Climate Action in Denver

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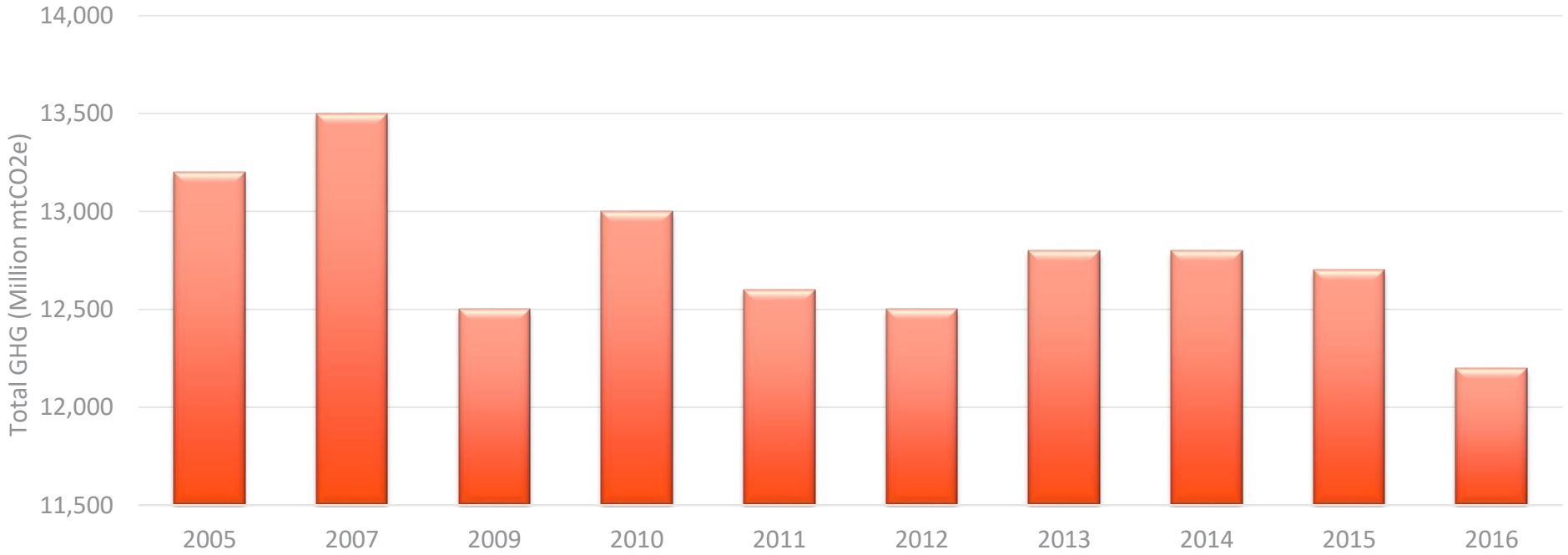
Denver's long-term climate goal: Reduce GHG emissions 80% by 2050 from 2005 baseline

80x50 is not just about our emissions on January 1st 2050.

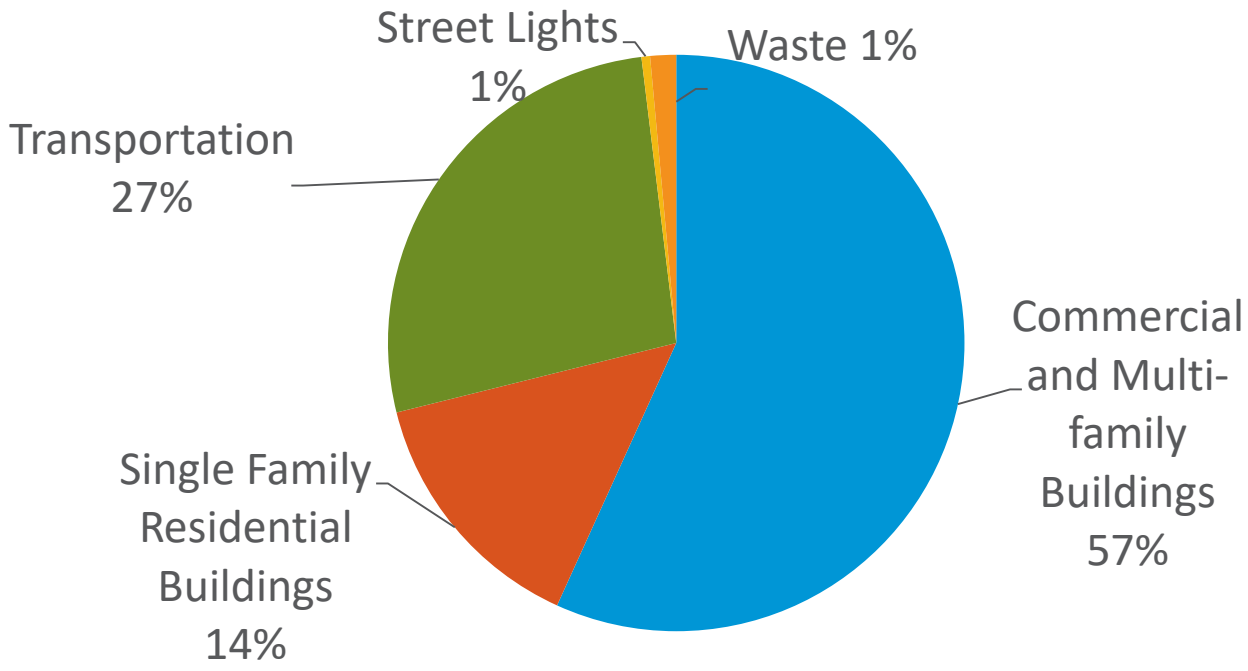
80x50 is, most importantly, about near term actions to put us on the path to 2050.

	GHG Reduction (2005 Baseline)	Buildings	Electricity Supply	Transportation
2020	15% reduction	Commercial buildings reduce energy use 15%		200 electric vehicles in the City fleet
2025	30% reduction	Single-family homes 10% reduction in energy use	Municipal buildings 100% renewable electricity	15% of Denver vehicle registrations are electric
2030	45% reduction	Commercial buildings 30% reduction in energy use	Community 100% renewable electricity	30% of Denver vehicle registrations are electric and meet Mobility Action Plan goals
2035	55% reduction	Single-family homes 20% reduction in energy use and new buildings Net Zero Energy		
2040	65% reduction	Reduce heating emissions in residential and commercial 25% and 50%, respectively		
2050	80% reduction	Commercial buildings 50% reduction in energy use		100% of light duty vehicles are electric 75% of freight trucks will use carbon neutral fuel 100% of taxis and transportation network vehicles are electric 100% of public transportation will be carbon free

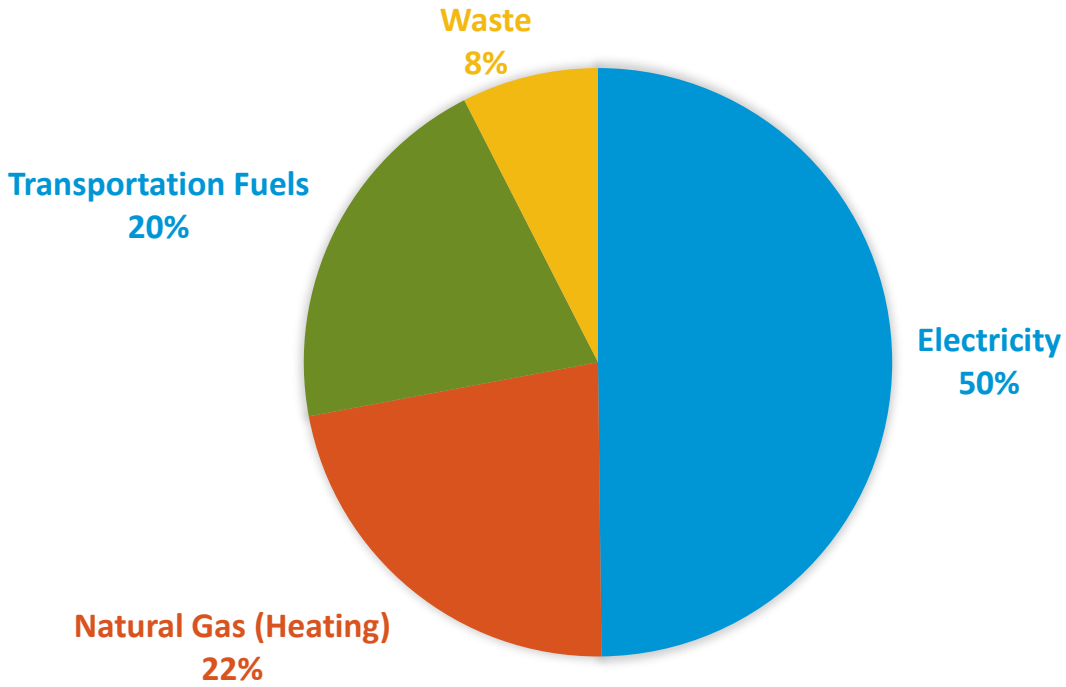
2005-2016 Total Denver Community GHG Emissions



Denver's Core GHG Emissions by Sector



Denver's Core GHG Emissions by Fuel 2016

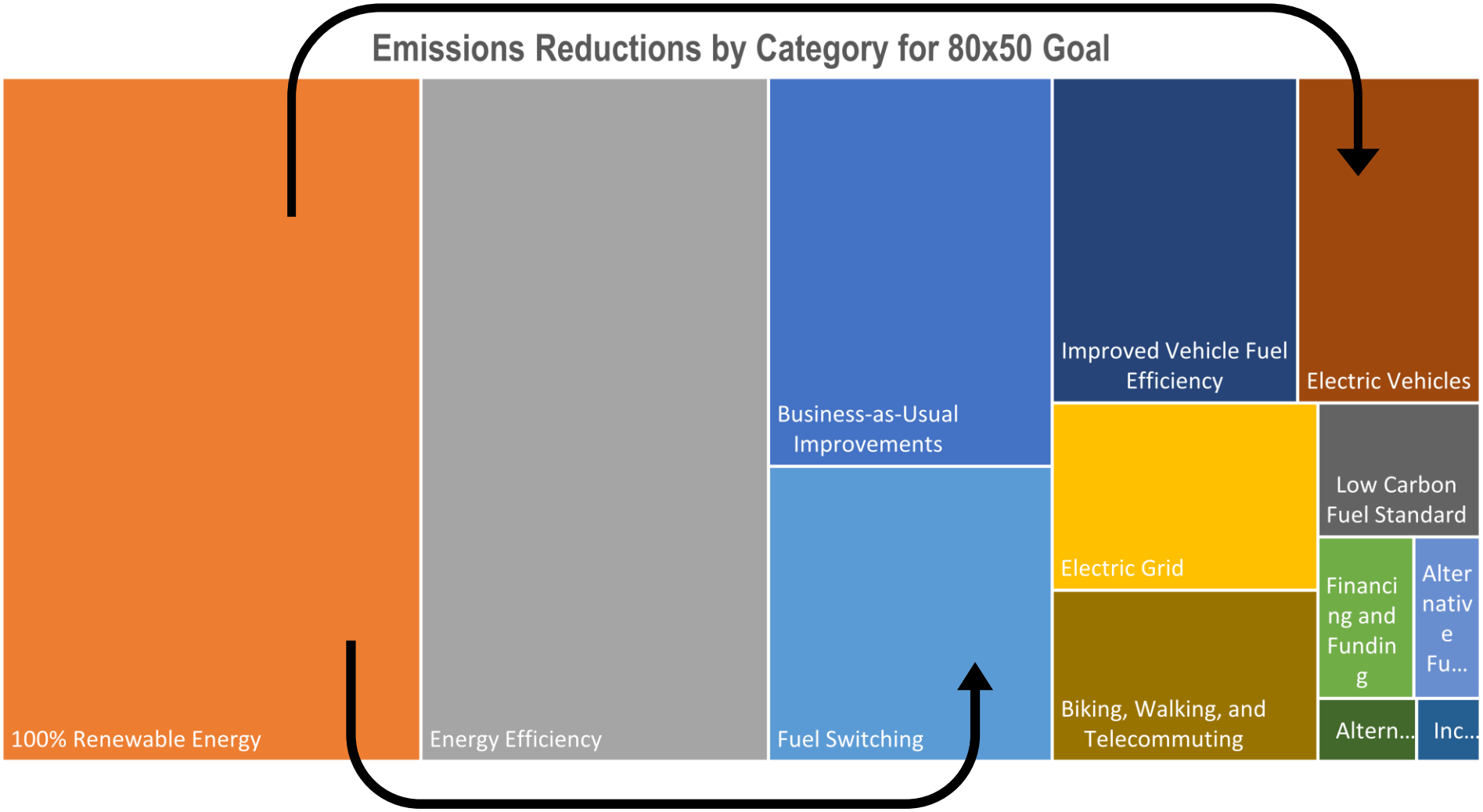


Focus on high impact strategies

optimizing energy efficiency in buildings

decarbonizing the electricity grid

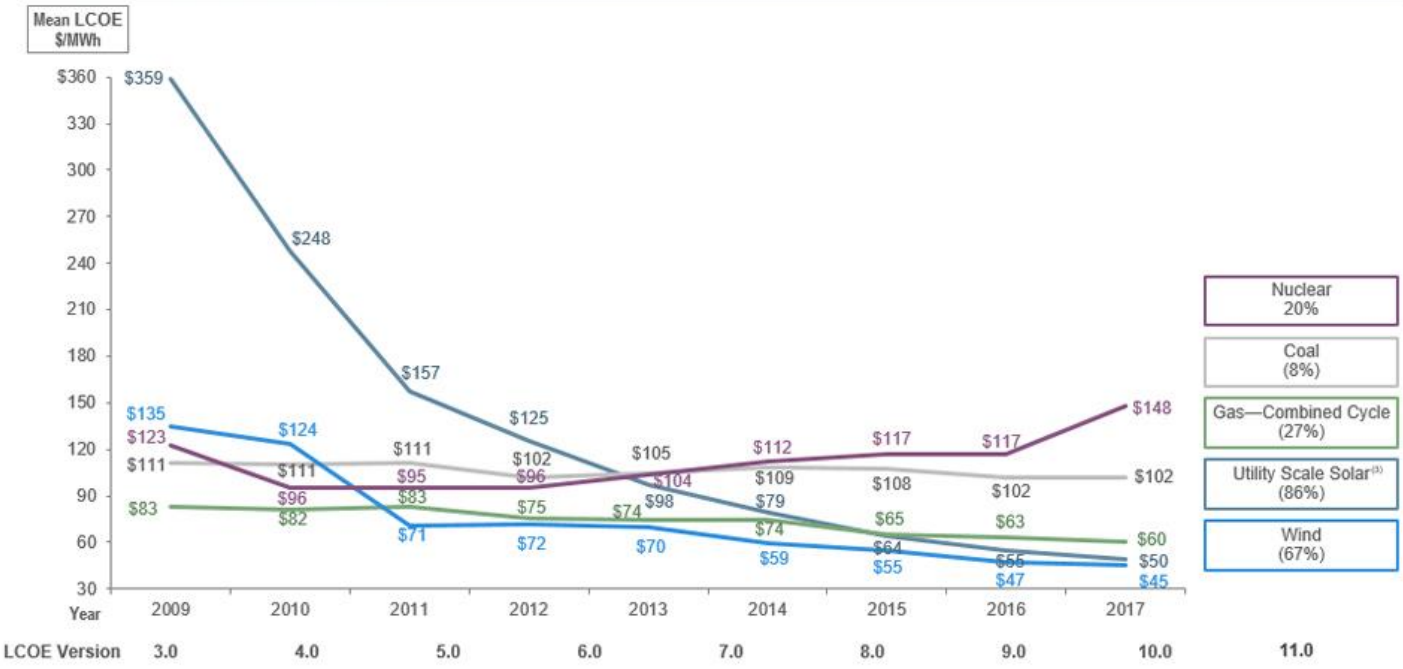
enabling next-generation mobility


Emissions Reductions by Category for 80x50 Goal
100% Renewable Energy
Energy Efficiency
Business-as-Usual Improvements
Fuel Switching
Improved Vehicle Fuel Efficiency
Electric Vehicles
Electric Grid
Low Carbon Fuel Standard
Biking, Walking, and Telecommuting
Financing and Funding
Alternative Fu...
Altern...
Inc...

Rapidly Declining Costs

Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis(1)

Selected Historical Mean LCOE Values(2)



Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.

THE DENVER POST

BUSINESS

Xcel Energy receives shockingly low bids for Colorado electricity from renewable sources

Solar and wind generation with storage now competitive with coal power

Bloomberg Markets | Markets | Tech | Pursuits | Politics | Opinion | Businessweek

A New Era of Batteries Spells Trouble for Gas in America

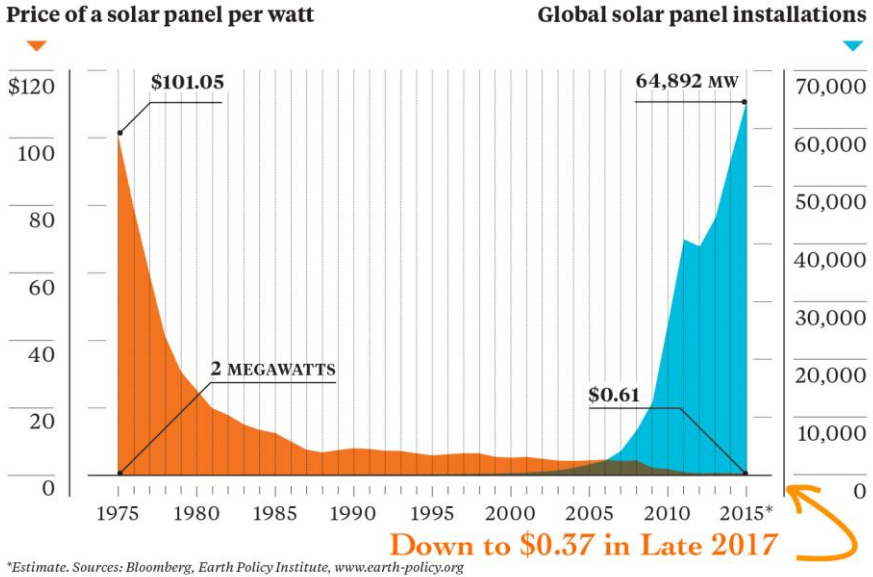
By **Mark Chediak**

January 11, 2018, 4:01 AM MST *Updated on* January 11, 2018, 12:07 PM MST

From **Climate Changed**

Solar on Fire

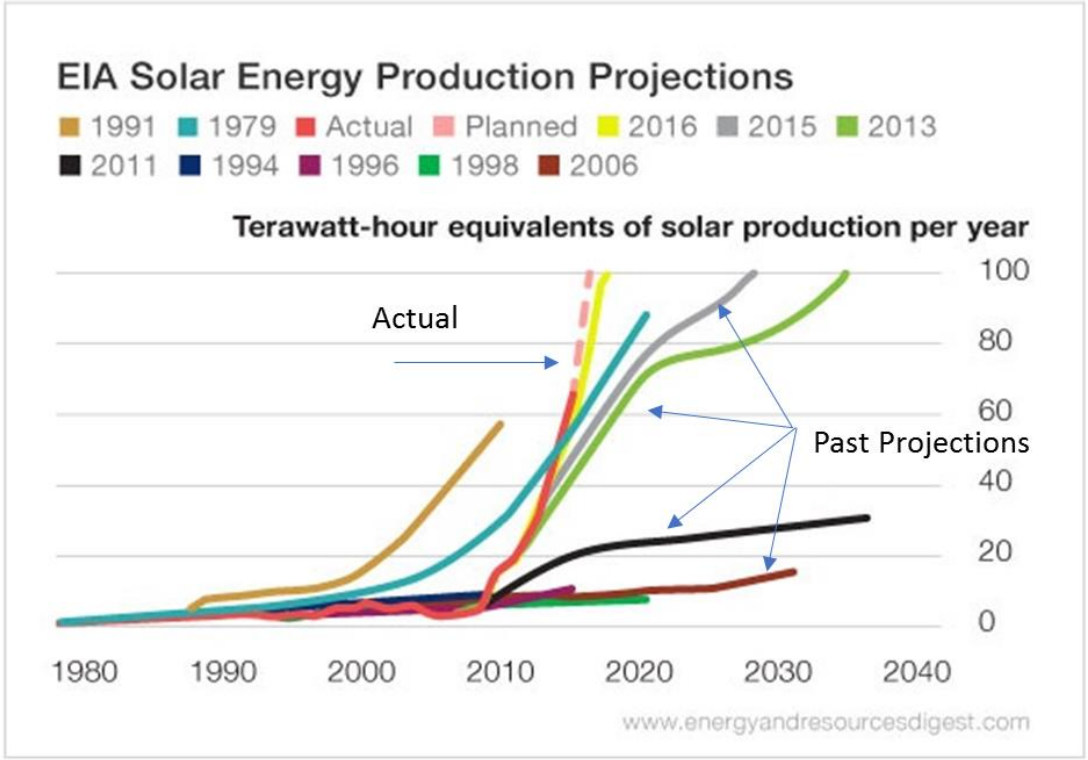
As prices have dropped, installations have skyrocketed.



Fessler's Three Laws of Technology

1. Technology marches on.
2. When it comes to technology, changes happen much faster than anyone expects they will.
3. New technology is almost always disruptive and transformative.

Exponential Growth Outperforms Projections



Innovative Energy REVIEW

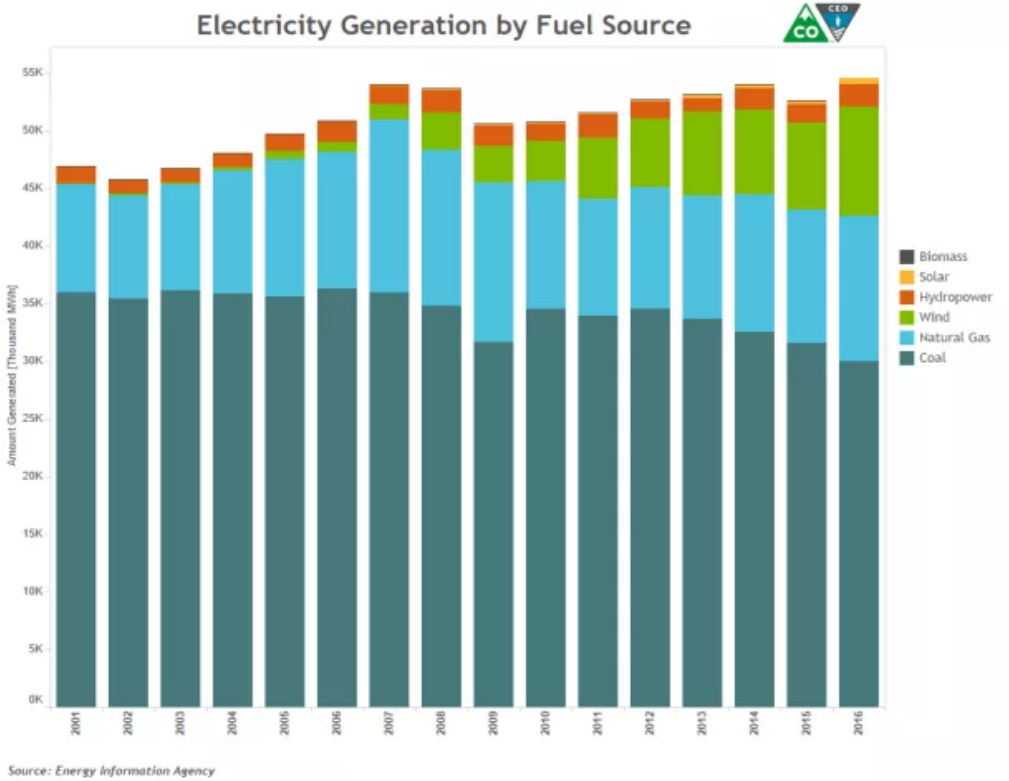
A Journal of the Colorado Cleantech Industries Association

Transforming the Energy Economy

Cleantech takes flight as renewable energy becomes the most economical option.

By Bill Radford III

Nationally and internationally, energy is becoming greener and more sustainable — and that change will only accelerate in the near future.



FEATURE

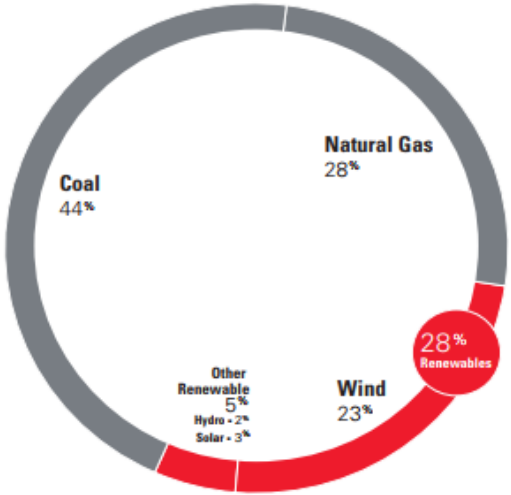
'Steel for fuel': Xcel CEO Ben Fowke on his utility's move to a renewable-centric grid

By 2021, Xcel expects wind to be its single largest energy resource — and that means big changes to grid operations. Fowke sat down with Utility Dive to discuss what the transition entails

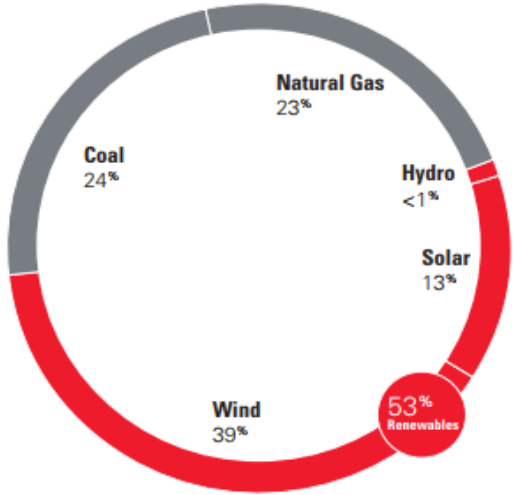
"If I were talking to you 10 years ago, I don't think I'd be telling you that I think solar is competing with fossil," said Ben Fowke, CEO of Xcel Energy. "I wouldn't tell you that wind is beating fossil. I am telling you that now."

Xcel Energy's Colorado Energy Plan

2017 Colorado Energy Mix



2026 Estimated Energy Mix
Under The Colorado Energy Plan



Community Vision and Input

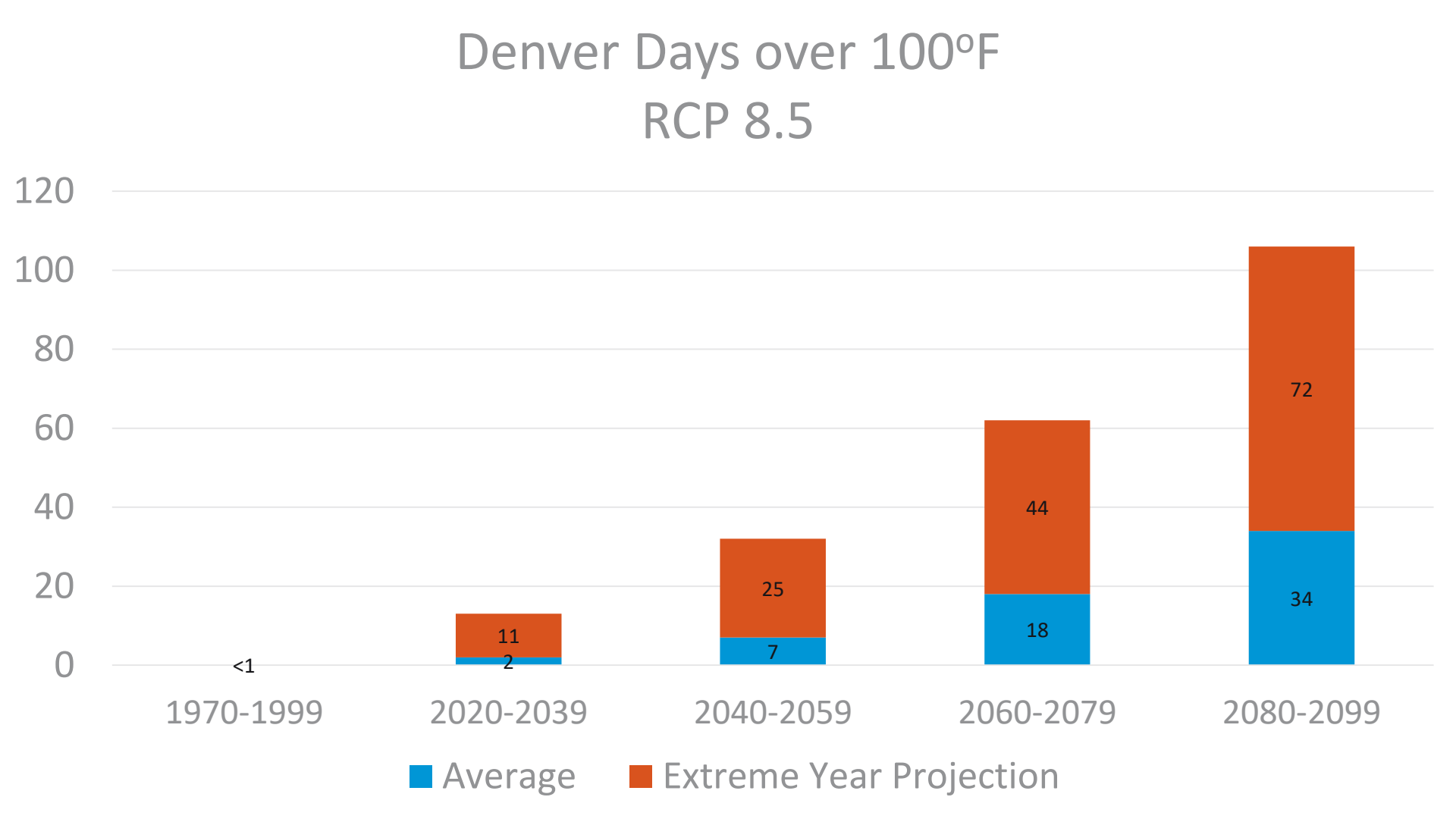
Make Denver a leader in clean and local energy that comes from the sun, wind, or other innovative renewable technologies.

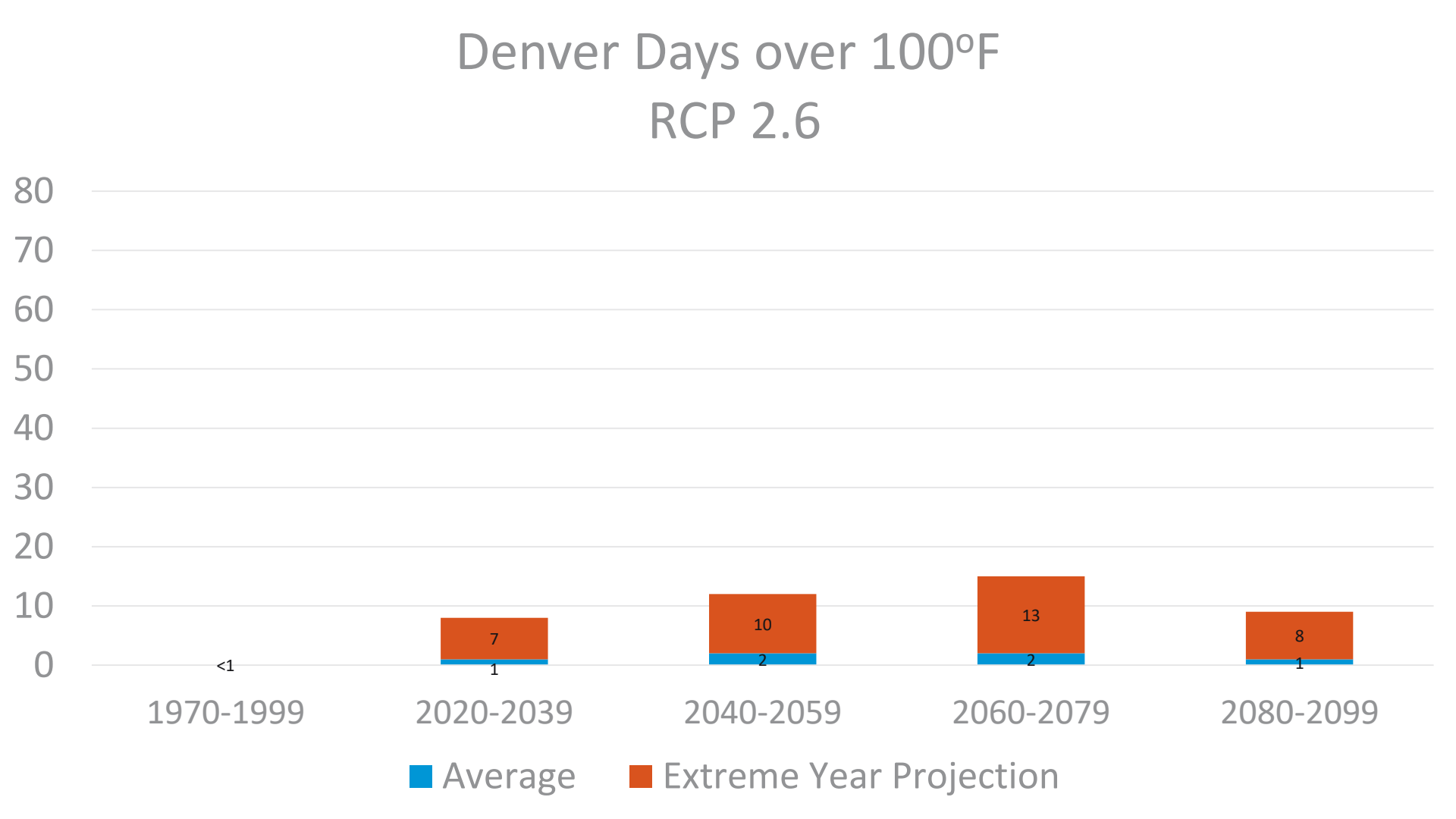
Inspire community action and ensure environmental justice, equity and affordability as Denver transitions to a carbon-free energy system.

Guide Denver toward a clean, carbon-free transportation system that improves the health and livability of our communities.

- Over 1700 responses to climate survey
- Strong support for aggressive climate goals
- Strong support for increased renewable energy
- Desire for continued input and engagement

Appendix


Denver Days over 100ºF
RCP 8.5
120
100
80
60
40
20
0
<1
11
2
25
7
44
18
72
34
1970-1999
2020-2039
2040-2059
2060-2079
2080-2099
Average
Extreme Year Projection


Denver Days over 100ºF
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30
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0
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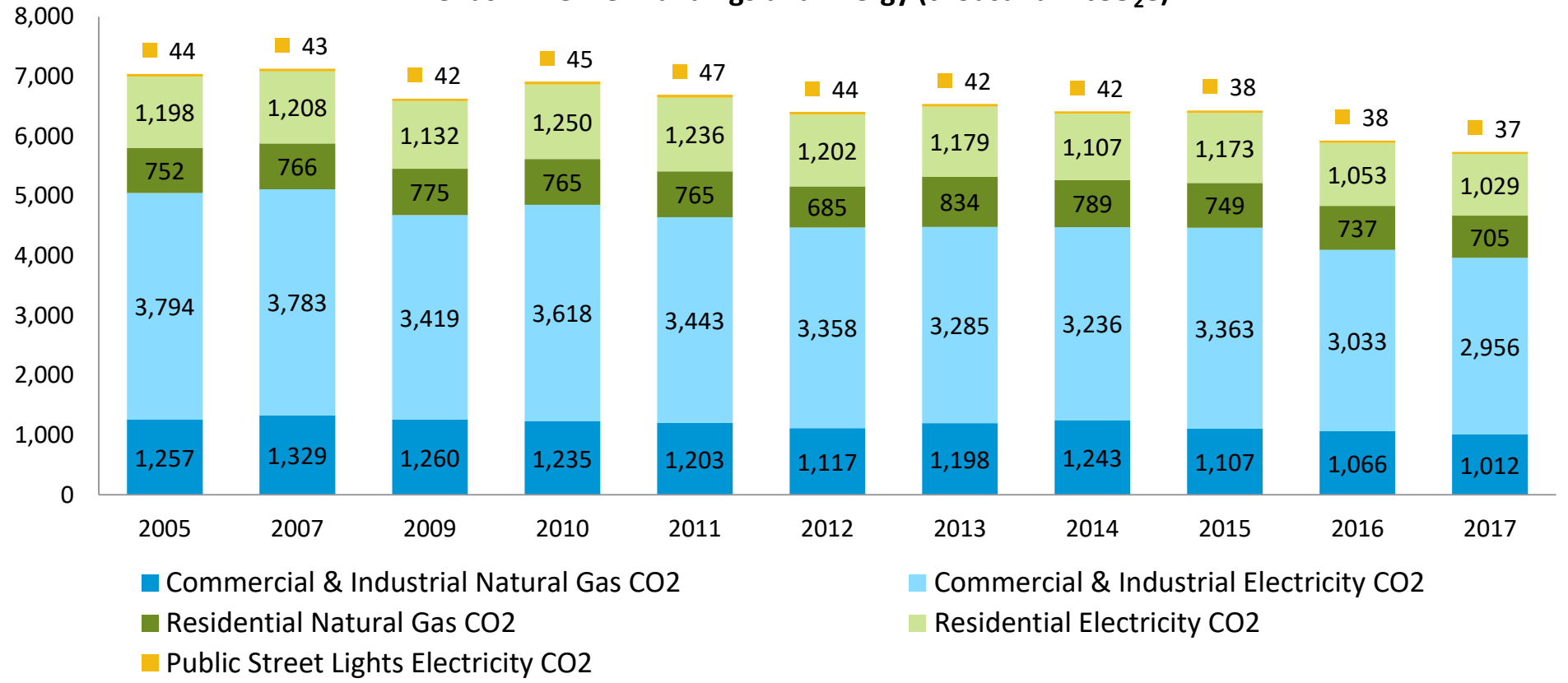
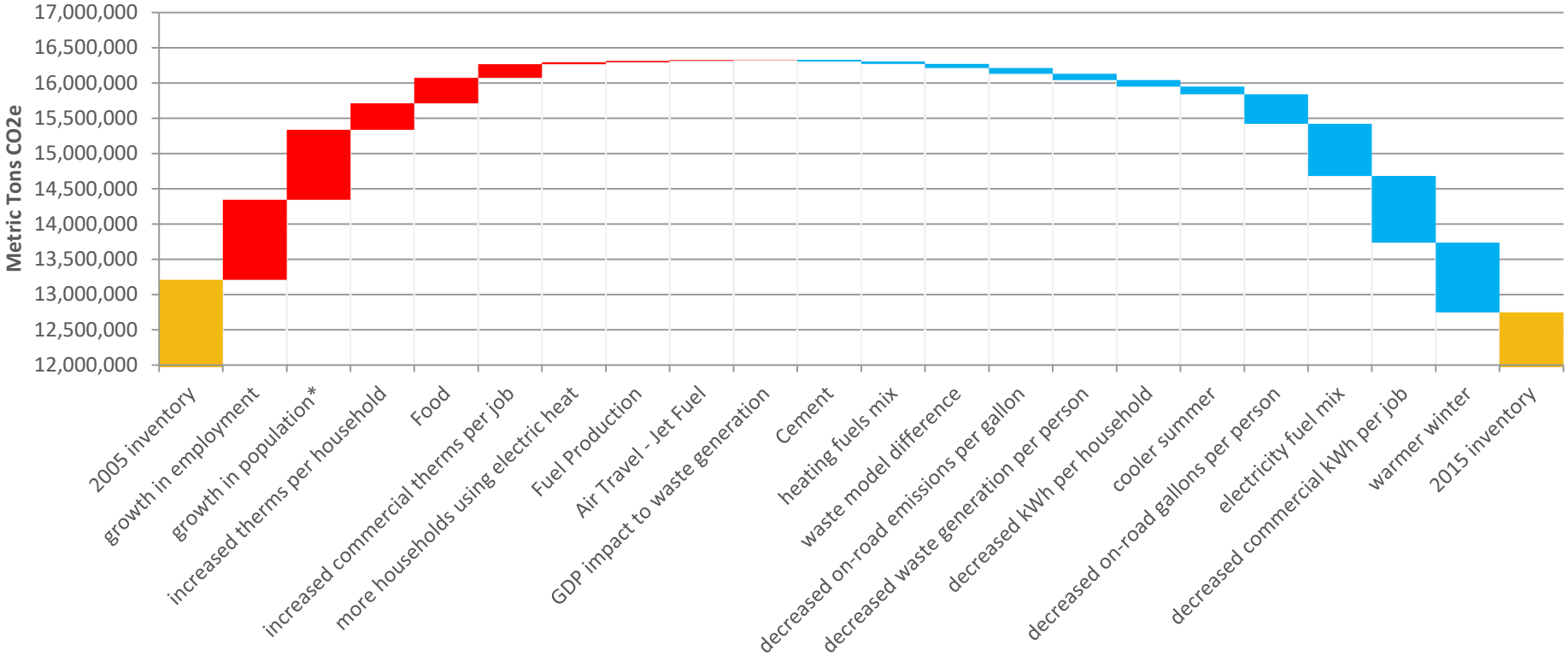
7
1
10
2
13
2
8
1
1970-1999
2020-2039
2040-2059
2060-2079
2080-2099
Average
Extreme Year Projection

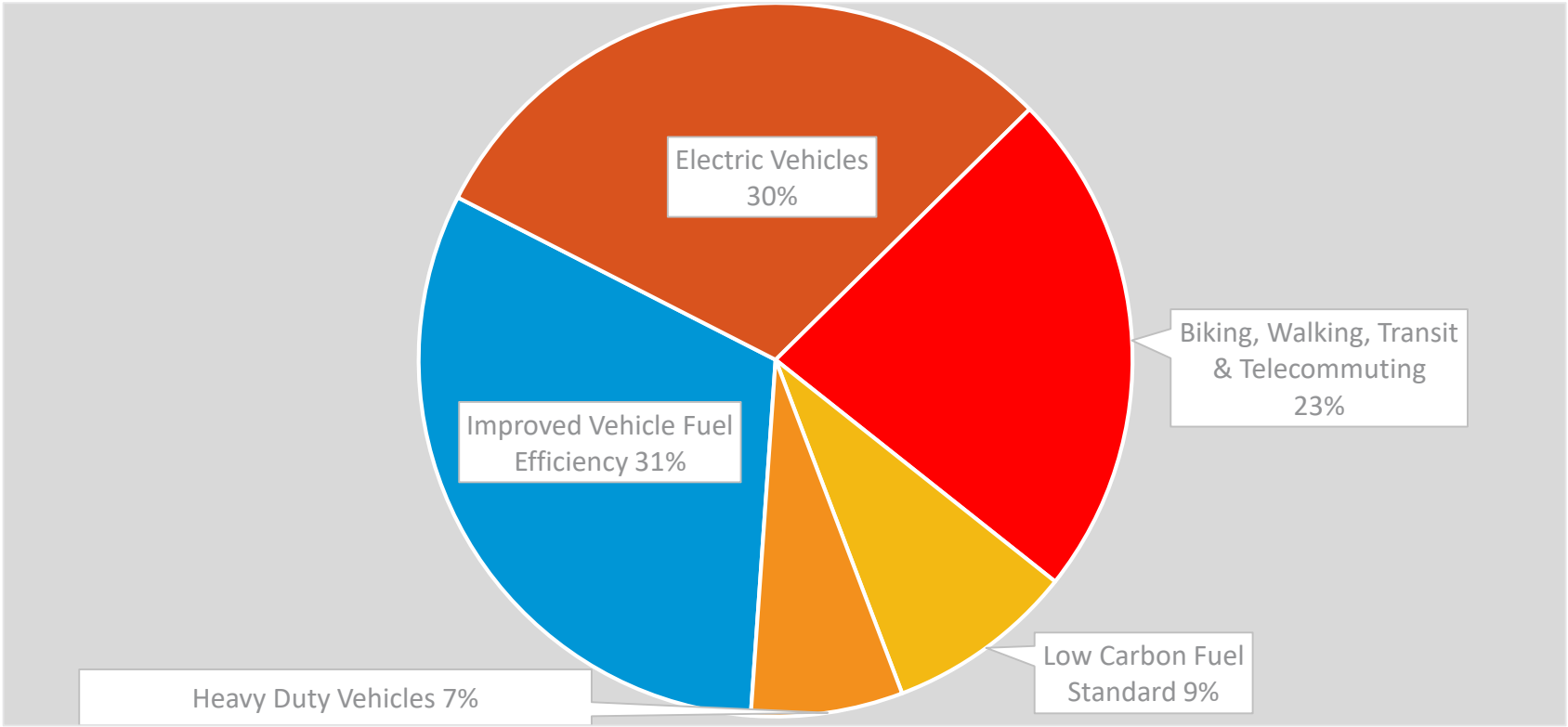
Trends in Denver Buildings and Energy (thousand $mtCO_2e$)



Comparison 2005 to 2015 GHG drivers



GHG Reductions in the Transportation Sector to Meet 2050 Goal



Benchmarking Compliance Rates

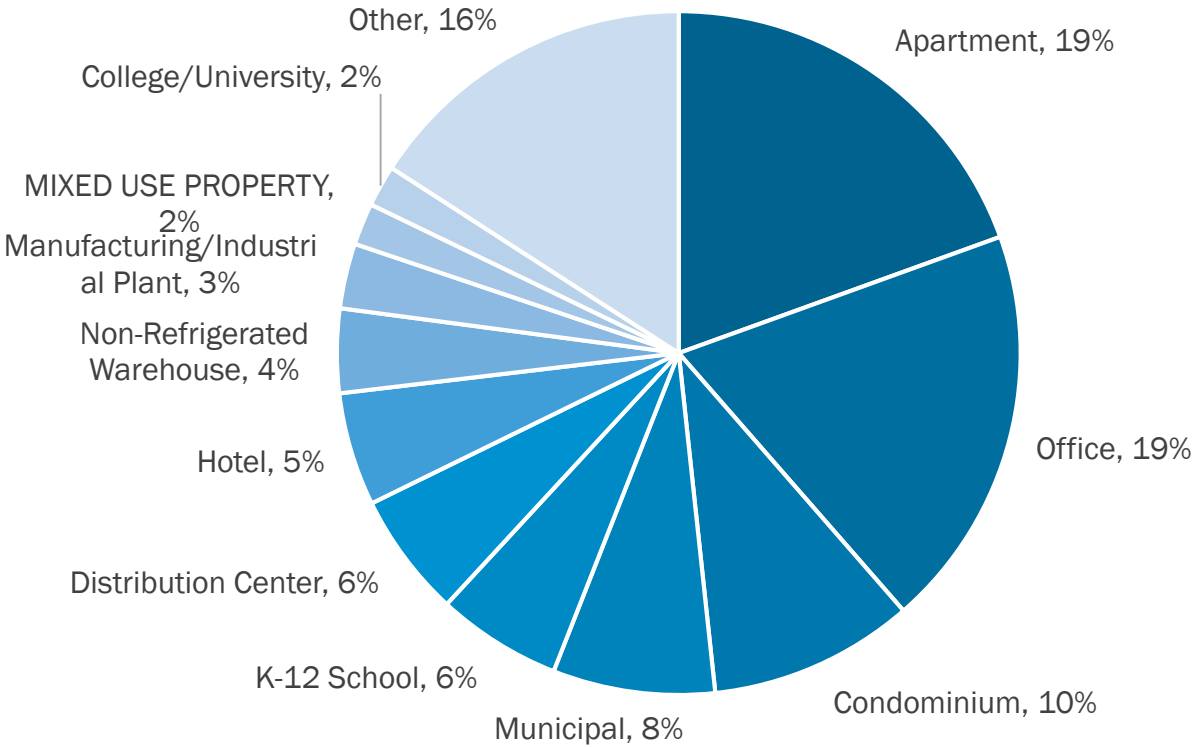
2017

- 90% compliance (only buildings over 50,000 sq ft. had to benchmark)

2018

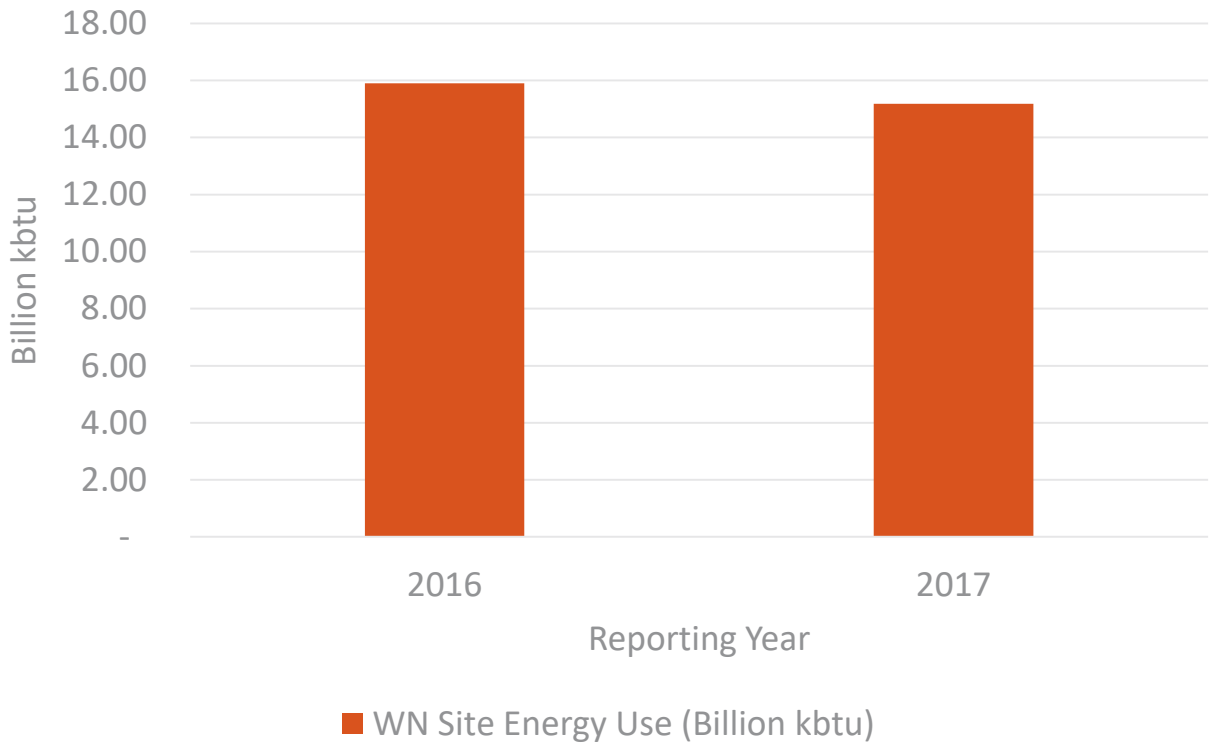
- 90% of buildings overall are in compliance.
- 94% of buildings over 50,000 sq ft (who benchmarked last year) are in compliance.
- 86% of buildings 25-50,000 sq ft are in compliance.

Greenhouse Gas Emissions by Property Type

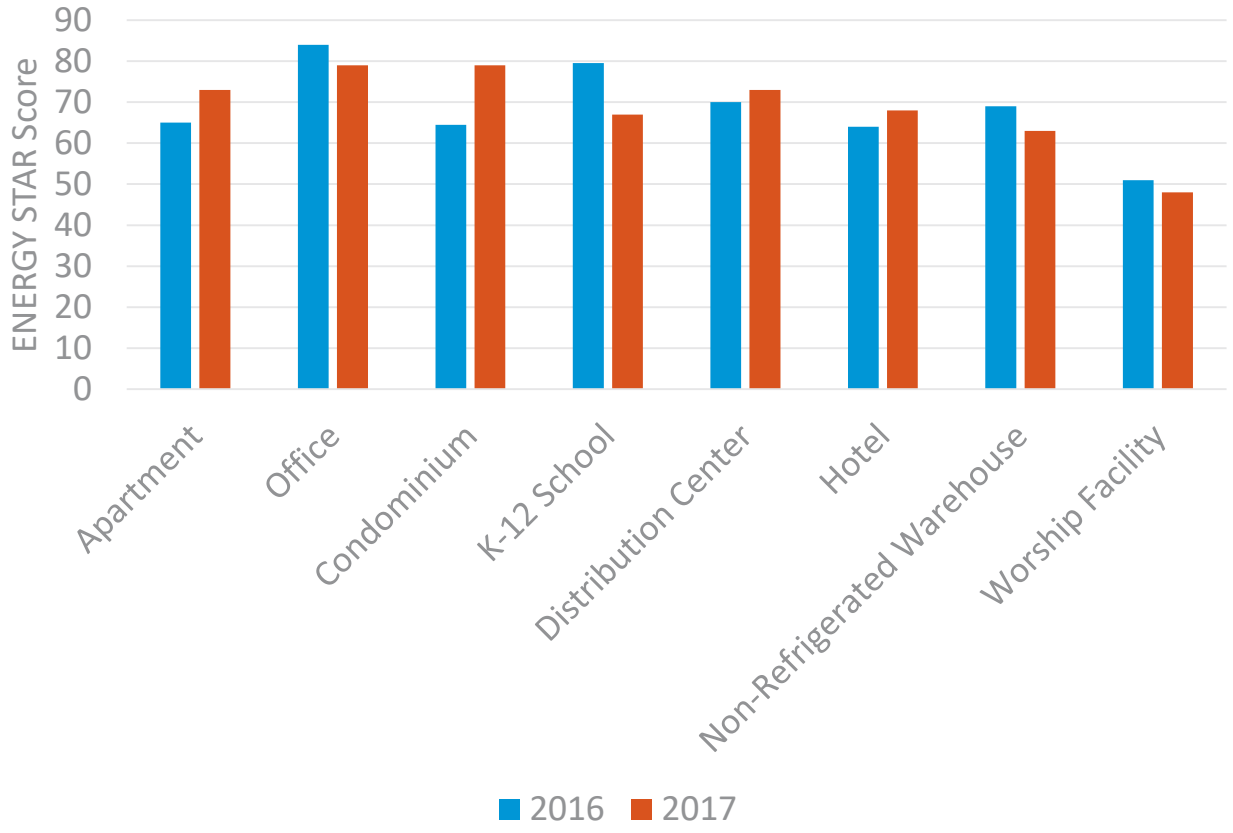


265 million square feet total

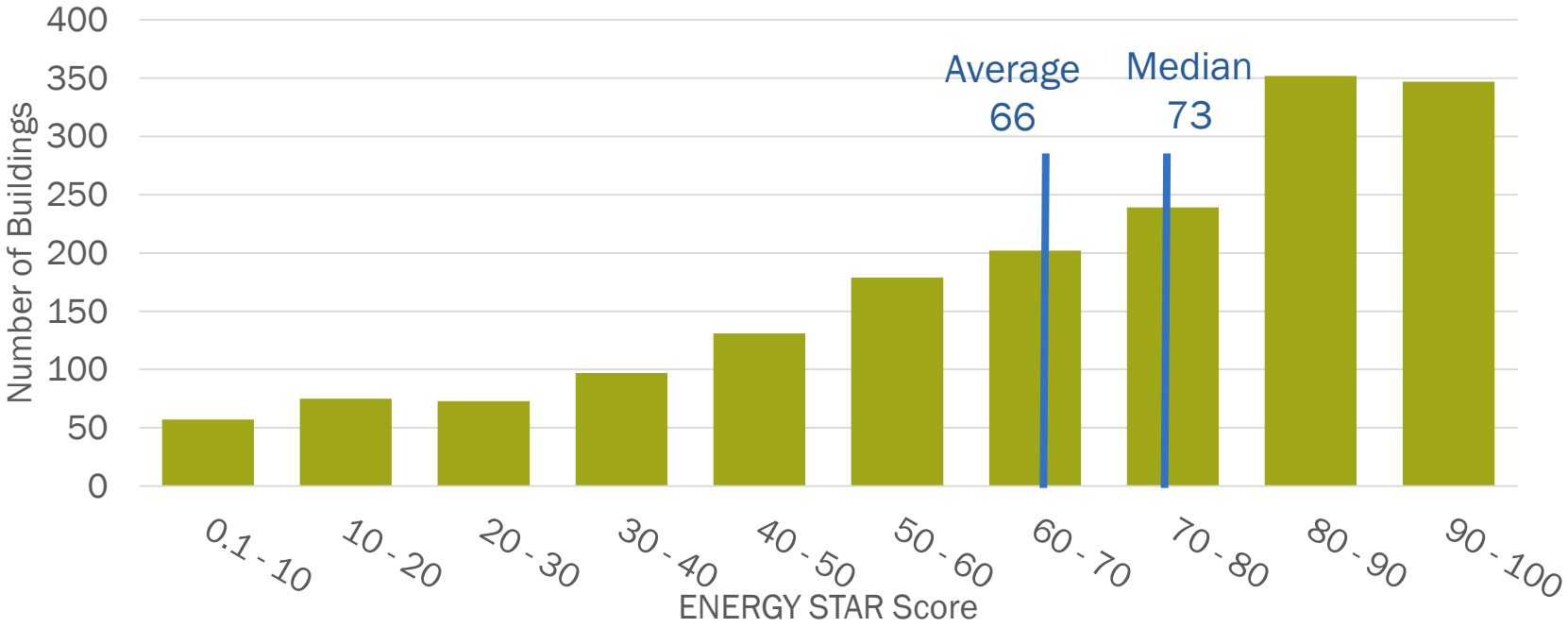
2018 Results: 4.5% Reduction in Weather Normalized Site Energy Use from 2016 to 2017



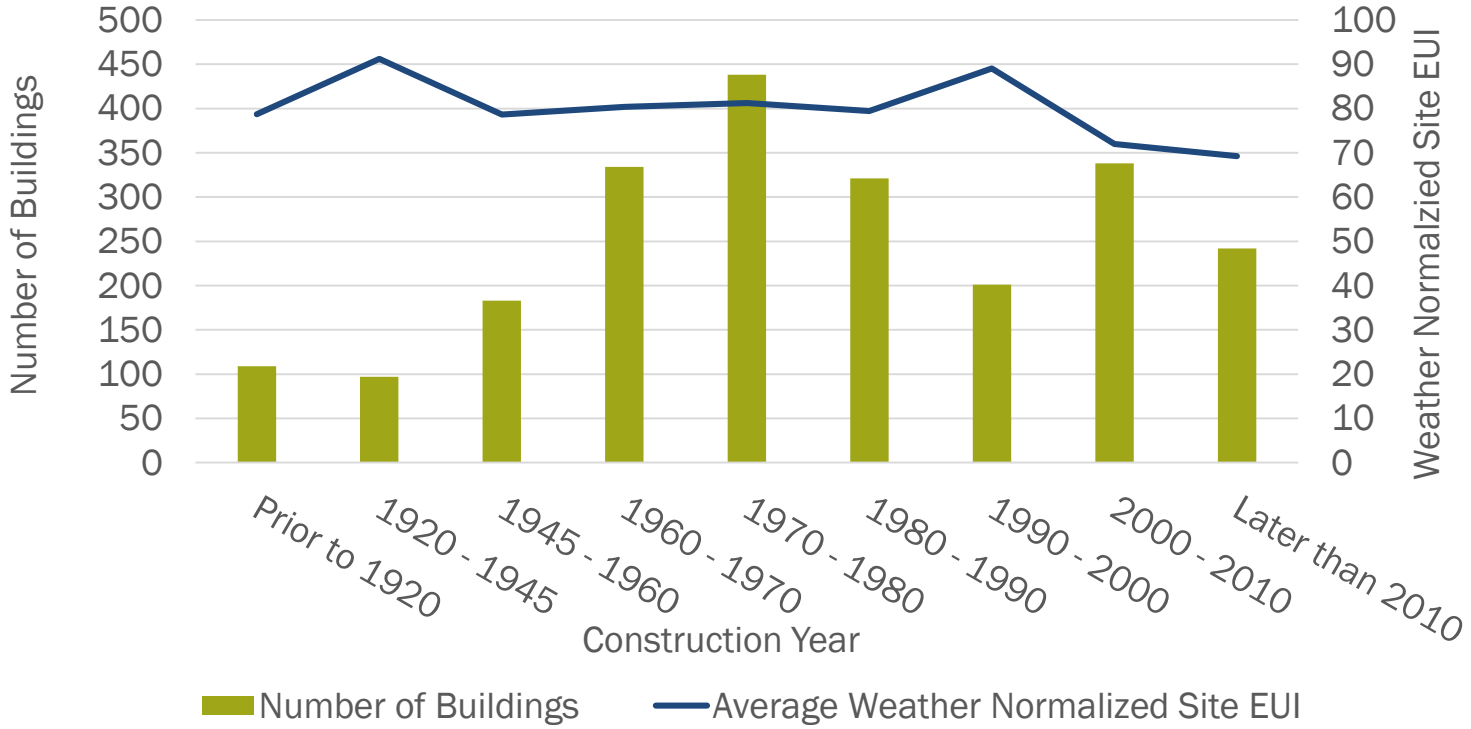
2018 Results: Change in ENERGY STAR Scores by Property Type



ENERGY STAR score distribution



Construction Year vs. Site EUI



Residential Energy Efficiency Efforts

Current efforts include:

- Home Energy Score Pilot – Focused on the transaction of a home (for sellers, buyers and new owners) to hone in on optimum time that residents are likely to make upgrades.

Score is developed and managed by the U.S. Department of Energy and based on a standard assessment* of a home's structure and major energy-consuming equipment fixed to the property. Provided at no cost and score provides recommendations. Sample score

- Residential Resources: www.Denvergov.org/HomeEnergy
- Solar Resources: www.Denvergov.org/Solar

Previous efforts have included:

- Denver Energy Challenge (now retired) created neutral energy advisor model (now adopted by Xcel Energy)
- Energy loan program (now available statewide through the CO Energy Office)
- Rebates (Grant funds)
- Facilitated group discounts for solar and HVAC systems (Developed "Roadmap for Neighborhoods on Securing a Group Discount")
- Contractor engagement and workforce development (Grant funds)

Commercial Sector Engagement – Certifiably Green Denver

- Provides free sustainability advising service and recognition to all types of businesses in Denver, with a focus on small businesses.
- Educates business owners on emissions-reducing practices including energy efficiency and alternative transportation programs.
- Has assisted over 1,900 businesses that save over 28 million kWh in electricity annually due to energy efficiency improvements.