The Willow Island Generating Station Opportunity Fuel Project

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Project Manager
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Allegheny Energy Supply
an Allegheny Energy company
Project Title:
Designing an Opportunity Fuel with Biomass and Tire-Derived Fuel for Cofiring at Willow Island Generating Station
Overview of the Program

• Design, Construct and Demonstrate a Sawdust Firing System at Willow Island #2 Boiler

• Integrate the Sawdust Firing with Tire-Derived Fuel Firing for a New Designer Opportunity Fuel

• Integrate the Opportunity Fuel Cofiring with Separated Overfire Air for NO\textsubscript{x} Management
Overview of the Unit

• Cyclone Boiler
  – Pressurized Operation
  – Scroll Feeders

• 188 MW\textsubscript{e} Capacity

• Hot Side Electrostatic Precipitator

• Part of Pleasants-Willow Island Site
Willow Island Generating Station
Willow Island #2 Boiler
One Cyclone Where Fuel is Fired
Objectives of the Project

• Enhanced NO$_x$ Reduction
• Voluntary Fossil CO$_2$ Reduction
• Enhance Performance of the Hot ESP with Biomass Ash if Possible
• Generation of Renewable - Green - Power
• Support for Local Economic Development
Project Plan

• Detail the Influences and Synergies Between Sawdust, TDF, and Overfire Air
  – Identify Individual Influences on NO\textsubscript{x}
  – Identify Synergies in NO\textsubscript{x} Management

• Detail Influences of Sawdust Ash on Performance of Hot Side ESP

• Commercialize Designer Opportunity Fuel Process

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Elements of the Project

• Final Biomass System Design (feasibility and preliminary design are complete)
• Biomass System Construction
• Designer Opportunity Fuel Demonstration
  – Short Term Testing [various blends, settings]
  – Demonstration [Long Term] Testing
Progress to Date

• Installation of TDF System is Complete
• Installation of Overfire Air System is Being Completed
• Preliminary Design of Sawdust Element in the System is Complete
• Feasibility Assessment of Designer Fuel Project is Complete
Process Flow Diagram for Sawdust Element
Sawdust Project Location - 1
### Comparison of Fuels to be Burned

<table>
<thead>
<tr>
<th></th>
<th>Sawdust</th>
<th>Coal</th>
<th>TDF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROXIMATE ANALYSIS (Wt %)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Carbon</td>
<td>9.29%</td>
<td>51.96%</td>
<td>27.96%</td>
</tr>
<tr>
<td>Volatile Matter</td>
<td>47.71%</td>
<td>33.84%</td>
<td>55.64%</td>
</tr>
<tr>
<td>Ash</td>
<td>0.90%</td>
<td>7.09%</td>
<td>4.78%</td>
</tr>
<tr>
<td>Moisture</td>
<td>42.10%</td>
<td>7.11%</td>
<td>0.62%</td>
</tr>
<tr>
<td><strong>ULTIMATE ANALYSIS (Wt %)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td>29.27%</td>
<td>72.41%</td>
<td>83.87%</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>3.33%</td>
<td>4.71%</td>
<td>7.09%</td>
</tr>
<tr>
<td>Oxygen</td>
<td>24.30%</td>
<td>5.93%</td>
<td>2.17%</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0.08%</td>
<td>1.33%</td>
<td>0.24%</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.01%</td>
<td>1.42%</td>
<td>1.23%</td>
</tr>
<tr>
<td>Ash</td>
<td>0.90%</td>
<td>7.09%</td>
<td>4.78%</td>
</tr>
<tr>
<td>Moisture</td>
<td>42.10%</td>
<td>7.11%</td>
<td>0.62%</td>
</tr>
<tr>
<td><strong>HIGHER HEATING VALUE (Btu/lb)</strong></td>
<td>4828</td>
<td>12941</td>
<td>16250</td>
</tr>
</tbody>
</table>
## Overall Project Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Start Date</th>
<th>End Date</th>
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</thead>
<tbody>
<tr>
<td>Selection of Fuels and Blends</td>
<td>9/1/00</td>
<td>12/1/00</td>
</tr>
<tr>
<td>Detailed Design</td>
<td>9/1/00</td>
<td>12/1/00</td>
</tr>
<tr>
<td>Construction</td>
<td>11/1/00</td>
<td>1/31/01</td>
</tr>
<tr>
<td>Short Term Testing</td>
<td>2/1/01</td>
<td>4/30/01</td>
</tr>
<tr>
<td>Demonstration</td>
<td>5/1/01</td>
<td>4/30/03</td>
</tr>
<tr>
<td>Reports and Closeout</td>
<td></td>
<td>5/31/03</td>
</tr>
</tbody>
</table>
Identification of Major Milestones

• Final Design Completion
• Fuel Blend Selection and Fuel Procurement
• Equipment Procurement
• Construction Completion
• Short Term Testing Completion
• Demonstration Completion
• Final Report
Additional Activities

• Performing Cofiring with Separate Injection of Sawdust at Albright Generating Station
  – 150 MWe Tangentially-Fired Boiler
  – Boiler Equipped With Separated Overfire Air and Low NO\textsubscript{x} Firing System
  – Separate Pneumatic Injection of Biomass
  – Data for Comparative Assessment of Willow Island Demonstration
Expected Accomplishments - 1

- Detailed Understanding of the Mechanisms and Opportunities for NO$_x$ Reduction with Biomass
  - Biomass Cofiring Alone
  - *Synergies With Other Opportunity Fuels*
  - Biomass Performance in Low NO$_x$ Firing Systems [e.g., SOFA]
Expected Accomplishments - 2

• Evaluate Biomass Ash as Additive for Hot Side ESP Performance Enhancement
• Demonstrate Cost-Effective, Voluntary Fossil CO₂ Reduction Approach
• Demonstrate Cost-Effective Approach to Generating Renewable - Green - Power
• *Key is Opportunity Fuel Synergies*
Projected Benefits

- Significant Potential to AE
  - NOx Management Technique
  - Reduction in Greenhouse Gas Emissions
  - Reduction in SO$_2$ Emissions
  - Other Environmental Benefits
Project Participants

- Allegheny Energy Supply Co., LLC - Prime Contractor
- Foster Wheeler - Principal Subcontractor
- Specialty Subcontractors
  - S. Harding and Associates - Overfire Air
  - Cofiring Alternatives - Biomass Fuel
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