Campus Wide District Heating & Cooling System

The Energy Loop... Today and Tomorrow

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Presentation Order

1. Vision, Mandate & Objectives
2. Yesterday
3. Today
   • Decentralisation of the heating plant
   • Introduction of an Energy Loop
   • Geothermal
4. Results
5. Tomorrow
6. Questions
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Vision & Mandate

-The Vision of the Buildings and Grounds Dept. of Bishop’s University is to be the Promoter and Guardian of our physical and natural environments.

-The Mandate of the Building and Grounds dept. is to provide our community with professional and durable services in the spirit of our Vision.
Energy Efficiency Objectives

- Put in place a concept that enables the utilisation of cost effective energy sources.
- Reduce our emissions of Green House Gases.
- Target 2016 as the year we can potentially be Carbon Neutral based on Direct GHG emissions.
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Bishop’s Campus

Yesterday

- 33 buildings
- 81 879 m² (881,338 sq.ft)
- Heating: steam network at = 100 PSIG (328F)
- Approximately 600m (2,000’) of buried lines
Central Plant

Yesterday

- Inefficient Distribution
- Steam traps
- Steam vents
- Purges
- Poorly insulated Steam lines in tunnels and buried
- Numerous leaks

GREEN LAWN IN JANUARY!
Central Plant

- Production of steam with all its inefficiencies
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Project

Project implementation in 2 phases:

1. 2010-2011: Eliminate steam distribution and decentralize the heating plant

2. 2011-2012: Introduction of the Campus Energy Loop
   - Geothermal Heating
   - Energy Recovery
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Decentralised Heating Plants

Today

→ 11 Heating Plants (hot water)
Decentralisation

- Central Plant becomes Energy Plant
- 11 Mechanical Rooms (water heaters)
  - Heat recovery from the new condensing furnaces.
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Energy Loop

Geothermal

87 F – 93 F Energy Loop

15,000 gallons Propylene Glycol

Cooling

Heating
Energy Loop

Heatpump Mode

First Stage Heatpump
170 (tons)

Cooling Units
- Chillers recovery
- Hot Water Heaters recovery

Second Stage Heatpumps (HWH + DHW)
70 (tons) x 4

Geothermal

Temperature Ranges:
- 50°F to 24°F
- 80°F to 90°F
- 90°F to 120°F
- 75°F to 80°F
- 120°F to 180°F
Energy Loop

Wells Regeneration Mode

Geothermal

87 F – 93 F Energy Loop

Cooling Units
Chillers recovery
Hot Water Heaters recovery

Second Stage Heatpumps (HWH + DHW)
70 (tons) X 4
180F

50F 90F 93F

75F
Energy Plant (old Central Plant)

- First Stage Heatpump (Energy Loop)
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Geothermal

- 57 wells in closed loop
- 520’ – 530’ (158 m- 161 m) deep
- 3 tons - 4 tons / well (171 tons - 228 tons)
- 15,000 Gallons Propylene Glycol
- Design Min - Max
  - 24 F, 100 F (-4 C, 38 C)
Geothermal
Geothermal
Geothermal
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Solutions Provided

- Flexible System, can expand: New Sports Center with new Arena & new heatpumps.
- Redundancies
Results (Gj)

January – December 2012

<table>
<thead>
<tr>
<th></th>
<th>Decentralization</th>
<th>Geothermal</th>
<th>Lighting</th>
<th>Optimization</th>
<th>Total</th>
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<tbody>
<tr>
<td>To Date (Gj)</td>
<td>25,140</td>
<td>5,000</td>
<td>1,128</td>
<td>4,288</td>
<td>35,556</td>
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<tr>
<td>Objectives(Gj)</td>
<td>25,140</td>
<td>10,294</td>
<td>1,128</td>
<td>4,288</td>
<td>40,850</td>
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</table>
Results

- Annual savings $472,000 (reference year 2006-07)
- Equivalent of 350 residences of 2,000 sq.ft.
- 2,364 tons of CO2, equivalent of 1,400 cars, 66% reduction

Next step towards a CARBON NEUTRAL CAMPUS
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Tomorrow

- Long Term Vision
- New Sports Center on the Energy Loop
- Gradual reduction in the remaining use of fossil fuels
  - Heating
  - Transportation
  - others
- Objective: Have a Carbon Neutral Campus in 2016 based on Direct GHG emissions
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Think Globally, Act Locally

Thank you!