Agenda

• Current Status
• Utility / System Overview
• Overview of Condition Assessment
• Review of Peak Loads v. Annual Growth
• Stakeholder Involvement / Input
• Model Review / Overview
• Future Considerations
Importance of Utilities and Integrated Planning

- Master Plans are NOT a one-time Study
  - Continuously followed and adjusted with feedback
  - Periodic Comprehensive Evaluations
- For Energy, Supply and Demand Must be Integrated
  - Safe, Compliant, and Reliable Energy Delivery Imperative
  - Capital Cost, Operating Cost, and Optional Benefits / Risk must be Balanced Based on University Priorities
- Previous Comprehensive Plan Implemented ~ 2004
  - Central Chilled Water Plant - 2004 (from 1997 Study)
  - Electrical Main Campus Sub 69 KV 2003 – 2004 Cut-over
• Electrical Main Campus Sub 69 KV 2003 – 2004 Cut-over
UIUC Utilities Existing Energy Systems

- Production
  - Abbott Power Plant
    - Steam
    - Electricity
  - Chiller Plants
- Distribution
  - Steam
  - Chilled Water
  - Electrical
  - Natural Gas
UIUC Utilities Existing Energy Systems

- Production
  - Abbott Power
    - Steam
    - Electricity
  - Chiller Plants

- Distribution
  - Steam
  - Chilled Water
  - Electrical
  - Natural Gas
Campus Central Utility System Advantages

• Production Advantages
  • Combined Heat & Power (CHP)*
  • Diversity Advantages of Aggregated Loads
  • Increased Reliability (N+1) at Central Plant
  • Opportunity of Thermal Energy Storage
  • Fuel Purchase Flexibility
• Building Associated Advantages
  • Production Equipment Remote from Building
  • Building Energy Conservation Allows Sharing Production Assets
  • Ability to add incremental Building Capacity
  • Large Central Production Equipment and Limited Equipment in Buildings
Peak vs. Consumption

Build infrastructure to meet peak load (fixed cost of energy)

- Electricity Peak: 80 MW
- Steam Peak: 600 kpph
- Cooling Peak: 31,000 tons
- Steam Piping: 31 miles
- Electric Cable: 294 miles
- CHW Pipe: 27 miles
- NG Pipe: 32 miles
- Steam Tunnel: 9 miles

Consumption (variable cost of energy)
- ≈6 Trillion BTUs of total energy consumed

220 Square Miles
15 Square Miles
2.8 Square Miles
320 Main Campus Buildings
ILLINOIS UTILITIES

Key:
- CW: Chilled Water
- E: Electrical
- G: Gas
- S: Low Pressure Steam
- S: High Pressure Steam
- O: Oil
- W: Water
- Orange: Sanitary
- Purple: Storm

- DC: Distribution Center
- LC: Load Center
- I.A.: Illinois American
- PEI: Prairie Land Energy Inc.
- UCSD: Urbana-Champaign Sanitary District

PURCHASE PEI

NATURAL GAS TRANSMISSION
800 PSI PIPELINE

SEQUENT KINDER MORGAN (NGPL)

FUEL OIL STORAGE TANK

MISO AMEREN 69 KV

PURCHASED ELECTRICAL
60 MW LIMIT 69 KV

ABBOTT POWER PLANT

HPS 150#

LPS 50#

LAB BLDG.

UI STORM (/CITY?)

UI SAN UCSD

U.I. I.A.

U.I. IL.

U.I. LOCAL/COMBO

AMEREN E

REMOTE BLDG.

AMEREN

G

UI SAN LOCAL
Implementation of Planned Strategies

• Long Term Infrastructure Commitments
  • Capital Financing
  • Compliance Permitting
  • Compliance Regulation Changes
  • Project Execution Duration
  • Energy Market Changes
  • Technology Changes
Implementation of Planned Strategies

- Infrastructure Requirements Change with Peak Demand
  - Cost Effective Solution Requires Accurate Target
  - Plan to Best Available Forecast
  - Control Demand by Following Integrated Plan
GAS HRSG 1 & 2
100,000 PPH EACH

NEW GAS BOILERS
175,000 PPH EACH

COAL BOILERS 5, 6, 7
300,000 PPH LIMIT

CHANGES REQUIRE NEW AIR PERMIT

GAS BOILER 2 & 3
130,000 PPH

GAS HRSG 1 & 2
100,000 PPH EACH

STEAM CAPACITY VS. FUTURE LOAD
BASELINE

STEAM LOAD (PPH)

0
100,000
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
1,000,000
1,100,000
1,200,000
1,300,000

N+1 FIRM CAPACITY
FUTURE STEAM LOAD, 150K GSF
FUTURE STEAM LOAD, 75K GSF/YR - DEMAND REDUCTION
FUTURE STEAM LOAD, 0 GSF/YR - DEMAND REDUCTION

FUTURE STEAM LOAD, 150K GSF
FUTURE STEAM LOAD, 75K GSF/YR - DEMAND REDUCTION
FUTURE STEAM LOAD, 0 GSF/YR - DEMAND REDUCTION

STEAM LOAD VS. FUTURE LOAD
BASELINE

FY 2019
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
FY 2020
FY 2021
FY 2022
FY 2023
FY 2024
FY 2025
FY 2026
FY 2027
FY 2028
FY 2029
FY 2030
FY 2031
FY 2032
FY 2033
FY 2034
FY 2035
FY 2036
FY 2037
FY 2038
FY 2039
FY 2040
FY 2041
FY 2042
FY 2043
FY 2044
FY 2045
FY 2046
FY 2047
FY 2048
FY 2049
Master Planning Process

- Assessment – complete
- Technology research – complete
- Stakeholder criteria – received
- Option development and analysis – in progress
- Roadmap forward – in progress
Stakeholder Concerns

- World Class Research – Reliable Energy
- Financial Risk – Utility Rate, Capital Expenses, Reduced State Funding, Market Changes
- Sustainability – Environmental Stewardship, iCAP goals
Stakeholder Involvement and Feedback

Non-negotiable:
• Safety
• Regulatory compliance

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Groups will be contacted to provide feedback on direction
Future Considerations

- Campus space needs steady or increasing
- High reliability critical for research
- Building energy conservation
- Data Center demand
- Heat recovery and storage technology
- Renewable technologies
- Fuel Supply Risk management
Next Steps in Getting to the Plan

- Complete development of scenarios
- Stakeholder review of scenarios
- Scenario adjustments to respond to feedback
- Preliminary plan
- Administrative review
- Final plan
Feedback

http://www.energymanagement.illinois.edu/index.cfm
Thank you for attending