Comprehensive Energy Master Plan (CEMP)

January 10, 2012
Comprehensive Energy Master Plan (CEMP)

Initiation & Development

- Initiated as the result of a February 2011 BOT resolution
- Collaboratively developed by Physical Facilities, Physical & Capital Planning, University Sustainability and Burns & McDonnell
- Addresses long-term energy needs for the West Lafayette campus
- Identifies production and distribution options to meet short and long-term needs
- Aligns with New Synergies and Sustainability Strategic Plans
- A dynamic, “living” document
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Purpose

• CEMP purpose is to develop:
  
  – Strategic framework for campus-wide energy management
  
  – Fiscally sustainable plan for utility production, distribution and demand (PD&D)
    • Utilities addressed include:
      – Potable water
      – Chilled water
      – Steam
      – Electricity
  
  – Environmentally responsible approach to energy management
    • Balances life-cycle costs and environmental issues responsibly
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**Process**

- Gathered current conditions (supply & demand)
- Analyzed current conditions/operations
- Developed near-term needs and options
- Developed long-term needs and options
- Developed plan
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Summary of Current Production, Distribution & Demand (PD&D)

- Wade Utility Plant (Wade) designed and constructed 1960-1962
- As of the close of FY11, Purdue Utilities
  - Supplies and distributes:
    - ~100% of heating to campus via steam
    - 100% of cooling to campus via chilled water and electric cooling
  - Generates:
    - 40-50% of electricity consumed
  - Provides:
    - 100% of campus electrical distribution
- Significant steps have already been taken to reduce campus energy consumption
  - Reduce HVAC system run time
  - Lighting retrofits
  - Fume hood sash control procedures
  - Temperature Control Optimization
  - More opportunities exist
- Future challenges
  - Over the course of the next year, available space to add heating and cooling production will be consumed
  - Energy-intense facilities in planning for the campus (Drug Discovery, HHS, Bindley, Herrick)
  - Infrastructure expansion is necessary
  - Operating costs to produce and distribute energy are increasing
  - Environmental issues related to coal
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Production Analysis

Steam
- Focused on the generation of steam, chilled water and electricity to meet current and future campus energy requirements
  - Analysis suggests that production of electricity will not present significant near-term or long-term challenges
- Currently only produced by Wade boilers- 750 KPPH
- Current firm capacity is 550 KPPH (installed capacity minus the capacity of the largest boiler)
- Current Peak steam demand is 545 KPPH
- Anticipated load increase is 110 KPPH over the next 10 years
- Increased production capacity to stay ahead of peak demand
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Production Analysis

Chilled Water

- Currently produced at Wade and the Northwest Satellite Chilled Water Plant
- Installed capacity in 2012: 36,900 tons
- 2012 firm capacity: 30,600 tons
- 2012 peak chilled water demand: 31,000 tons
- Retirement of chillers #6 & #7 reduces chilled water capacity by 9,250 tons by 2017
- Anticipated chilled water increase: 9,200 tons in ten years
- Increased production capacity to stay ahead of peak demand

![Graph of Chilled Water Production Analysis](image-url)

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**Do Nothing Case Chilled Water**

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**Chilled Water**

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Distribution Analysis
Focused on steam and chilled water distribution systems

- Steam
  - Single point of production (Wade) creates a distribution challenge in the northern areas of campus
  - Anticipated future deficits in Permanent Apartments (PA) Pit steam pressure for distribution
  - CEMP Recommendation:
    - Increase the steam distribution system along Jischke Drive from Third Street to Tower Drive
- Chilled Water
  - Chilled water produced at the Northwest Satellite Chilled Water Plant encounters distribution challenges in the eastern portion of campus
  - Chilled water produced at Wade encounters distribution challenges in the northeastern portion of campus
  - Anticipated future deficits in chilled water distribution
  - CEMP Recommendations (two options):
    - Increase the chilled water line size from the Northwest Satellite Chilled Water Plant east along Third Street to near Lawson
    - Upgrade the chilled water distribution pumps in the Northwest Satellite Chilled Water Plant
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Demand Analysis

• Significant steps have already been taken to reduce campus energy consumption

• Additional opportunities for energy saving activities exist
  – Energy investigations of eight representative campus facilities validated the availability of additional energy saving/consumption reduction opportunities

  – The greatest additional energy savings potential exists in classroom and research/lab facilities

  – Examples of potential future energy saving activities:
    • Reduction of air change rate in selected existing labs
    • Temperature setbacks/optimization of control sequences
    • Retrofitting of fixtures with low flow devices
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Public Comment Period

• 11 January 2012 - Post CEMP for 30 day public comment period

• 14 February 2012 - Hold Public meeting and accept additional comments
Questions