X.7 Landfill Gas-to-Hydrogen

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Subcontractors:
- [1]Advanced Technology International, Charleston, SC
- Ameresco, Inc., Framingham, MA
- Gas Technology Institute, Des Plains, IL

Project Start Date: June 17, 2011
Project End Date: October 31, 2011

Fiscal Year (FY) 2011 Objectives

- Validate that a financially viable business case exists for a full-scale deployment of commercially available equipment capable of taking landfill gas (LFG) to hydrogen under the specific BMW operating environment.
- Validate that commercially available clean-up and reformation equipment can convert BMW's LFG to hydrogen at purity levels consistent with fuel cell industry standards.
- Conduct a side-by-side operational verification of fuel cell material handling equipment (MHE) performance and durability between a test group operating on LFG-supplied hydrogen and a control group operating on delivered hydrogen supplied by an industrial gas provider.

Technical Barriers

This project addresses the following technical barriers:

- Integration of individually-proven technologies into an unproven "end-to-end" solution.
- Unknown impact of long-term fuel cell performance when operating on LFG-derived hydrogen.

Technical Targets

- Months 1-3: Financial/business case feasibility.
- Months 4-10: Technical feasibility of producing fuel cell-quality hydrogen from LFG source.
- Months 11-17: Validate impact of LFG-derived hydrogen on fuel cell durability and compare it with fuel cell performance using hydrogen supplied by an industrial gas provider.

Approach

With the support of federal, state and private sponsors and stakeholders, the project will be conducted in three distinct phases:

- First, the project team would determine whether a viable business case exists that would permit recovering methane from the existing LFG source, converting it to hydrogen at large scale through an optimized capital equipment investment, and providing that hydrogen via a long term fee-for-services to the host site as the fueling source for its entire fleet of MHE.
- Should such a business case exist, the project next would validate the technical feasibility of taking the existing LFG stream that already has been filtered, dried and pre-treated sufficiently for use in gas turbine electrical generator sets, further cleaning and purifying it to remove the remaining trace contaminants, and then recovering the hydrogen using commercially available steam-methane reformer technology.
- As the final phase of this project, the hydrogen produced from the purified LFG source would be compressed, stored, and distributed to a single site within the host site manufacturing facility to permit a "side-by-side" performance evaluation using actual fuel cell-powered MHE. Hydrogen already available on-site from the contracted industrial gas provider would fuel the "control group" of MHE pieces; hydrogen produced from the pilot-scale LFG-to-hydrogen project would fuel the "test group" of MHE pieces. The performance evaluation would gather data for a period of six months from the control and test group fuel cells, and draw conclusions regarding the impact, if any, of the LFG source of hydrogen on fuel cell durability and maintenance requirements.

FY 2011 Accomplishments

Feasibility study (phase 1) began on June 17, 2011. Expected completion date is September 2011.

Future Directions

- "Go/No-Go" decision for proceeding with subsequent phases of the project will be made upon completion of the feasibility study. Based upon information already available to the project team, the likelihood of a finding of financial feasibility is high.
- Once financial feasibility has been confirmed, the project team will begin the technical feasibility portion of the project at pilot-scale (notionally 15 kilograms per day of hydrogen production).

FY 2011 Publications/Presentations

1. Presented project overview at Annual Merit Review (poster session) on May 10, 2011.