Steven D. Maze, Principal
Elara Engineering

Rich Soderquist, Director of Facilities
Kankakee Community College

Infrastructure Improvements Begin in the Classroom

April 27, 2017

ELARA ENGINEERING

Big Picture Thinking. Practical Approach. Sustainable Design.

History

1951-1999

Mechanical Contracting

- Design and Energy Awards Dating Back to 1983
- Contractor of the Year
- Sold to Honeywell

2001-Present (Beginning our 17th Year)

Consulting Engineering

- Full MEP, FP, IT and Commissioning
- Licensed Professional Engineers
- Certified Energy Managers and Auditors
- LEED Accredited Professionals
- Local, National and International Projects

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About Us

ELARA ENGINEERING PHILOSOPHY

Big Picture Thinking. Practical Approach. Sustainable Design.

- Investigate each project's effect on the *entire* facility
- Phase projects to meet budgets
- Design for best long term investment

NOTABLE ACHIEVEMENTS

Recipient of numerous engineering awards

- ASHRAE
- IREM
- USGBC
- Energy Star

Over $4MM in incentives procured for our clients

- Natural Gas Savings Program
- Smart Ideas Program
- Clean Energy Program
- Department of Commerce and Economic Opportunity

ENERGY STAR PARTNER

ASHRAE

U.S. GREEN BUILDING COUNCIL MEMBER

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ELARA Philosophy Applied to Community Colleges

BEGIN WITH A PLAN (BIG PICTURE THINKING)

Master Infrastructure Plan

- Typical Community College
  - Several additions over the years
  - Different design firms without infrastructure knowledge of the entire campus
  - Often leads to underutilized infrastructure
- Master Plan
  - Assess and quantify need and opportunity of the *entire* campus' infrastructure
- Goal
  - Capitalize on underutilized infrastructure

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Engineering Philosophy Applied to Community Colleges

IMPLEMENT (PRACTICAL APPROACH)

Phasing – Where to begin and why?

- Classrooms, Labs, Offices, etc. (aka Room Level)
  - LED, occupancy, shading, control, load, etc…
  - Lowest investment costs with good ROI
  - Focus on rooms served by one system
  - Reduces investment of subsequent levels
- Air Handling Units, Pumps, etc. (aka Distribution Level)
  - Consolidation, elimination (i.e.steam) and "right sizing" of equipment
  - Lower equipment, operational and maintenance costs due to Room Level reductions
  - Reduces investment of subsequent level
- Boilers, Chillers, etc. (aka Plant Level)
  - Consolidation, elimination (i.e.steam) and "right sizing" of Plant
  - Lower equipment, operational and maintenance costs due to Room and Distribution Level reductions
  - Introduce new system types for consideration (i.e. geothermal)

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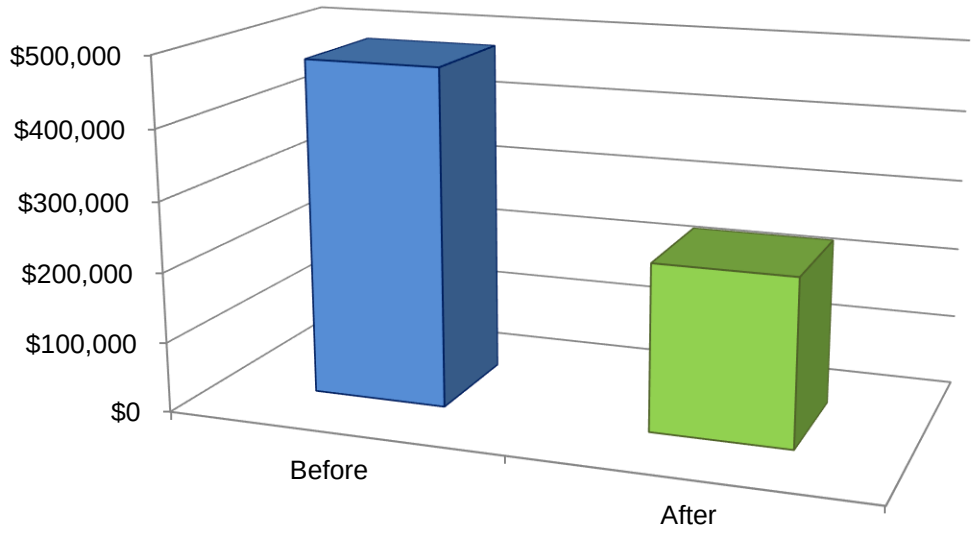
Engineering Philosophy Applied to Community Colleges

MEASURE RESULTS (SUSTAINABLE DESIGN)

Post Implementation

- Commissioning
- Annual review of operating and maintenance costs

Actual Utility Savings



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KCC Main Campus Case Study

CAMPUS INFRASTRUCTURE

Campus

- 1970s with additions in 1988,1992, 2004 & 2006
  - 360,000 sq.ft. total

Mechanical Systems

- Chiller plant with partial ice storage
  - Second and third independent chiller plants
- Steam boiler plant
  - Second and third independent hot water boiler plants
- Numerous additional independent heating/cooling systems
- Approximately 25 air handling systems
  - Steam and hot water for space heating
- Pneumatic and digital controls

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KCC Main Campus Case Study

2009 MASTER INFRASTRUCTURE PLAN

Assess

- Learn the *entire* campus infrastructure
- Estimate remaining useful life of equipment

Identify Need and Opportunity

- Replace aged equipment (Need)
- Consolidate and eliminate equipment (Opportunity)
- Convert from steam to hot water space heating (Opportunity)
- Improve energy performance and reduce utility costs (Opportunity)
- Estimate investment and savings (Quantifying)
- Prioritize Implementation in several phases

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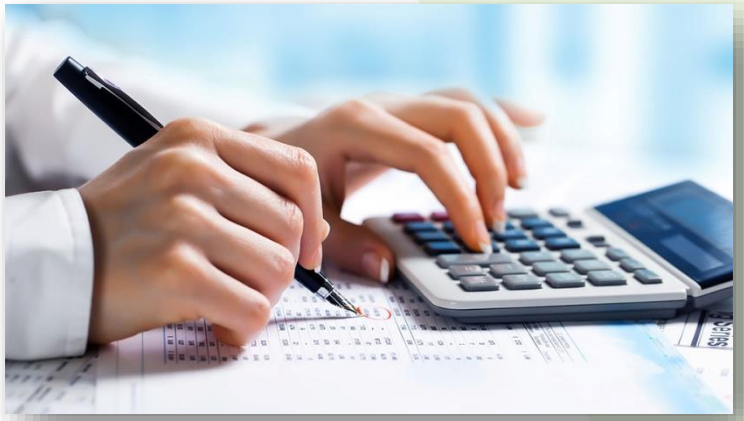
KCC Main Campus Case Study

2010-2014 IMPLEMENTATION



Five Phases

- One per year
- Primarily mechanical infrastructure improvements based on the College's annual budget

Room Level

- New Direct Digital Controls (DDC)
- New Load Calculations
    - Existing equipment oversized with spare capacity

Distribution Level

- Replace and redesign 15 Air Handling Units (AHUs)
    - Convert from constant to variable air flow
    - Convert from steam to hot water heating
    - Consolidate systems
        - **Eliminate 4 AHUs (over 25% reduction in equipment)**
- Add cooling to areas previously without space cooling

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KCC Main Campus Case Study

2010-2014 IMPLEMENTATION - Continued

Plant

- Consolidate systems
  - Eliminate 2 independent chiller plants and 6 supplemental cooling systems
- Convert from steam to hot water heating
  - Eliminate losses associated with steam system
  - Smallest boiler operates the majority of the year
- Reduce plant investment
  - Remaining boilers and chillers currently being assessed
    - Eliminate steam and install smaller hot water boilers
    - Convert to smaller higher efficiency chillers
  - Load reduction increases feasibility of geothermal

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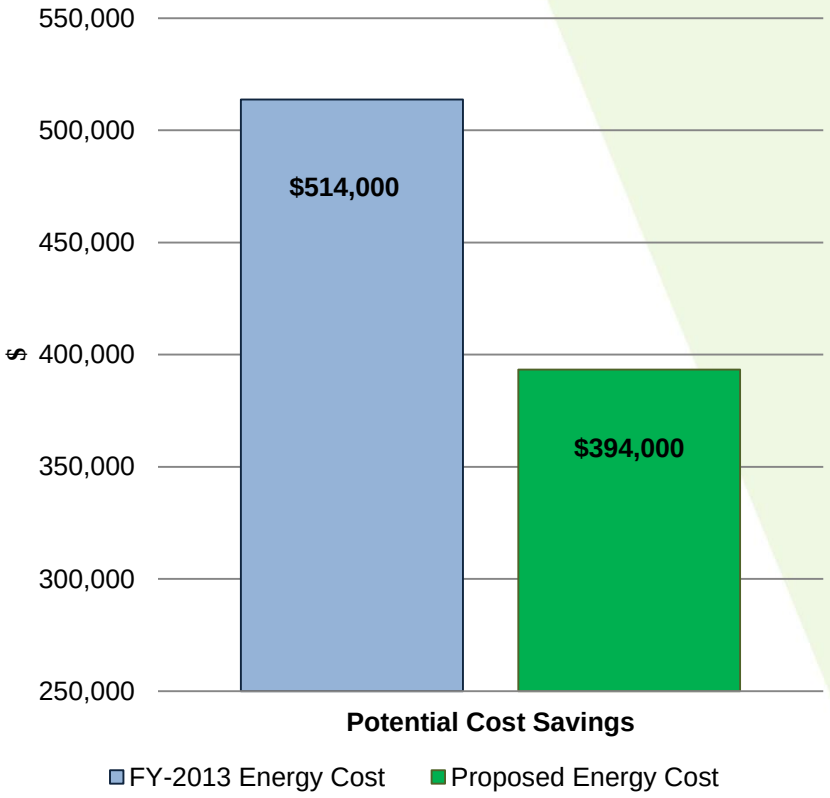
KCC Main Campus Case Study

MEASURED RESULTS

Actual energy reduction of over 23% between 2009 and 2015

- Projected utility savings of **$840,000** over 7 years
- Achieved without making central plant investments
- Eliminated equipment savings
  - Avoided maintenance cost
  - Avoided future equipment replacement cost
- Successfully obtained nearly **$190,000** in incentive funding



Summary

BIG PICTURE THINKING. PRACTICAL APPROACH. SUSTAINABLE DESIGN.

Begin with a plan

- Comprehensive understanding of entire campus

Start small

- Begin at the end use (“room”) level and work back to the plant for maximum impact

QUESTIONS?