Draft Technology Transfer Plan

Technology transfer does not happen by chance or without special efforts. PHMSA recognizes this challenge and understands that successful completion of R&D projects is not good enough. Implementing an effective and rapid deployment of technology is not insurmountable. PHMSA is partnering and co-funding with pipeline stakeholders to plan, measure and report technology transfer efforts. Success with these endeavors requires diligence throughout the research project life and requires early involvement with targeted end users. PHMSA recognizes the following technology planning process for identifying needed technologies, identifying the correct end users, planning when end users are involved and demonstrating to benchmark applicability:

- *Pipeline R&D Forums & Workshops* – Brings policymakers, stakeholders funding research and end users together, removes duplication of efforts, identifies the right technology gaps, identifies who will use technology, crafts the research scope necessary to develop technology for the identified end user and provides a technology roadmap as an output for funding organizations to generate research solicitations.
- *Independent, Relevant and Balanced Merit Review Panels* – Provides a check and balance that submitted proposals address research roadmap details (what technology, who would use it, what research actions are required) identified at forums or workshops. They utilize strong evaluation criteria ensuring the best researchers are recommended and keep the "idea" on track and moving to the next step.
- *Leveraging Research with multiple Stakeholders* – Removes duplication, leverages resources between the government and industry, forces researchers to organize with credible groups and increases the credibility and likelihood of technology transfer through keeping end users involved.
- *Holding Annual Peer Reviews* – Technology projects span several years. Holding annual peer reviews involving end users and independent, relevant and balanced panelists keeps projects on track, provides opportunities to cease or modify ineffective performance. It paves the way for effective project expansion and provides a good quality record.
- *Adjusting Technology Roadmaps* – Using peer reviews, researcher performance, future R&D forums and workshops can report progress toward technology goals. Consensus here drives the next logical step/research project required to develop the technology. Forums and workshops report this consensus output and stakeholders funding the research should solicit the logical next step and or research project.
- *Demonstrating Frequently* – Technology demonstrations should occur within the project scope or should be organized outside the project scope with other stakeholders funding similar research. Demonstrations expose technologies to the environment in which it must operate successfully, promote the deployment and utilization of new technologies through observations and participation of end users. It is also a litmus to some Federal programs that technologies are reaching pre-commercialization and the point where Federal programs can endorse further demonstrations or cease further financial support.
- *Measure and Report* – Some Federal programs must identify a point where further public monies are not appropriate. This point is when prototype technologies are demonstrated successfully in the environment they are to perform. Technology is referred as pre-commercial and a commercializer will now market to the pipeline industry. Communication to all involved stakeholders must occur and a record should be posted on the program's website as a success story.

PHMSA uses this plan to convert technology "gaps/ideas" coming from research forums and workshops into measurable reality. PHMSA promulgates regulations for the pipeline industry and does not identify technology vendors to meet regulatory requirement. Therefore a point exists where PHMSA must cease financial support of commercialization efforts.

PHMSA recognizes constraints and opportunities in developing technology and acknowledges the importance of transparency. Figure 1 depicts the Technology Readiness Level (TRL) as well as when PHMSA begins and concludes its investment.

PHMSA Begins Investment		Technology Readiness Level (TRL)		PHMSA Concludes Investment	
Proof of Concept	Demonstrations Phase	7	Field Test	Prototype Field Tested Pre-Commercialization Phase	Commercialization
		6	Test Bed		
		5	Test Rig		
	Laboratory Development & Testing Phase	4	Launchers		
		3	Communications & Software		
		2	Packaging or Housing		
		1	Sensor		

Figure 1 - Technology Readiness Level

NOTE: The TRL involves technologies applied either externally or internally or in proximity to the pipe. These technologies are past proof of concept and are new or the improvement of existing ones.

PHMSA recognizes four (4) main phases for technology development and transfer. Each phase may involve one or more projects to achieve technical goals identified in the development roadmap. These main phases are:

1. _Proof of Concept_ – Congress directed PHMSA to address short term needs. Other stakeholders who fund longer term pipeline research are addressing proof of concept research. Ideas are taken from theory to concept and are proven by some means. Once proven, PHMSA solicits and awards technology projects and begins its role in technology development.
2. _Laboratory Development and Testing_ – This phase can include several sub-steps or individual projects addressing specific technical milestones. Developing sensors can be the first sub-step or project leading toward the platform required to house it. Communication requirements and systems such as a Graphic User Interface between the sensors, platform and the end users is the next logical sub-step or project. For some technologies a launcher is required and is the final logical sub-step with in this phase. Each sub-step must complete its milestone and must conclude successfully before moving on.
3. _Demonstrations_ – This phase can include several sub-steps or individual projects addressing specific technical milestones. After laboratory development and testing sub-steps, demonstrations in test rigs (mock-up pipes/in air/little or no pressure), test beds (mock-up pipeline system/in air or hydrocarbon fluid/little to medium pressures) and field tests (the environment in which it must operate successfully) are held. Projects may bounce between this phase and the previous one based upon knowledge from conducting the research.

4. _Pre-Commercialization_ – This phase is reached when technology is successfully demonstrated in or on or around an operating pipeline. PHMSA concludes its role in technology development and commercialization continues between other funding stakeholders and a commercializer. If a commercial vendor is not identified during any of these phases, PHMSA may co-sponsor focused technology demonstrations aiming to disseminate the readiness of the technology and for securing a commercializer.

We want to hear from you! Please contact PHMSA so we can get your feedback!

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