project risk.

A TMP provides a systematic planning approach for maturing technologies using the protocols in the DOE Guide as a basis and provides the logic path to assist with maturation of Critical Technology Elements (CTEs) identified as part of the TRA self-assessment. It also minimizes the chance that 'surprises' are discovered late in the project that could jeopardize success.

Technology Maturation Process

An internal WRPS multi-disciplinary team developed the TMP. The team included representatives from the Chief Technology Office (CTO), Instrument and Control Engineering, Industrial Hygiene, and Pacific Northwest National Laboratory (PNNL) staff.

The CTO is responsible for executing the technology maturation program and periodically updating the TMP as directed by the project team.

Identification of Technology Elements

Those VMDS Technology Elements (TEs) that are discrete pieces of equipment that are readily available for commercial applications without modification, i.e.TE-1, and TE-4 through TE-7, were not determined to be critical. However, five TEs were determined to be critical.

- TE1: Meteorological station (primary and secondary)
- TE2: Open-Path Fourier Transform infrared (FTIR) spectrometer (CTE)
- TE3: Optical gas imaging (OGI) camera (portable and fixed, CTE)
- TE4: Transportable direct reading instrument (MeshGuard NH3, Fixed Instrumented Skid, Haz-Scanner and AreaRAE)
- TE5: Portable direct reading instrument (MultiRAE Pro)
- TE6: Personnel location monitor (Blackline GPS)
- TE7: Personnel Chemical Badge (TOXIRAE and CUB)
- TE8: Ultra-violet (UV) Differential Optical Absorption system (DOAS) and Fourier Transform Infrared (FTIR) Stack Monitor (CTE)
- TE9: Open path UV DOAS (CTE)
- TE10: SAFER Systems Tank Farm Vapor detection system integration software plus RAE Guardian7 (CTE).

Required Technology Maturation Activities

A detailed assessment using the questions for Technology Maturation was completed for each CTE. The results of the analysis led to the description of the tasks necessary for technology maturation to reach TRL 6. The maturation activities identified are primarily programmatic requirements. After assessing the maturity of the CTE using the TRL question calculators, comprehensive activity requirements were identified that are relevant to the entire integrated VMDS.

Conclusion

The VMDS will be used to augment and improve Hanford Site vapor monitoring and detection. This VMDS TMP systematically used the DOE Guide to evaluate which VMDS unit operations are critical and what the self-assessed TRL values are. In the case of the VMDS, all of the component equipment is commercially available and technically mature. However, several pieces of equipment were determined to be CTEs based upon additional documentation/maturation of the steps taken to tailor them to the Hanford Tank Farms-specific VMDS application.

Most of the areas that require maturation are either related to integrated system testing or are programmatic in nature. Due to the fact that the system components have been deployed in environments similar to the Hanford Site, the VMDS components are commercially available and have been used for similar industrial applications, it is anticipated that the VMDS may be rapidly matured. Follow this link to view the full report.