Advanced RTU Campaign Webinar
A Successful 2030 District is a PRIVATE-PUBLIC PARTNERSHIP, comprised of:

With over 410 MILLION SQUARE FEET of commercial building space and 960 member organizations, 2030 Districts are rapidly emerging as a new model for urban sustainability.
The New York City 2030 District mission is to help building owners reach their energy, sustainability and resiliency goals through education, outreach & project aggregation.

To help our City and our stakeholders, The NYC 2030 District is currently focusing on:

- **Electrifying NYC Buildings**
  - Heat Pumps
  - Variable Refrigerant Flow
  - Energy Recovery Ventilation
  - Roof Top Units (RTUs)

- **Smart Buildings (IoT)**
  - Meters
  - Sensors
  - Controls + BAS/BMS
  - Advanced Energy Optimization

- **Distributed Energy/Microgrids**
  - Solar PV
  - Battery Storage
  - Fuel Cells
  - Combined Heat & Power (CHP)
Advanced RTU Campaign
Sormeh Konjkav
Waypoint Energy
What is the Advanced RTU Campaign?

**National Dept of Energy campaign to promote high-efficiency RTU solutions**

- High-efficiency RTU replacements and new installations
- Advanced control retrofits for existing units
- Quality installations and quality maintenance
- Advanced Fault Detection and Diagnostics and intelligent controls – *new!*

www.advancedRTU.org
What are the Benefits of Joining the Campaign?

✓ **Business opportunity** – gain credibility from the experiences of a national campaign
✓ **Leverage DOE technical resources** in evaluating savings opportunities
✓ **Qualify for discounts** from supporters, including on ASHRAE technical guides
✓ **Stay informed** on innovative RTU technologies and resources produced through the campaign
✓ **Gain recognition, achievement awards, and participate in case studies** based on energy savings
✓ **Save energy and money** – older RTUs can waste from $1,000 to $3,700 per unit annually, depending on the building size and type
RTU Toolkits for Specific Use Cases

- **Replacement** or **Retrofit** toolkit for contractors and service providers
- **Replacement** or **Retrofit** toolkit for utility and efficiency programs
- Toolkit for **leased-space tenants**
- **Evaluation methodology** toolkit
RTU Evaluation Methodology

Resources to walk through for evaluating whether to replace your RTU or retrofit it with advanced controls

www.advancedrtu.org/retrofit-or-replace.html
Identify what high-efficiency considerations should be included when
- Replacing RTUs
- Retrofitting existing RTUs with advanced controls
- Spec-ing new RTUs

www.advancedrtu.org/find-a-product.html
# RTU Utility Incentives Database – New York Examples

<table>
<thead>
<tr>
<th>NY Utility</th>
<th>RTU Products</th>
<th>Incentive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Con Edison</td>
<td>HVAC Variable Frequency Drives (VFDs)</td>
<td>$60-115/ton&lt;br&gt;$50/HP with negative peak kW savings; $0.08/kWh all other VFDs</td>
</tr>
<tr>
<td>NYSEG</td>
<td>HVAC Variable Frequency Drives (VFDs)</td>
<td>$25-$80/ton Tier 1; $90 or $100/ton Tier 2&lt;br&gt;$60/HP</td>
</tr>
<tr>
<td>Orange &amp; Rockland</td>
<td>HVAC Variable Frequency Drives (VFDs)</td>
<td>$35 or $45/ton Tier 1; $55 or $95/ton Tier 2&lt;br&gt;$175-$1,495/unit</td>
</tr>
<tr>
<td>RG&amp;E</td>
<td>HVAC Variable Frequency Drives (VFDs)</td>
<td>$25-$80/ton Tier 1; $90 or $100/ton Tier 2&lt;br&gt;$60/HP</td>
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</table>
Direct opportunities to connect with HVAC Manufacturers (Campaign Supporters) for discussions on RTU products of interest

www.advancedrtu.org/supporters.html
Hot Resource: Business Case for Proactive RTU Replacement

http://betterbuildingssolutioncenter.energy.gov/resources/business-case-proactive-rooftop-unit-rtu-replacement
Proactive RTU Replacement Benefits

- Avoid costly emergency replacements
- Allows time for proper planning, design, and getting the best value
- Avoided maintenance calls
- Improved comfort (better temp and relative humidity control)
- Remove R22 from inventory
- Energy and peak demand savings
Early Retirement Example – Retail Store

Existing RTUs
- 5 12-ton 15 year old units
- 8.7 EER degraded to 7.3
- Constant speed
- R22

Replacement RTUs
- 5 10-ton RTUs (right sized)
- 12 EER, 13.8 IEER
- R410A

Can the replacement be cost effective?
## Up-Front Costs

<table>
<thead>
<tr>
<th>Capital</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Design and Analysis</td>
<td>$8,000/Unit</td>
</tr>
<tr>
<td>+ Cost of RTUs</td>
<td>$20,000</td>
</tr>
<tr>
<td>+ Installation &amp; Building</td>
<td></td>
</tr>
<tr>
<td>Upgrade Costs</td>
<td></td>
</tr>
<tr>
<td>- Utility Incentives</td>
<td>-$1,640/unit</td>
</tr>
<tr>
<td>- Financing Options</td>
<td></td>
</tr>
<tr>
<td>- Scrap Value</td>
<td>-$200/Unit</td>
</tr>
</tbody>
</table>

- Total Cost for 5 Units = $50,800

## Variable Ongoing

- O&M                          | -$12,500 |
  ($500 * 5 Units) = $2,500/yr * 5 yrs
- Tax Depreciation             | $1,750  |
  ($70 * 5 Units) = $350/yr * 5 yrs

## Benefits

### Energy Savings
- + $7,688*5 years = $38,439

### Additional Cost Savings
- + Right-Sized Equipment (included in price)
- + Avoided Emergency Replacement
- + Bulk Purchase (included in price)
- + Multiple-Measure (included in price)
- + RTU Packages
- + Avoided R-22 Costs (included in O&M)

### Qualitative Benefits
- + Air Quality and Comfort $2,000
- + Sustainability Values

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## Financial Metrics

- **ROI Energy and Other Costs**: 52%
- **Payback Period**: 3.3 Years
- **NPV**: $5,030
- **IRR Energy and Other Costs**: 16%
Thank You

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(415) 757-6254

www.advancedRTU.org
Open-Source Modular Wireless Monitoring & Optimization Suite for HVAC – SAVE Over 20%!
Focus on Advanced RTU Goals

- New York has tens of thousands of HVAC and refrigeration units --

- That contribute to peak grid loading, and are a major building energy cost

- NYSEDA and Con Edison, responding with focused programs – including Con Edison’s Commercial Direct Install (CDI) program
CDI New Measures, Developments

- **New Types of Systems**
  - [Not only Lighting, DHW & Refrigeration, but also]
    - HVAC Equipment
    - Kitchen Equipment

- **New Types of Measures**
  - [Not Only Retrofits & Replacements, but also]
    - Operations & Maintenance (O&M)
    - More Controls, and more to Come

- **New Types of Collaborations**
  - Lighting and Electrical Contractors with HVAC Contractors

- **New Types of Partnerships**
  - With other Con Edison programs, such as Residential Mini-Split and the C&I Programs
## CDI Measures: Incentive Amounts

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Measure Name</th>
<th>Measure Description</th>
<th>Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Replace</td>
<td>Air Conditioner and Heat Pump - Packaged Terminal</td>
<td>Packaged Terminal Air Conditioners</td>
<td>$100/ton</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Packaged Terminal Heat Pump</td>
<td>$125/ton</td>
</tr>
<tr>
<td>2</td>
<td>Replace</td>
<td>Unitary Air Conditioners &amp; Unitary and Applied Unitary Heat Pumps</td>
<td>Unitary Air Conditioners</td>
<td>$250/ton</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unitary &amp; Applied Unitary Heat Pumps</td>
<td>$400/ton</td>
</tr>
<tr>
<td>3</td>
<td>Retrofit</td>
<td>EC Brushless Permeant Magnet Motors for HVAC Circulator Fan</td>
<td>ECBPM Motor for HVAC Circulator Fan - Fan Coil Unit &amp; Ducted Cassette Unit</td>
<td>50% of Cost; Up to $150/Unit</td>
</tr>
<tr>
<td>4</td>
<td>Retrofit</td>
<td>Variable Frequency Drive (VFD)</td>
<td>VFD for Select Fans and Pumps</td>
<td>$75/HP</td>
</tr>
<tr>
<td>5</td>
<td>O&amp;M</td>
<td>Air Conditioner and Heat Pump - Refrigerant Charge Correction</td>
<td>Refrigerant Charge Correction</td>
<td>50% of Cost; Up to $350/unit</td>
</tr>
<tr>
<td>6</td>
<td>O&amp;M</td>
<td>Duct Sealing &amp; Insulation</td>
<td>Duct Sealing &amp; Insulation</td>
<td>50% of Cost; Up to $500/unit</td>
</tr>
<tr>
<td>7</td>
<td>Controls</td>
<td>Demand Controlled Ventilation [DCV]</td>
<td>Single Demand Controlled Ventilation (DCV)</td>
<td>$50 per 1,000 sq ft</td>
</tr>
<tr>
<td>8</td>
<td>Controls</td>
<td>Economizer - Air-Side, with Dual Enthalpy</td>
<td>Air-Side Economizer</td>
<td>$75/ton</td>
</tr>
<tr>
<td>9</td>
<td>Controls</td>
<td>Thermostat - Wi-fi (Communicating)</td>
<td>Wifi Thermostats</td>
<td>$100/Unit</td>
</tr>
<tr>
<td>10</td>
<td>Controls</td>
<td>Smart Compressor Controls</td>
<td>Pace + Pace Cloud Controls</td>
<td>$100/ton; Up to 80% of Unit</td>
</tr>
</tbody>
</table>
Advanced HVAC Controls: PACE+PACE Cloud

Climate Controlled Air Stream

- Zone Occupancy & Temperature Sensor
- CO2 Sensor

Outdoors

- OAT Sensor

HVAC Unit

- Sensors for fault detection and diagnostics
- PACE Node (ZigBee / Wi-Fi / 4G LTE)
- 110 / 24 Volts (I/O)
- Temp

OR

- Gateway (ZigBee to Ethernet / Wi-Fi / Cellular)

PACE Cloud

- Customer DB

PACE Node in small home A/C unit
20% Savings, Electric or Gas – Plus Cloud Monitoring, Fault Detection

- Right: 10 month California Energy Commission-sponsored independent study
- 18%-24% energy savings, even with a modern building system in place
- 80+ IPMVP-compliant studies – leading credentialed HVAC retrofit solution
Breakthrough ThrottleBack™ Cloud-Based Demand Reduction: 3 Way Win

Hitachi client – 16% peak kW reduction with maintained setpoints, installation on 2 RTUs in ~3 hours

Source: DOE-Lawrence Berkeley National Lab
Choice of Global Property Managers, Utilities, OEM Joint Development

CBRE

*kWh Energy Saving Estimation*

<table>
<thead>
<tr>
<th>ID</th>
<th>Step Descriptions For Calculated Savings</th>
<th>OEM Control</th>
<th>PACE Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Actual kWh consumption for the RTUs under OEM control</td>
<td>9280</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Actual kWh consumption for the PACE retrofitted RTUs</td>
<td>7795</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Projected monthly average kWh consumption for all RTUs</td>
<td>36709</td>
<td>30954</td>
</tr>
<tr>
<td>d.</td>
<td>Projected kWh for the facility - Feb '16</td>
<td>61688</td>
<td>55833</td>
</tr>
<tr>
<td>e.</td>
<td>Baseline kWh consumption for the facility</td>
<td></td>
<td>30931</td>
</tr>
<tr>
<td>f.</td>
<td>Annual kWh for the facility - Projected PACE savings</td>
<td>843720</td>
<td>774656</td>
</tr>
<tr>
<td>g.</td>
<td>Annualized building-wide savings (%)</td>
<td>8.2%</td>
<td></td>
</tr>
<tr>
<td>h.</td>
<td>Annualized building-wide savings ($)</td>
<td>$5,887</td>
<td></td>
</tr>
</tbody>
</table>

Above: CBRE national account – 8% whole-building savings

Right: national program for NextEra Energy (parent of FP&L)

Pairable with WiFi thermostats, HVAC tuneups, any BAS

Big HVAC improvements. Not just hot air.

With a demand-response solution powered by Gexa Energy Solutions and the award-winning PACE+PACE Cloud smart grid suite.

Over 20% of a typical commercial building’s electricity use is consumed by Heating, Ventilation and Air Conditioning (HVAC) systems. Gexa Energy Solutions and PaceControls have teamed up to offer you an extraordinary opportunity—an easy way to get in on demand response and potentially reduce what you spend on air conditioning and heating systems by 10-15%, using your existing equipment. And your employees and customers won’t know the difference.

Large businesses or small could see immediate benefits from the GES-HVAC Optimization Program: not just potential energy savings, but better system monitoring and potential improvements to equipment longevity. And the Android-powered PACE+PACE Cloud suite is already doing the job in more than 15,000 locations worldwide—so you’re getting technology with a track record. We’ll even take care of installation*. It’s painless.

3 easy steps to get started. 1 simple way to increase your opportunity to save energy, every single month.

1. Fill out our brief info form. Get a response within 48 hours.
2. Get a response from us, detailing the number of modules your system needs. Agree to terms and conditions and schedule your installation. We’ll bring the technicians and get it done.
3. Start optimizing your HVAC unit immediately, without replacing any existing equipment. Stick up the benefits of participating in demand response—without hassles or discomfort.

*Talk to your Gexa Energy Solutions rep or call 1-855-639-8111 (M–F 8 am – 5 pm CST) to get started. Answer a few questions about your current air conditioning and heating systems.

**Sign off on the terms and conditions and give us the go-ahead.

Get installed within 3 – 7 business days, without affecting your operations in any way.
### Project Analysis: Equipment Data

#### Nameplate Data
- System vs Component
- Tonnage vs HP
- Power vs Capacity
- kVA vs KW vs HP
- LF vs PF vs Efficiency

#### HVAC Controls - System Level [Prgm. Tstat + Wifi Tstat + Economizer + DCV]

<table>
<thead>
<tr>
<th>Building</th>
<th>Floor</th>
<th>Site</th>
<th>Building</th>
<th>Floor</th>
<th>Site</th>
<th>System Description</th>
<th>Model</th>
<th>Number of Controls</th>
<th>Existing Measured Capacity [Tod]</th>
<th>Existing Measured Capacity [BTU/hr]</th>
<th>Existing Measured Capacity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>B</td>
<td></td>
<td></td>
<td>Roof Top Unit (RTU)</td>
<td>VFD</td>
<td>2</td>
<td>60,000 Btu/hr</td>
<td>65,000 Btu/hr</td>
<td>55,000 Btu/hr</td>
</tr>
</tbody>
</table>

#### HVAC Controls - Component Level [Variable Frequency Drives]

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Roof Top Unit (RTU)</td>
<td>VFD</td>
<td>230</td>
<td>24</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Roof Top Unit (RTU)</td>
<td>VFD</td>
<td>230</td>
<td>24</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
Enrolling & Finding a Contractor

Per the CDI Program Webpage on the ConEdison Website:

Participating in the program is as easy as 1,2,3:

1. **Schedule Your Free Energy Assessment**
   Willdan Energy Solutions is the authorized program implementation contractor. Willdan or a participating contractor will visit your business and recommend ways you can save energy. We’ll also tell you how much it will cost to upgrade your equipment and how much Con Edison will cover.

2. **Install Energy Efficient Technology**
   You decide if and when the job gets done. A participating program contractor will perform the work. Con Edison will pay approximately 50 percent of the cost directly to the contractor, and you pay the difference. No waiting for rebates.

3. **Start Saving**
   The energy that you save with system upgrades pay for themselves over time.
Select CDI-Approved HVAC and energy contractors – **some examples:**

- **Bright Energy Services** –
  
  [www.brightenergyservices.com](http://www.brightenergyservices.com)

- **Tristate Energy Efficient Corp./Tristate Electric Corp.** –
  
  [www.tsenergyefficient.com](http://www.tsenergyefficient.com)

- **Sight Energy** –
  
  [www.sightenergy.com](http://www.sightenergy.com)

- **Willdan | Genesys Engineering** –
  
  [www.genesysengineering.net](http://www.genesysengineering.net)

- **DVM Industries** –
  
  [www.dvmindustries.us](http://www.dvmindustries.us)

- **Burton Energy Group** –
  
  [www.burtonenergygroup.com](http://www.burtonenergygroup.com)
Questions, Contacts

- CDI Program Manager, Willdan Group: Antuan Cannon, CEM, LEED AP, CEA / 646-357-6033 / acannon@willdan.com

- PACE+PACE Cloud
  Tom Wieser, P.E., Rafael Coven, Tom Mills / toll-free 877-PACE-HVAC, Option 1 / pm@pacecontrols.com
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