CON EDISON: FALL 2014

STEAM SEMINAR

BUILDING ON STEAM
STEAM SEMINAR

Accomplishments

Saumil Shukla, Vice President, Steam Operations
Key Focus

- Technology
- Environment
- Cost
Technology: Multiple Screens for Status

**SOMIS:**
Steam Assets and equipment database

**REMMS:**
Trap functionality and manhole water levels (Alerts)

**ORM:**
Customer usage and pressure

**JOB TRACKING:**
Leaks, Excavations, Stacks, etc.

**Mapping Data:**
As-builts, Steam Plates, Meter Room maps, Looseleafs, etc.

Steam Troubleshooter Dispatchers

PI: Plant Information

AVAIL: Trucks
Remote Monitoring System

1. TRAP Monitoring

2. INSTRUMENT MANHOLE

3. Cellular Provider

Water Level

Con Edison Server
Consolidation Into a Common Interface
3S System – Steam System Status

SOMIS:
Steam Assets and equipment database

REMMS:
Trap functionality and manhole water levels (Alerts)

ORM:
Customer usage and pressure

JOB TRACKING:
Leaks, Excavations, Stacks, etc.

Mapping Data:
As-builds, Steam Plates, Meter Room maps, Looseleafs, etc.

Steam Troubleshooter Dispatchers

AVAIL:
Trucks

PI:
Plant Information
Technology: Steam Dispatcher Present State
3S System – Dispatcher Enhancements

- GPS Field Vehicle Locations
- Improved Dispatch Capability
  - Emergency Response
  - Customer Response
- Efficiency Improvements
3S System – Stack Information

• Displays all stack locations.
• SMART symbols with all applicable information.
• Improved customer stack inquiry response.
3S System – Customer Information

• Displays
  – Service Status: Active or Seasonally Shut
  – pressure and flow rate at location
  – Customer information
  – Field Vehicle Locations
  – Improved Dispatch Capability
Environment – Emission Reductions

- NOx
- SO2
- PM10
- CO2

Tons

- 2008
- 2014
Environment - Emissions Reductions

• 95% Gas Burn
• Reduction of 1.3 million tons of \( \text{CO}_2 \) per year
• Equivalent to 250,000 cars per year
2014 Rates

~15% Lower Bill

2013

2014

- Taxes and Fees
- Fuel
- Service Charges
Bill Savings Contributors

Cost Savings
Total Savings - $139 Million

- Gas Additions: $81 million
- Hudson Ave
- Operating Criteria
- Water
- Fuel
- Ravenswood Contract

Total Savings: $139 Million
STEAM SEMINAR

Achieving LEED Certification with District Steam
Charles Viemeister and Paulina Marinkovic, Steam Business Development
Background on LEED Certification

• LEED = Leadership in Energy and Environmental Design

• Developed by the U.S. Green Building Council (USGBC), a non-profit organization based in Washington DC

• Available programs:
  – New Construction (NC)
  – Existing Building Operation & Maintenance (EBOM)
  – Commercial Interiors
  – Core and Shell
  – Others: School, Healthcare, Homes, and Neighborhood
District Energy Guidance

• Created in 2008 in collaboration among:
  – USGBC
  – International District Energy Association (IDEA)
  – Con Edison Steam Operations

• Provides a framework to properly account for the impact of the DES within the LEED program:
  – Treatment of District or Campus Thermal Energy in LEED V2 and LEED 2009 – Design & Construction Version 2
  – Treatment of District or Campus Thermal Energy in LEED for Existing Buildings: Operations and Maintenance Version 1.0

http://www.usgbc.org/
District Steam & LEED NC Energy & Atmosphere Category

• Con Edison meets all the requirements of the pre-requisites under NC

• There are six credits available in LEED NC in the Energy & Atmosphere Category

✔ The building can get points under 4 credits with District Steam:
  ✔ Credit 1 Optimize Energy Performance
  ✔ Credit 3 Enhanced Commissioning
  ✔ Credit 4 Enhanced Refrigerant Management
  ✔ Credit 5 Measurement & Verification
Prerequisites

- P.#1 Fundamental Commissioning
- P.#2 Minimum Energy Efficiency
- P.#3 Fundamental Refrigerant Management
- P.#4 Building Level Energy Metering for V4
## Energy & Atmosphere Section
### Prerequisites & Associated Credits

<table>
<thead>
<tr>
<th>Energy &amp; Atmosphere</th>
<th>LEED 2009 Total Points:</th>
<th>LEED V 4 Total Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prereq. 1 Fundamental Commissioning of Building Systems</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Prereq. 2 Minimum Energy Efficiency</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Prereq. 3 Fundamental Refrigerant Management</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Prereq. 4 Building Level Energy Metering</td>
<td>Not Required</td>
<td>Required</td>
</tr>
<tr>
<td>Credit 1 Optimize Energy Performance</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Credit 3 Enhanced Commissioning</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Credit 4 Enhanced Refrigerant Management</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Credit 5 Measurement &amp; Verification / Advanced Energy Metering</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
Credit #1
Optimize Energy Performance

- LEED:
  - **2009**: 48% cost improvement = max. 19 pts.
  - **V4**: Min 50% cost improvement = max. 18 pts.

- **Goal**: To determine how many points can be awarded by constructing a building that is designed to use less annual energy than if the same building was designed based on the minimum requirements of ASHRAE 90.1 (2004 or 2007, depending on LEED version).

- **Energy modeling**:
  - **Option 1**: *(streamlined)* Building stand-alone scenario
  - **Option 2**: *(full-accounting)* Aggregate buildingDES scenario
Option 2: Model
Aggregate building DES scenario

Virtual DES-equivalent Plant

On-Site Equipment per ASHRAE 90.1

$ per year for total energy use

$ \times \left(1 - \frac{\text{Proposed Building } \$}{\text{Baseline Building } \$}\right) = \text{Percentage Improvement}

100 * \left(1 - \frac{\text{Proposed Building } \$}{\text{Baseline Building } \$}\right) = \text{Percentage Improvement}
Total Overall Efficiency

Conventional Generation

Power Station Fuel (U.S. Fossil Mix)

91 Units Fuel

147 Units Fuel

Efficiency 33%

Energy Delivered to the Building

Power Plant

Electricity

30 Units Electricity

Con Edison’s District Steam System

Con Edison’s District Energy System

125 Units Fuel

Efficiency 80%

Boiler

Heat

45 Units Steam

Energy Delivered to the Building

... Overall Efficiency ...

51% ~ 60%
Con Edison Steam System
2013 Statistics

• Overall end-to-end efficiency is approximately 60%.
• Out of every 2.57 MMBtu of fuel consumed at the station:
  – 1 MMBtu of steam is delivered to the building
  AND
  – 179 kWh are produced simultaneously:
    
    LEED guidelines considers this cogenerated electricity as an energy cost credit to the project building energy model.
Credit #1
Optimize Cost Energy Performance – Example

• Energy Cost Assumptions:
  – Natural Gas: $13.00 / MMBtu
  – Electric: $0.18 / kWh
  – Typical on-site building boiler efficiency: 85%
Credit #1
Optimize Cost Energy Performance – Example

• Steam Cost per MMBTU Delivered = Gas Costs * Plant Heat Input
  
  = $13 x 2.57 MMBtu HI / MMBtu Steam delivered = **$33.41**

• Value of Electricity Credit = Power to Heat Ratio * Electric Cost
  
  = 179 kWh / MMBtu delivered * $0.18 / kWh = **$32.27**

• Net Cost Per MMBtu of Steam Purchased = $33.41 - $32.27 = **$1.14**

• On-Site Boiler Cost per MMBtu Produced
  
  = Building Heat Load / Boiler Efficiency x Gas Cost
  
  = 1 MMBtu / 85% x $13 per MMBtu = **$15.29**
Credit # 1 – LEED New Construction - Available Points

• LEED 2009: 48% cost improvement = max. 19 points
• LEED V4: 50% cost improvement = max. 18 points

... 80%!

Con Edison’s cost improvement
Credit #3
Enhanced Commissioning

• Up to 2 pts. (LEED 2009) 6 pts. (LEED V4)

• Perform commissioning at a higher level:
  - Hire a third party commissioning agent with more than 2 years of experience
  - Building design prior to bidding must be reviewed
  - Agent must review submittals, the O&M manuals & develop a systems manual
  - The agent also must verify that proper training occurs

• The DES must also meet the guidelines if the project building is:
  - Greater than 50,000 Square ft.
  - If the DES supplies more than 20% of the building’s total energy or
  - If the building is pursuing points through Credit 1
  - If the building's connected load is more than 50% of the DES total load
Credit #4
Enhanced Refrigerant Management

- Up to 2 pts. (LEED 2009) 1 pt. (LEED V4)
- Project must show a combined weighted Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) less than a defined threshold
- Applies for customers using steam to generate chilled water through absorption chillers
  - The refrigerant in the chillers being water
  - Achieves refrigerant management credit
Credit #5
Measurement & Verification

• Up to 3 pts. (LEED 2009) 1 pt. (LEED V4) for developing and implementing M&V

• Requirements:

✓ All downstream equipment needs to be accounted for (tertiary pump, heat exchanger, condensate pump, etc.)

✓ Provide material to show the DES’s efficiency claimed in Credit 1 by including an M&V that shows this information

✓ Energy delivered by the DES to the building must be metered
Steam & LEED EBOM

• Coned meets all the requirements of the pre-requisites under EBOM

• There are six credits available in LEED EBOM in the Energy & Atmosphere Category

✓ The building can get pts. under 4 credits with District Steam:
  ✓ Credit 1 Optimize Energy Efficiency Performance
  ✓ Credit 2 Existing Building Commissioning
  ✓ Credit 3 Performance Measurement
  ✓ Credit 6 Emissions Reduction Reporting
Prerequisites

• P.#1: Energy Efficiency Best Management practices

• P.#2: Minimum Energy Performance

• P. #3: Fundamental Refrigerant Management
# Energy & Atmosphere Section

Prerequisites & Associated Credits

## EBOM

<table>
<thead>
<tr>
<th>Energy &amp; Atmosphere</th>
<th>LEED 2009 Total Points:</th>
<th>LEED V 4 Total Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prereq. 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Efficiency Best Management Practices</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>Prereq. 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Energy Performance</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>Prereq. 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fundamental Refrigerant Management</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>Credit 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimize Energy Efficiency Performance</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td><strong>Credit 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing Building Commissioning</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td><strong>Credit 3/5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Measurement / Advanced Energy Metering</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Credit 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emissions Reduction Reporting</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
Credit #1
Optimize Energy Performance

• Up to 19 pts. (LEED 2009) 18 pts. (LEED V4)
• Total building energy must be metered
• Score 71 min. points in the Energy Star Performance Rating System using EPA’s Portfolio Manager
• Information needed from Con Edison’s DES is:
  – district system’s overall efficiency
  – annual fuel mix
Credit #2: Existing Building Commissioning

• Up to 7 pts. (LEED 2009) 7 pts. (LEED V4)

• The DES itself does not need to be commissioned in order for the project to meet the requirements of the credit
Credit #3: Performance Measurement

• Up to 2 pts. (LEED 2009) 2 pts. (LEED V4)

• Must have a Building Automation System (BAS) to monitor and control major building systems

• Does not apply to DES components that are not within the building itself
Credit #6: Emissions Reduction Reporting

• Up to 2 pts. (LEED 2009) 5 pts. (LEED V4)

• Document the GHG emission reduction benefits of building efficiency measures:

  ✓ Track and record emission reductions delivered by energy efficiency and other building measures

  ✓ Use a third party for reporting or certification program

• GHG emissions from the DES must be included in the reporting

Con Edison Steam Operations’ 2013 carbon footprint

123 lb CO₂ / Mlb* of steam delivered to customers
## LEED Certifications Awarded to Steam Buildings

<table>
<thead>
<tr>
<th>LEED Category</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Interiors</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>19</td>
<td>67</td>
</tr>
<tr>
<td>Core and Shell</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Existing Buildings</td>
<td>1</td>
<td></td>
<td>5</td>
<td>1</td>
<td>12</td>
<td></td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Existing Buildings: O&amp;M</td>
<td></td>
<td></td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>New Construction</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Retail</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Retail - Commercial Interiors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Grand Total</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>19</td>
<td>21</td>
<td>22</td>
<td>21</td>
<td>34</td>
<td>127**</td>
</tr>
</tbody>
</table>

**Some buildings may have more than one LEED certification such as three Commercial Interior Certifications.**
LEED with Steam District Energy

• Copy of guidance document available at:

• Guidance document provides the opportunity to take advantage of points through steam

• Work closely with your DES (i.e. Con Edison Steam) to obtain necessary information
LEED Contacts in Steam

Armand Agasian
AgasianA@coned.com
Michelle Isoldi
IsoldiM@coned.com
Paulina Marinkovic
MarinkovicP@coned.com

To learn more about what steam can do for you contact us at:
1-212-460-2011
SteamSales@conEd.com
Or visit:
coned.com/Steam
STEAM SEMINAR

Consultant Curriculum

Robert Forte, Project Specialist, Steam Business Development
Steam Services
Course Outline

Areas of Concentration

– Steam Product
– New Services / New Construction Process
– Load Modifications to Existing Meter Stations
Steam Services
Course Outline

Steam Product

• Quality / Purity
• Pressure/Temperature, Btu content
• Pipe specifications
New Services / New Construction

- Application / notifications
- Load Letter
- POE
- Service / main extension Riders (A or B)
- Design Drawings / Shop Drawings
- Stress Calculations – sign-off
- Turn-on scheduled
Load Modifications to Existing Services

• Changes in Load - require a Load Letter
• Metering Changes for:
  • Proper registration
  • Prevent “hunting” of PRV
• Con Edison steam meter specifications issued
Steam Service Application

Apply and Obtain Steam Service

• Application
    – Please be sure the Application Form is:
      • Signed by Customer/Authorized Agent
Steam Service
Load Letter

• Load Letter - Build-out Detailed Load Letter:

  • http://www.coned.com/steam/SteamServiceLoadLetter.pdf
Load Letter (Peak Loads)
Steam Service
Point-of-Entry Form

Steam Service

Dresser Coupling

CONCRETE HOUSING

THERMAL INSULATION

RUBBER BUTADIENE STYRENE (SBR) GASKET
\( \frac{1}{2} \times \frac{1}{16} \) GRADE 27, DRESSER SPEC. 0035

INSIDE OF WALL

SEPCO HIGH TEMPERATURE GASKET \( \frac{1}{2} \times \frac{29}{32} \) SEPCO SPEC. SHEET SS554

SERVICE LINE
SEE TABLE

SHELL PIPE
SEE TABLE FOR SIZE

DRESSER COUPLING
SERVICE SLEEVE

A DIA

B

C

SEE NOTE 5

7" MIN.
Steam Services
Meter Station Specifications

• Meter station specifications

• Engineering Specification package (ESP) submitted to Engineer of Record (EOR) after review of Load Letter
GENERATION AND DISTRIBUTION OVERVIEW
Steam Distribution – Meter Room Overview

Typical Customer Meter Station

Responsibilities
- Con Edicon
- Customer
Steam Service
Inside Service Valve

Customer’s valve –
Only Con Ed Steam operates it!

CAUTION

Do not close this valve except in an emergency

Immediately call Con Edison at 1-212-894-9540
when this valve is OPERATED CLOSED

This valve is ONLY to be opened by Con Edison
Steam Services
Stress Calculations

• P.E. submits to Con Edison:
  – Letter, PE signed and sealed
    • certifying stress analysis is reviewed and accepted
  – Inspection has been performed
    • analysis model conforms to final as-constructed conditions
Steam Services
Turn-on Requirements

• Field “walk-down” inspections
  – review piping installation from POE to the House Valve

• Constructed field conditions
  – conform to the approved shop drawings and approved stress analysis; PE signed and sealed

• Electrical connections
  – to metering equipment must conform to Con Edison requirements

• NYC DOB bar-coded Initial and Final TR-1s
Who to contact in Con Edison Steam?

Contact the Steam Business Development (SBD) Group

212-460-2011 for:

- questions related to an existing steam account
  - inquiries for new steam service
  - modifications to existing steam service
- customized solutions for your building
Contact the Steam Dispatcher or Emergency Number

1-800-75-CONED - Emergency
(1-800-752-6633)

Steam Dispatcher:
212-894-9540

- Emergencies
- Steam turn-on or turn-off
- Internal service repairs
- Vapor conditions
STEAM SEMINAR

Customer Case Studies
157 West 57\textsuperscript{th} Street

**Customer Value:**
- No Local Emissions
- Maximize rental space

**Building Background**

Extell’s new flagship residential tower and hotel development.

One of the tallest residential properties in Manhattan

- 90 Stories (over 1000 feet)
- Square Footage 854,000
- Mixed use building
  - 92 Luxury condominiums
  - Hyatt Hotel
157 West 57th Street

• The Decision
  – New Business - Turned on 2012
  – Usage for steam: Heat & HW

• Benefits
  – Maximize valuable living & rental space
  – Architectural design, aesthetically pleasing without stack
  – No onsite emissions
  – No setbacks for mechanical equipment
  – Instantaneous load response
450 Lexington Avenue

Building Background
• Owned and operated by RXR Realty LLC
• 35 stories, 950,000 square feet
• Steam usage: heat and hot water

“Steam system is very simple to operate, we’re afforded more opportunities to address tenant needs and property goals” (Asst Chief Engineer, Nick Mazzalo)
Customer Value
- Energy conservation & sustainability
- Space
- Operating simplicity of Steam Service
51 Astor Place

• Building Background
  – Developer: Edward J. Minskoff
  – 13 stories, 400,000 square feet
  – Steam Usage: Heat only
  – LEED Gold Certified

Customer Value:
• Space
• No Local Emissions
• LEED Gold Certification
51 Astor Place

Benefits

• Two green roofs
• Bicycle storage room & showers
• No onsite emissions
• Building Management System
• Featured in Green Building Design
Building Background

- Office Building
- About 1.7 million square feet
- 42 floors
- Managed by Jones Lang LaSalle

About the Incentive

- Wanted to upgrade chiller plant to lower operating costs.
- Options:
  - Install steam turbine control panels on two of the four 1,275-ton chillers to increase efficiency of existing turbines
  - Install a new 1,000 ton electric chiller
- Engineering assessment was performed by a consulting engineer to compare both options.

Customer Value:
- Steam A/C Incentive
1285 Sixth Avenue

Bottom Line:

• With the panels, the building will be able to lower its operating costs.

• With the incentive and energy savings combined, the building can recover a portion of the capital cost for the project (2-year payback) as well as a portion of maintenance costs over the next ten years.
77 Park Avenue

Building Background:
• The building is currently upgrading to Con Edison Steam Service, eliminating its onsite, oil-fired boilers.
• 15 stories, over 158,000 square feet

Options:
- switch temporarily from heavy #6 oil to #4 oil
- move to lighter #2 oil
- convert to gas burners
- set up dual fuel
- build on steam

Customer Value:
• Zero onsite emission
• Maximize rental space
77 Park Avenue

Benefits

• Elimination of onsite emissions
• Cleaner air on their rooftop
• Building on Steam opened up space
• Stable rates

*Conceptual Images
STEAM SEMINAR

Energy Assessment and Benchmarking
Michelle Isoldi, PE, Steam Business Development
Energy Assessment Program

Details

• All Con Edison steam customers can request a free one-time energy efficiency assessment for their building.

• One of our engineers will review your steam system during a site visit and make recommendations.

• Recommendations include:
  – Site specific recommendations
  – Common recommendations:
    • Steam trap maintenance and/or assessment
    • Terminal unit controllability and monitoring
    • Condensate recovery
    • Insulation
Energy Assessment Program
Sample Documents

Historic Steam Consumption for Sample Customer

Consumption (Mlb) vs. Month

- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
Energy Assessment Program
Sample Documents

10 Similar Buildings Examined:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Building Consumption</td>
<td>3.97 Mlb per 100 sqft</td>
<td></td>
</tr>
<tr>
<td>Sample Customer Consumption</td>
<td>4.91 Mlb per 100 sqft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24% More</td>
<td></td>
</tr>
</tbody>
</table>

- Specific benchmarking at the building level:
  - Square footage
  - Service usage
  - Building type
  - Age of the building
A report is issued that can be taken to the building board, management, etc. for further consideration.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>ACTION REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>ConEdison GE attends: Frank A. Cuomo – Project Special Steam Business Development</td>
<td>Information Only</td>
</tr>
<tr>
<td></td>
<td>Michelle Iozoli – Associate Engineer Steam Business Development</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>The objectives of the meetings are as follows:</td>
<td>Information Only</td>
</tr>
<tr>
<td></td>
<td>1. Meet the group</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Discuss steam usage at Sample Customer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Review and discuss the analysis prepared by CE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Review provided information and materials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Review potential energy efficiency strategies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Visit the mechanical room and meter station</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Provide recommendations for further investigation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>These steps were discussed in detail throughout the meeting.</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>CE reviewed all of the materials provided in the information packet with the Board members. This included but was not limited to the ESIA study comparison, building enero efficiency, the lifecycle analysis, an environmental assessment, steam utilization information, steam efficiency, safety instructions, and the steam system maintenance report.</td>
<td>Information Only</td>
</tr>
<tr>
<td>1.4</td>
<td>Sample Customer Historic Steam Consumption</td>
<td>Information Only</td>
</tr>
<tr>
<td></td>
<td>Based on a review of the historical usage data, the building's steam usage has been consistent since 2008. During the peak heating season (November to April), the building's demand is consistent with 97.5% of its peak steam usage. The building's energy-saving measures have had a significant impact on the overall steam consumption. This may be a result of the original single-pane windows that were still used throughout the building.</td>
<td>Information Only</td>
</tr>
<tr>
<td>1.5</td>
<td>CE reviewed the annual usage of Sample Customer and compared it to similar buildings</td>
<td>Information Only</td>
</tr>
</tbody>
</table>

**END OF MEETINGS**

CE will rely on the emerging market rate as the approved record of matters discussed and conclusions reached unless written notice is received by CE within ten calendar days of the issue date of this notice.

Frank A. Cuomo, P.E. Date Issued

ConEdison Recommendations

Steam Trap Maintenance

- It is unclear if the building has conducted a review of the steam traps in recent years. It is recommended that the customer have an independent contractor review all of the steam traps throughout the building. Where applicable, these traps are to be drained. The cost for such a service is typically recovered quickly on reduced steam costs. It is recommended that this type of review is conducted every 2-3 years.

Condenser Keene

- It is unclear if the building is excavating the loss from the steam condensate to pre-heat the domestic hot water supply. This should be verified to the building staff. If so, this practice should be continued and would help reduce the steam required to produce the domestic water as well as reduce the amount of energy purchased to decrease the condensate temperature for disposal.

Firing instructions

- Based on the field survey of the steam boiler room, all piping isolation appears to be in order. It is recommended that the customer remove the isolation valves for the valves and devices in the room. Moreover, the current piping isolation should be replaced by reduced amount of isolation into the sidewalk vault. Protective cover guards should be installed on all piping located directly above the open sidewalk piping. This will reduce the heating loss within this section of the distribution system.

**END OF MINUTES**

It should be noted that all of the recommendations listed above are for consideration and discussion only. The property is required to have a licensed engineer review the feasibility of each option prior to construction and installation.
Benchmarking Analysis

• In line with the city’s new benchmarking requirements
• Customers grouped according to:
  – Building Type
  – Service Use (heat, heat and hot water, etc.)
• Further breakdown included building size
• Customers excluded in analysis:
  – New business
  – Square footage breakdown not available
  – Outliers
Building Types

• Commercial and residential

• Commercial
  – Office Buildings

• Residential
  – Condominiums
  – Elevator Apartments
  – Walk Up Apartments
  – One/Two Family Dwellings
Residential Buildings

Note: 2013 data used for analysis.
Residential Buildings (Large and Small Buildings)

Note: 2013 data used for analysis.

<table>
<thead>
<tr>
<th>Square Footage Breakdown</th>
<th>Small Bldgs</th>
<th>Large Bldgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>H &lt; 30,000 Sq. Ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H, HW &lt; 150,000 Sq. Ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H, HW, AC &lt; 200,000 Sq. Ft.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Different square footages were used to maintain an equal distribution of customers in each category.

<table>
<thead>
<tr>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam Use</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>H, HW</td>
</tr>
<tr>
<td>H, HW, AC</td>
</tr>
</tbody>
</table>

Note: Steam Use refers to different combinations of heating, hot water, and air conditioning.
Office Buildings

Note: 2013 data used for analysis.
Office Buildings
(Large and Small Buildings)

Note: 2013 data used for analysis.

<table>
<thead>
<tr>
<th>Steam Use</th>
<th>Small Bldgs</th>
<th>Large Bldgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>&lt; 75,000 Sq. Ft.</td>
<td>&gt; 75,000 Sq. Ft.</td>
</tr>
<tr>
<td>H, HW</td>
<td>&lt; 250,000 Sq. Ft.</td>
<td>&gt; 250,000 Sq. Ft.</td>
</tr>
<tr>
<td>H, HW, AC</td>
<td>&lt; 700,000 Sq. Ft.</td>
<td>&gt; 700,000 Sq. Ft.</td>
</tr>
</tbody>
</table>

Note: Different square footages were used to maintain an equal distribution of customers in each category.

### Sample Size

<table>
<thead>
<tr>
<th>Steam Use</th>
<th>Total</th>
<th>Small Bldgs</th>
<th>Large Bldgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>160</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>H, HW</td>
<td>255</td>
<td>132</td>
<td>123</td>
</tr>
<tr>
<td>H, HW, AC</td>
<td>154</td>
<td>77</td>
<td>77</td>
</tr>
</tbody>
</table>
STEAM SEMINAR

New Technologies

Kaitlin Slattery, Steam Business Development
Typical Configuration

Typical Customer Configuration with Heating, Hot Water, and/or Low Pressure Steam AC

- In most buildings, the pressure of the incoming steam must be reduced prior to being distributed throughout the facility
  - Pressure reducing valves are typically used to step down the steam pressure.
Electric Generation Opportunities

- Commercially available devices can be utilized for steam pressure reduction in parallel with pressure reduction valves
  - These units use incoming high-pressure steam to produce electricity and output low-pressure steam
Energent Corporation

Microsteam Turbine

- Power system consists of Euler turbine connected to a planetary gear which in turn is connected to an induction generator
- Maximum power output of 275 kWe at a steam load of 13,500 lb/hr
- Installed in five customer locations
Energent Corporation

Nanosteam Turbine

- Based on the Euler turbine technology and utilizes a high speed generator and power electronics in place of a traditional gear box
- Developed to fill the need for a small, efficient turbine generator
- Maximum power output of 100 kWe at steam load of 4,000 lb/hr

Nanosteam Turbine Installed in Power Plant
Elliott Group

- Elliott’s steam turbine generator (STG) sets allow consumers to capture this wasted energy by placing the STG in parallel with an existing PRV
- YR steam turbine product line is specifically designed to produce power for customers looking to replace a PRV
- Elliott offers custom designed sets that can produce outputs ranging from 100 kWe to 50,000 kWe
Heliex Power & Continuum Energy

- Screw Expanders are utilized in systems for steam pressure reduction in parallel with pressure reduction valves.
- The package includes a single screw expander, an induction generator, and a generator interconnection module.

<table>
<thead>
<tr>
<th>Model</th>
<th>Steam Flow (pounds per hour)</th>
<th>Output Power (kWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 145</td>
<td>Up to 6,000</td>
<td>60 to 160</td>
</tr>
<tr>
<td>HP 204</td>
<td>Up to 20,000</td>
<td>180 to 500</td>
</tr>
</tbody>
</table>

Core Technology: Screw Expander

conEdison
ElectraTherm: Green Machine

- Uses waste heat in the form of condensate to produce electricity while cooling condensate
- Core technology is a twin screw expander
- Steam loads of 25,000 lbs/hr or more can produce power outputs between 35 kWe to 110 kWe
- Potential savings from electric production and condensate cooling
Steam Programs
Sheria Stallings, Analyst, Steam Business Development
STEAM SEMINAR

Steam AC Incentive Program
Steam AC Incentive Program

Program Outline

• Two types of incentives are offered:
  – *Lump-sum incentive* for equipment purchase
  – *Maintenance incentive* to support cost of maintenance

• Implemented Improvements:
  – All incentives have increased
  – Addition of Single Stage Absorption Chillers
  – Addition of Custom Project Option
    • Incentives will be reviewed and determined on a case-by-case basis.
  – The incentives will be available to all customers within the Manhattan electric networks.

• Projects must be completed and fully operational by June 1, 2016
### Equipment Incentive Levels

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Capacity Range</th>
<th>Incentive Level ($ per ton)</th>
<th>Incentive Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam Turbine Chiller</td>
<td>Less than or equal to 1,700 tons</td>
<td>$600</td>
<td>Up to 65% of the delivered equipment cost</td>
</tr>
<tr>
<td></td>
<td>Greater than 1,700 tons</td>
<td>$525</td>
<td></td>
</tr>
<tr>
<td>Double Stage Steam Absorption Chiller</td>
<td>All</td>
<td>$480</td>
<td></td>
</tr>
<tr>
<td>Single Stage Steam Absorption Chiller</td>
<td>All</td>
<td>$325</td>
<td></td>
</tr>
<tr>
<td>Custom Chiller Project</td>
<td>All</td>
<td>Incentives determined on a case-by-case basis. Con Edison shall review the required material to determine the incentive offering for each eligible project.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large Project Bonus</th>
<th>Electric Avoidance (kW)</th>
<th>Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500 – 999</td>
<td>+10% of base incentive</td>
</tr>
<tr>
<td></td>
<td>&gt;= 1000</td>
<td>+15% of base incentive</td>
</tr>
</tbody>
</table>

Projects must be completed and fully operational by:

June 1, 2016
## Maintenance Incentive Levels

- Steam Chiller Maintenance Incentive (available for projects that have received the equipment incentive)

<table>
<thead>
<tr>
<th>Maintenance Incentive Type</th>
<th>Incentive Level</th>
<th>Incentive Limit</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance Costs (Must have service contract w/ manufacturer)</td>
<td>$5 per ton annually</td>
<td>$3,000 annually</td>
<td>Up to ten years on an annual schedule</td>
</tr>
<tr>
<td>Remote Monitoring Bonus</td>
<td>$2 per ton annually</td>
<td>$1,000 annually</td>
<td></td>
</tr>
</tbody>
</table>

Note – Both types of maintenance funding are contingent on submission of an executed preventive maintenance contract with the chiller manufacturer, or an authorized service provider, and invoices for the maintenance expenses incentivized by Con Edison.

Projects must be completed and fully operational by June 1, 2016
How to Apply

- Go to: www.coned.com/steamac
- Click Link - “Program Application”
STEAM SEMINAR

Negotiated Fuel Cost Program
Negotiated Fuel Cost Program

- Reduce volatility associated with fuel costs
- Customers may enroll up to 60% of their average monthly usage
- Eligible customers – SC 2 & SC 3
Negotiated Fuel Cost Program

The Process – Customer Base Agreement

- Open Enrollment:  
  - Tues, Oct. 21 – Mon., Oct. 27

- Customer Base Agreement

- www.coned.com/steam
# Negotiated Fuel Cost Program

## Transaction Confirmation Form

**Date:** October 29, 2014  
**Transaction Confirmation #:** «TCF»

This Transaction Confirmation incorporates and is subject to the terms of the Master Negotiated Fuel Cost Service Agreement between ConEdison and Customer dated «Dates». Customer must return this Transaction Form to ConEdison at 212-669-0752 (fax#) by 1:00 p.m. on Thursday, October 30, 2014 in order to receive Negotiated Fuel Cost Service from ConEdison.

### Consolidated Edison Company of New York, Inc.

- **4 Irving Place - New York, 10003**
- **Attn:** Sheria Stallings
- **Phone:** 212-460-2011
- **Fax:** 212-669-0752

### Customer:

- «Acct1_coname»
- «Acct1_address»
- **Attn:** «ContactName»
- **Phone:** «Tel»
- **Fax:** «Fax»
- **AccountNo.** «Acct1_num»

### Contract Price:

1. $___/Mlb for «EligibleDec» Mlb for December 2014
2. $___/Mlb for «EligibleJan» Mlb for January 2015
3. $___/Mlb for «EligibleFeb» Mlb for February 2015
4. $___/Mlb for «EligibleMar» Mlb for March 2015

*The Customer may not alter the volumes and/or prices set forth in this Transaction Confirmation.*
Contract Price

- Customers have a chance to review prices before locking into the program

Contract Price:
1. $___/Mlb for «EligibleDec» Mlb for December 2014
2. $___/Mlb for «EligibleJan» Mlb for January 2015
3. $___/Mlb for «EligibleFeb» Mlb for February 2015
4. $___/Mlb for «EligibleMar» Mlb for March 2015

The Customer may not alter the volumes and/or prices set forth in this Transaction Confirmation.
ST E A M S E M I N A R

Customer Sited Supply
Customer Sited Supply Pilot Program

- Commenced January 1, 2012
- Rider G in Tariff
- Applicable to Customers with CHP
  - Primary purpose of CHP is for use by Customer premise
  - Must be a Firm Gas facility
  - Backup / Supplementary steam service available under SC4
Customer Sited Supply Pilot Program

Terms of Service

- Up to five participant slots in Pilot
- Five year energy payment window
- Maximum Export Quantity from 2 to 40 Mlb/hr
- Application and Procedures
    - Steam Operations Pilot Program
Steam Program Managers

- **Negotiated Fuel Cost Program:** Sheria Stallings
  212-460-2013
  Stallingsss@coned.com

- **Steam A/C Incentive:** Michelle Isoldi, PE
  212-460-2325
  Isoldim@coned.com

- **Customer Sited Supply:** Charles Viemeister
  (212) 460-6522
  viemeisterc@coned.com

  Silvia Khurrum
  212-460-3746
  Khurrums@coned.com
Steam Business Development Group

Charles Viemeister

Armand Agasian
Robert Forte
Michelle Isoldi
Paulina Marinkovic

Jamie Setteducati
Sheria Stallings
Christina Vlachos

212-460-2011

steamsales@coned.com
SteamOmbudsman@coned.com
www.coned.com/steam