Industrial Energy Technology Conference
New Orleans
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Edison Synthetics Plant - Energy Improvements

Steam Generation System Upgrade

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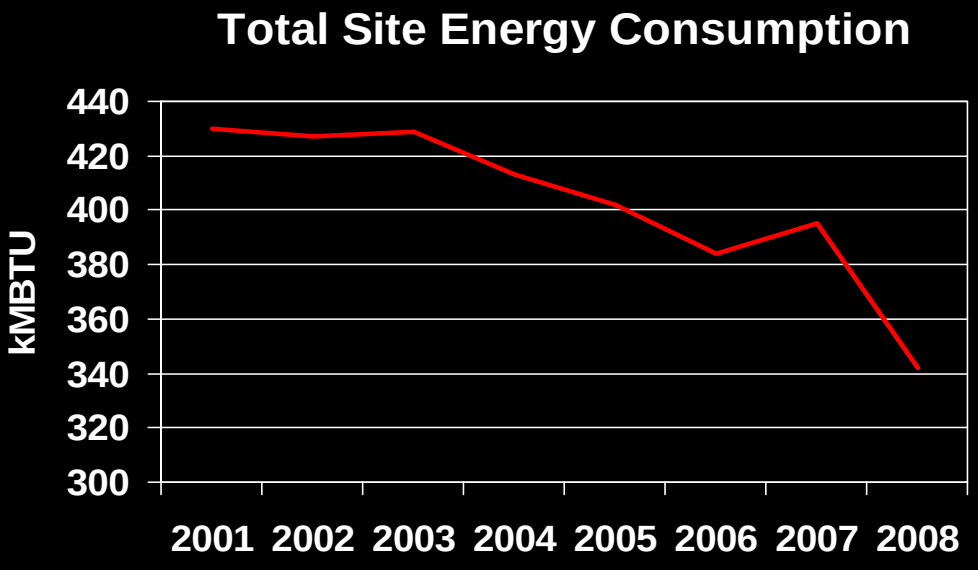
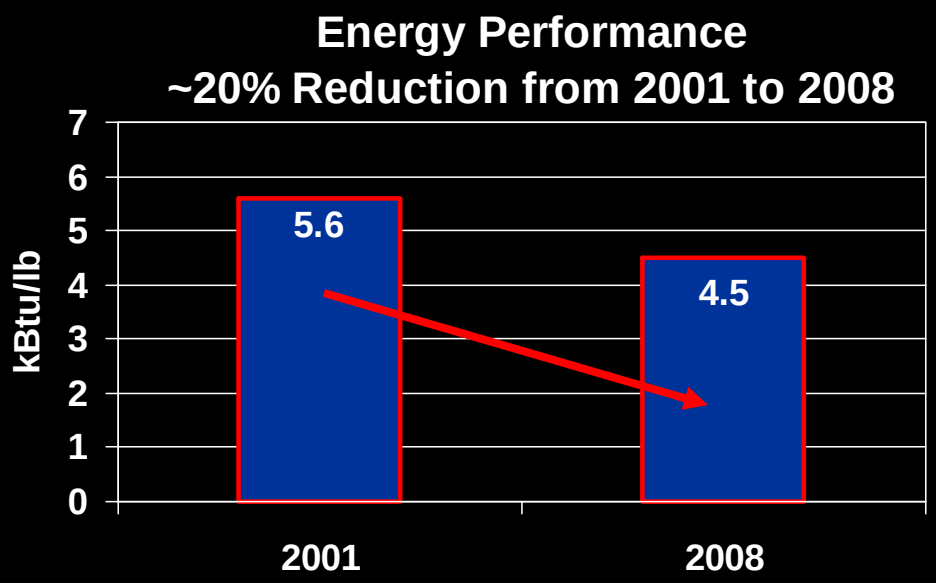
Taking on the world's toughest energy challenges.™

Edison Energy Overall Improvements





Ongoing Conservation

- Idling or Shutdown of equipment
- Locate/resolve any steam/condensate leaks
- Reactor Utilization

Equipment Performance Improvements

- Higher Efficiency Equipment Upgrades
- Equipment Automation
- VFD Utilization

Focus of this presentation:
Steam Generation
System Upgrade

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Steam Generation System Upgrade

Challenge:

- *Aged (35+years) steam generation system – 15# low pressure*
- *New system constrained by footprint – size limitations*
- *New system needed to integrate into existing distribution system*
- *New system needed to be installed while manufacturing continued*

Approach:

- *Gathered input from multiple disciplines*
  - *+ Technical, maintenance, reliability, & project engineers*
  - *+ Regulatory & environmental compliance advisors*
  - *+ Boiler vendor and boiler manufacturer experts*
- *Reviewed historical energy data*
- *Identified opportunities for improvement*
  - *+ Exercise revealed other opportunities outside project*
- *Developed plan to implement in phases while plant continued manufacturing operation*

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Multiple Years of Activities – 2005 & 2006

2005

Boiler #1 Replacement

- *Before: 500 hp 3 pass fire tube*
- *After: 500 hp 3 pass high-performance fire tube & low-NOx burner with Flue Gas Recirculation (FGR)*

Blower #1 Variable Speed Control

- *Before: Constant Speed Motor*
- *After: Variable Frequency Drive to reduce Electricity*

2006

Boiler #1 & #2 Control System Upgrade

- *Before: 2 independent control systems – boilers continuously fire*
- *After: Integrated system – 1 boiler "lead," other fires on demand*

Boiler #2 New Stack

- *Before: Both boilers shared a common stack. Pressure imbalances resulted in less than optimal Boiler #2 performance.*
- *After: Independent stack constructed for Boiler #2.*

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Multiple Years of Activities – 2007 & 2008

2007

Boiler #2 Replacement

Before: 400 hp 3 pass fire tube

After: 490 hp 4 pass fire tube, low NOx burner with FGR

Blower #2 Variable Speed Control

Before: Constant Speed Motor

After: Variable Frequency Drive to reduce Electricity

2008

Boiler Room Upgrades & New Stack for Boiler #1

Before: Boiler #1 still used the original common stack, which was oversized for the operation. This caused an excessive amount of cold air to be drawn into the boiler room, resulting in condensate formation in the burner and nuisance trips.

After: Boiler room kept at reasonable temperature with use of new doors and heaters. Smaller stack requiring less draft constructed for Boiler #1

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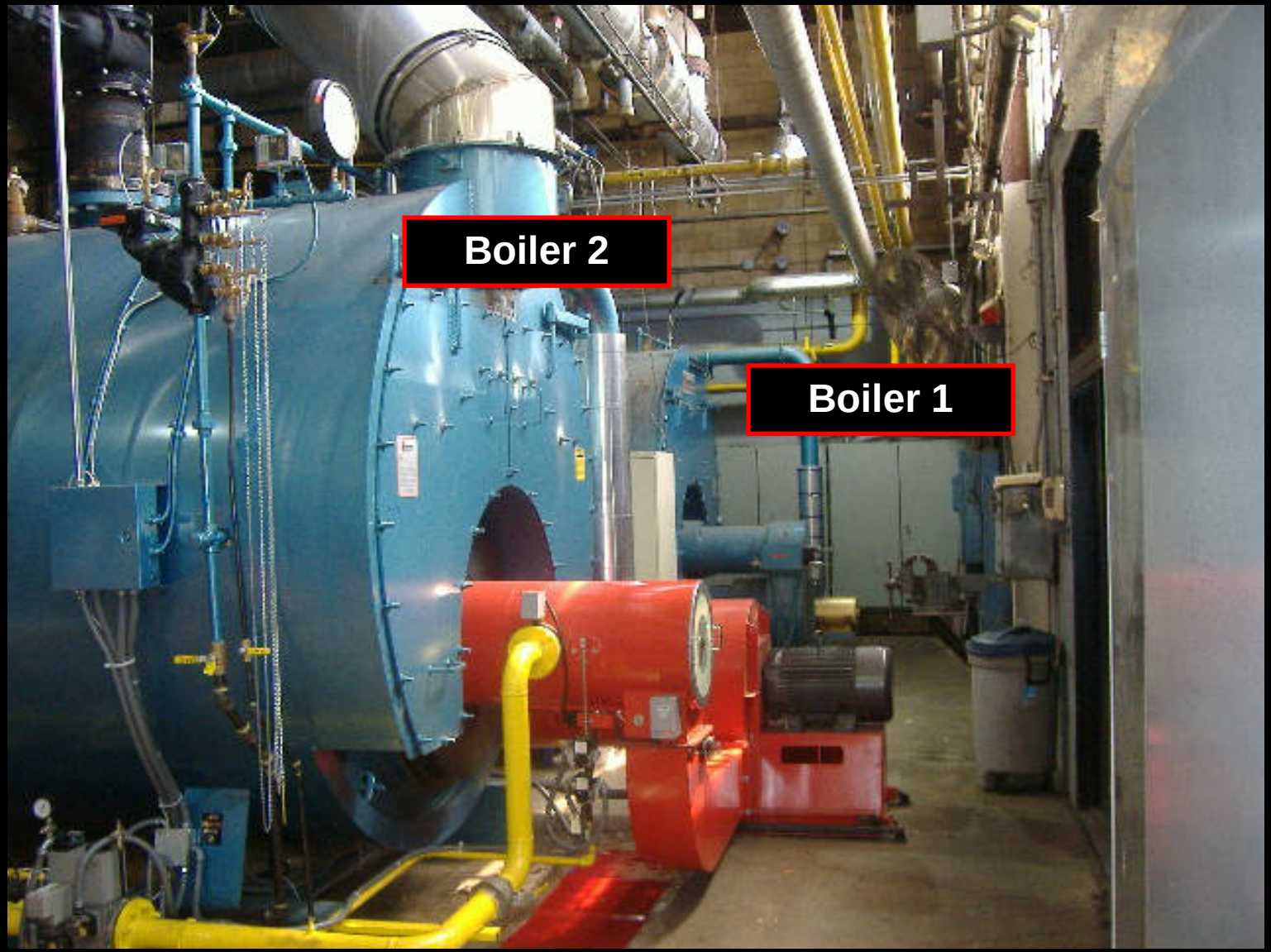
Boilers



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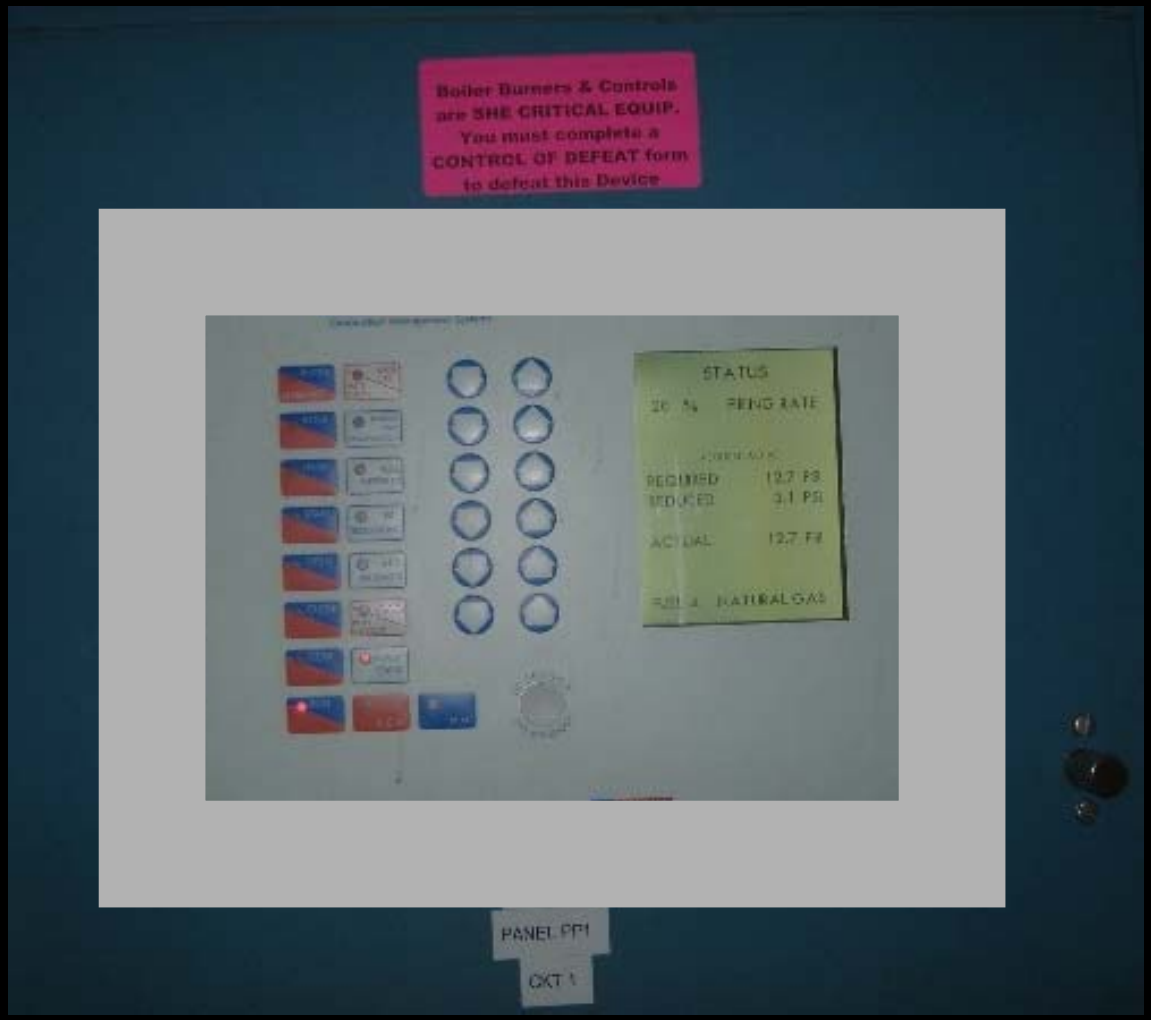
Combustion Monitoring & Control System



- Burner Management & Optimal fuel/air ratio control
- Exhaust Gas Analysis and Trim
- Continuous Emissions Monitoring and Control
- Intelligent Boiler Sequencing

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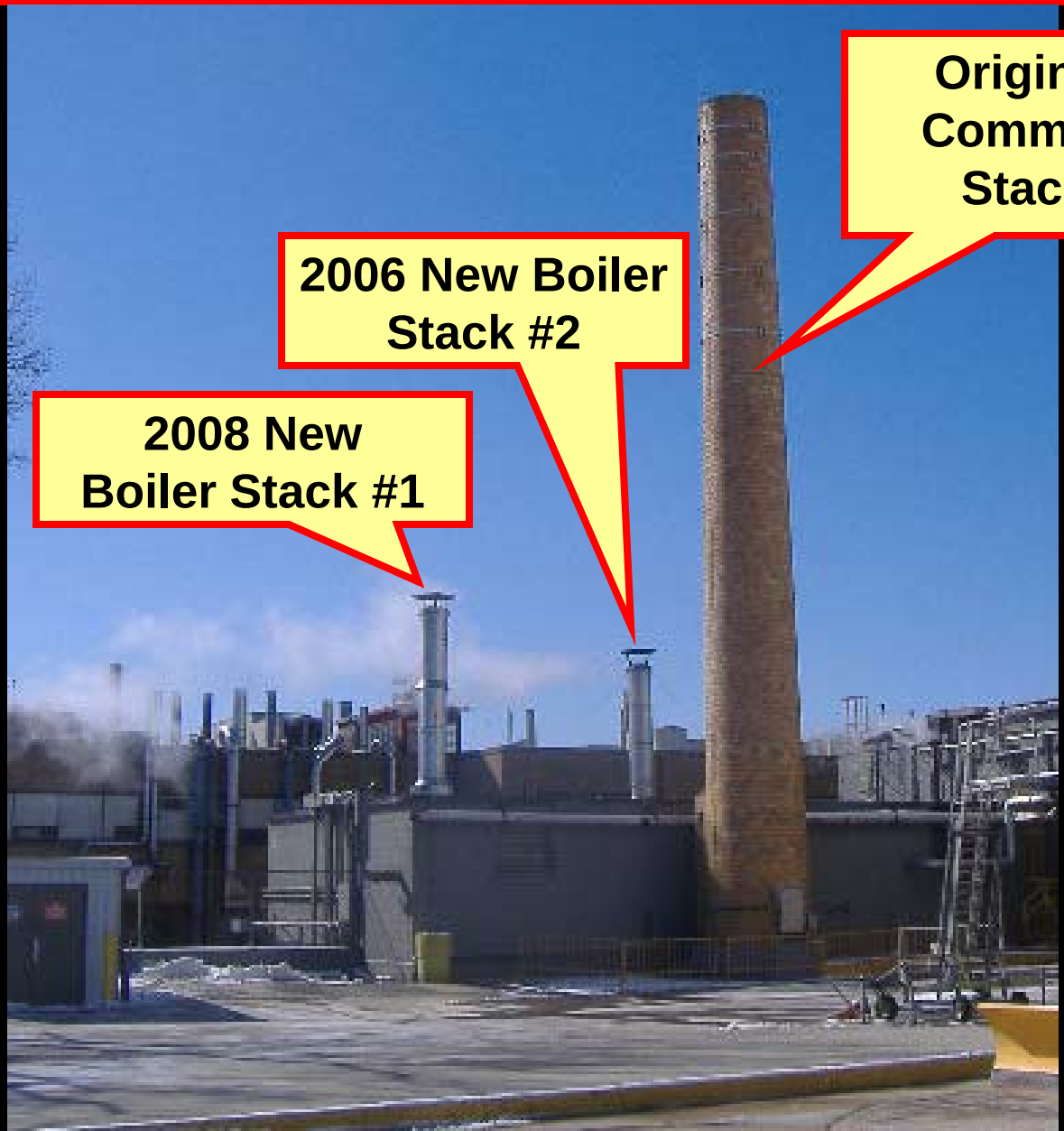
Stacks



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Results

- Steam Generation System Upgrade Efficiencies
  - Post 2004 Boiler Modifications ~ 3%
  - Stack temperature decreased from 350°F to 270°F
  - Excess air in stack reduced from 30% to 15%
  - Reduced blower electricity consumption by 60%

- Overall Energy Management Improvements at Edison based on Average (2000-2007 period) versus 2008

  - Natural Gas Consumption Evaluation[1]
    - 12,200 kMBTu/yr ~ 10% Savings
  - Electricity Consumption Evaluation
    - 1,400 kMBTu/yr ~ 60% Savings
  - Annualized Net CO_2 and Other GHG Emissions Reduction[3]
    - 728 Tons
  - Annualized Energy Savings Evaluation[2] = $197k

(1) 128,884 DTH/ Avg. Yr - 115,313 DTH/2008 = 13,571 DTH/Yr or 12,144 MMBtu/Yr (LHV)
(2) Based on 2008 Edison energy price of $14.50/MMBtu – 13,616 MMBtu/Yr. * $14.50/MMBtu =$197K
(3) (12,214 MMBtu/Yr * 116 Lb/MMBtu) + (1,402 MMBtu/Yr * 133.1 Lb/MMBtu) = 1,603,407 Lbs or 728 Ton

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