

OPPORTUNITIES AND CHALLENGES OF MULTIFAMILY RETROFITS FOR UTILITY DSM PROGRAMS

2013 Rocky Mountain Utility Exchange

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Energy Outreach Colorado

We are a private, non-profit dedicated to helping make energy affordable for all Coloradans:

- Utility Bill Payment Assistance
- Advocacy
- Energy Efficiency Programs



Energy Outreach Colorado

Helping all Coloradans afford home energy.

www.EnergyOutreach.org

Learning Objectives

- Colorado Multifamily Utility Low Income Program Overview
- The Deep Retrofit Opportunity
- Multifamily Utility Program Strengths
- Lessons Learned & Program Weaknesses
- Results!-Predicted vs. Actual
- Results!-Cost Effectiveness

Utility Multifamily Program

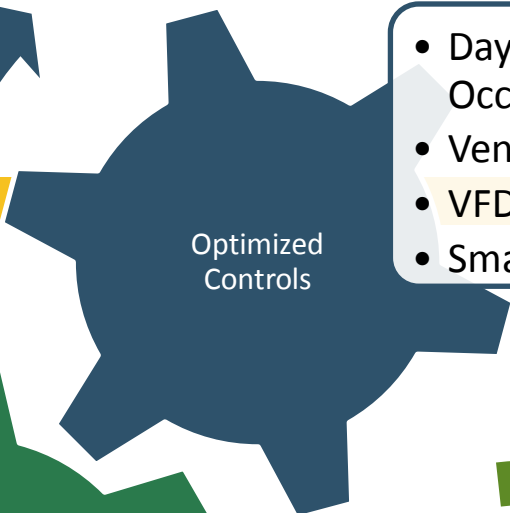
- Since 2009, 95 MF projects (+8000 units, 5.4 M SQFT) have been weatherized through Xcel Energy, Atmos Energy, and Source Gas
- Over \$5 M dollars have been spent on these projects, actual average savings of 24%
- Difficultly implementing projects and passing the MTRC
- Leveraging Programs is KEY-Federal, state, municipal, and utility MF programs

Program Process

- ❑ Application
- ❑ Free Onsite Energy Assessment
- ❑ Bid Documentation
- ❑ Contractor Bidding and Selection
- ❑ Reviewed through custom analysis to determine cost effectiveness, rebate levels, and attributable deemed savings
- ❑ Implementation-QA Inspection

Opportunities with MF Utility Programs

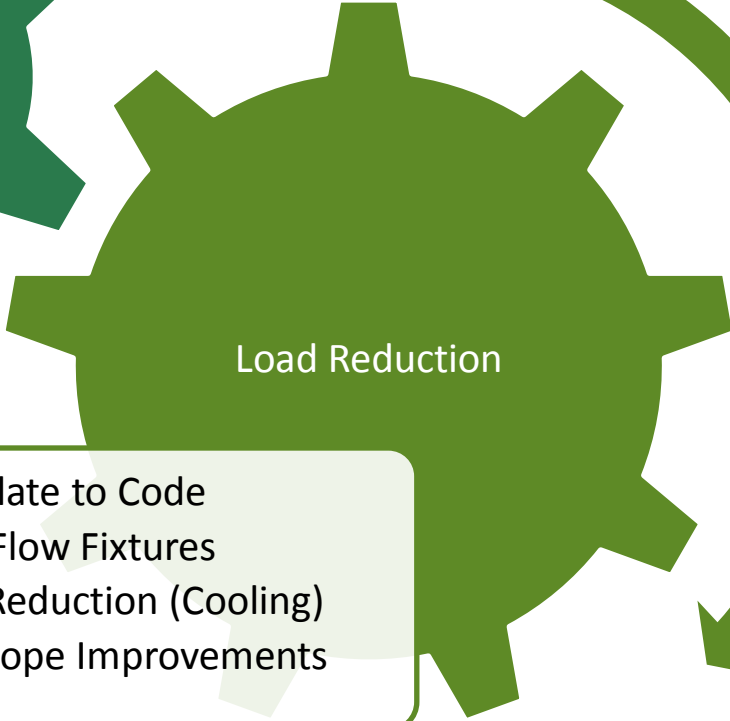
- Utility programs across the country have established MF programs (not just cost effective in NY and CA)
- Many customers already know what measures to target and can contribute leveraged funding
- High Energy Use for MF Bldgs with Central Cooling
- Low cost measures=significant savings opportunities
- Significant NG Savings with oversized, outdated, limited control systems



- Daylight and Occupancy
- Ventilation Setback
- VFDs
- Smart Thermostats



- Central Plant Heating and Cooling
- Domestic Hot Water
- MAUs



- Ventilate to Code
- Low Flow Fixtures
- LPD Reduction (Cooling)
- Envelope Improvements

Deep Retrofit Opportunities

Proven EEMs for MF in CO

- Boiler Opt/Replace
- DHW Improve/Replace
- Ventilation Improvement
- Insulation/Air Sealing
- Refrigerators
- Low Flow Plumbing Fixtures
- Lighting & Controls

Predicted % of Savings

- Boiler/DHW-34%
- Insulation-18%
- LF Fixtures-17%
- Refrigerators-14%
- Lighting-12%
- Ventilation-5%

Lighting Redesign

LPD

0.6 W/SF
In-unit

0.5 W/SF in Corridors

0.7–1.0 W/SF in
Common Areas

Adequate Light Levels

No Glare and Uniform
Light Distribution

10-15 fc for <65
20-30 fc for >65

Control

Occupancy Sensors for
Connected Loads of 150
Watts+

Two Stage Corridor and
Stairwell Lighting

Astronomical Time
Clocks/
Photocells/Multi-Level
Control









Heating System Considerations

Central Heating



- Is Condensing Appropriate?
- Modular Plan Design
- 10:1 Plant Turn Down
- Separate Out DHW or DHW prioritization
- Piped Right? Insulated?
- Right Sized!
- OA Lockout and Rest Working
- Zone Valves Functioning?

Unit Heating



- Condensing Furnace
- Two Stage, EC Motor
- Energy Star DHW
- Long Paybacks
- No Simultaneous Heating & Cooling

LO#
72745

COLORADO BREED INSPECTION SECTION SIC 1100000	
INSPECTOR	<i>[Signature]</i>
DATE	<i>[Date]</i>
CLASS	<i>[Class]</i>
MODEL	<i>[Model]</i>
NO.	<i>[No.]</i>
TYPE	<i>[Type]</i>



Measure Status

Measures with Control Variables

- Hydronic Boiler
- Indirect DHW Temps
- MAUs
- Low Flow Plumbing Fixtures
- Lighting & Controls

Installation Inconsistencies

- All Set Points Changed
- 30% Tank Temp Increased
- 20% VFDs disabled
- 40% LF Fixtures Removed
- 30% CFLs removed

Differed Maintenance



- ❑ Heat Exchanger from job completed in 2008 that had not received maintenance in FOUR years
- ❑ Lack of knowledge and resources created this situation, buildings canceled preventative maintenance one year after project completion
- ❑ Originally 96% Efficient Lochinvar tested at 65% efficient in this condition

- ❑ Disconnected flue spilling combustion products out into mechanical room
- ❑ Consequences of a deferring maintenance-loss in efficiency and worker/tenant safety!
- ❑ Program Consideration-Require building owners to sign contract for annual maintenance for 5 years?



Program Strengths

- Prescriptive or Custom Program
- Bid specs define submittal requirements
- HVAC measures account for the majority of savings and have greatest potential for poor design that leads to missed savings goals
- Require piping diagrams/schematics, sizing calculations, code compliance, performance requirements, and transparent pricing breakouts

Program Strengths

- Participant Benefits: Reduced Turnover, Utility Savings, H&S Concerns, Reduced O&M Cost
- ECM bundle evaluated through a custom deemed savings calculator
 - Enables utility reviewers to understand the scope without developing an audit narrative
 - Easily eliminate non-cost effective measures from package
 - Drives Customer Participation with faster custom rebate level determinations

Program Weaknesses

- ❑ Must engage with decision maker
- ❑ Split Incentive to pass on cost to residents
- ❑ Bid Specifications need strong focus on constructability (venting, wiring, electrical circuit configuration, warranty issues, etc.)
- ❑ Limited Commissioning: Not installed to spec or approved design
- ❑ Contractor Community Expertise
- ❑ Unfamiliar = expensive

Program Weaknesses

- EE not a priority for MF building owners (Aesthetics, Investors, HUD Inspections, etc.)
- Complex hybrid boiler plant designs or MAU retrofits lead to problems
- Poor Maintenance leads to low persistence in energy savings
- Cannot Predict Utility Rebate Contribution

How to Measure the Impact of the Program

- **Collect Utility Waivers**
- **Energy Management Software-EnergyCAP**
- **Compare Predicted vs. Actual on a Quarterly Basis and Generate Energy Score Cards**
- **Projects can be monitored for monthly spikes**
 - Unexpected monthly spikes identified, action taken
 - Is the spike easily explained (increased hours) or requires further investigation (billing error, faulty equip) = \$\$ Savings

Actual CO MF Savings Results!

MF Project	Location	Utility Program	Sqft	Units	Retrofit Cost	Rebate	KWH Savings	Dth Savings	Predicted Cost Savings	Annual Cost Savings
Birchwood Manor	Greeley	Xcel/Atmos	123840	162	\$ 324,567	\$54,988	50,264	2423	34%	22%
Corona Residence	Denver	Xcel/Xcel	32439	54	\$ 171,399	\$13,244	34,247	745	42%	25%
Maltese Cross Manor	Denver	Xcel/Xcel	132129	158	\$ 843,677	\$65,891	202,990	2825	46%	34%
Mountain View	Denver	Xcel/Xcel	93352	154	\$ 540,838	\$27,095	197,200	2810	37%	42%
College Overlook	La Junta	LaJunta/Source	15168	24	\$ 158,068	\$3,400	12,669	491	45%	50%
Casa Loma	Denver	Xcel/Sem	59885	84	\$ 359,282	\$20,163	268,997	2495	36%	41%
Cathedral Plaza	Denver	Xcel/Sem	111841	154	\$ 361,151	\$24,396	144,219	829	28%	15%
Higgins Plaza	Denver	Xcel/Xcel	45360	90	\$ 620,156	\$21,122	219,297	1438	38%	40%
Villa de Santa Lucia	Silverthorne	Xcel/Xcel	51245	60	\$ 167,000	\$161,393	68,912	277	35%	44%
Manor 1 & 2	Glenwood Sprgs	City of GS/Source Gas	53433	106	\$ 264,671	\$48,765	18,295	924	44%	15%
Totals					\$ 3,810,809	\$440,457	1,217,090	15,257		

Data Breakdown

- Electric: \$0.14/KWH
- Natural Gas: \$17.40/Dth
- 2013 Xcel MFW Program Goals
 - ▣ Electric: \$0.21/KWH
 - ▣ Natural Gas: \$50.23/Dth
 - ▣ Average Project MTRC=1.2
- How? Leverage funding from other efficiency programs offered by the feds, state, municipal, and private funds

Questions

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Thanks!