OVERVIEW OF
IWT’S WASTE TO ETHANOL PROJECT
PRESENTED TO
LOS ANGELES COUNTY
INTEGRATED WASTE MANAGEMENT TASK FORCE
ALTERNATIVE TECHNOLOGY ADVISORY SUBCOMMITTEE

July 19, 2017
INTERSTATE WASTE TECHNOLOGIES

- Formed in 1990 as a wholly owned subsidiary of Interstate General Corp, a public company then traded on the American & Pacific Stock Exchanges
- A development & technology company specializing in waste to energy projects
- In-house staff has the skills necessary to manage the development effort and technology application for its projects
- Has assembled a team technically and financially qualified to assist with the development of the project
  - AECOM – EPC Contractor
  - NAES – Operation & Maintenance Contractor
  - Eco-Energy – A major distributor/broker of ethanol in US
  - Similarly qualified team members to participate in the engineering, permitting, financing and insurance requirements for the project
PROVEN TECHNOLOGIES

• IWT licenses patented Thermoselect high temperature gasification technology
• The technology produces an energy rich synthesis gas comprised of carbon monoxide and hydrogen gas
• The synthesis gas is used in patented LanzaTech technology to produce ethanol
• The technologies are proven at industrial scale
• Thermoselect technology
  – Began operating in 1992 (25 years ago) in a Demonstration Facility
  – 7 commercial facilities have been in continuous and reliable operation, the first beginning in 1999
  – Has successfully & reliably processed millions of tons of unprocessed MSW
• LanzaTech Technology
  – Has successfully operated in 5 facilities beginning in 2008
  – 4 projects currently under development
Thermoselect Process Overview

- Clean recycled water reused in the Thermoselect project

Diagram showing the process steps:
1. Waste of all kinds is input.
2. Waste goes through a press and degassing channel.
3. Oxygen facility is used.
4. The mixture goes through a high temperature chamber with a temperature of 1200°C.
5. The mixture enters a homogenization reactor with temperatures of 2000°C and 1600°C.
6. The mixture goes through a quench and scrubber.
8. Synthesis gas production for alternative fuel or power generation, leading to sulfur, clean water, salt, zinc concentrate, and metals and minerals.
The LanzaTech Process is Driving Innovation

- Process **recycles** waste carbon into fuels
- Process brings underutilized carbon into the fuel pool via *industrial symbiosis*
- Potential to make **material** impact on the future energy pool (>100s of billions of gallons per year)

*Novel gas fermentation technology captures CO-rich gases and converts the carbon to fuels*
THERMOSELECT FONDOTOCE, ITALY DEMONSTRATION FACILITY – 110 TPD
Projects in Japan

PROVEN TECHNOLOGY
NAGASAKI FACILITY
PROJECT OVERVIEW

• IWT participated in a process conducted by LADPW to identify commercially available non-incineration conversion technologies to process MSW

• IWT and the Thermoselect technology were ranked first among all respondents

• IWT’s proposed facility will:
  – Process about 2,000 tons per day of MSW (Black Bin & MRF rejects) in 6 Thermoselect modules producing about 3 million cubic feet of syngas per hour
  – Use LanzaTech’s fermentation technology to produce about 52 million gallons of ethanol per year (142,500 gallons per day)

• Advantages include:
  – Reduced air emissions compared to a conventional MSW to electricity project
  – Diversified revenue streams
    • Ethanol, RINs, LCFS credits, tipping fees, recycled products
PROJECT OVERVIEW

• IWT has entered into a contract with Eco-Energy for the purchase of ethanol and associated RINS and LCFS credits under a long term agreement
• IWT entered into a LOI with LADPW for the supply of a portion of the waste required for the project
• IWT is in the process of finalizing a site location and obtaining the additional waste required for the project
• IWT intends to begin community outreach and permitting soon, based on finalizing the above two objectives
• Similar project being developed in Massachusetts
ENVIRONMENTAL BENEFITS OF THE PROJECT

• 100% of the MSW is processed into
  – Synthesis gas used to manufacture ethanol
  – Five recycled products which are sold
• No ash is produced; No ash landfill is required
• Air emissions are minimal; No dioxins or benzofurans are produced
• There are no process water discharges
• The project will convert synthesis gas into ethanol required by the US EPA Clean Air Act to be blended with gasoline (10%)
• Produce 385,000 California LCFS credits (pathway to be submitted)
  – CI value of minus 3 compared to California 2020 target of 88
• Left-over microbes produced in the ethanol production process will be converted into biogas and used in the Thermoselect process - This will enhance the Carbon Intensity value by substituting biogas for about a third of the natural gas required by the process
• Produces 48 million cellulosic RINs required by refiners & blenders as defined by the US EPA Clean Air Act and EPA regulations
ENVIRONMENTAL BENEFITS OF THE PROJECT

• Will significantly reduce greenhouse gas emissions compared to landfilling the same quantity of waste – refer to LADPW’s Comparative Greenhouse Gas Emissions Analysis of Alternative Scenario for Waste Treatment and/or Disposal
• Will reduce emissions from diesel trucks hauling MSW to distant landfills
• Will reduce emissions from transporting 52 million gallons of ethanol per year from the Midwest to LA County
• Does not use US corn crops
• Clean and attractive facility
  – Waste processing activities will be conducted in an enclosed bldg designed to blend in with surrounding environment
  – Building will be operated to prevent odors emitted to the surrounding area
  – Photographs of the type of architecture incorporated into the design of the facility have been presented earlier
100% DIVERSION FROM LANDFILL

THERMOSELECT

Vitreous Mineral Granulate

Iron-Copper Alloy

Salt

Sulfur

Zinc-Concentrate

Concrete Road Construction Sand-Blasting

Metallurgy

Chemical Industry, Additive for Metallurgy

Chemical Industry, Sulfuric Acid Production

Zinc, Lead, Copper Recovery
IWT MSW TO ETHANOL PROJECT
Thermoselect – LanzaTech Process Flow Diagram
Water & Biogas Recycling
ECONOMIC BENEFITS

• Private development of a $750 million dollar project
• Will invest hundreds of millions of dollars locally during construction
• Will create 2 million man hours of shop fabrication and construction work over a two year construction period
• Will invest millions of dollars locally during the 30 year operation and maintenance period
• Will create 130 permanent and well paying operation & maintenance jobs for at least 30 years
• Will provide clean & reliable waste disposal capacity in California for at least 30 years
CONTACT INFORMATION

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SUPPLEMENTAL INFORMATION
Independent Third Party Evaluation Of Conversion Technologies

• The County of Los Angeles sponsored a comprehensive study to evaluate commercially available non-incineration waste processing technologies.

• URS, a nationally recognized engineering firm, conducted the study.

• The County and URS concluded the following:
  Based on supplier credibility, existing operational experience, completeness of engineering, landfill diversion, permitability and economics, IWT and the Thermoselect technology were ranked #1.

• The entire report is available on IWT’s website at iwtonline.com.

• The ranking of the top 14 study participants is included on the following page.
Evaluation of Conversion Technologies

SECTION 2.0

EVALUATION, SCREENING, AND RANKING OF TECHNOLOGIES

FIGURE 2-1
SCORES OF CONVERSION TECHNOLOGY BY SUPPLIERS

Score in (%)

0.0  10.0  20.0  30.0  40.0  50.0  60.0  70.0  80.0  90.0  100.0

Supplier

Intestate Waste Technologies
Primeenergy LLC
Neoch Environmental
GEAM America, Inc.
Waste Recovery Systems, Inc.
Ehrenstahl, Inc.
Envision Energy
Grapes LLC
Arrow Ecology Ltd.
Changing World Solutions (IES)
Canada Composting
Green Energy Corporation
Bioengineering Resources, Inc.

Thermal Conversion
Bioconversion
Waste to Green Fuel
Independent Third Party Evaluation Of Conversion Technologies (Cont’d)

• The New York City Economic Development Corporation and the Department of Sanitation evaluated non incineration waste conversion technologies

• The City’s consultant, ARI, concluded the following:
  – Based on technology readiness, reliability, facility design, environmental performance, beneficial use of waste, marketability of recycled products and experience and resources of the project sponsor, IWT and the Thermoselect technology were judged superior
  – The entire evaluation is available on IWT’s website