Weatherization and Renewable Energy: The Colorado Experience

Joseph M. Pereira
Director of Low-Income Energy Services

September 29, 2016

@pereira1_j

COLORADO
Energy Office

The Colorado Energy Office

MISSION STATEMENT

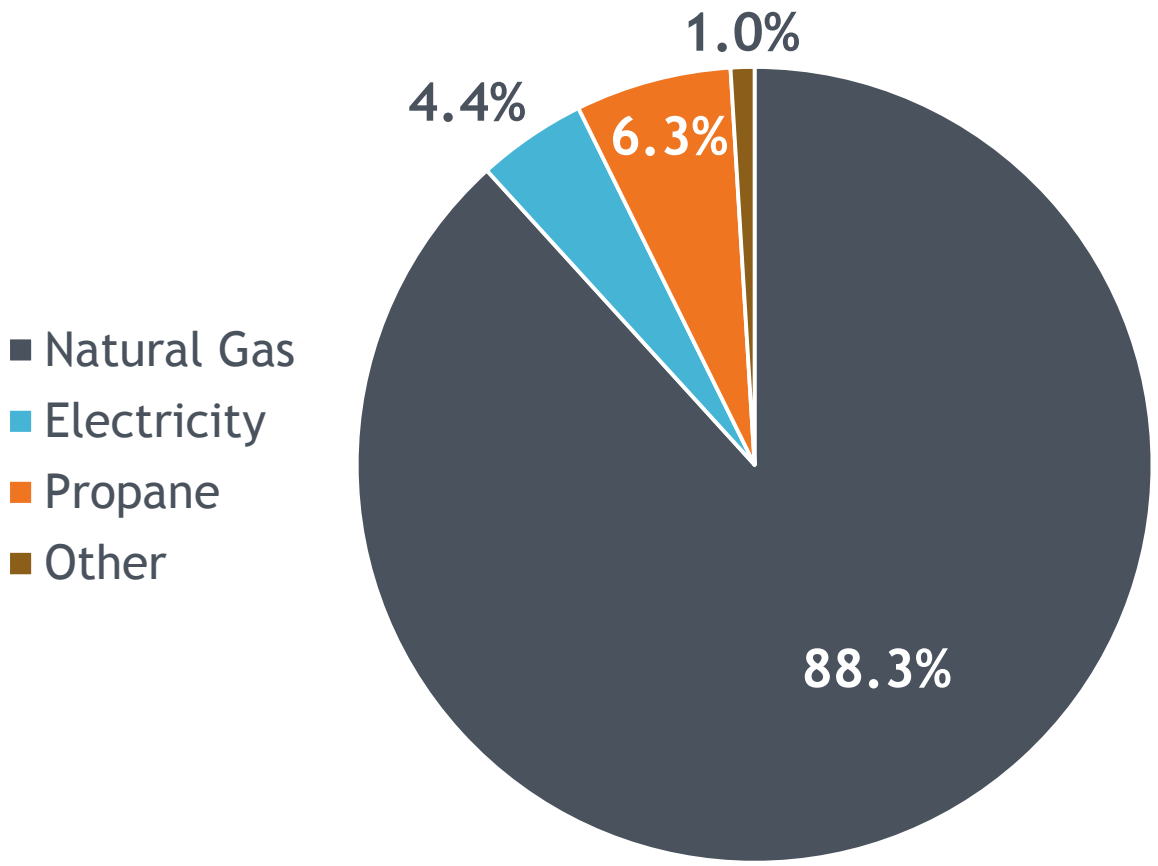
The CEO's mission is to improve the effective use of all of Colorado's energy resources and the efficient consumption of energy in all economic sectors, through providing technical guidance, financial support, policy advocacy and public communications.

DEPARTMENT VISION

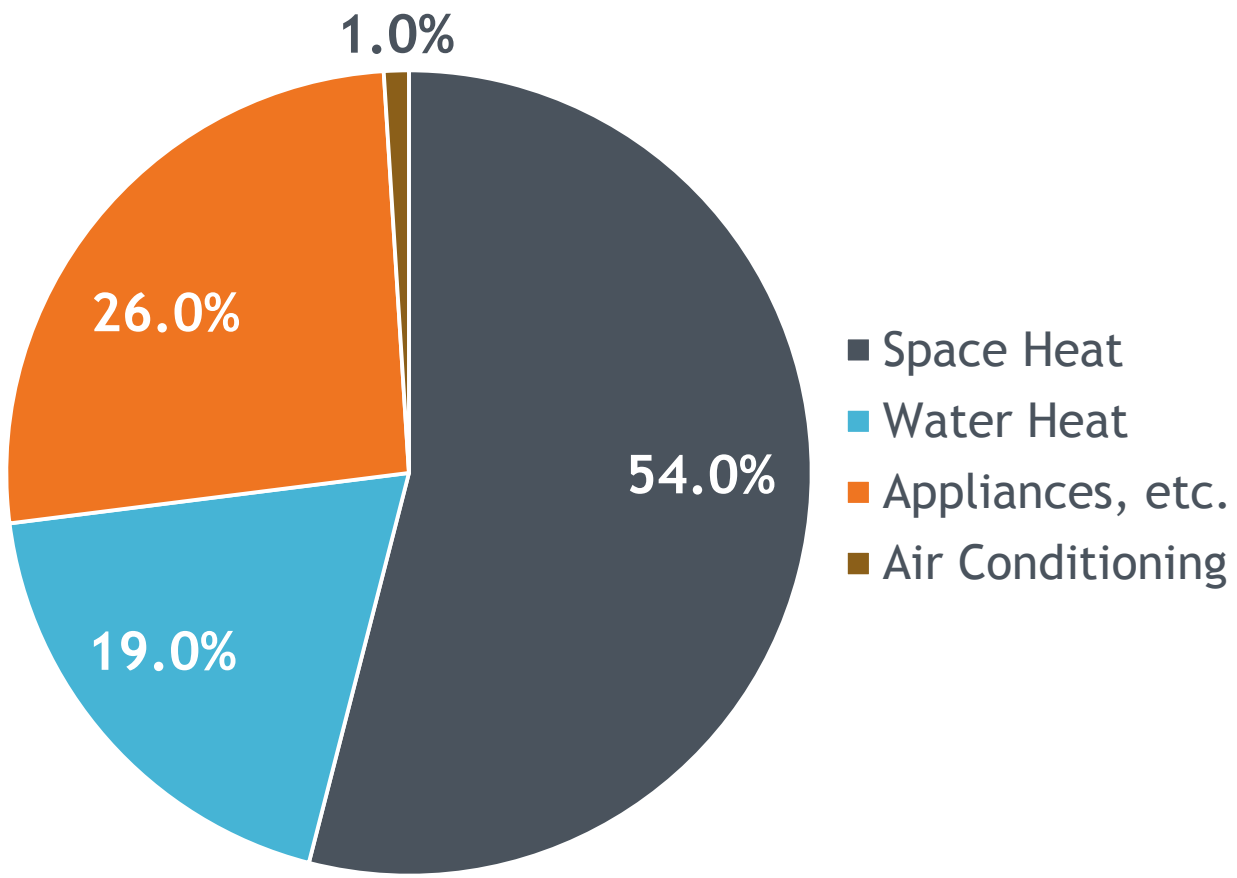
The CEO's vision is to help Coloradans live more prosperous and healthy lives by promoting innovative energy production and efficient energy consumption practices that are beneficial to the economic and environmental health of the state.

Household Fuel Usage in Colorado

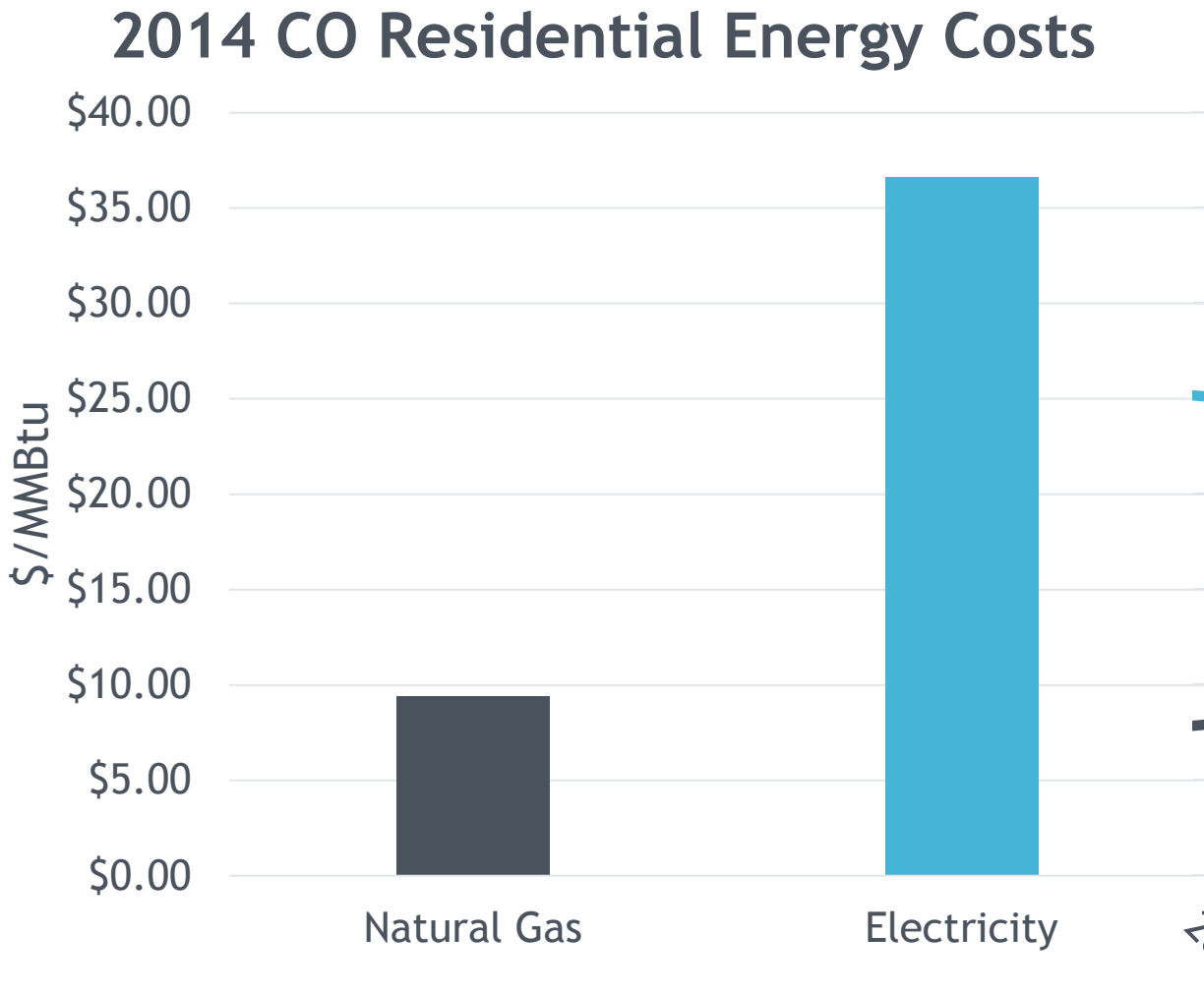
CO Residential Heating Fuel Usage

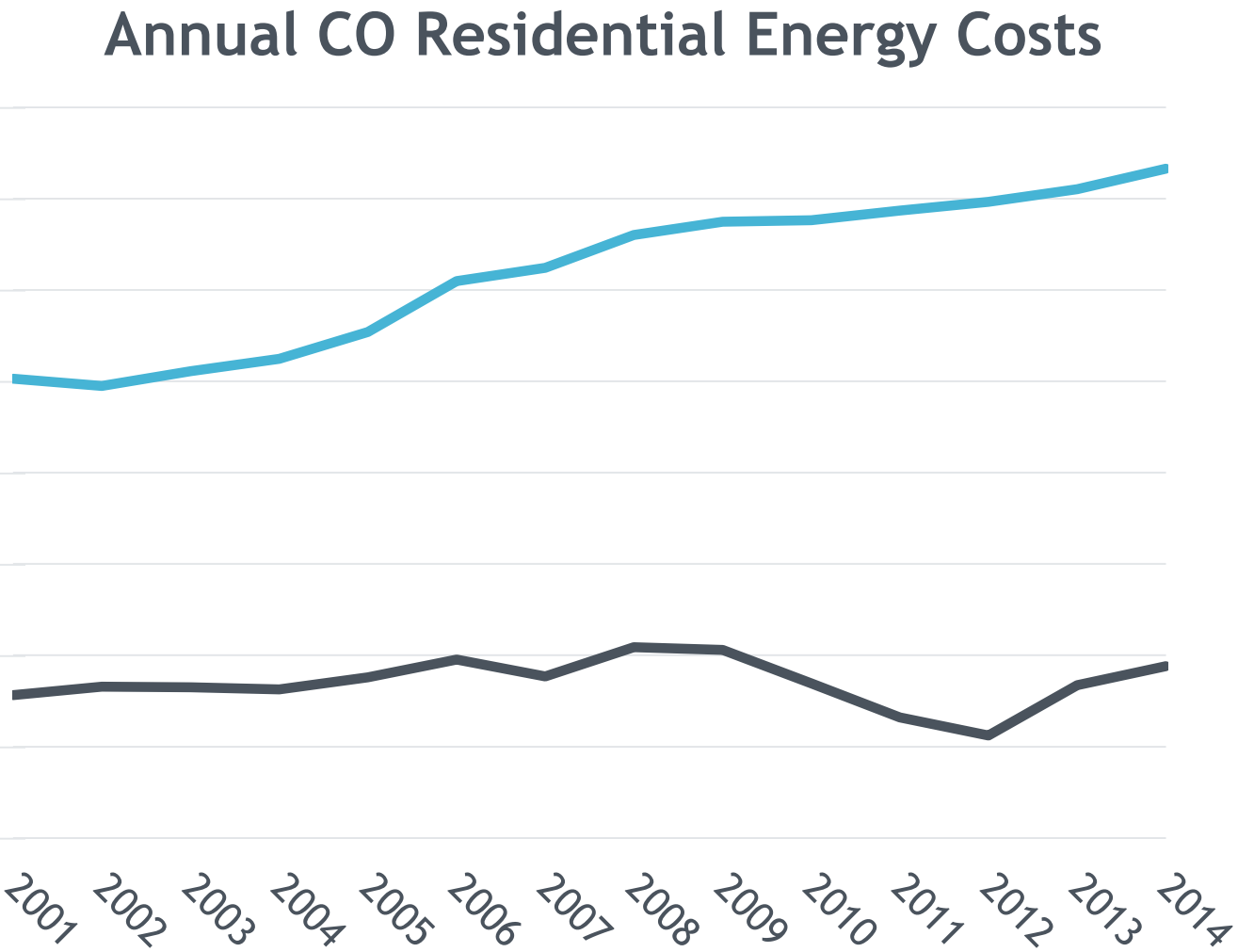


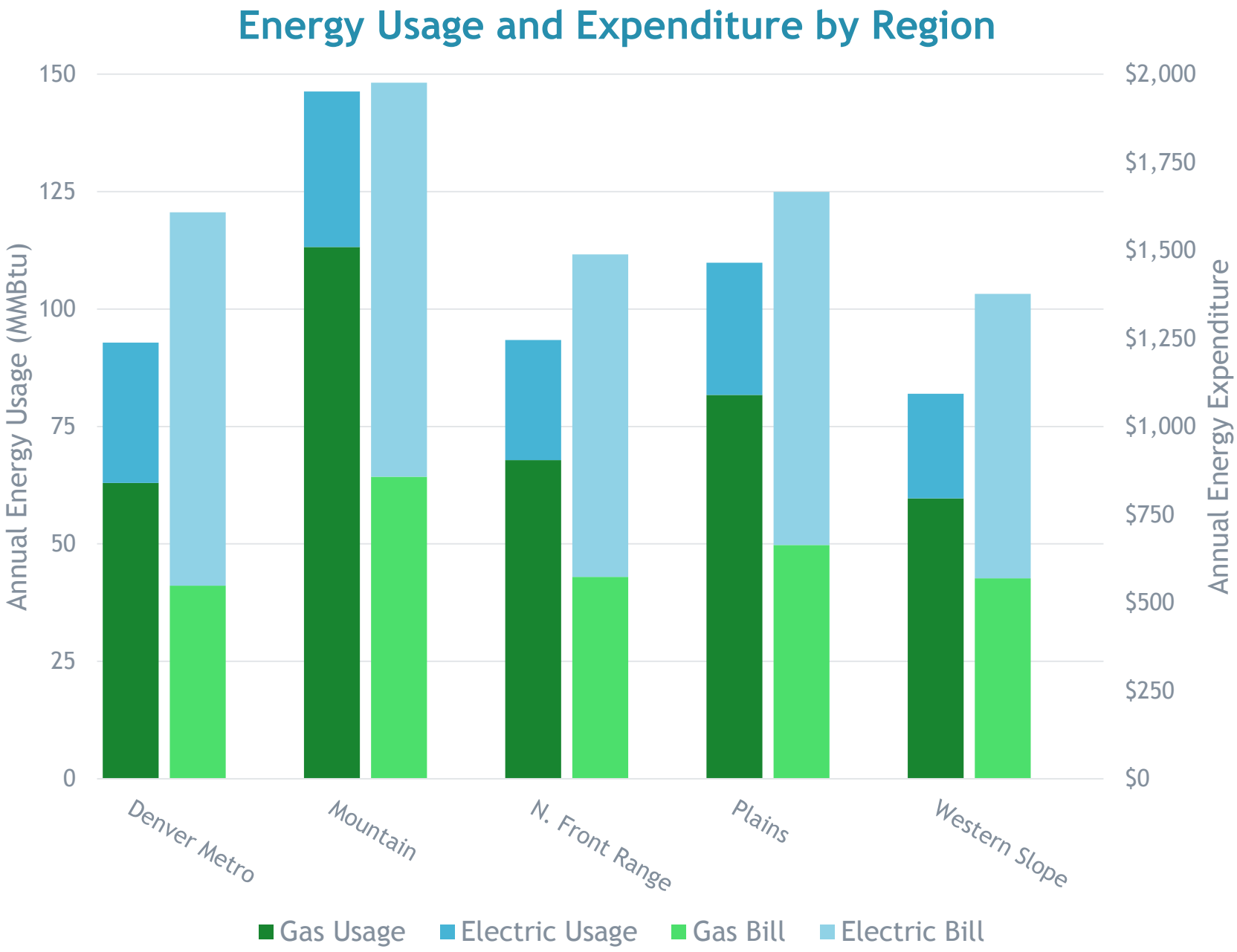
CO Residential Energy by End Use



Gas and Electricity Costs in Colorado

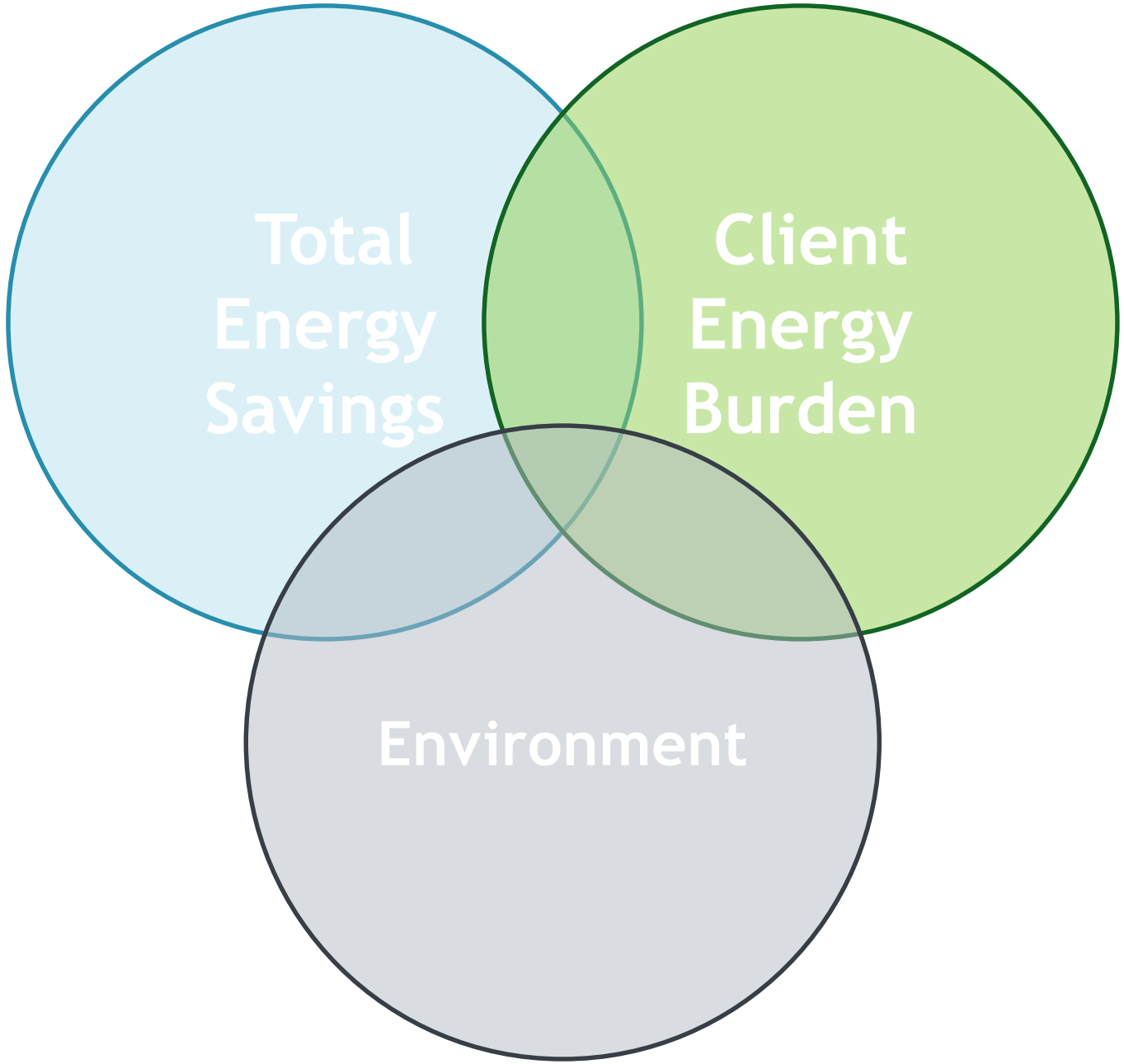






Energy Usage

- Denver Metro, N. Front Range, and Plains have similar energy usage
- Mountain has higher energy usage
- Western Slope has lower energy usage
- Gas makes up more than 70% of usage, but accounts for less than 40% of expenditure
- Gas is relatively inexpensive compared to electricity (and vice-versa)



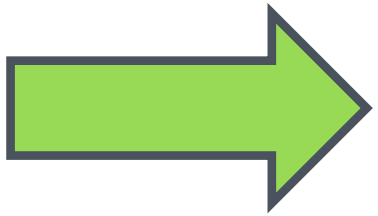
Weatherization Considerations

- Energy Savings vs. Energy Burden
- Energy value
- Electricity vs. Natural Gas
- Targeting electric loads
- Targeting seasonal loads
- Solar PV
- Environment

Goal: Reduce Energy Burden

$$\text{Energy Burden} = \frac{\text{Annual Energy Expenditure}}{\text{Annual Income}}$$

Reduction in Annual Energy Expenditure

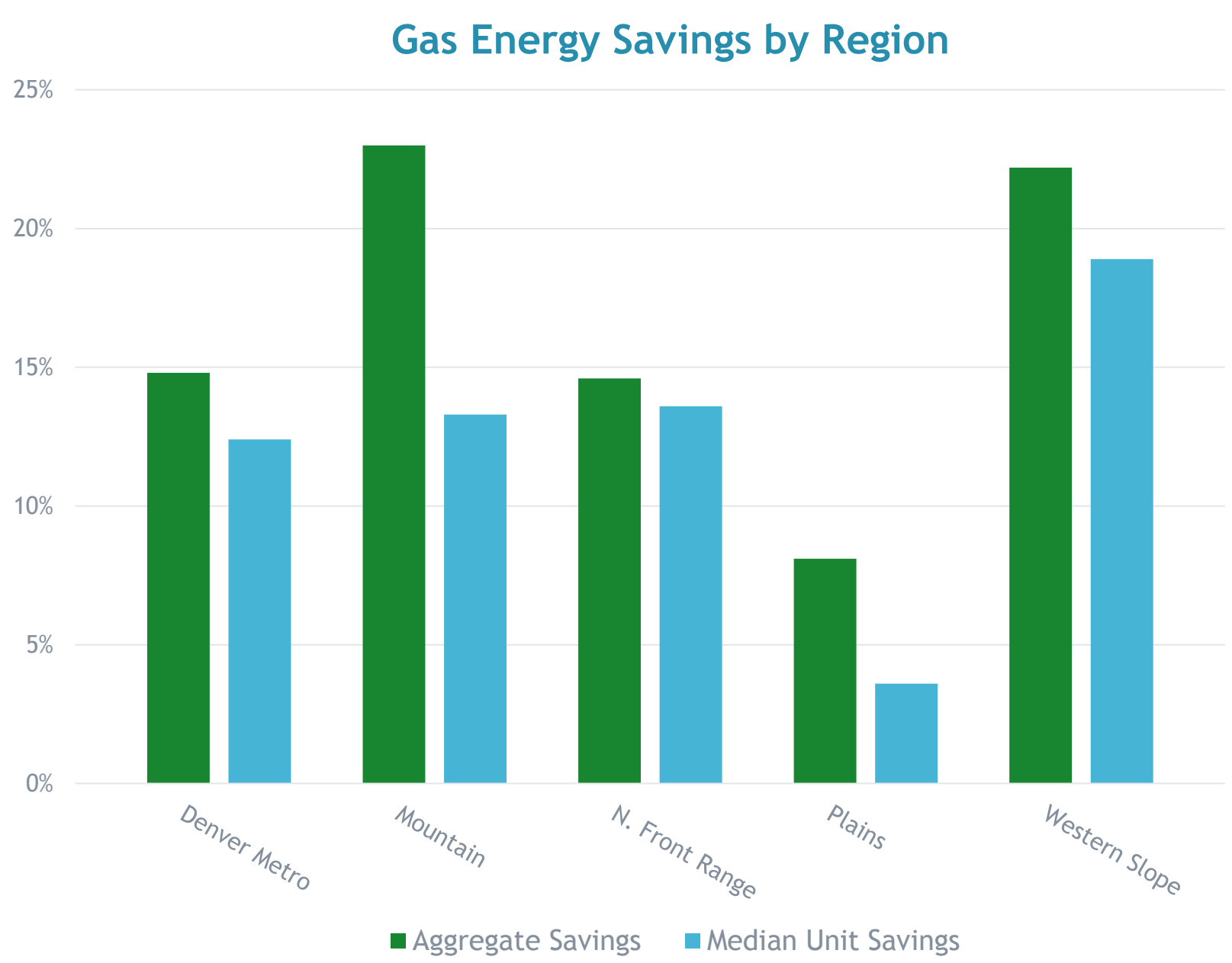


Reduction in Energy Burden

Maximize energy cost savings for EACH client

CEO Wx Home Heating

- Weatherization is the building block program to address client cost savings.
- Wx has been highly effective in addressing cost savings related to home heating. However, most of the potential savings have been realized.
- Adjustments made in Wx take what we are already doing well and improve it by percentage points.
- Largest gains Wx can make on a “Macro” level are in the homes Wx installs in, not what Wx installs.



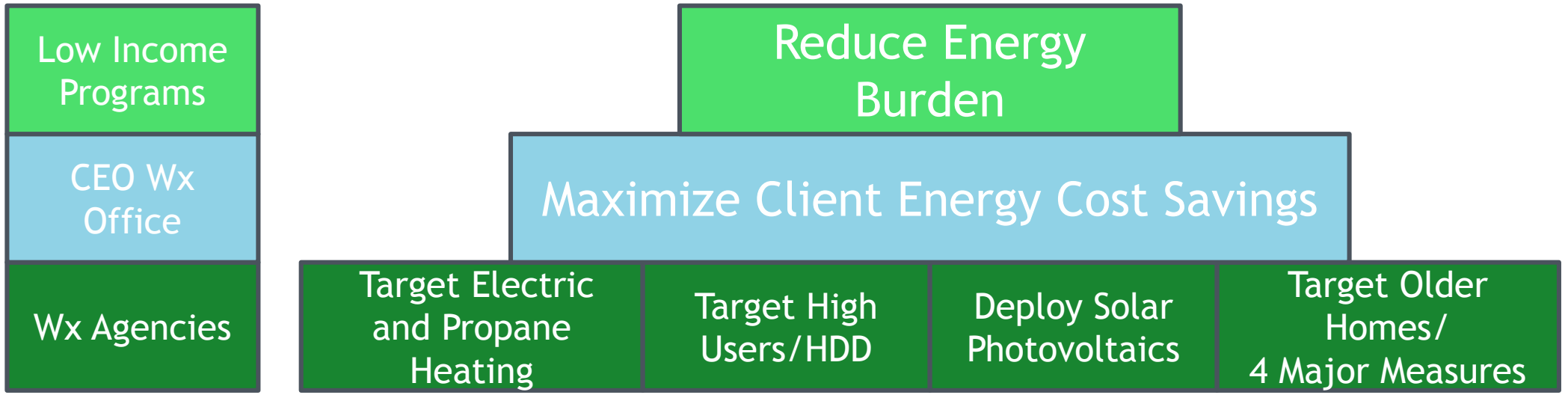
Gas Energy Savings

- Savings calculated by comparing energy usage to Heating-Degree Days
- Aggregate energy savings across the state is about 15%
- Median energy savings across the state is about 12%
- Still looking into electricity savings

Major Measure Installation Rate by Region

	0MM	1MM	2MM	3MM	4MM
1-NECALG	6.8%	29.5%	39.1%	21.8%	2.8%
2-Pueblo	8.3%	24.6%	43.4%	23.2%	0.5%
4-HRWC	2.7%	34.0%	43.8%	17.5%	2.0%
5-NWCCOG	4.6%	18.5%	49.0%	25.0%	2.9%
6-LPEC	1.6%	27.6%	44.8%	21.1%	4.9%
7-Arapahoe	0.6%	24.3%	52.5%	22.5%	0.0%
8-ERC	1.1%	17.7%	34.3%	33.3%	13.7%

Multi-Tier Client Savings Approach



How Are Client Cost Savings Better Delivered?

- Through effective data gathering and analysis.
- Through effective problem diagnosis.
- Focusing on a common approach.
- Maximizing already existing delivery approaches (Install 4MM)
- Holistic approaches to the problem.
- Summing the programmatic parts.

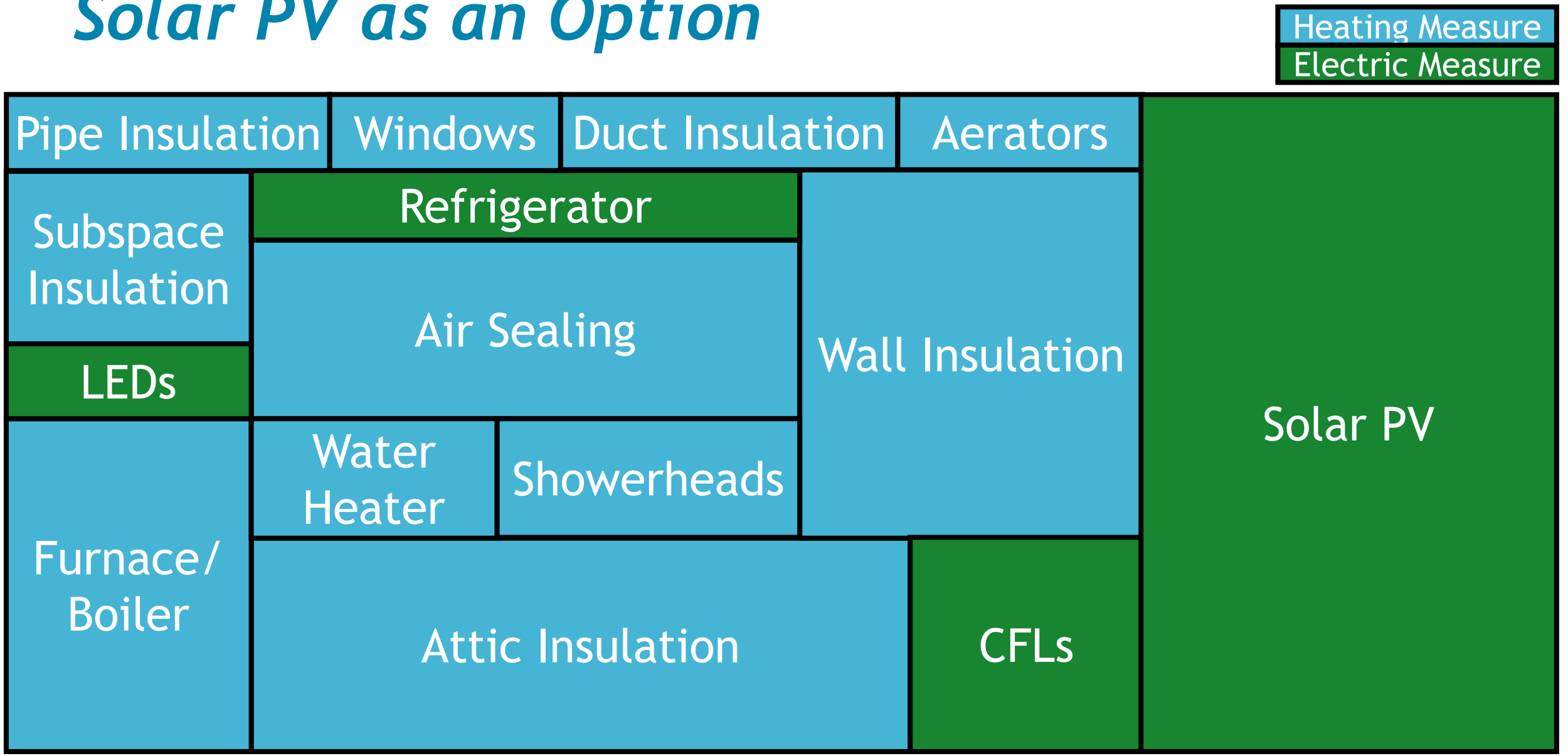
CEO Wx Client Intake Emphasis

- Build agency capacity to effectively build and mine waitlists.
- Focus agency attention on priority categories.
    - 1. Energy Burden 2. Elderly 3. Disabled 4. Families w/ Children 5 or Under
- Enable agencies to conduct sub-category intake.
    - Energy Burden- Electric/ Propane Heating, High Energy Users, Older Homes/ Major Measures, PV Potential
- Assist in building capacity to shift approaches/ priorities.

CEO Wx Electric

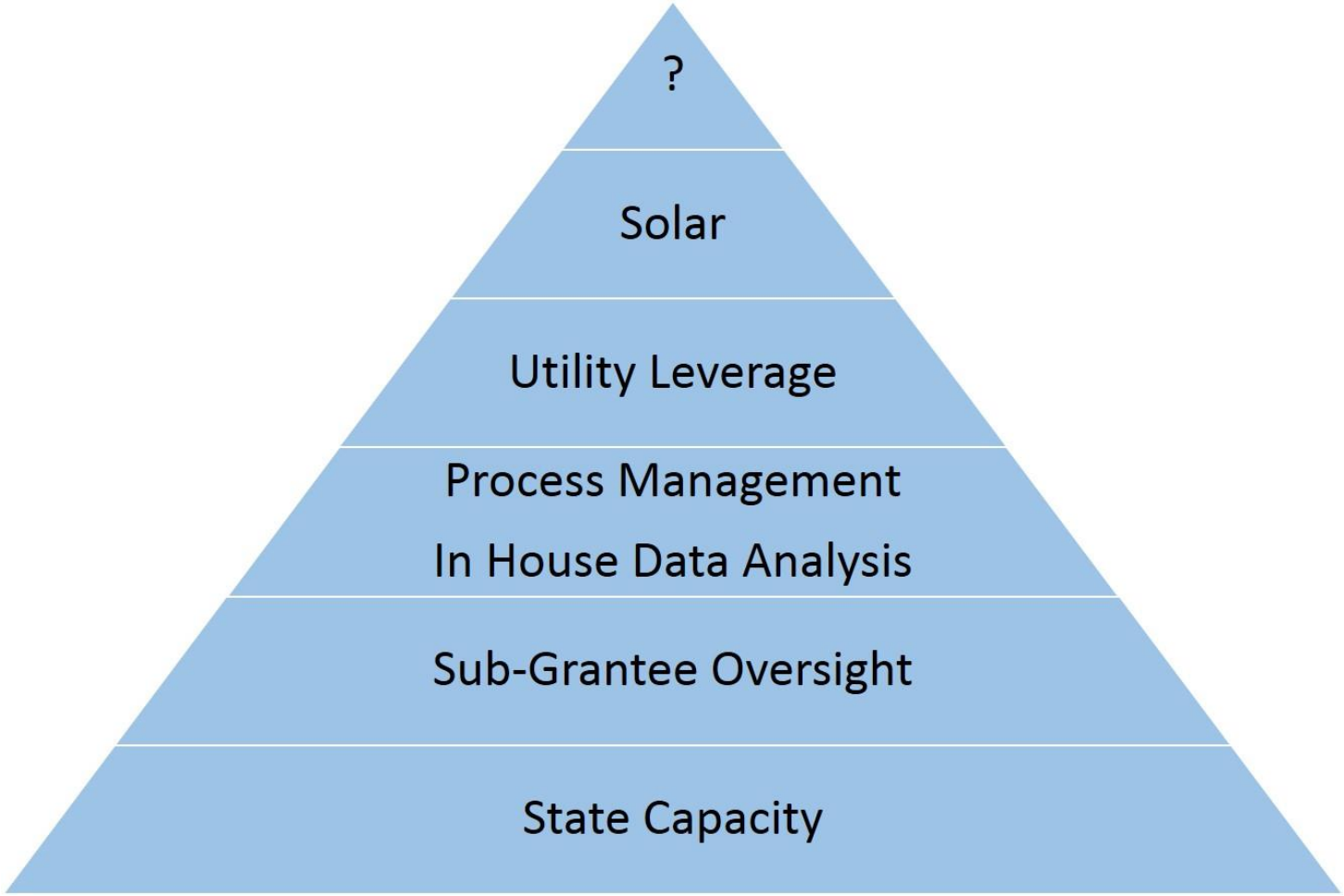
- Based on the limited additional cost savings gains related to home heating, CEO has begun exploring ways to deliver client savings through generation.
    - Community Solar, Rooftop etc…
- Coupling generation to already weatherized homes has the potential to more than double energy cost savings for that household.
- Both community solar and rooftop PV show promise in delivering these savings.
- Solar cannot be looked at separately than any other measure the program delivers (Energy Burden Lens).

Solar PV as an Option



Are We Ready for Rooftop PV?

Jiacoletti's Hierarchy of Wx Needs



Applying to DOE for PV Inclusion

System for Identifying and Reviewing Technologies and Techniques (SIRTT)

- Description of the product, how it works, and the principals and laws of science upon which it is based
- Discussion of its energy benefits, costs and cost effectiveness
- Description of the additional site analysis that is necessary
- Its durability, reliability, maintainability and serviceability
- Its useful life and applicable warrantees
- Its availability as a reliable, consumer-friendly product
- A summary of lack of evidence of any potential detrimental health, indoor air quality, life and fire safety, and structural or cosmetic deterioration to the home
- A listing of the applicable certifying organizations and industry specifications

Applying to DOE for PV Inclusion cont…

- Example of a system's sizing, cost, savings and performance (Incorporated Into NEAT Library)
- NEPA review (Consistent w/ DOE categorical exclusions B5.16)
- Reviewed through normal DOE WAP audit channels (In accordance w/ WPN 13-5 and in compliance with CFR 440.21)

GRID ALTERNATIVES

Customer Profile: 10-May-15

Previously weatherized household

Grand Junction, Colorado; Xcel Customer

System Size and Performance

System Details		
Total Purchase Price:	$ 3,500.00	
Proposed System Size:	1.00	(kW DC)
Estimated Annual Production:	1,519	kWh
Historical Annual Usage:	7,274	
Percentage in Load Reduction	20.88%	
Electric Rate	$0.10	
Estimated Annual Savings:	$159	

Cost per Watt (DC-STC):	$3.50

Equipment:

Panels: (16) MEMC MEMC-250W

Inverters: (16) Enphase M215

Savings Analysis

Common Area Meter (A6-TOU)

YR	System Costs	Savings from Solar	Cumulative Savings
0	(3,500)		
1		159	(3,341)
2		163	(3,178)
3		167	(3,010)
4		171	(2,839)
5		176	(2,663)
6		180	(2,483)
7		185	(2,298)
8		189	(2,109)
9		194	(1,915)
10		199	(1,716)
11		204	(1,513)
12		209	(1,304)
13		214	(1,090)
14		219	(870)
15		225	(645)
20		255	567
25		288	1,938

Notes

This analysis is based on the following assumptions:

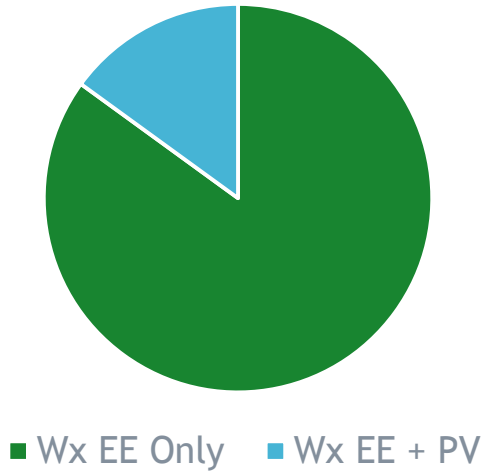
- Years Before Inverter Replacement: 25 years (See your Owner's Manual for more details)
- Labor Warranty from GRID Alternatives: 10 Years
- Panel and Inverter Warranties: 25 Years
- This analysis assumes an annual electric rate escalation of 3% per year and an annual system efficiency, degradation rate of 0.5% per year

DOE WAP Stipulations

- DOE approved, site-specific audit(s) must be executed and be used in tandem with solar site analysis to justify cost-effectiveness
- No structural improvements may be made beyond necessary and must not be ground mounted. Each system is to be net-metered and cannot exceed 5kW
- DOE Project Officer must approve each installation
- CO must comply with Section 106 of national Historic Preservation Act (NHPA)
- WAP funding will be rarely used and is subject to WAP cost limitations ($3,545) on renewable energy measures
- Approval does not constitute approval of State's H&S Plan or materials listed for purpose of allowable expenditures

What Will the Addition of Rooftop PV Look Like?

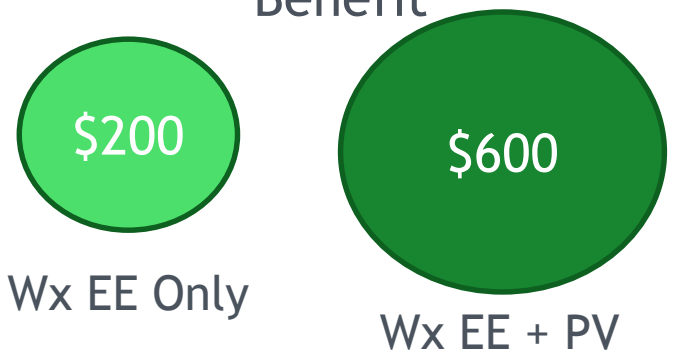
10-20% of Units Receive Rooftop PV



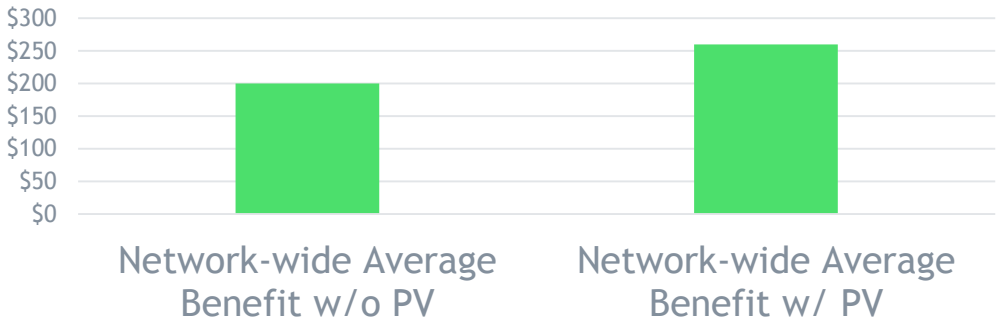
3.5 kW

Average Size

Typical Unit Annual Benefit



Network-wide Average Annual Benefit



CEO Wx Next Steps

- Develop sub-grantee capacity for installation rollout
- Develop and secure leveraging opportunities
- Data collection and analysis
- Policy and procedure adjustment
- Full program integration

State of Colorado
John W. Hickenlooper, Governor
1580 Logan Street, Suite OL1
Denver, Colorado 80203

The Colorado Energy Office

@coenergyoffice