Rooftop Unit Tune-Ups: The AirCare Plus Program from ComEd and CLEAResult

August 17th, 2016
Advanced RTU Campaign

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Michael Deru
National Renewable Energy Lab
Why Do We Care About RTUs?
RTUs are the Workhorses of Space Conditioning

- Condition 60% of commercial building floor area
- Consume over 4 Quads of primary energy
What is the Advanced RTU Campaign?

National Campaign to promote high-efficiency RTU solutions

- High-efficiency RTU replacements and new installations
- Advanced control retrofits
- Quality Installation and Quality Maintenance

www.advancedRTU.org
Join the Campaign!

- **Participants** are building owners, managers, and operators (72)

- **Supporters** provide technical services and products (197)
Campaign Supporters

197 Organizations that provide technical services and products, electric utilities, or regional efficiency organizations
Campaign Participants

72 Building owners and managers responsible for RTUs
### Managing RTUs to Get the Highest ROI

1. **Planned replacement with high-efficiency RTU**
   - RTUs > 10-15 years old, 20% - 50% energy savings

2. **Advanced RTU control retrofits**
   - RTUs > 7 tons and > 5 years of service life, 20% - 50% energy savings

→ Lots of resources to guide you through the process!

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### Advanced RTU Campaign: Decision Tree for RTU Replacements or Retrofits

<table>
<thead>
<tr>
<th>General Condition</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>Fair-Good, Over 5 years Under 7 tons</td>
<td>No Action</td>
</tr>
<tr>
<td>Fair-Good, Over 5 years Over 7 tons</td>
<td>Retrofit</td>
</tr>
<tr>
<td>Fair-Good, Under 5 years</td>
<td>Replace</td>
</tr>
<tr>
<td>Poor</td>
<td>Replace</td>
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</tbody>
</table>
Incorporate RTU Efficiency into your Retail Lease Language

Resource Summary:

- With long lifetimes and high up-front costs, RTUs often are untouched and low prioritized in the leasing process.

- Retailers and landlords can select from menu of potential clauses to insert into leases or work letters to ensure high RTU efficiency and performance.

- Clauses address efficiency considerations, repairs and maintenance, and capital replacement for RTU usage and operations.

http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/retail_rtu_lease_language.pdf
Use Language the C-Suite Understands to Make the Case for RTU Efficiency

Resource Summary:

- Outlines a method to weigh the costs and benefits of energy and non-energy factors for a proactive high-efficiency RTU replacement.
- Includes detailed and realistic example to walk facility maintenance staff and building engineers through the process of calculating the business case.
- [Link to resource summary](http://betterbuildingssolutioncenter.energy.gov/resources/business-case-proactive-rooftop-unit-rtu-replacement)
Thank You

www.AdvancedRTU.org

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AirCare Plus in Northern Illinois
Agenda

- ComEd Energy Efficiency
- ComEd’s evolving program portfolio
- AirCare Plus
  - Origins
  - Program design
  - History
  - Market transformation
  - Challenges and opportunities
- Program goals and accomplishments
- Customer Benefit
- Case studies
- Contractor testimonial
Energy Efficiency at ComEd

Energy-efficiency products and services bring many benefits:

✓ Economic Impact
  • Over **$330 million** dollars Smart Ideas incentives paid to ComEd business customers since 2008
  • Illinois businesses now save over **$240 million** – annually – on their electric bills

✓ Residents of Illinois
  • Job creation: over **86,000 energy efficiency jobs** “created or sustained” in Illinois since 2008
How Ratepayer Funding Works

- Energy Efficiency Programs charge on monthly bill (all customers in service territory)
- Based on kWh usage
- What Commercial Demand Rate are you on?
- How much are you contributing?

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ComEd
An Exelon Company

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**Taxes and Other**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Meter Program</td>
<td>0.47</td>
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<tr>
<td>Environmental Cost Recovery Adj</td>
<td>0.19</td>
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<tr>
<td>Energy Efficiency Programs</td>
<td>1.19</td>
</tr>
<tr>
<td>Franchise Cost</td>
<td>2.04</td>
</tr>
<tr>
<td>State Tax</td>
<td>3.09</td>
</tr>
</tbody>
</table>

**Summary**

- ComEd Demand + 9 to 100kW
- $6.98

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Details of energy usage and billing information are shown, including kWh usage and corresponding charges.
Energy Efficiency Offerings

Assessment Types
- Facility
- Laboratory
- Healthcare
- Data Center
- Combined Heat & Power
- Process Efficiency

Incentives
- Standard
- Custom
- Small Business Energy Savings
- New Construction Services

Discounts
- Business Instant Lighting Discounts (BILD)
- Business Products Discounts

Optimization
- Retro-commissioning
- Rooftop Units
- Compressed Air
- Industrial Refrigeration
- Process Cooling
Energy Efficiency is Growing

✓ Small Business started in 2011
  • 500 Customers

✓ 2015
  • 10,000 customers & 140 GWh energy savings

✓ 20,000 customers total, 400 GWh savings

✓ Predominately lighting retrofits

✓ ≤ 100 kW peak demand

Incentives per year

[Graph showing increasing incentives from 2011 to 2017]
Energy Efficiency Measure Mix

2015 Savings by Measure Category

- Retrofit Lighting: 52%
- New Lighting: 43%
- Refrigeration: 5%

2016 Savings by Measure Category

- Refrigeration: 37%
- New Lighting: 55%
- Lighting Control: 4%
- HVAC: 1%
- Compr. Air: 3%
How Does the Program Work?

- Commercial and industrial customers
- Existing air-cooled HVAC equipment
- Multiple program measures can address multiple system deficiencies
- Midstream closed contractor network
- Specially trained network of trade allies
- Dedicated program field staff for training, contractor support, and site audits
- Multiple channels of project origination: contractors, utility reps, customers, traditional outreach efforts
AirCare Plus History

Pilots

Avista Utilities (2004-2007)

SoCal Edison (2004-2005)

Full Scale Program with PG&E

PG&E 2006-2015

Multi-year ComEd contract

ComEd contract awarded 2014 Project initiation
AirCare Plus Measure Overview

1. Programmable Thermostat Replacement

2. Programmable Thermostat Modification

3. Tune-Up
   a. Refrigerant charge:
   b. Coil cleaning:
   c. Cogged v-belt:

4. Economizer Repair

5. Economizer Changeover Sensor Replacement

6. Economizer Adjustment

7. Variable Frequency Drive and Demand-Controlled Ventilation
   a. Digital Economizer Control:
   b. CO2 Sensor:
   c. Variable Frequency Drive:
Program Equipment

- Fault Detection and Diagnostics (FDD) equipment
- Custom contractor portal
- Current equipment – HVAC Service Assistant
- New equipment – iManifold
Challenges

- This Chicago Climate
- Lack of customer awareness
- Contractor training
- Digital gauges
- Contractors are new to utility energy efficiency programs
- TA difficulty selling energy efficiency
Solutions

- Year-round measure participation
- Introduction of year-round measures
- Continuous contractor recruitment
- Frequent contractor sales and technical training to promote technical excellence and program sales
ACP program statistics to date

- Number of contractors: 21
- Trainings held: 75+
- Number of customers serviced: 535+
- Number of measures offered: 15
- Number of completed measures: 2,304
- Total kWh savings: >12,500,000+ kWh
- Total kW savings: 1,314+ kW
## Measure Savings

<table>
<thead>
<tr>
<th>Measures</th>
<th>kWh Annual Savings</th>
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<tbody>
<tr>
<td>AC Tune-Up</td>
<td>4,021</td>
</tr>
<tr>
<td>AC Tune-Up: Test In</td>
<td>-</td>
</tr>
<tr>
<td>Cogged V-Belt</td>
<td>188</td>
</tr>
<tr>
<td>Economizer Optimization - minor</td>
<td>1,229</td>
</tr>
<tr>
<td>Economizer Optimization - Major</td>
<td>2,026</td>
</tr>
<tr>
<td>Thermostat Adjustment</td>
<td>5,000</td>
</tr>
<tr>
<td>Thermostat Replacement</td>
<td>8,500</td>
</tr>
</tbody>
</table>
Customers - ideal participants

- Customers who don’t regularly maintain their HVAC equipment

- Customers interested in increasing their unit operating efficiency beyond the level of regular maintenance can do

- Customers with run-until-fail mentality and who are reluctant to pursue routine maintenance
Customer value proposition

- Reduced or no cost service
- Real-time assessment of equipment operating efficiency
- Custom energy savings report
- Improved equipment life
- Reduced emergency repair service
- Access to specially trained contractors
- High ROI
Existing large industrial customer

- **Profile**
  - Annual Demand: >30,000,000 kWh
  - Peak kW Demand: >5,500 kW
  - 100+ RTUs, varying from 3 to 75 ton
  - Motivated by the verified energy savings

- **Key Figures**
  - 7 days of work
  - 32 units serviced
  - Measures
    - 32 tune-ups
    - 22 test-ins
    - 11 Adjust Economizer Changeover Sensor

- **Results**
  - 135,974 kWh savings
  - 90,823 kWh saved
  - $9,157 annual savings
  - $4,295 contractor incentive
  - No cost to the customer
Religious

- **Profile**
  - New customer, medium sized religious – C29
  - 9 RTUs, varying from 3 to 20 tons
  - Customer motivated by the reduced cost of service

- **Key Figures**
  - 1 day of work
  - 9 units serviced
  - Measures
    - 9 test-ins
    - 7 tune-ups
    - 7 cogged v-belts
    - 3 thermostat replacements
    - 5 thermostat modifications
    - 9 economizer adjustments

- **Results**
  - ~95,000 kWh saved
  - $6,650 annual savings
  - $4,595 contractor incentive
  - No cost to the customer
Small Business – Broadway Street, Melrose Park, IL

- **Profile**
  - Small commercial area dominated by independently owned small businesses.
  - One contractor marketed the program to all of the business on Broadway street.

- **Key Figures**
  - 4 days of work

- **Measures**
  - 19 tune-ups
  - 26 thermostat replacements

- **Results**
  - 119,000 kWh saved
  - $8,300 annual savings
  - $9,400 Contractor Incentive
Contractor Benefits

- Access to program information and marketing materials
- Program sponsored technical training
- Fault detection and diagnostic equipment
- Program sponsored administrative training
- Weekly incentive payments
- Improved service offering for existing customers
- New customers and leads
Commercial HVAC Service and Installation Contractor in Chicago

✓ 1936—company is founded
✓ 2012—Energy Services division started
✓ 2013—joined Advanced RTU Campaign
✓ 2015—joined ComEd AirCare Plus Trade Ally Network
1. How AirCare Plus benefits our technicians
2. How AirCare Plus benefits our clients
3. Recent success stories
Some national data from CBECs* on packaged air-conditioning units (i.e. RTU’s)
✓ 1.9 million buildings
✓ 45 billion SF of commercial space
✓ 306 trillion BTU’s of energy for cooling & ventilation

* Commercial Buildings Energy Consumption Survey, 2012
How do contractors perceive RTU’s?

How do building owners and managers perceive RTU’s?
How Contractors See RTU’s

- Installation cost ↓↓↓
- Maintenance ↓
- Energy use ↑↑
How Clients See RTU’s

- Necessary evil
- Ugly nuisances
- Cash drains
How Clients See RTU’s

Photo courtesy of Scott Fielder, National Balancing Council
Different perceptions

= 

Communication challenge
How AirCare Plus benefits our technicians

“Without data you’re just another person with an opinion.”

-W. Edwards Deming
Data Scientist
How AirCare Plus benefits our technicians

Other industries have powerful tools for **visualization** and **measurement**
How AirCare Plus benefits our technicians
1 How AirCare Plus benefits our technicians

Boiler tune-ups

✓ **Before** and **after** readings
✓ “Tale of the tape”
✓ Calibrated instrument
✓ No guesswork
✓ Able to **show** and **prove** efficiency gains
AirCare Plus benefits our technicians

AirCare Plus tune-ups
✓ **Before** and **after** readings
✓ “Tale of the tape”
✓ Calibrated instrument
✓ No guesswork
✓ Able to **show** and **prove** efficiency gains
1. How AirCare Plus benefits our technicians

AirCare PLUS™

Sensor Measurements

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWB</td>
<td>66 F</td>
</tr>
<tr>
<td>SP</td>
<td>75 psig</td>
</tr>
<tr>
<td>AMB</td>
<td>87 F</td>
</tr>
<tr>
<td>SWB</td>
<td>63 F</td>
</tr>
<tr>
<td>ST</td>
<td>61 F</td>
</tr>
<tr>
<td>LT</td>
<td>127 F</td>
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<tr>
<td>RA</td>
<td>77 F</td>
</tr>
<tr>
<td>LP</td>
<td>304 psig</td>
</tr>
<tr>
<td>SA</td>
<td>72 F</td>
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</table>

Calculated Performance Metrics

Efficiency Index (EI)
Capacity Index (CI)
How AirCare Plus benefits our clients

Total annual savings: 300,384 kWh
Estimated annual cost savings: $21,026.86

Summary - Estimated Energy Savings

<table>
<thead>
<tr>
<th>Total Units</th>
<th>Total Annual kWh</th>
<th>Total Annual Therms</th>
<th>Total Annual kW</th>
<th>Estimated Annual Cost Savings</th>
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<tbody>
<tr>
<td>34</td>
<td>300,384</td>
<td>-94.858</td>
<td>48.8010</td>
<td>$21,026.86</td>
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</table>
2 How AirCare Plus benefits our clients

- Enhanced service for often-ignored equipment
- Improved operation and comfort
- Incentives to directly discount cost
- Energy savings report from ComEd
Recent success story #1

- Major manufacturer in northern Chicago suburbs
- Older RTU’s, not recently serviced
- Tune-ups scheduled for start of cooling season
- Great opportunity for optimization
### Recent success story #1

**AirCare PLUS™**

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<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Units</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Total Annual kWh</strong></td>
<td>259,560</td>
</tr>
<tr>
<td><strong>Total Annual kW</strong></td>
<td>237.1213</td>
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<tr>
<td><strong>Estimated Annual Cost Savings</strong></td>
<td>$18,169.22</td>
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<tr>
<td><strong>Payback Period</strong></td>
<td>Instant</td>
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Recent success story #2

- Manufacturer on south side of Chicago
- Variety of new and old equipment
- Long-term client, equipment being maintained
- Client is aggressively pursuing energy savings
### Recent success story #2

#### AirCare PLUS™

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<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Units</strong></td>
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</tr>
<tr>
<td><strong>Total Annual kWh</strong></td>
<td>131,768</td>
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<td><strong>Total Annual kW</strong></td>
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<td><strong>Estimated Annual Cost Savings</strong></td>
<td>$9,223.74</td>
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<tr>
<td><strong>Payback Period</strong></td>
<td>Instant</td>
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</table>
How AirCare Plus benefits our technicians

- Can prove and validate performance improvement
- Can show value of service

How AirCare Plus benefits our clients

- Enhanced service
- Aggressive discounts
- Savings reports from ComEd ($$$)

Recent success stories

- 42 RTU’s total
- Over $27,000 in savings
- Instant payback
Thank you!

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