COMPREHENSIVE ENERGY MASTER PLAN

UPDATE

Bob McMains
Vice President for Physical Facilities

Ken Sandel
Director of Physical and Capital Planning

May 7, 2012
REVISED PLAN/ FEB 2011
Requested BOT approval to

- Stop the project for installation of Boiler #6

- Continue forward with plans for installation and operation of Boiler #7 (funded through University funds)

- Pursue new capacity after an overarching campus-wide energy plan was developed (CEMP)

- Request use of the excess bond proceeds for other high-priority capital or infrastructure projects.
## Current Authorization

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler #6 A&amp;E/Permitting</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Boiler #6</td>
<td>$53,000,000</td>
</tr>
<tr>
<td><strong>Total Authorization</strong></td>
<td><strong>$54,500,000</strong></td>
</tr>
</tbody>
</table>

## Expenses

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler 6 Design/Planning</td>
<td>$5,400,000</td>
</tr>
<tr>
<td>Health and Human Sciences</td>
<td>$16,000,000</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>$21,400,000</strong></td>
</tr>
</tbody>
</table>

## Balance Available

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance Available</strong></td>
<td><strong>$33,100,000</strong></td>
</tr>
</tbody>
</table>
CEMP / PRODUCTION & DISTRIBUTION
Purdue requests approval to proceed with a revised plan that calls for the reallocation of $33.1 million in bond proceeds from the Boiler 6 project to support related utility infrastructure projects for boiler/steam generation and distribution as described above.

4 Specific Projects
1. Demolish Boiler #1 = ~$2.5M
2. Purchase/Install a Combined Heat and Power unit (CHP) = ~$23.6M
3. Convert coal fired Boiler #2 to natural gas = ~$2.5M
4. Upgrade the steam distribution along Jischke Dr. = ~$4.5M

Combined Project
1. Power Plant Production and Distribution Improvements = $33.1M
COMPREHENSIVE ENERGY MASTER
PURDUE REQUEST – NEAR, MID, AND LONG-TERM

NEAR-TERM

Demo Boiler 1
6.5 MW CHP
Convert Boiler 2 to Natural Gas
Upsize Steam Line on Jischke Drive (3rd to Tower)
TES – 8000 Tons (5 million gallons) with Distribution
Wade Chiller 6 Life Extension
NW Sat. Plant Pump Upgrade

MID-TERM

Demo Chiller 6 in Wade; Replace with 2700 Ton Electric Chiller
Add 18” Chilled Water Main Along Third Street
Third Street to PA Pit Steam Line

LONG-TERM

Satellite Plant 2 with one 2700 Ton Chiller
Added Chillers in Satellite Plant 2
Demo Boiler 2
Demo Chiller 7 in Wade
Boiler 9
CEMP / DEMAND SIDE
• Develop a sustainable energy demand side plan and implementation program

• Goals – Utilize CEMP Recommendations
  o Reduce peak energy demands
  o Reduce energy consumption
  o Engage faculty and staff
  o Integrate R&R, O&M, and Metering
  o Change culture and modify behaviors
  o Reduce, optimize, and sustain
BOT / PREVIEW
1) Production and Distribution Improvements
   • 6.5 MW CHP
   • Demo Boiler 1
   • Convert Boiler 2 to Natural Gas
   • Upsize Steam Line on Jischke Drive (3rd to Tower)

2) TES – 8000 Tons (5 million gallons) with Distribution

3) West Lafayette Metering Installation
## PRODUCTION IMPROVEMENTS

### IMPACT

<table>
<thead>
<tr>
<th>2010</th>
<th>Boilers</th>
<th>Fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Stoker Coal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Stoker Coal / 20% Natural Gas</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Natural Gas / #2 oil</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>CFB Coal / Biomass Capable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2015</th>
<th></th>
<th>Fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>Natural gas</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Natural gas</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>CFB Coal / Biomass Capable</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Natural gas</td>
</tr>
<tr>
<td></td>
<td>Combustion Turbine (CHP)</td>
<td>Natural gas</td>
</tr>
</tbody>
</table>
• Increase steam distribution and reduce steam bottleneck

• 3rd Street to Tower Drive

• Address steam infrastructure that serves the north end of campus

• Increase size or add an additional line
Project information:

- Project cost estimate: $33,100,000
- Source of funds: Boiler 6 Bond Proceeds – Series X (Fee Replacement – Bond Proceeds)

Project schedule:

- Planning: May 2012
- Fundraising: Beginning Discussion with State
- Design: May 2012- March 2013
- Construction: April 2013 – November 2015
THERMAL ENERGY STORAGE

• Chilled Water Storage System (5 million gallon tank)
• Addresses production shortage
• Produces chilled water with existing chillers
• Produces chilled water with electricity when it is the least expensive to produce
Project information:
• Project cost estimate: $16,800,000
• Source of funds: Infrastructure reserve

Project schedule:
• Planning: May 2012
• Design: May 2012 – February 2013
• Construction: February 2013 – June 2014
Project information:

• Project cost estimate: $5M over three years
• Source of funds: Infrastructure reserve
• Utilizes Purdue Design & Construction Staff and Small Public Works

Project schedule:

• Phase III Planning: May 2012
• Design: 2012 – 2015
• Construction: 2013 – 2015
CEMP / PUBLIC MEETING UPDATE
• Public Comment Period: 1/11/12 – 2/14/12

• Public Meeting held on 2/15/12

• Comments/Responses were grouped into two main categories:
  o Energy Production & Renewable Energy
  o Energy Demand
    – Comment/Response Categories: Metering Campus Buildings, Building Audits, Occupancy Sensors, Lighting & Building Controls, and Campus Engagement

• Add appendix to CEMP to include Purdue’s written response to categories of public comments
• Director of University Sustainability is engaging stakeholders in ongoing communication pertaining to the future of campus sustainability initiatives

• The University Senate approved the establishment of the Committee for Sustainability Planning and Assessment, a subcommittee of the University Resources Policy Committee (URPC)
  o To be composed of representatives of the student body and members of the Purdue faculty and staff
  o Five year goals to advance the sustainability of the university
QUESTIONS?