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Sierra BioFuels Project
Goal Statement

- Generate a Renewable Transportation Fuel that Lessens the Reliance on Fossil Fuels
- Convert MSW-Derived Feedstock Into Renewable Transportation Fuels
- Commercialize the Fulcrum Technology that was Demonstrated at a Pilot Scale to Produce Renewable Transportation Fuels from MSW derived Feedstock
## Sierra BioFuels – Key Milestones

<table>
<thead>
<tr>
<th>Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Demonstration Unit Operations</td>
<td>Dec 2013 – Jul 2014</td>
</tr>
<tr>
<td>LNTP Engineering Design</td>
<td>May 2015 - Aug 2017</td>
</tr>
<tr>
<td>Detailed Engineering</td>
<td>Sep 2017 -</td>
</tr>
<tr>
<td>Stage 1 FPF Construction</td>
<td>Jan 2016 – Aug 2016</td>
</tr>
<tr>
<td>Stage 1 FPF Performance Testing</td>
<td>Jul 2017</td>
</tr>
</tbody>
</table>
## Sierra BioFuels – Key Milestones, cont’d

<table>
<thead>
<tr>
<th>Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2 FPF Design</td>
<td>Aug 2018 – Jan 2019</td>
</tr>
<tr>
<td>Stage 2 FPF Construction and Testing</td>
<td>Feb 2019 – Jul 2019</td>
</tr>
<tr>
<td>Biorefinery Construction</td>
<td>May 2018 – Jan 2020</td>
</tr>
<tr>
<td>Biorefinery Performance Test</td>
<td>Jan 2020 – Jun 2020</td>
</tr>
<tr>
<td>Stage 3 Upgrading</td>
<td>Sep 2019 – Jun 2021</td>
</tr>
</tbody>
</table>
Sierra BioFuels – Master Schedule
Quad Chart Overview

Timeline
Construction Start: 2Q 2018
Production: 2Q 2020

Barriers
• Produce On-Spec Feedstock
• Complete Stage 3 of the Project and Upgrade F-T Liquids into SPK

Budget
Approximately $205 MM
• DoD: $70 MM
• Fulcrum: Approximately $135 MM

Project Participants
• Fulcrum Sierra BioFuels, LLC
• DoD
• Various Technology Providers
Project Overview
Project Overview

• Overview
  o Convert MSW-Derived Feedstock Into Renewable Transportation Fuels

• Approach
  o Secured Feedstock Contracts
  o Demonstrated Technology at Pilot Scale That Minimized Scale-Up Risk

• Technical Accomplishments/Progress/Results
  o Pilot Demonstration Unit Successfully Demonstrated Technology
Fulcrum – MSW to Low-Carbon Fuels

Technology Performance Guaranteed
Zero-Sulfur Fuel
80% Carbon Emissions Reductions
Cost Competitive with Fossil Fuel
MSW Available Worldwide
Technical Approach

- Technical Approach
  - Develop Process to Convert Feedstock into Fuel
  - Demonstrate Process at Pilot Scale
  - Utilize Commercially Available Technologies
  - Engage EPC Contractor that will Provide a Process and Cost Guarantee (based on Fulcrum Process)

- Critical Success Factors
  - Incorporate Lessons Learned from First of a Kind Process to Future Projects
  - Optimized FPF Process
  - Meet Production Goals
  - Meet Schedule and Budget Constraints
Technical Approach - Cont

- Potential Challenges
  - Skilled Construction/Operations Labor Force in Reno Area
  - Material Inflation
  - Offtake Agreement for F-T Liquids Product
MSW – A Strategic Feedstock

Changing the way Garbage is Handled and Disposed

- Large Volumes, Ideal Locations
- Established Infrastructure
- Carbon-Rich Feedstock Ideal for Biofuel Production
- Predictable Cost
- No Competing Uses
- Resolves Waste Disposal Problems
• In Operations; Stage 1 Construction Completed on Schedule and on Budget

• MSW Delivered by Waste Service Partners Waste Management and Waste Connections

• 350,000 Tons of Waste Processed Each Year

• 175,000 Tons of Prepared MSW Feedstock Produced per Year

• Capacity up to 120 Tons per Hour of Waste Processing
Feedstock Processing Facility

Photos

Truck Tipper

MSW Tip Floor
Feedstock Processing Facility
Photos, cont’d

Processing Equipment

Processing Equipment
Project Management

- EPC Contractor
  - Design, Procurement, Construction and Commissioning with a Fixed-Price and Guaranteed Cost and Production Yield
- Fulcrum Project Management
  - Engaged With EPC Contractor on Daily Basis
  - Weekly Project Review Meetings Ensure Executing Project in Accordance With Project Requirements
  - Conducting Management Oversight to Execution in Accordance With Project Scope, Cost and Schedule
Project Management, cont’d

- Owner’s Engineer
  - Provides Supplemental Technical Support to Fulcrum Technical Staff
- Lender Independent Engineer
  - Ensures EPC Activities are Executed in Accordance With Project Requirements
- Research and Development
  - Fulcrum
- Operator
  - Fulcrum
Technical Progress and Accomplishments
Technical Progress

Highlights

• Pilot Demonstration Unit Operated Successfully, Met or Exceeded the Performance Metrics and Demonstrated the Bio-Refinery Technology

• Scale up Risks Minimized due to the Design of the Pilot Demonstration Unit

• Completed 75% of the Detailed Design for the Bio Refinery

• Started Construction on the Bio Refinery

• Feedstock Processing Facility (FPF) Stage 1- Operated for 12 Months and Highlighted Required Processing Changes to Produce In Spec Feedstock
Completed Stage 2 FPF Process Improvements and Have Begun Construction

Biorefinery EPC is Advancing With Procurement Nearing Completion, Foundations Being Poured and Equipment Arriving at the Site

Installation of 120 kV Substation has Began

Water Treatment Plant Civil Work Began in January 2019

ASU Civil Work Began in February 2019
Feedstock Processing Facility
Stage 2 Construction Highlights

- Construction / Demolition
  - Contractor Mobilized to the Site in December 2018
  - Residual Truck Load-Out Structure Dismantled
  - Concrete Floors Saw Cut for New Trommels and Shredder Foundations
  - Tipping Floor Dust Collector Dismantled

- Procurement
  - Five Containers of Processing Equipment Delivered to the Site Including the Three Secondary Shredders
Biorefinery

Construction Site Update

- Construction Activities Completed Since November 2018
  - Gasification Structure Foundations Poured
  - Auxiliary Boiler Foundation Poured
  - Auxiliary Boiler Main Body and Economizer Delivered to the Site and set on Their Foundations
  - Installed Underground Sewage, Water and Grounding Network
  - Material Handling Equipment Delivered to the Site
Biorefinery

Photos – Construction Progress, cont’d

Overview of Concrete Pour

Placement of Auxiliary Boiler
Biorefinery
Photos – Construction Progress

Auxiliary Boiler Main Body

Economizer
Relevance and Future Work
Fulcrum’s Process Will Reduce Greenhouse Gas Emissions by More Than 80% Compared to Traditional Petroleum Production

- Creates an Excellent Source of Domestic Renewable Fuels
- Reduces Greenhouse Gas Emissions by More Than 80%
- Lowers Methane Gas Emissions From Landfills
- Reduces Carbon Emissions From Fuel Products
- Very Low Emissions Profile From Fulcrum’s Facilities
- Mitigates Need for New Landfills and Greatly Extends Life of Existing Landfills
- Creates a New Generation of Green Jobs
Future Work

- Sierra BioFuels Feedstock Processing Facility
  - Complete Phase 2 Construction and Commissioning

- Sierra BioFuels Biorefinery
  - Complete Construction Activities, Commission and Start-Up of Phase 2 Activities
    - Complete Design of Phase 3 - Upgrading
    - Construction of Phase 3 - Upgrading