

### Project Summary

<b>Project Title:</b>	<b>Decontamination of Non-recyclable MSW and Preprocessing for Conversion to Diesel</b>
<b>Principal Investigator:</b>	Timothy W Saunders
<b>Name of Applicant:</b>	Gas Technology Institute (GTI)
<b>Solicitation Number:</b>	DE-FOA-0002203 (Topic 2a)

**Objectives:** Identification and removal of Non recyclable Municipal Solid Waste (NMSW) contaminants is required to overcome key handling barriers, enable conversion chemistries, and allow a minimum fuel Selling price of less than \$2.50/GGE. The project will characterize NMSW to determine purity and quality implications with bench scale testing and component proof of concept (TRL 2-4) targeted to enable GTI's U-Gas® conversion technologies. NMSW characterization and variability analysis will indicate potential feedstock supply systems to deliver at-scale quantities. Project will remediate physical/mechanical NMSW properties and address material segregation and flow issues for gasifier injection of a homogeneous and pure feedstock with a novel solids injection system.

**Technology proposed, methods to be employed:** NMSW will be evaluated for analytical representation of the chemical/physical nature of the material as well as the variability. The NMSW will be characterized with chemical analysis to determine suitability for gasification, as well as physically characterized to be evaluated with numerical models for the physical behavior of NMSW in materials handling equipment such as active mass flow hoppers and the final fuel injection system. The NMSW sample will be screened with non-destructive sensing techniques to identify differential characteristics for the development of automated decontamination methods. To facilitate a deep understanding of the quality impacts, NMSW will be fractionated into major material components using a combination of air-classification/air-column, density table, forage separator to generate pure (or enriched) fractions for Quality-by-Design testing and learnings. NMSW fractions will be preprocessed through size reduction or formatting techniques to meet conversion and handling requirements. NMSW stream components detrimental to U-Gas or feedstock injection will be removed or remediated with additional processing. The final samples produced with the developed decontamination strategies will be characterized to inform techno-economic analysis (TEA) and life cycle analysis (LCA) of scale-up. The NMSW stream will be tested in the continuous feeding Solids Pump system to validate delivery into U-Gas® pressure.

**Potential impact of project benefits and outcomes:** Currently, Material Recovery Facilities or other recycling efforts do not address homogenization or decontamination of their NMSW residuals due to the lack of a market and turn-key fractionation/decontamination technologies. Further, and critical for conversion due to the harmful physical/mechanical properties of NMSW, there is no commercially available feed system capable of continuous injection into gasification pressures. This project will address these issues.

**Major participants (collaborative projects):** GTI has assembled a world-class team to undertake the proposed project; Gas Technology Institute (GTI) - (Team Lead. Has key technologies including U-Gas and IH<sup>2</sup>® for conversion and pump for continuous feedstock delivery), Idaho National Laboratory - Physical and chemical pre-processing, Georgia Institute of Technology - Physical and chemical characterization of NMSW and numerical modeling of system, NanoRanch - Non-invasive sensing and artificial intelligence controls, and Waste Management – Supply NMSW samples and technical input to testing and TEA/LCA.