External Quarterly Report

Date of Report: 5th Quarterly Report -December31st, 2025

Contract Number: 693JK32410008POTA

Prepared for: DOT PHMSA

Project Title: A Non-Destructive Toughness Measurement

Prepared by: GTI (Gas Technology Institute)

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For quarterly period ending: December 31st, 2025

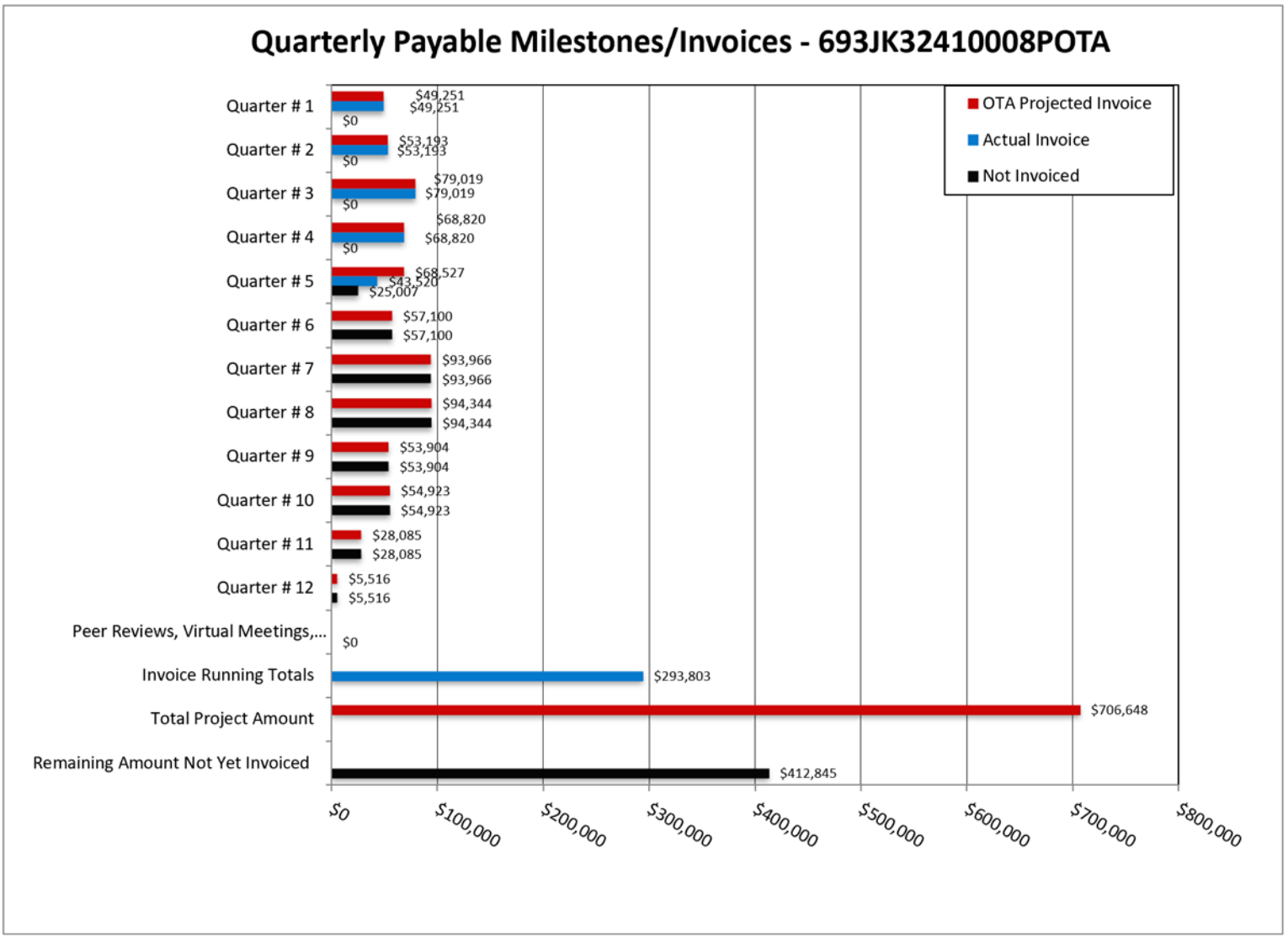
1: Items Completed During this Quarterly Period:

Item #	*Task #*	*Activity/Deliverable*	*Title*	*Federal Cost*	*Cost Share*
17	4	Information Exchange with ILI Providers	Second Interim Information Exchange Report	15,550.00	8,024.00
18	5	Instrumented Charpy Testing	Final Interim Charpy Testing Report	-	74,409.00
19	10	5th Quarterly Status Report	Submit 5th quarterly report	27,970.00	12,160.00

2: Items Not Completed During this Quarterly Period:

1. Item #18 Final Interim Charpy Testing Report is 80% complete. The report will be issued Q6 and will not be invoiced in Q5.

3: Project Financial Tracking During this Quarterly Period:



4: Project Technical Status

Task #	Description	2024	2025				2026				2027			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task 1	Assemble TAP and Project Kickoff Activities													
Task 2	Literature and Standards Review													
Task 3	Database Design and Data Ingestion													
Task 4	Information exchange with ILI providers													
Task 5	Instrumented Charpy testing of the pipeline steels						Scope Modification							
Task 6	Surface indentation testing of the instrumented Charpy test specimens													
Task 7	In ditch surface indentation testing of pressurized pipes													
Task 8	Data analysis and toughness prediction model refinement													
Task 9	Comparative Performance Analysis													
Task 10	Reporting and Project Management													
	Quarterly Reports and TAP Meetings													
	Draft Final Report													
	Final Report													
	Public Closeout Meeting													

- Will delay issuing of final Charpy testing report to Q6 to allow for completion of testing in-situ hydrogen specimens, cryo-testing for lower shelf behavior, and fracture toughness testing scope modification
- The project is on budget
- Appendix 1: Second Interim Information Exchange Report:
    - The report presents the progress of collaboration between GTI Energy and InnerSpec Technologies inc. on correlating the magnetic coercivity of pipeline steels to the materials properties of the same. InnerSpec technologies, a non-destructive inspection technology company, is seeking to build a field-ready tool to calculate fracture toughness values of pipeline steel by measuring coercivity of the steel in-ditch, under the USDOT PHMSA small business innovation research (SIBR) program (6913G624C100001). Within the "Information Exchange with In-Line Inspection Providers" task of our project, GTI Energy will assist InnerSpec with metallurgical expertise in developing the correlations between magnetic coercivity and mechanical properties of steel.
    - Magnetic Coercivity: the strength of reverse magnetic field needed to bring the magnetization of steel back to zero, once the steel has been magnetized to saturation. The coercivity of a steel is controlled by the ease of re-orientation of the magnetic domains within the structure of the steel. Microstructural features such as dislocations, grain boundaries, precipitates, and phases (ferrite/martensite) determine the magnetic coercivity of a steel. External factors such as presence of residual stress (welds) or plastic deformation (dents) can also alter the local coercivity measurement in a pipe section.
    - The microstructural features that dictate the magnetic coercivity of a steel also govern the mechanical properties such as strength, hardness and toughness. Therefore, the structure of the steel can provide a bridge between the magnetic and mechanical properties of the steel. The subsections below present preliminary results regarding correlating the magnetic coercivity and mechanical properties of 25 pipeline steels from GTI Energy's pipe library.
- Appendix 2: Second Interim Charpy Testing Report:

    - The report presents the experimental details and the results of instrumented Charpy testing of 40 pipeline steels conducted at GTI energy. Over 500 instrumented Charpy tests have been performed to measure the impact toughness response of the various pipeline steels.
    - Section 2 provides metadata, mechanical properties, and chemical composition of the different pipeline steels tested in this project. Section 3 describes the mechanical testing methodology used. Section 4 presents a snapshot of the instrumented Charpy results describing the materials response and the trends in both impact energy vs test temperature data and the load v/s displacement data. Finally, Section 5 presents the summary of test results containing all measured and analyzed data thus far, for the 40 pipeline steels. Impact testing of approximately 20 steel materials at cryogenic temperatures is still pending and is expected to be completed in Q6 of the project.
- A TAP meeting was held on December 11th, 2025.
    - A detailed review of the project progress in previous quarters was provided.
    - The delay in delivering the final Charpy testing report was explained,
    - The modification of the scope of work to include fracture toughness testing and how the results will enhance the modeling efforts in 2026 were explained.

End of section

End of Report