WASATCH RESOURCE RECOVERY

- TURNING WASTE ORGANICS INTO ENERGY

A Joint Venture between:
South Davis Sewer District and ALPRO Energy & Water
WASATCH RESOURCE RECOVERY (WRR)

- A Public – Private Partnership between ALPRO Energy and Water and the South Davis Sewer District.
- Located just north of the District’s South Water Reclamation Facility.
- Sized to take 250,000 gallons per day of 10% food slurry (230 tons per day of food waste at 45% dry).
- Will create 2,500 dekatherms per day of renewable natural gas (RNG) and 174 tons per day of soil amendment at 30% dry.
- $45 million project began construction in May of 2017 and started up in February of 2019 (21 months).
- This is a renewable energy project that is economically viable strictly based on revenues generated from RNG sales, tip fees, and soil amendment sales. No grants or government subsidies were obtained.
WASATCH RESOURCE RECOVERY

1380 West Center Street
North Salt Lake, UT 84054

(Just north of Salt Lake City. At the center of the Wasatch Front along I-15 and ten minutes from the airport)
21% of waste in landfills is food waste

40% of all food produced in the US is thrown away
• 35 million tons of food waste generated annually in the US.

• 95% is landfilled or incinerated, many times into landfills that do not have biogas capturing systems. In comparison to Anaerobic Digestion, landfill methane capture is less efficient and is also expensive to install.

• Methane, as a greenhouse gas is 25 times more potent than carbon dioxide.

(Sources: EPA, CalRecycle, EcoCycle)
WRR COMMUNITY BENEFITS

• Divert waste from local landfill which will extend the life of the landfills.
• Low tipping fees due to value of energy & fertilizer.
• Reduce methane /CO2 /ammonia emissions from landfills.
• Produces at least 2 times the RNG than from a covered landfill with the equivalent waste.
• Take advantage of over 3 billion BTU’s of energy every day from organic waste.
• Produce enough natural gas to supply a community of 40,000, or supply electricity to about 15,000 homes.
• Provides 15 full time jobs at the facility with many more offsite.
• Population: 2,276,297 (2012).
• Tons MSW / Person / Year in Utah: .94 (1880lbs)*
• 20.5% Food Waste (EPA).
• Wasatch Front / Back: 438,642 Tons / Year.
• Project @ full capacity is Based on +/- 109,000 Tons / Year of Food Waste Being Diverted to the WRR or +/- 30% of the Available SSOW.
• This is Food Waste Only, FOG & Food Processing Waste is in Addition to the Above Numbers and account for about another 200,000 to 250,000 tons / year to the facility.
FOOD WASTE DIVERSION
FEEDSTOCKS

- BREAD / DOUGH
- PREPACKAGED MEALS
- RETAIL WASTE
- FISH PRODUCTS
- CHICKEN VICERA
- EXPIRED GROCERY
DE-PACKAGING PROCESS

What is the process?
PRE-PROCESSING AND DE-PACKAGING

Tipping on Receiving Floor
Very First Load!

Receiving Liquid Waste

SUEZ – MONSAL RE:SEP
Grind, Liquefy, and Screen
Where do all the packages go?
Refuse Derived Fuel (RDF) to Cement Kiln as fuel (coal replacement).
EXPIRED / OFF-SPEC CAN GOODS AND BEVERAGE PROCESS

CRUSH CANS/BEVERAGES WITH LIQUID TO DIGESTION AND RECYCLE METAL, PLASTIC, CARDBOARD, AND GLASS
ANAEROBIC DIGESTION

1. Complex organic matter (Carbohydrates, proteins, fats)
2. Soluble organic molecules (Sugars, amino acids, fatty acids)
3. Volatile fatty acids
4. Acetic acid
5. $\text{CH}_4 + \text{CO}_2$
6. $\text{H}_2\text{CO}_2$

Hydrolysis

Acidogenesis (Fermentation)

Acetogenesis

Methanogenesis
ANAEROBIC DIGESTION PROCESS
ENERGY OFFTAKES – BIOGAS UPGRADING

RNG PIPELINE INJECTION AND RENEWABLE POWER PRODUCTION

Raw biogas IN

CO₂, H₂S, H₂O, O₂

Purified methane OUT
FUTURE BIO-BASED SOIL AMENDMENT

FUTURE DRYER / PELLETIZER

DEWATERING PRESS

AIR SPREADABLE PRODUCT
WASATCH RESOURCE RECOVERY FACILITY

PHASE 1
Started Construction
MAY 2017

START UP
FEBRUARY 2019
2.5 acre Greenhouse, 140 miles of 4 inch glass pipe

Recover / capture of phosphorus and nitrogen from municipal treatment plant WRR anaerobic digestion process, along with carbon dioxide from gas upgrade process.

All elements essential to grow algae.
ClearAs Flow Diagram

Utilizes a membrane bioreactor (MBR) to separate algae.

Zenon Zeweed Ultrafiltration, Hollow-fiber Membrane
Algae Dewatering – GEA Westfalia Disc Stack Centrifuge

Algae Drying - Andritz Gouda Rotary Drum Steam Dryer
ALGAE BIOMASS MARKETS

- **Soil Amendment**
  - Specialty Fertilizers
  - Soil Enhancers
  - Soil Remediation
  - Growth Additives

- **Food & Feed**
  - Protein Replacements
  - Nutraceuticals
  - Animal Feed (Pellets)
  - Fish Food (Aquaculture)

- **Bioplastics**
  - Shoe Components
  - Moldable Foams
  - Packaging Materials
  - Consumable Products

- **Biofuels**
  - Gasoline Replacements
  - Biodiesel
  - Specialty Fuels
  - Derived Products

- **Biochemicals**
  - Bio-Succinic Acid
  - Surfactants
  - Lubricants
  - Paints & Coatings

- **$7B Annual Market Segment**
  - CAGR 4%

- **$704B Annual Market Segment**
  - CAGR 5%

- **$650B Annual Market Segment**
  - CAGR 12%

- **$41B Annual Market Segment**
  - CAGR 4%

- **$904B Annual Market Segment**
  - CAGR 3.5%
## OFFTAKES

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Quarterly</th>
<th>Annual Anticipated Gross Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Natural Gas - Methane</td>
<td>2500 Dekatherms per day</td>
<td>$9,600,000</td>
</tr>
<tr>
<td>Carbon Dioxide from Gas Conditioning</td>
<td>75 tons per day</td>
<td>$2,600,000 + $438,000 Tax Credit</td>
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<tr>
<td>Dewatered Digestate - Cake</td>
<td>40 dry tons per day → 160 wet tons per day</td>
<td>$1,500,000</td>
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<tr>
<td>Cake NPKS-nitrogen/phosphorus/potassium/sulfur</td>
<td>8:6:1:16 with nutrient recovery</td>
<td></td>
</tr>
<tr>
<td>Nitrogen from Anaerobic Digestion</td>
<td>6,300 lbs per day into cake</td>
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</tr>
<tr>
<td>Phosphorus from Anaerobic Digestion</td>
<td>2,000 lbs per day into cake</td>
<td></td>
</tr>
<tr>
<td>Nitrogen from Municipal Treatment Plant</td>
<td>700 lbs / day → into algae</td>
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</tr>
<tr>
<td>Phosphorus from Municipal Treatment Plant</td>
<td>133 lbs / day → into algae</td>
<td></td>
</tr>
<tr>
<td>Algae Production</td>
<td>8,000 lbs per day</td>
<td>$2,200,000</td>
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WASATCH RESOURCE RECOVERY AT BUILD-OUT

THANK YOU

QUESTIONS?