Quarterly Report – Public Page

Date of Report: 6*th Quarterly Report – February 3, 2020*

Contract Number: *693JK31810002*

Prepared for: *DOT*

Project Title: *On-Board Power and Thrust Generation for the Explorer Family of Robots for the Inspection of Unpiggable Natural Gas Pipelines*

Prepared by: *Northeast Gas Association*

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For quarterly period ending: *January 31, 2020*

1: Items Completed During this Quarterly Period:

During this 6th Quarter the following tasks were completed.

Item #	***Task #***	***Activity/Deliverable***	***Title***	***Federal Cost***	***Cost Share***
22	2-F	Technical management of project	Consultant	$4,200	$8,400
23	3-F	Submit 6th quarterly report	NYSEARCH project management	$6,054	$12,075
25	1.6-B	Test the system in the field	Field testing	$43,750	$87,500
26	1.7-A	Integrate energy harvesting module on the Explorer 20/26 robot	Explorer integration	$29,250	$58,500

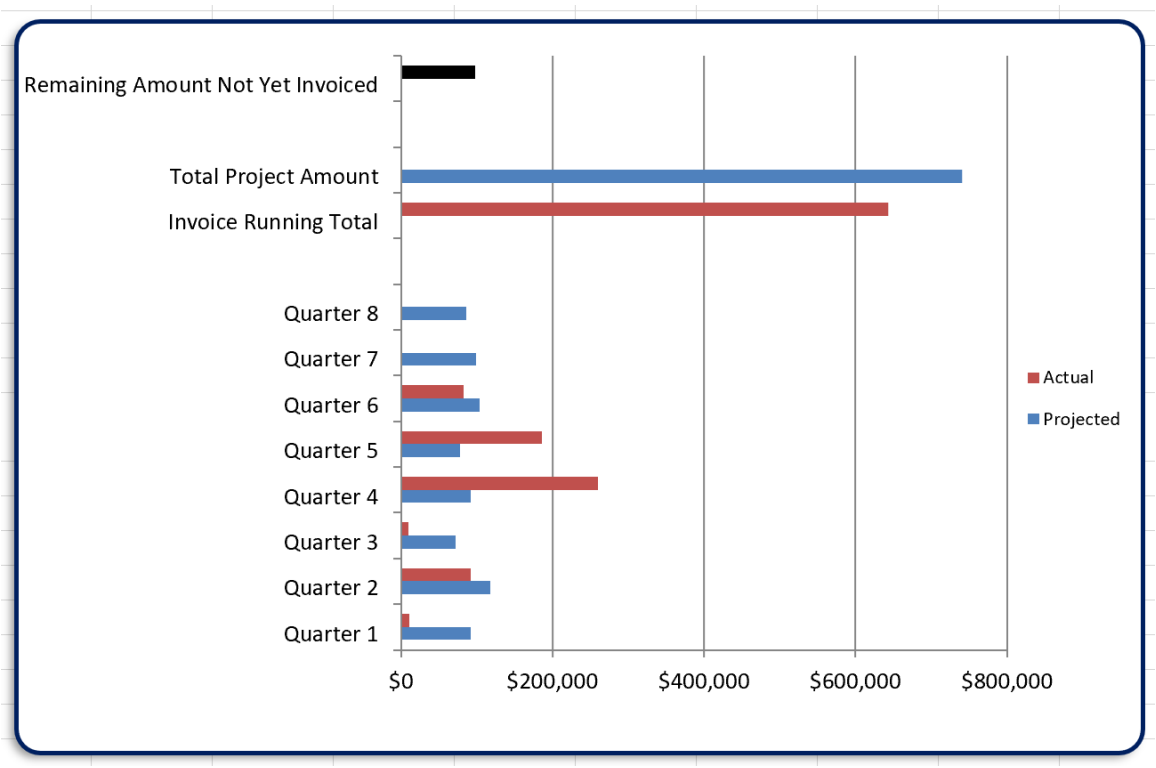
As seen the project is ahead of schedule.

2: Items Not-Completed During this Quarterly Period:

The project is ahead of schedule.

3: Project Financial Tracking During this Quarterly Period:

QUARTERLY PAYABLE MILESTONES/INVOICES - 693JK31810002



4: Project Technical Status –

Task 1.6-B: Field testing

The objective of the test is to verify how much energy can be harvested from the pipeline flow and made available to the Explorer robot to extend its range. The field test involves the following activities:

- Identify proper site and work with hosting utility to prepare and execute the field testing plan
- Prepare and deploy the Explorer 20/26 platform equipped with the energy harvesting module and the testing system on a live pipeline where pipeline flow rates can be varied and metered.
- Establish baseline operating conditions for the test setup using varying flow conditions
- Engage the energy harvesting module and measure the performance of the robot (test platform) under varying flow conditions (if flow variability is allowed by the host utility)
- Determine the effects of the energy harvesting module on robot operational parameters such as overall range and gains in operational efficiencies.

The planning of the field trial of the system was carried out during the previous period. The field trial itself was carried out successfully on November 19, 2019, in a live 24in natural gas pipeline. The line pressure reading taken at the time of the trial was 224psig. Figures1 shows the energy harvesting module aboard an Explorer 20/26 robot as it is loaded into the launcher.

Figure 1: Field Trial; the robot being driven into the launcher (right)

Figure 2 shows a schematic of the pipeline that was inspected during the trial and the various operational modes tested.

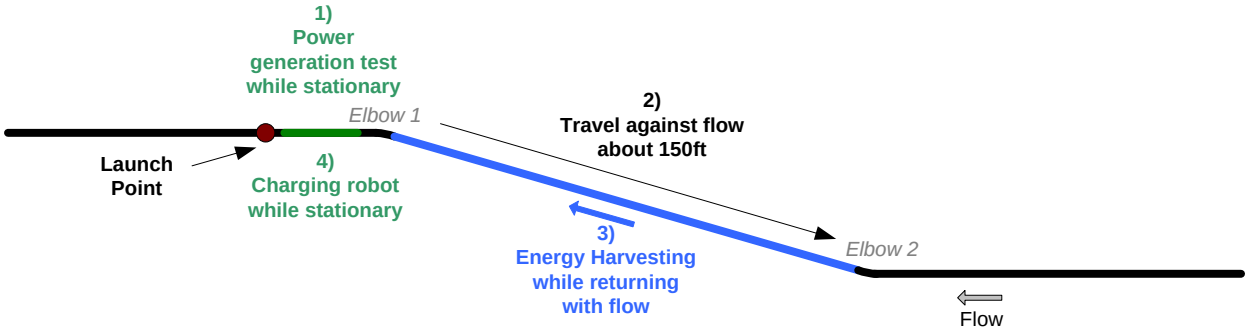


Figure 2: Energy harvesting module field trial overview and operational modes

The field trial uncovered numerous issues that should be addressed; some from a design perspective and some from an implementation perspective.

Task 1.7-A: *Explorer Integration*

The energy harvesting module was integrated on Explorer 20/26 prior to the field testing of the system. All necessary testing was carried out to ensure that the module communicated properly with the robot, transmitted all information to the robot properly,

and executed commands received from the robot as intended. No major issues identified. This effort will continue in the aftermath of the field trial to implement needed changes to issues that emerged (as discussed forces outside this project necessitate otherwise.

5: Project Schedule

The project is ahead of schedule.