DEC SW 40th Street
Thermal Energy Plant
May 19, 2010

This presentation does not contain any proprietary confidential, or otherwise restricted information.
Project Overview

• Geothermal Heat Pump Central Plant
  – 667 Boreholes at 300 ft depth
  – 25 nominal 70 ton of water-to-water heat pumps
    (1050 tons firm capacity)
• Serving County Adult Detention Facility
  – 779 Beds
  – 270,000 Square Feet
  – Critical Load
  – Secured Facility
• Domestic Hot Water Pre-Heat System
• Emergency Power System
### Project Overview

#### Timeline

**Design**
- **Project Initiation**: April '08
- **Feasibility Study**: October '08
- **Initial Environmental Review**: February '09
- **Schematic Design**: April '09
- **DD/CD Design**: April '10
- **Equipment Pre-Purchase**: May '10
- **Award Construction Contracts**: May '10

**Construction**
- **Underground Utilities**: November '10
- **Loop Field Installation**: December '10
- **Construction Service**: Winter '10-11
- **Building Construction (Mechanical and Electrical)**: August '11
- **Completion/Commissioning**: February '12
- **Building Occupancy**: August '12
- **Data Collection**:
Total Project Cost $20,132,824
FY09 Funding = $1,225,224
FY10 Funding = $16,591,659
Project Overview

- **Barriers**
  - Environmental Concerns
    - Wetlands
    - Floodplain
  - National Environmental Policy Act Clearance
  - Bond Financing

- **Partners**
  - Project Management
    District Energy Corp
  - Project Engineering
    Farris Engineering
  - Project Environmental
    Lincoln Electric
  - Project Customer
    County A/E Firm
Relevance/Impact of Research
Program Goals

Applications
Secured Facility, Critical Load

Costs
District Shares Capital Costs

Market
District
Energy

Performance
Load Diversity
Relevance/Impact of Research

• Research results that will achieve DOE Program goals
  – Demonstration of Reduction in Energy Consumption and Cost
  – Data Collection to Support Application of Geothermal Technologies in District Energy Systems
  – Future Added Loads to Show Benefits Available with District Structure
  – Future Expansion to Explore the Versatility of Plant Growth Options
  – Plant Solutions to Possibility of Long Term Temperature Migration
Scientific/Technical Approach

- Feasibility Study
  - Comparison of Mechanical Systems
  - Technical Feasibility
  - Life Cycle Cost Analysis

- Modeling
  - Building Load Modeling
  - Hydraulic Modeling

- Design
  - Collaboration with Industry Experts

- Data Collection/Recording
  - Metering
  - Plant Control System
Scientific/Technical Approach

• Go/No-Go Decisions
  – County Approval
  – Feasibility Study
  – Initial Environmental Review
  – NEPA Clearance

• Milestones
  – Pre-Purchase Equipment Contracts
  – Construction Documents Packages
  – Bond Issuance
  – Loop Field Installation
  – Building Construction
  – Equipment Delivery
  – Thermal Service for Construction Activities
  – Final Completion/Commissioning
  – Metering/Data Collection
Accomplishments, Expected Outcomes and Progress

• Progress to Date
  – Design Substantially Complete
  – Bonds Issued for Recipient Financing
  – NEPA Clearance Granted

• Expected Outcomes
  – Construction of GSHP District Energy Plant
  – Energy/Cost Savings of HW, CHW, and DHW service (~8-9%)
  – Data Collection to Establish Model for Geothermal District System

• Team Qualifications
  – Experience in District Energy and Plant Design
  – Experience in Geothermal System Design
  – Engineering Involved on All Levels
  – Experience in Development and Implementation of Successful District Energy Business and Financial Model
Project Management/Coordination

DEC Project Manager

DEC Project Engineers

Farris Engineering

DEC Plant Management

Building A/E

LES Environmental

County Representatives

Project Design

Project Construction
## Project Management/Coordination Schedule

### Design Tasks

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<tr>
<th>Task</th>
<th>Original Task Schedule</th>
<th>Actual Task Schedule</th>
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<tbody>
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<td>Schematic Design</td>
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<td>DD/CD Design</td>
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<td>Loop Field Design</td>
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<td>Emergency Generator Design</td>
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<td>Plant Systems Design</td>
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<td>Controls Design</td>
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### Pre-Purchase Equipment

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<th>Equipment</th>
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<td>Emergency Generators</td>
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### Construction Tasks

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<th>Task</th>
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<td>Civil Construction</td>
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<td>Rough Grading</td>
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<td>Loop Field Installation</td>
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<td>Building Sitework</td>
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<td>Underground Fuel Storage Installation</td>
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<td>Control System Installation</td>
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Original Task Schedule: 

Actual Task Schedule:
### Project Management/Coordination

#### Projected Funding Schedule

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| Budget Phases | DOE Cost Share $ / % | Recipient Cost Share $ / % | Total Estimated Costs |
| Phase I | $503,645 / 41% | $721,579 / 59% | $1,225,224 |
| Phase II | $4,458,903 / 27% | $12,132,756 / 73% | $16,591,659 |
| Phase III | $37,452 / 2% | $2,278,487 / 98% | $2,315,939 |
| Total Project | $5,000,000 / 24.8% | $15,132,822 / 75.2% | $20,132,822 |
Future Directions

**Short Term**

- FY10 Plans
  - Issue Bonds to Finance
  - Pre-Purchased Equipment Delivery
  - Underground Utilities Installed
  - Construction Service
- FY11 Plans
  - Plant Building Complete
  - Loop Field Installation Complete
- Upcoming Key Milestones
  - Start of Construction
  - Completion of Design Packages
  - Controls System Configuration

**Long Term**

- Alternative Development Pathways
  - Contingency Plan for Construction Service
  - Addition of Conventional Equipment to Resolve Temperature Migration
- Reporting to National Geothermal Data System
  - Plant Instrumentation
  - Plant Control System
  - System Optimization Analysis
  - Long Term Borefield Conditions
Summary

• Current Status
  – Project is ahead of schedule
  – Project is under budget
  – Major challenges to date have been resolved

• Future Steps
  – Complete Construction
  – Data Collection, Reporting to National Geothermal Data System
  – System Growth
  – District Energy Market Expansion

• Impact to DOE Goals
  – Market=Applications=Performance=Cost