



Efficiency Works

Platte River
Power Authority

Estes Park
Light and Power

Fort Collins
Utilities

Longmont
Power &
Communications

Loveland
Water and Power

Increased Cooling Demand Means More Energy Saving Opportunities

Wednesday, May 25th, 2016

AIA Provider:
Colorado Green Building Guild

Provider Number: 50111120

Increased Cooling Demand Means More Energy Saving
Opportunities

AIA Course Number: EW03.25.15

Speakers: Bryce Brady and Kelley Gonzales



Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

This course is registered with **AIA CES**



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Sign-in Sheet:

When you sign the sheet, PLEASE WRITE LEGIBLY!

- AIA column – fill in this column with your AIA ID# if you would like us to apply for CEUs on your behalf.
- BPI column– fill in this column with your BPI number if you would like us to apply for CEUs on your behalf.

If you do not fill in your ID#, it is your responsibility to email it to the CGBG within 3 business days.

Certificates of Completion:

If you need a Certificate of Completion, please check the appropriate box on the sign-in sheet.

Course Evaluations:

If you would like to fill out a course evaluation form, please email the CGBG within 3 business days to request one.

The Colorado Green Building Guild (CGBG) is the Provider for this course:

Email: julie.nelson@bgbg.org



Course Description

Some of the largest, untapped energy and money saving opportunities are in commercial space cooling. Review local case studies and learn to take advantage of advances in cooling technology such as evaporative and 'free' cooling options. Also learn how Efficiency Works rebates and programs support low-cost cooling.

Approved for .75 hours BPI and 1.5 hours AIA LU/HSW

With over 30 years of experience in the construction, energy efficiency and utility industry, **Kelley Gonzales** currently manages the commercial Demand Side Management program for Fort Collins Utilities. Gonzales holds a B.S. in Construction Management and is certified as an Energy Manager, Energy Auditor and Demand Side Management professional.

Currently a Customer Services Engineer for Platte River Power Authority, **Bryce Brady** spends the majority of his time on the Efficiency Works for Business incentive programs. Brady has experience working with both energy efficiency contractors and utility customers, implementing energy efficient upgrades that take advantage of the various incentive programs available. Brady holds a B.S. in Architectural Engineering, Masters in Business Administration and is a registered Professional Engineer.

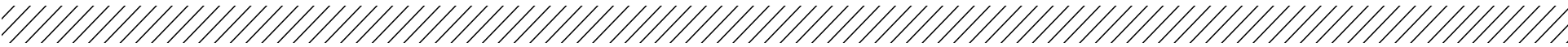


Learning Objectives

At the end of the this course, participants will be able to:

- .. Identify minimum cooling efficiency requirements related to code and incentive programs
- .. Understand case studies of other Cooling upgrades and the associated energy savings
- .. Recognize new advances and alternative applications in cooling technologies in commercial space cooling
- .. Identify upcoming cooling incentive program changes





This concludes The American Institute of Architects Continuing Education Systems Course

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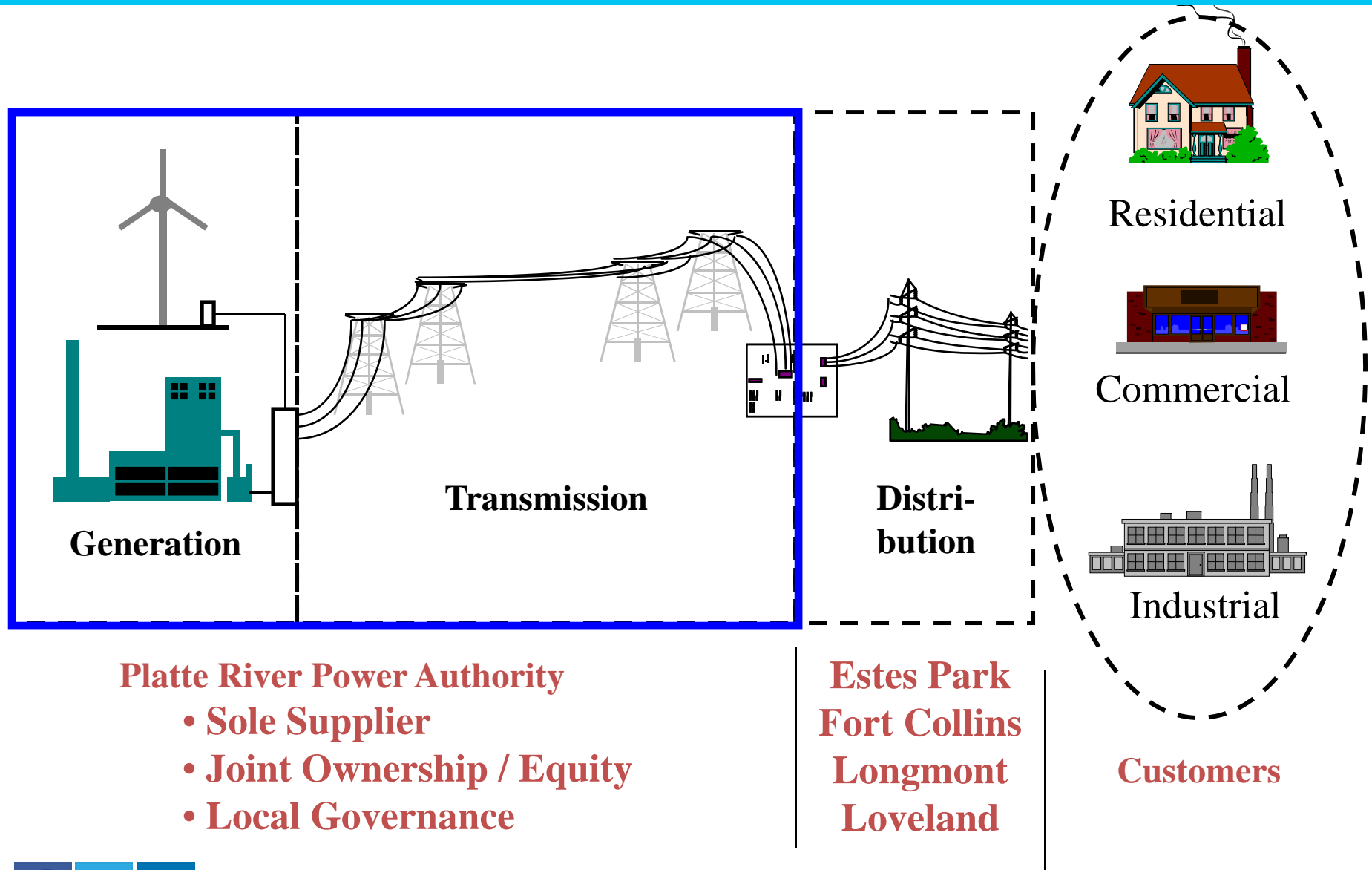
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Overview

- ✓ Current Cooling Rebate Offerings from Efficiency Works Program
- ✓ Code Review of Minimum Efficiencies
- ✓ Case Studies – How others have saved!
- ✓ Future Incentive Program Offerings and Changes

Platte River-City Relationship



Efficiency Works for Business

What's Available?



- ✓ Facility Assessments
 - Building Specific Reports
 - Technical Assistance
- ✓ Building Tune-up
- ✓ Integrated Design Assistance

- ✓ Efficiency Improvement Incentives
 - Lighting
 - Cooling
 - Motors
 - Building Envelope
 - Kitchen Equipment
 - Custom Projects



Cooling Rebates are Available!



Cooling Rebates

Tiers on unit size and efficiency

Equipment Type	Cooling Capacity (tons)	Efficiency Tier	Minimum Qualifying Efficiency (Must Meet Both)				Incentive (\$/ton)
			Peak		Seasonal		
PTAC*	<4.2	1	11.0	EER	n/a		\$50
		2	12.0	EER	n/a		\$100
Split system**	<5.4	1	12.5	EER	15.0	SEER	\$200
		2	12.5	EER	16.0	SEER	\$250
		3	12.5	EER	17.0	SEER	\$300
Unitary	<5.4	1	12.0	EER	15.0	SEER	\$200
		2	12.0	EER	16.0	SEER	\$250
		3	12.0	EER	17.0	SEER	\$300
Unitary	5.5 - 11.2	1	12.0	EER	13.8	IEER	\$300
		2	12.0	EER	15.0	IEER	\$350
		3	12.0	EER	16.0	IEER	\$400
Unitary	11.3 - 19.9	1	12.0	EER	13.0	IEER	\$300
		2	12.0	EER	14.0	IEER	\$350
Unitary	20 - 63.3	1	10.6	EER	12.1	IEER	\$300
		2	10.6	EER	13.0	IEER	\$350

* PTAC = Packaged Terminal Air Conditioning

** Split systems include mini-split heat pumps or air conditioners




Cooling Rebates (cont'd)

Additional rebates based on features/add-ons

Measure	Description	Incentive
Early Retirement	Additional incentive is available for retiring working standard air conditioner units less than 20 years old.	\$100 / ton
Evaporative Condensing	Pre-cools the air entering the condenser of a rooftop unit or air-cooled chiller with mist or an evaporative media.	\$100 / ton
Advanced Evaporative Cooling	Direct, Direct/Indirect, or Indirect evaporative coolers. Continuous water 'bleed' systems for sediment control DO NOT qualify. Must guarantee air quality against bacteria, mold, and include a maintenance plan.	\$0.20 / cfm
Economizer Controls	Add an economizer to either an existing unit or to a replacement high-efficiency unit where an economizer previously did not exist.	\$250 / unit
PTAC/PTHP Controls	Motion Sensor or Card Lock control with setback capabilities.	\$75 / unit
Advanced RTU Controller	After market controllers that utilize variable supply fan control combines with integrated economizer and demand ventilation controls.	\$2,000 / unit
Premium Ventilation Package	New units that select the integrated economizer (i.e. differential control) and demand control ventilation options for new equipment. Is in addition to economizer rebate for existing equipment.	\$500 / unit

Rebate Information is Available

www.EfficiencyWorks.CO



[Homes](#) [Business](#) [Service Providers](#)

Serving Businesses

Help customers identify and implement efficiency upgrades.

Efficiency Works™ provides funding to help customers conserve energy, water, and reduce costs when upgrading to more efficient equipment in new construction or existing commercial buildings.

- + How to become an Efficiency Works™ Provider to businesses
- + Steps for Completing a Project
- + Applications
- Summary of Rebates

Efficiency Works provides funding to help you conserve energy, water, and reduce costs when upgrading to more efficient equipment in new construction or existing commercial buildings. The following links provide a rebate summary. For complete rebate details and requirements please consult the Efficiency Works [Rebate Application](#) and the Efficiency Works [Program Guide](#).

Click on a category for rebate details

Lighting (Existing Building Retrofits)	Lighting (New Buildings & Major Renovation)	Cooling
Building Envelope	Food Service	Grocery
IT and Office	VFDs	Water
Custom		

Detailed program specifications and incentive requirements can be found in the [Efficiency Works Program Guide](#).

Important Links for Business Providers

[Assessment Application](#)

[Building Tune-up Application](#)

[Efficiency Works Rebate Application](#)

[AC Commissioning Form](#)



Get Started!

1. Develop project proposal and obtain customer commitment
2. Complete a rebate application and submit to Efficiency Works for pre-approval with detailed project quote – info@efficiencyworks.CO
3. Complete Project
4. Submit final paperwork to Efficiency Works
 - Final invoice and W9
 - Signed request for payment
 - Final application
5. Receive payment with in 4 to 6 weeks
 - Rebate can be paid to contractor or customer

Code Requirements

IECC 2012 (currently)

Equipment Type	Cooling Capacity (tons)	Cooling Capacity (Btu/h)	Minimum Code Required Efficiency** 2012 IECC		Minimum Qualifying Efficiency for Incentives (Must Meet Both)	
			Peak	Seasonal	Peak	Seasonal
PTAC	<4.2	<50,000 Btu/h	9.3-11.7 EER	n/a	12.0 EER	n/a
Split system*	<5.4	<65,000 Btu/h	n/a	13.0 SEER	12.5 EER	15.0 SEER
Unitary*	<5.4	<65,000 Btu/h	n/a	13.0 SEER	12.0 EER	15.0 SEER
Unitary*	5.5 - 11.2	65,000 - 134,999 Btu/h	11.2 EER	11.4 IEER	12.0 EER	13.8 IEER
Unitary*	11.3 - 19.9	135,000 - 239,999 Btu/h	11.0 EER	11.2 IEER	12.0 EER	13.0 IEER
Unitary*	20 - 63.3	240,000 - 759,999 Btu/h	10.0 EER	10.1 IEER	10.6 EER	12.1 IEER

* All systems are air cooled

**ASHRAE Standard 90.1-2010 (Table 6.8.1A & D)

Note: Cx is required.



How are others saving?

Types of Upgrades

- ✓ New RTU's
 - Including early retirement
- ✓ Evaporative Cooling
- ✓ Advanced Controls
 - After market retrofits
 - New unit upgrades
- ✓ BTU/Retrocommissioning



Case Studies

Commercial Customer with Existing Air Cooled Chiller

Background:

- 180,000 square foot office building
- 3 Story Building
- Built in 1998
- Air cooled McQuay chiller
- Capacity 425 tons



Problem: Existing air cooled chiller suffers from recirculation of warm air and cooling demands that cannot satisfy the tenants.

Case Studies

Commercial Customer with Existing Air Cooled Chiller

Solution: Install an evaporative pre-cooling system to improve condenser and chiller efficiency and restore design cooling tonnage availability.

- Cost - \$85,000
- Utility savings - \$12,000/yr
- Electric savings – 117,205kWh/yr
- Rebate - \$44,500

Evaporcool condensing pre-cooler



Case Studies

Commercial Office Building with Multiple RTUs

Background:

- 30,000 sq ft office building
- 3 Story Building
- Built in the late 1970s
- 15 standard RTUs with DX cooling of various vintage
- Units are 5.6 to 7.5 tons each



Problem:

Aged units that have outlived their useful life and are failing.
Many do not have economizers or programmable thermostats.

Case Studies

Commercial Office Building with Multiple RTUs

Solution:

Replace units one at a time with new high efficiency RTUs (12.6 EER and 14.5 IEER) with economizers and programmable thermostats.

- Cost range \$12,000- \$15,000
- Utilities savings – avg. \$200/unit/yr *
- Electric savings – avg. 2,200 kWh/unit/yr*
- Rebate – avg. \$1,400/unit

* Does not include savings related to programmable thermostat



Case Studies

Commercial Customer Packaged RTU with Evaporative Condensers

Background:

- 156,000 square foot office building
- Built in 2002
- Standard efficiency DX cooling RTU
- Four 75 ton units (300 tons total)

Problem:

Standard efficiency units with maintenance issues and failing compressors.



Case Studies

Solution:

Replace four Trane 75 ton RTUs with higher efficiency units including Premium Ventilation and Evaporative Condensing.

- Cost - \$913,000
- Utility savings - \$15,000/yr
- Electric savings – 390,000kWh/yr
- Rebate - \$54,250 (includes early retirement)



Advanced Controls: Upgrade Potential



Why Advanced RTU Controllers?

- Cost effective for utilities – DR ready
- Cost effective for customers
- Additional web interface and fault diagnostics for maintenance

Energy Saving Measures

- Integrated Economizer with Differential Changeover Control
- Variable Speed Fan Control to Match the Needs of the Space Served
- Elimination of Over-Ventilation via Demand Control Ventilation (DCV)
- Remediation of Service and Operational Issues



Results All Sites

Estimated Annual Savings based on MV Trending									
Site	Install Date	# Units	Total Capacity (Tons)	Nominal Fan Power (HP)	Runtime		Annual Savings		
					Avg Daily (Hrs)	Annual (Hrs)	Total (kWh)	%	Normalized (kWh/Ton per 1,000 h)
Office	3/30/2013	1	6	2	5 AM-9:30 PM Mon-Sun	6,025	8,900	62%	246
Fitness Center	3/20/2013	1	15	3	24/7	8,760	25,000	68%	190
Retail ¹	7/27/2013	1	10	3	7 AM-11 PM Mon-Sun	5,840	9,300	88%	159
Composite		3	31	8		6,875	43,200	70%	203

¹Initially installed 3/20, but existing Stat was not functioning

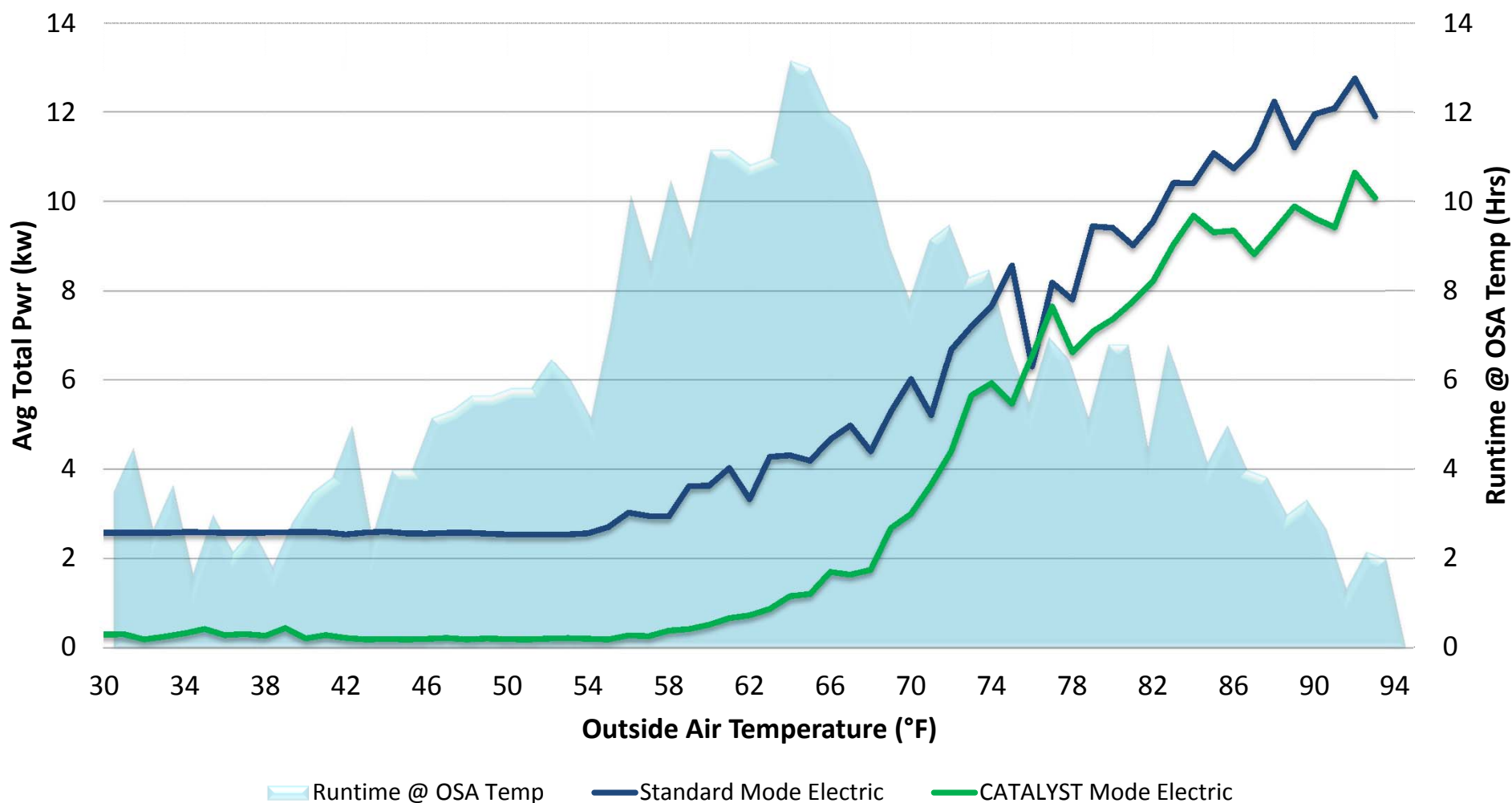
²Results based on data collected from install to 9/26/2013

Data supplied by Transformative Wave Technologies (Catalyst)



Applying the Data

Average HVAC Electric Power vs OSA Temp



Another Way to Save: Building Tune-up

What is the Building Tune-up Program?



- Tune-up (or retro-commission) existing building/energy systems
- Identify and implement low to no cost measures resulting in less than a 2 yr payback
- Provide financial incentives for cost effective energy savings
- Identify EE measures not covered by BTU that may qualify for other rebate programs (EW Business)

Building Tune-up

General prerequisites for all buildings:



- The facility shall be at least 2 years old
- Facility is served by four utilities and on commercial rate
- HVAC equipment shall be between 2-20 years old and must have regular preventive maintenance
- All Projects require completed application and pre-approval.
- BTU project must be performed by qualified Retro-commissioning Service Provider (RSP)

Building Tune-up

All types of Buildings:

- Schools
- Office
- Gov't
- Heath Club
- Retail
- Light industrial
- Warehouse
- Industrial



Building Tune-up Project Tiers

Tier #1 – Small Buildings

Typically less than 50K sq ft, single zone thermostats, roof top units (RTU) or split systems

Rebate is based on **\$0.15 per sq ft** for implementation of selected measures and customer commits \$0.05 per sq ft.

Tier #2 – Medium

Typically between 50K to 100K sq ft, BAS and trending, AHU/VAV systems

Rebate is based on 100% of the cost of RCx study and implementation support and verification by RSP and customer commits \$0.05 per sq ft for implementation of selected measures.

Tier #3 – Large Buildings

Typically greater than 100K sq ft, BAS and trending, central plant and industrial processes



What's Next (late 2016+)

Midstream Cooling Incentive Program (Pilot)

What

- The Efficiency Works Midstream Cooling Incentive Program (EW MCIP) provides incentive payments to HVAC distributors in the region that stock and sell high efficiency cooling units based on a per ton amount for the new equipment sold depending on the size and efficiency of the units.

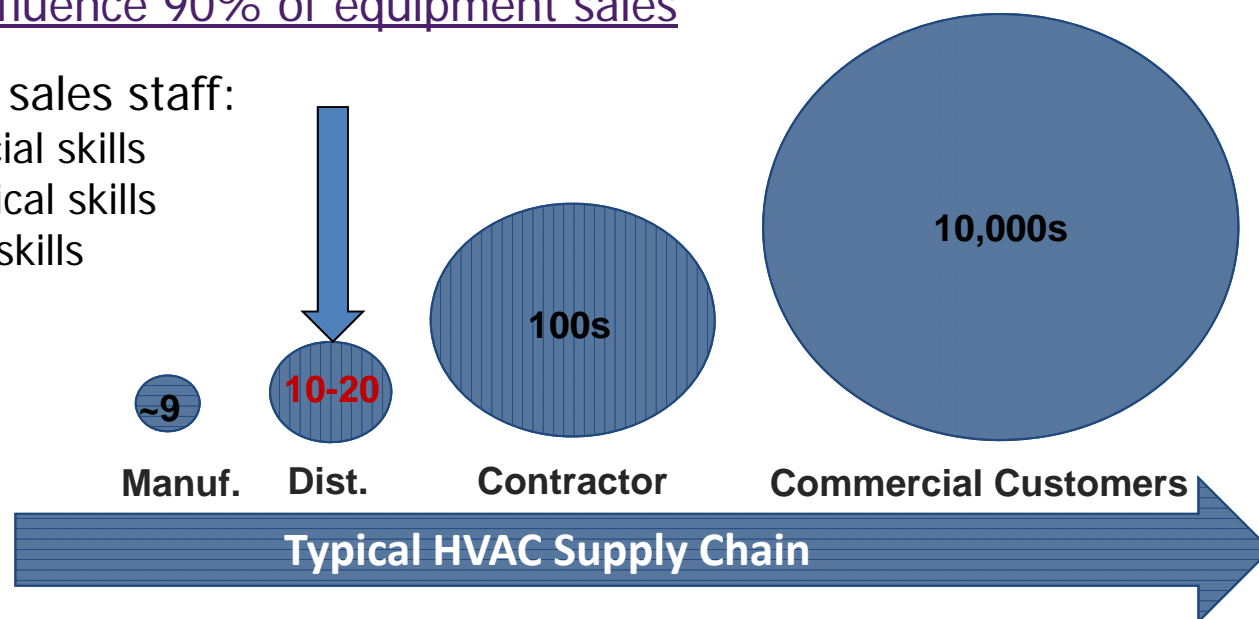
Why

- Make it easier for the end use customer
- High Efficiency units right off the shelf.



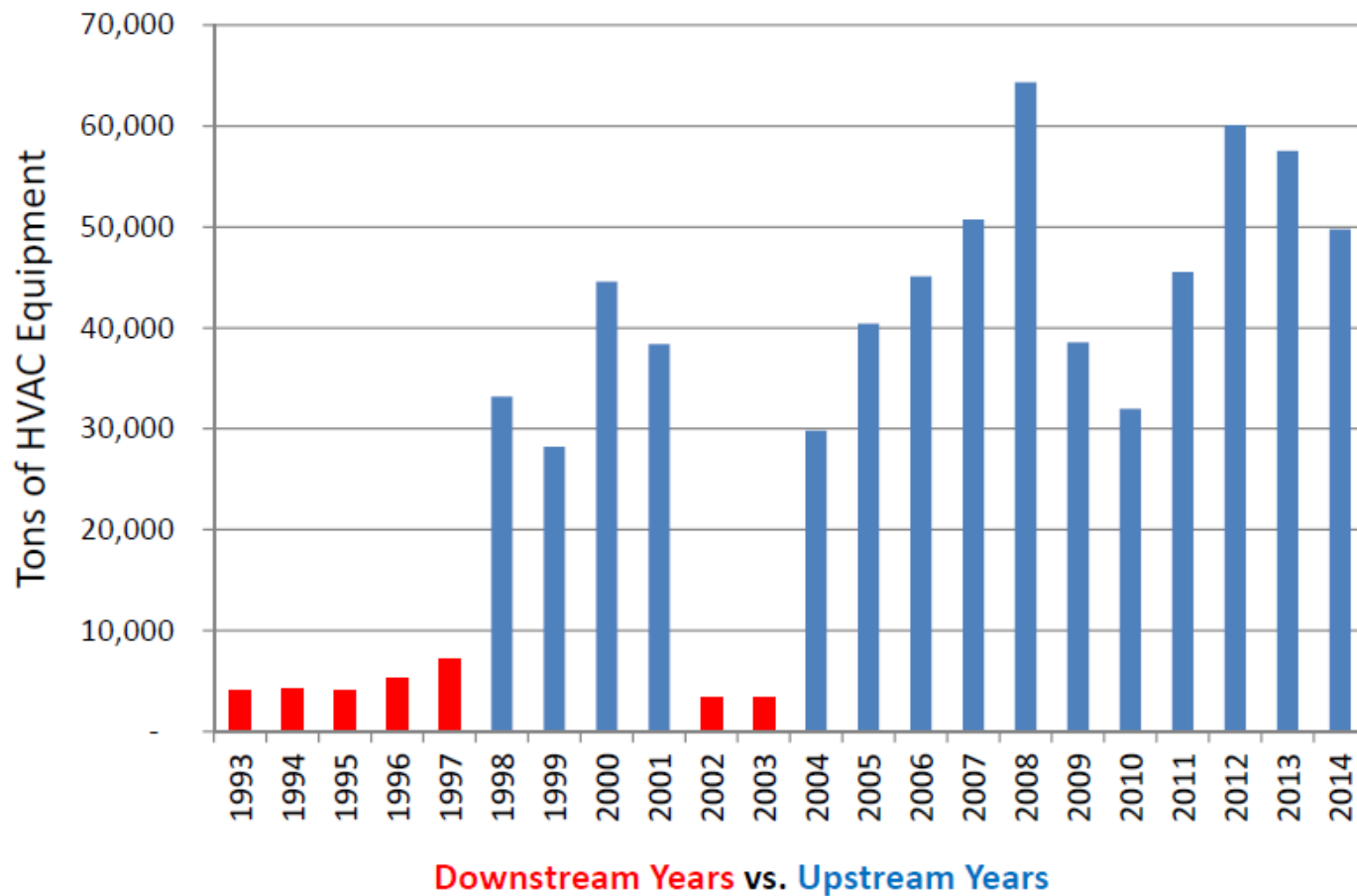
Why target distributors?

1. Distributors control equipment stocking
2. Influences contractors' purchase decisions
3. Fewer market actors means lower implementation costs
4. Distributors influence 90% of equipment sales
5. Most qualified sales staff:
 - a) With financial skills
 - b) With technical skills
 - c) With sales skills

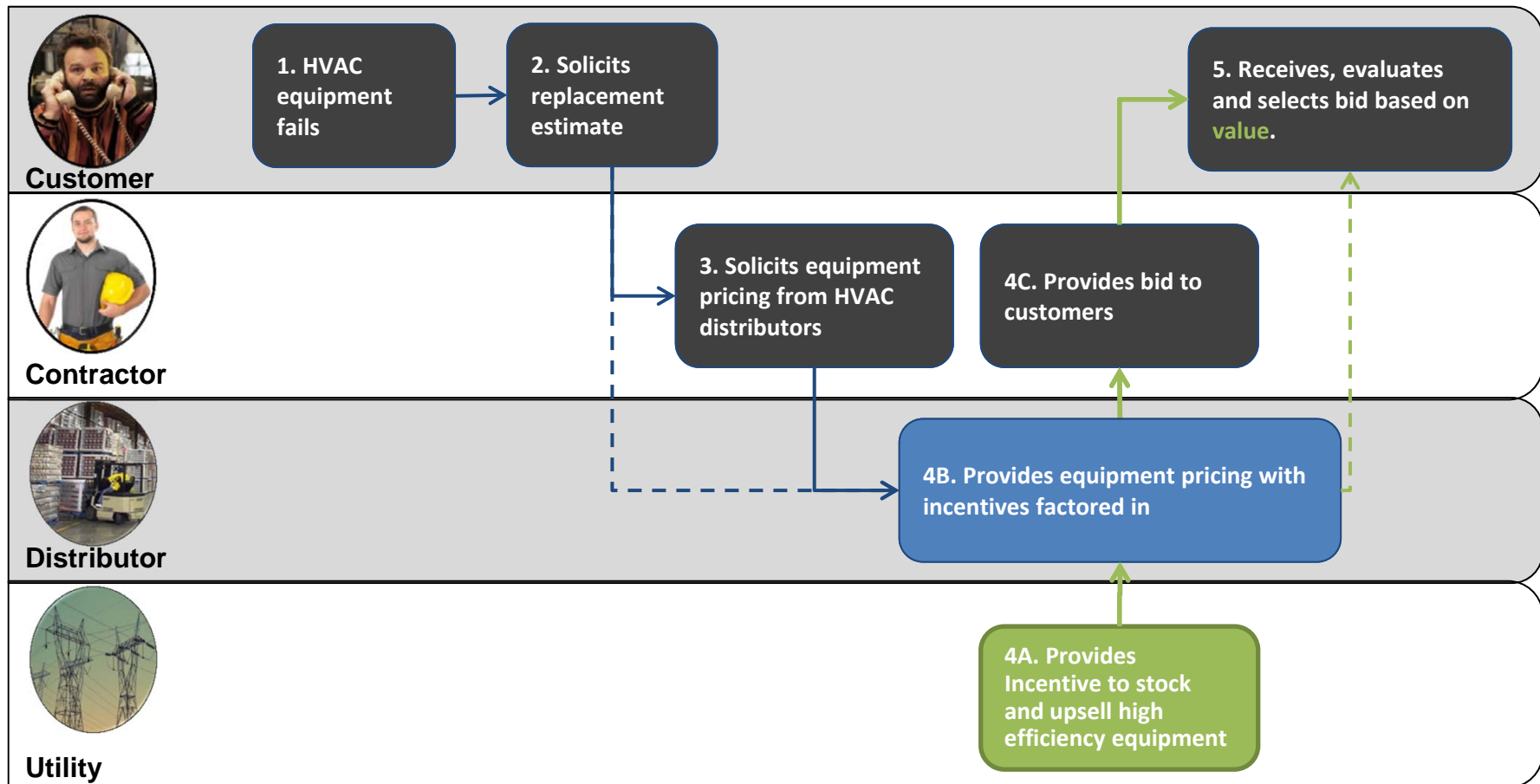


Does it Work?

PG&E HVAC Results: 1993 to 2014



Midstream Sales Process



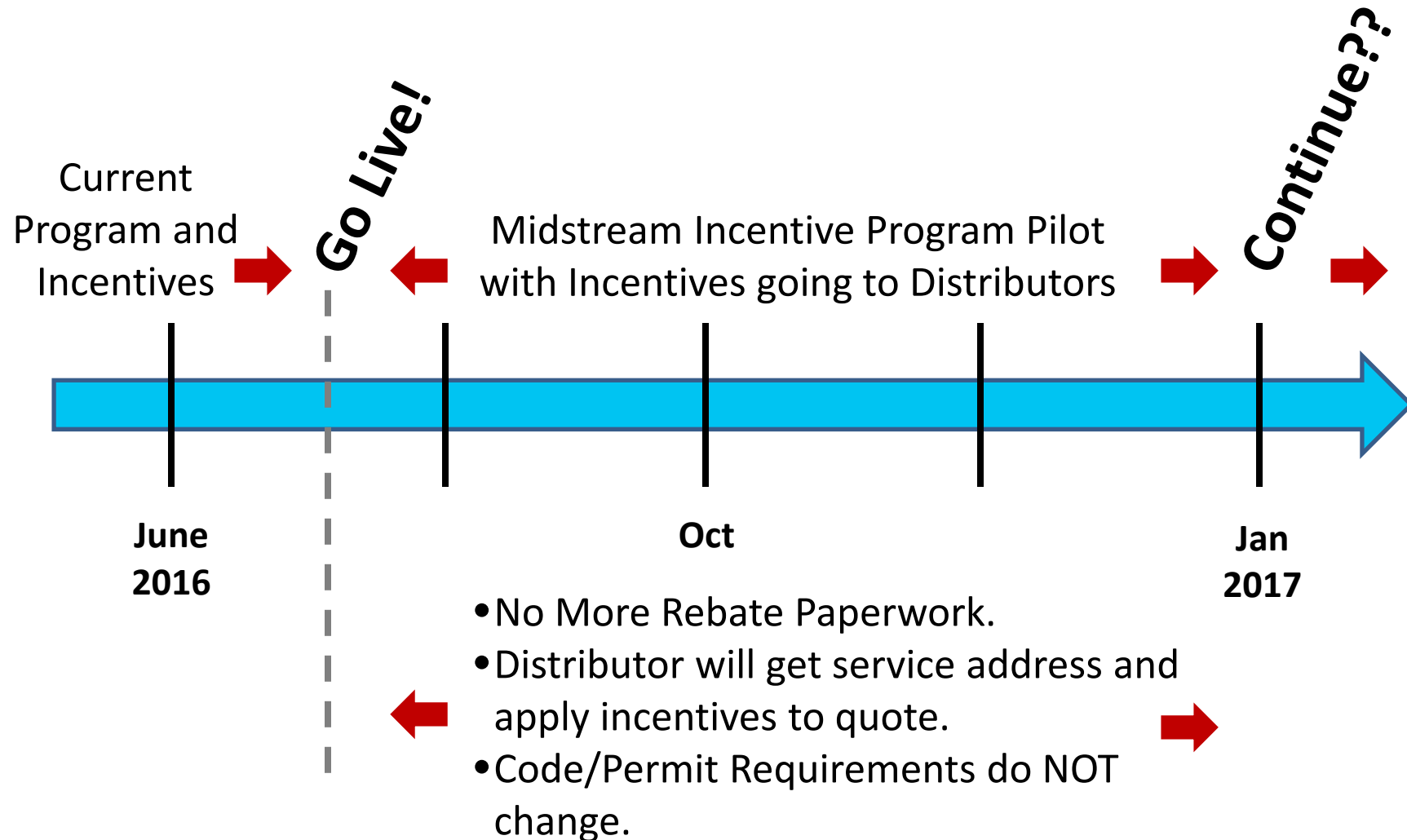
Cooling Equipment Incentives

Midstream Incentives:

- PTAC's
- Split System (<5.4 tons)
- Unitary Roof Top Units
(up to 63.3 tons)



Implementation Timeline



Downstream Cooling Incentives

Measures to still be eligible for downstream incentives:

Measure	Description	Incentive
Early Retirement	Incentive is available for retiring working standard air conditioner units less than 20 years old. Commissioning required	\$100 / ton
Evaporative Condensing	Pre-cools the air entering the condenser of a rooftop unit or air-cooled chiller with mist or an evaporative media.	\$100 / ton
Advanced Evaporative Cooling	Direct, Direct/Indirect, or Indirect evaporative coolers. Continuous water 'bleed' systems for sediment control DO NOT qualify. Must guarantee air quality against bacteria, mold, and include a maintenance plan.	\$0.20 / cfm
Economizer Controls	Add an economizer to either an existing unit or to a replacement high-efficiency unit where an economizer previously did not exist.	\$250 / unit
PTAC/PTHP Controls	Motion Sensor or Card Lock control with setback capabilities.	\$75 / unit
Advanced RTU Controller	After market controllers that utilize variable supply fan control combines with integrated economizer and demand ventilation controls.	\$2,000 / unit



Become an Efficiency Works Provider

- Requirements:
 1. Complete one project including application
 2. Customer rating
 3. Agreement and Insurance
- Updated semi-annually
- Provided to customers
- On website



BTU Retro—Commissioning Providers must complete RSP application to qualify

Future Trainings (4th Wednesday)

New Financing Options for Commercial Energy Efficiency

June 22nd, 2016. 8:30 am - 10:00 am

Integrated EV and PV

July 27th, 2016. 8:30 am - 10:00 am

Tour of Platte River Power Authority's Rawhide Energy Station and the Silver Sage Windpower Project - Sept 28th, TBD

New Options for Managing Peak and Facility Demand

Oct 26, 8:30-10 am

And more at <http://efficiencyworks.prpa.org/training/>



Thank You

Any Questions??

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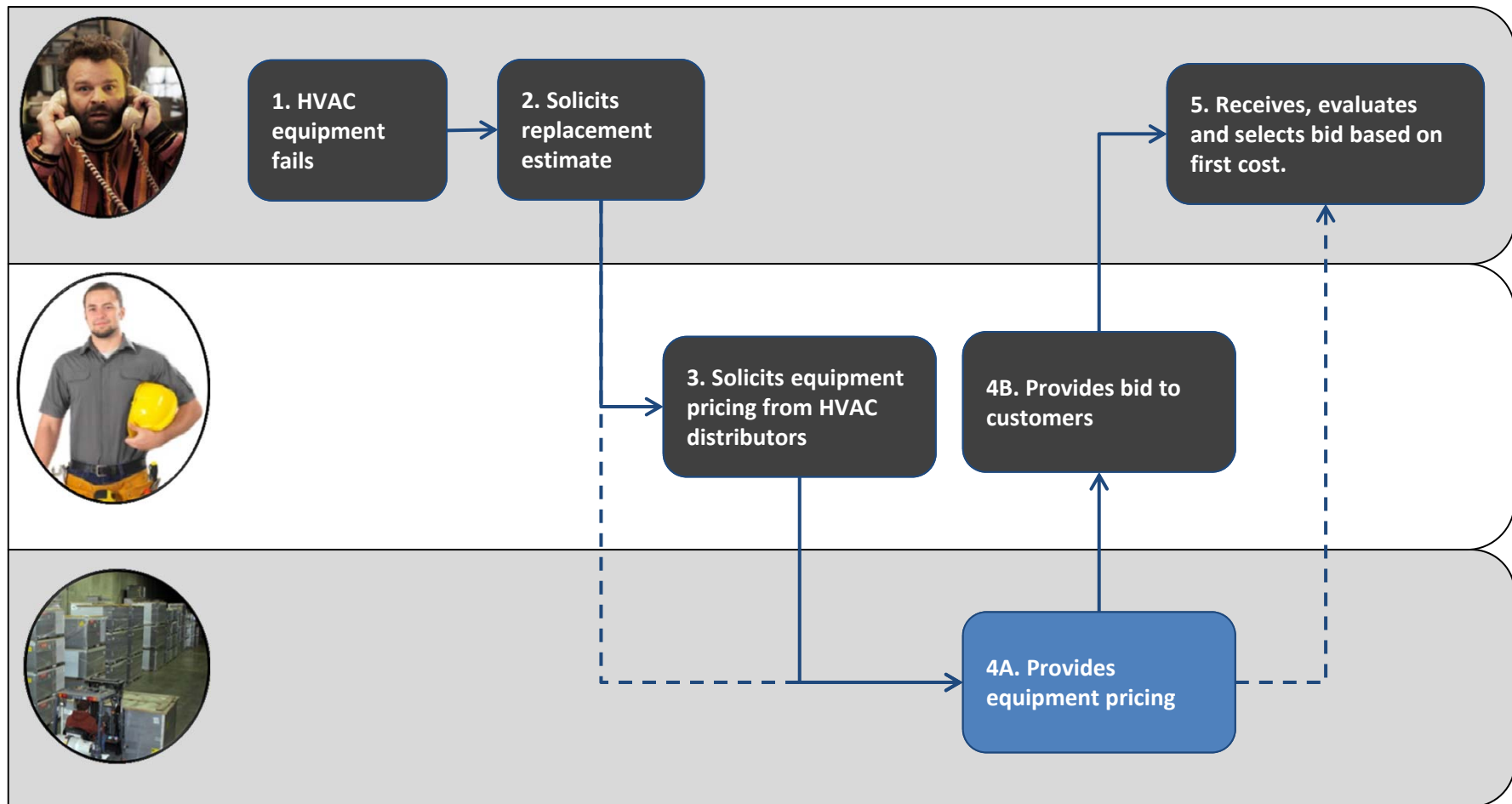
Application Process

The software and application process:

<https://energy-solution.com/project/distributor-hvac-program/>



Typical HVAC Sales Process



Where's the Utility?