Don’t Freeze in the Dark

The University of Alaska Fairbanks CHP Story
Introducing University of Alaska Fairbanks

- Founded in 1917
- Located in Fairbanks Alaska
- Approximately 10,000 students at the Fairbanks campus
- 3,400,000 square feet of academic, research, administrative and housing space
- $124 Million in Research grants per year
- Extreme temperature variation: -66°F to 99°F
- Approximately 14,000 degree heating days
Our foundation looks like this
UAF’s Project Objectives

• Increase capacity to meet 30 year growth

• Reduce emissions

• Natural Disaster Resistant

• Increase reliability and lower costs

• NO real Natural Gas

• Be permitted in an PM2.5 non-attainment area
CHP is the Foundation

Combined heat and power efficiency

- Separate heat & power: 52%
- Combined heat & power: 65%
Options Considered

- Do Nothing
- Coal CFB w/ Steam Turbine = Selected Option
- Gas Turbine w/ HRSG
- Gas Boilers w/ Steam Turbine
- Coal/Biomass gasifier/boiler/steam turbine
- Electric boilers (using Susitna hydro electricity)
- Reciprocating Engines (Natural Gas) w/ HRSG - boilers
Why don’t you _________?

• Buy power from GVEA
  • *We need* heat and electricity.
  • CHP more efficient

• Build a natural gas plant
  • A reliable supply of gas is not available
  • Lower capital cost
  • Double to more than triple the fuel cost
Solution: Major plant upgrade

- Circulating fluidized bed boiler 240,000 lbs/hr
- 17 MW Steam turbine
- Use condensing water for campus heat
- 3 Cell ACC
- Baghouse with DSI system
- Common steam header with existing plant
Environmental benefits

- Current main boilers are 1890’s technology
- Plant burns coal, diesel and gas
- Newer technology is more efficient
Permitting

• Modification to existing permit
• Lowest PM2.5 ever guaranteed
• Almost 3 years to get permit
• No major opposition
Fishing for Funding

• $245M Total Project Cost
• Champion in the Legislature
• Statewide Community support
• Hire a Marketing Team !!!
The Boilers

Old Boilers from 1964

1 ton of coal makes 10,012 lbs of 600 psi steam

New CFB boilers

20% more efficient!!

1 ton of coal makes 12,174 lbs of 600 psi steam
Contracting

• Advance Purchase of major equipment
• Construction Manager at Risk
• Early Contractor involvement
• Real Time cost estimating during design
• Requires active Owner involvement
Project Budget Challenges

• Original Scope $50M over budget !!!
• Team Effort to rescope (UAF/Engineer/vendors/contractor)
• Maintained capacity but sacrificed flexibility (2 - 50% boilers to 1 - 100%)
• 4 month delay
Project Schedule

- 2011 - Preliminary Engineering and Permitting
- 2014 - Obtain permit, funding and start Design
- 2015 - Site Preparation and Re-scoping
- 2016 - Foundation, steel and boiler erection, install steam turbine
- 2017 - 2018 - Complete boiler erection and Balance of Plant scope
- 2018 - Commissioning (starts in April)
- Fall 2018 - Commercial Operation
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Lessons learned

• Use of DCS simulator
• Early Contractor Involvement
• Early Site Preparation
• Robust Document Management System
- Lessons learned

• Pay Attention to Contract Interfaces
  – Especially structural
  – Vendor/Engineer/Contractor

• Commissioning Costs

• Procure equipment early

• Model Everything!
Questions?