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Webinar

Planning for a Clean Energy Future with Cities-LEAP

May 15, 2018

CM | 1.0

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Today's Event

Planning for a Clean Energy Future with Cities-LEAP

(Cities Leading through Energy Analysis and Planning)

Megan Day, AICP

Planner and Project Leader at the National Renewable Energy Laboratory (NREL)

Alison Holm

Planner and Project Leader at NREL

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Cities Leading through Energy Analysis and Planning (Cities-LEAP)

Delivering Data and Analysis to Enable more Strategic City Energy Planning

Megan Day and Alison Holm

National Renewable Energy Laboratory

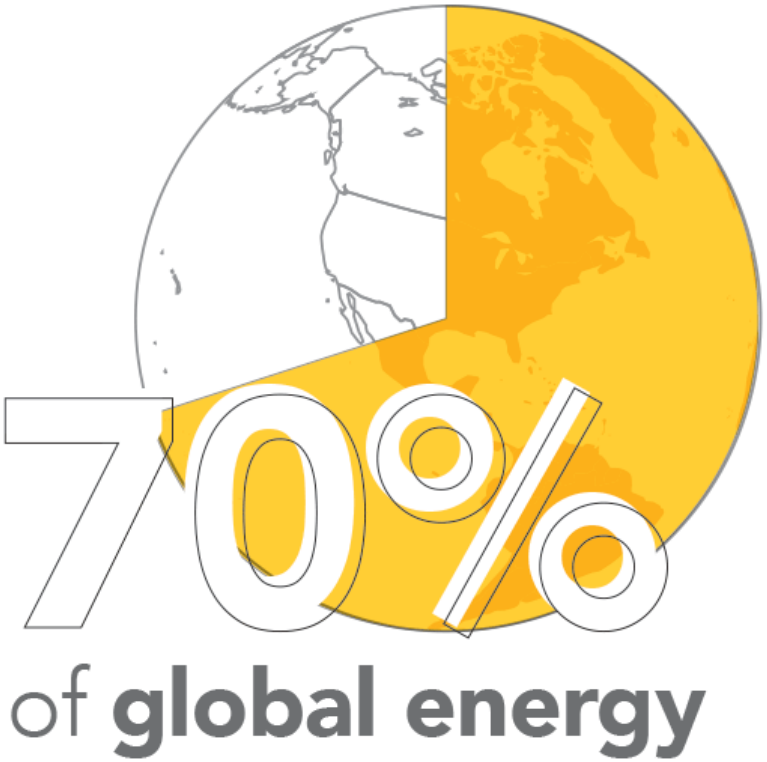
Cities-LEAP

Cities Leading through Energy Analysis and Planning

DELIVERS standardized, localized energy data and analysis *that* **ENABLES** Cities to lead clean energy innovation *and* **INTEGRATE** strategic energy analysis into decision making

WHY CITIES?

Cities **consume** approximately



Cities-LEAP

SUPPORTS THE WIDESPREAD IMPLEMENTATION

of city-sponsored, data-driven energy policies, programs, and projects that have the potential

to

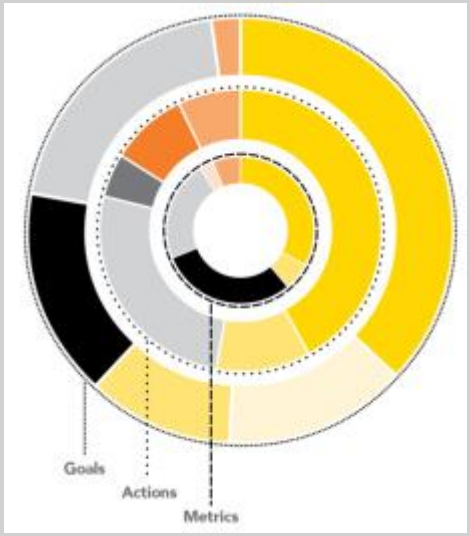
DRIVE A SEA CHANGE

in the national energy landscape.

Cities-LEAP – Cities Leading through Energy Analysis and Planning

FOUNDATIONAL RESEARCH

City-Level Energy Decision Making: Data Use in Energy Planning, Implementation, and Evaluation in U.S. Cities



CITY ENERGY PROFILES

Developed new, replicable methodology and generated a publicly available city energy profile for every U.S. city

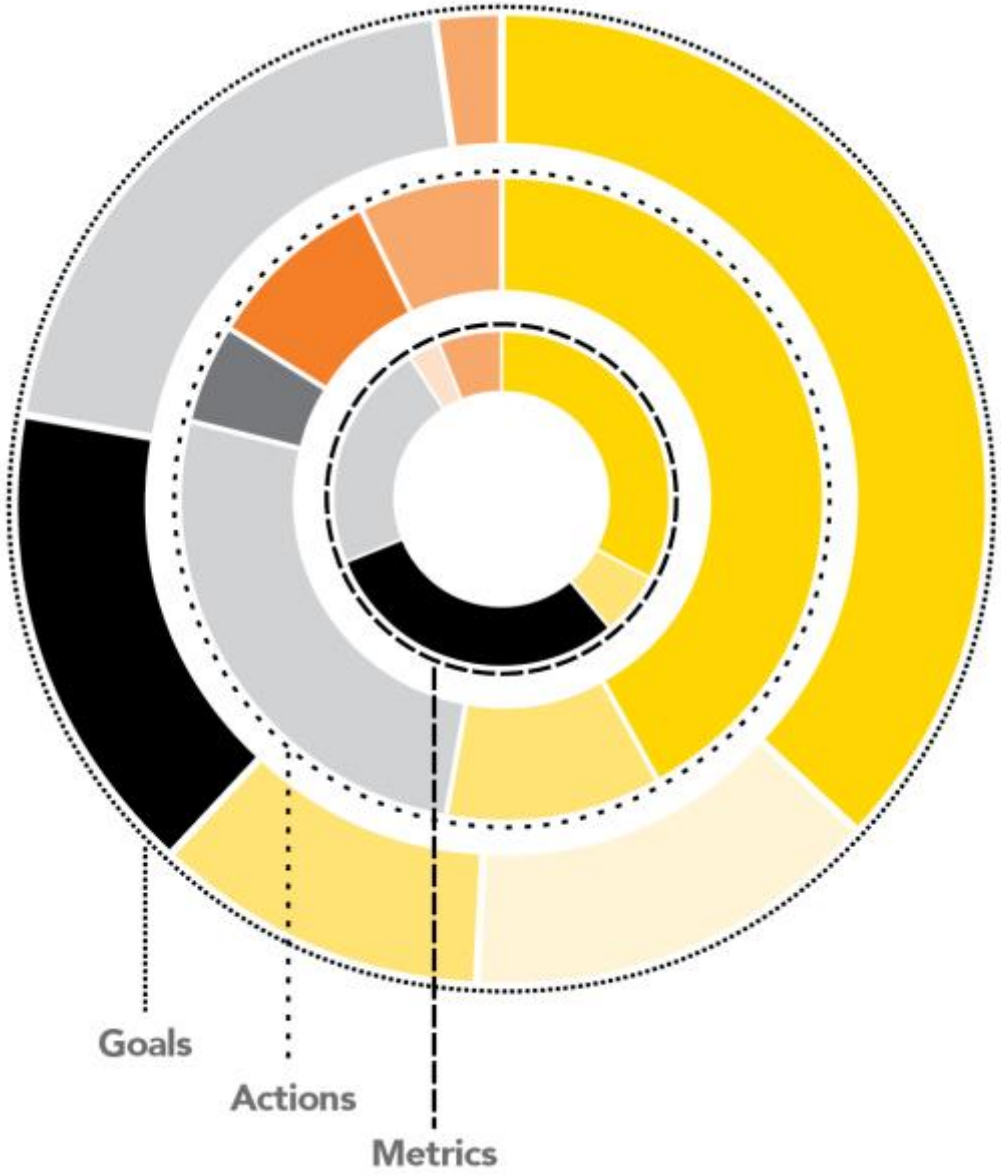
CITY ENERGY FUTURES

Aggregate, national economic and GHG impact of suites of city energy actions

FUNDING OPPORTUNITY ANNOUNCEMENT

Three awardees pursuing innovative approaches to incorporating energy data in city decision making

City-Level Energy Decision Making: Data Use in Energy Planning, Implementation, and Evaluation in U.S. Cities



- Transportation and Land Use
- Sustainability
- Renewable Power
- Energy and Emissions
- Buildings and Efficiency
- Electricity Supply and Infrastructure
- Municipal Operations and Programs
- Economic Development
- Other

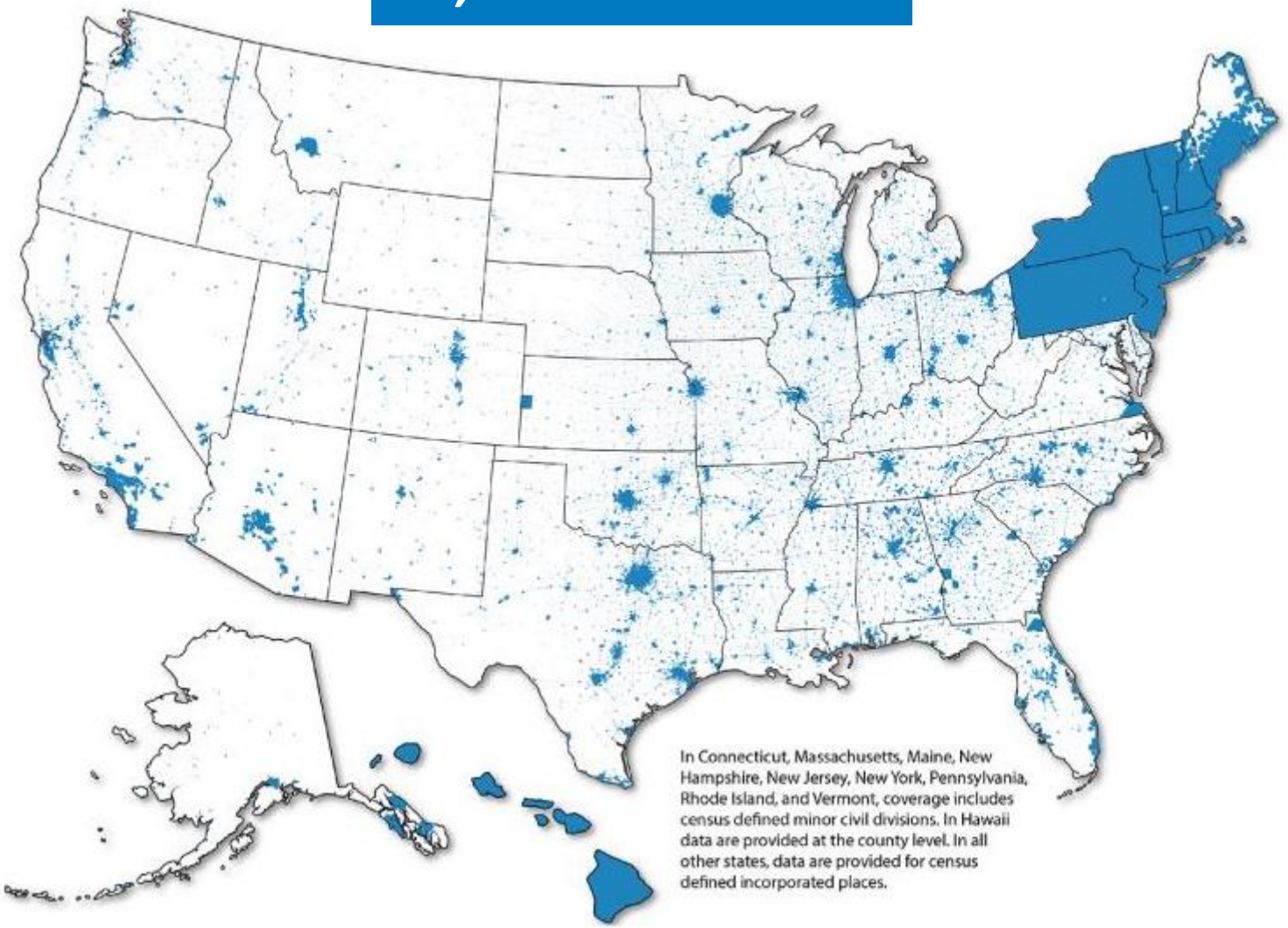
The most common actions fall in the Transportation & Land Use and Buildings & Efficiency sectors.

Factors that Impact City Energy Decision Making

- A city's level of influence in each sector
- Political priorities
- Timing and opportunities
- Staff capacity
- Data availability and granularity, data management and monitoring systems
- Cost considerations

Cities-LEAP City Energy Profile Coverage

23,400+ U.S. Cities



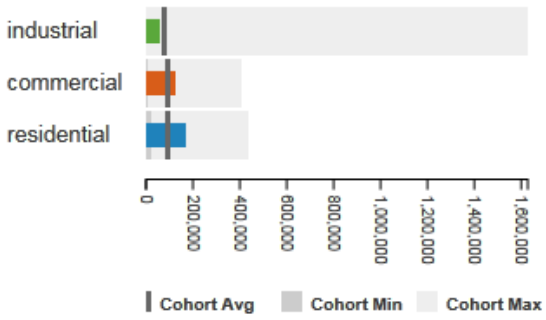
https://apps1.eere.energy.gov/sled/

City Energy Profiles: Electricity, Natural Gas

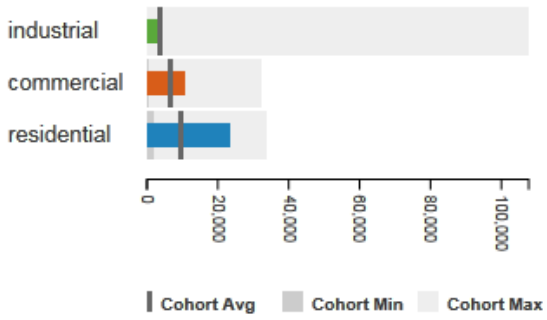
Learning about the energy market in your city and similar cities can lead to more strategic energy decisions toward a clean energy future.

Electricity Statistics for Salem, Massachusetts in 2013 derived

ELECTRICITY USAGE
(MWH)

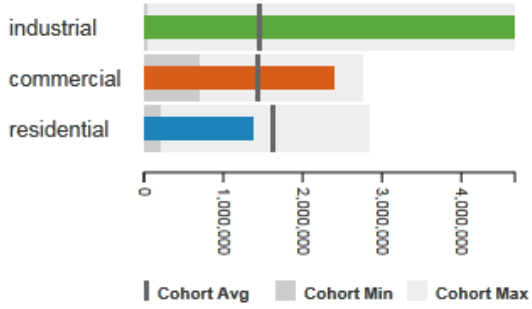


ELECTRICITY EXPENDITURES
($1000)

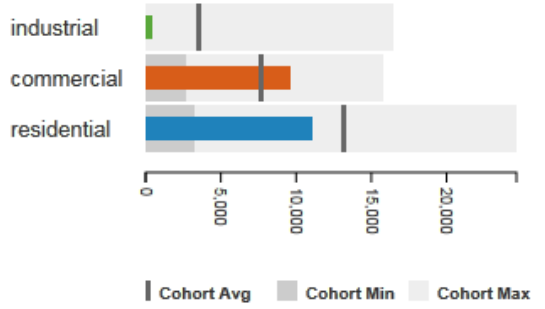


Natural Gas Statistics for Cheyenne, Wyoming in 2013 derived

NATURAL GAS USAGE
(MCF)



NATURAL GAS EXPENDITURES
($1000)

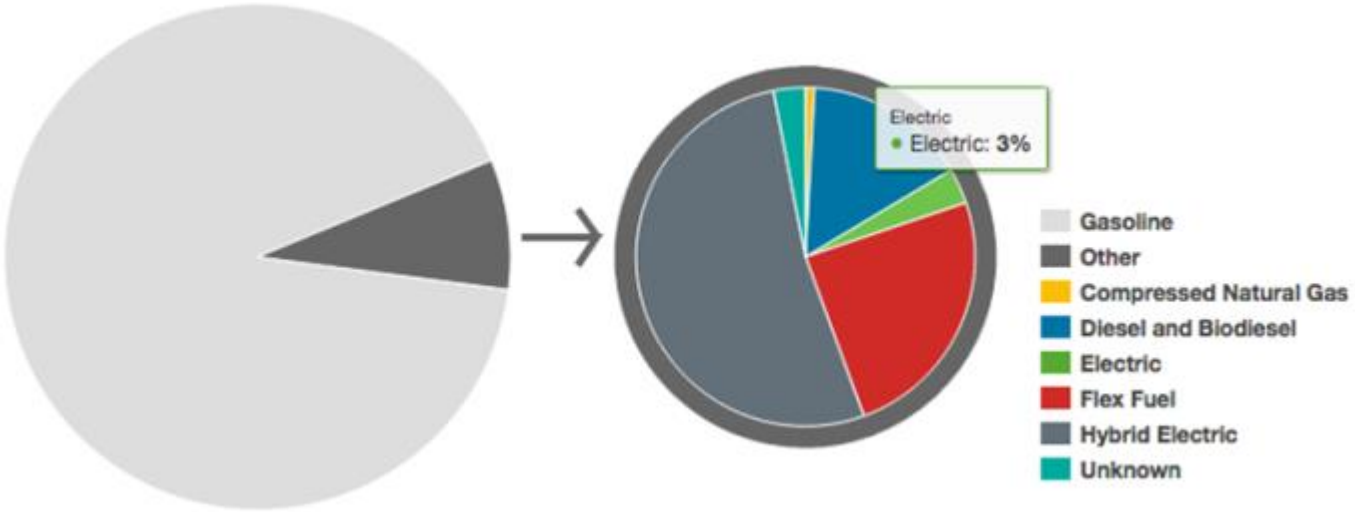


City Energy Profiles: Fuel Types, PV Potential

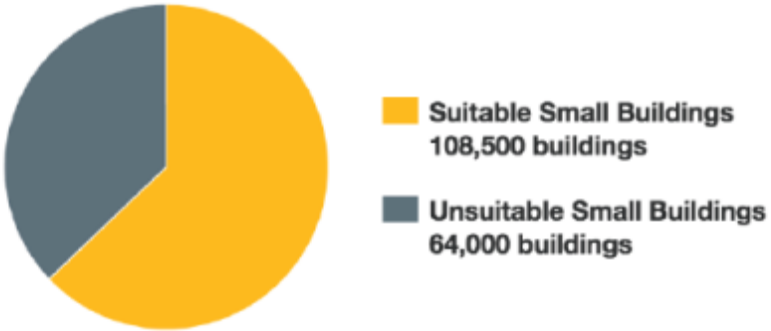
Light-Duty Alternative Fuel and Conventional Vehicle, Oakland, CA

Total number of light-duty vehicles: 252,500

Average fuel economy of light-duty vehicles: 25.5 MPG



Small Building Rooftop PV Potential, Denver CO



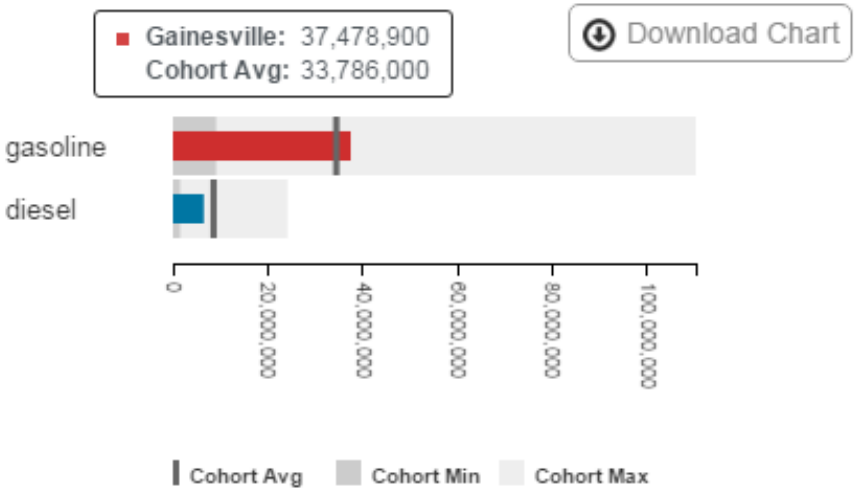
Suitable area	5,000,000 m2
Capacity potential	700,000 kW
Energy generation potential	1,000,000 MWh

City Energy Profiles: Fuel Use, VMT

Vehicle Data for Gainesville, Florida in 2013 derived

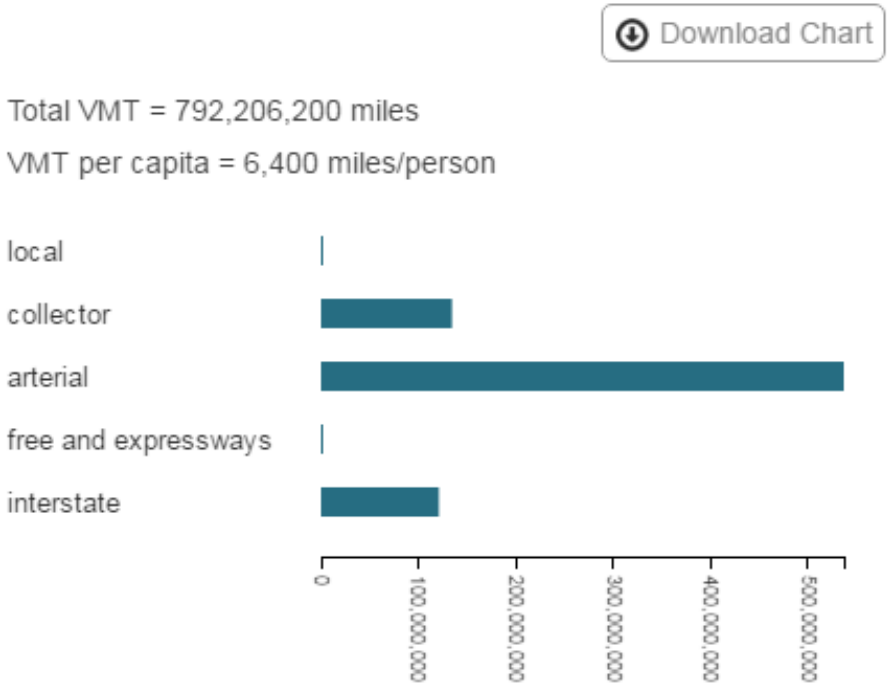
ON-ROAD VEHICLE FUEL USE (LIGHT, MEDIUM, AND HEAVY DUTY)

(GALLONS)



VEHICLE MILES TRAVELED BY ROAD CLASS

(TOTAL VMT)



City Energy Profiles: Greenhouse Gas Emissions Summary

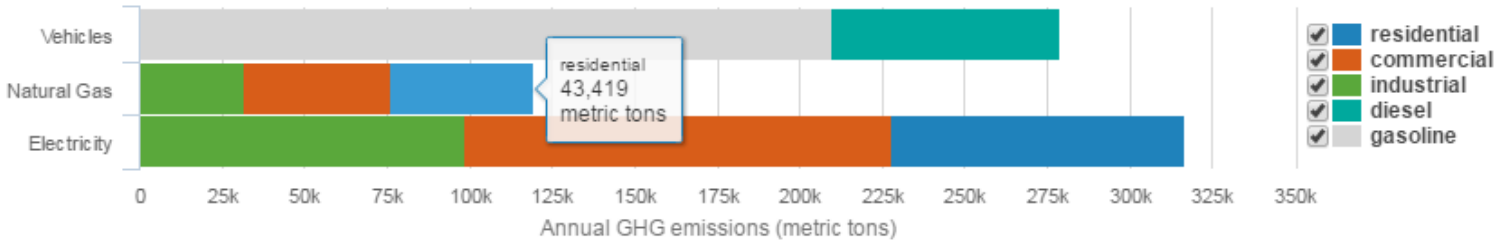
Annual Energy GHG Emissions for Redmond, Washington derived

Total GHG: 715,000 metric tons

GHG per capita: 13 metric tons/person

GHG per BTU: 0.08 metric tons/MMBTU

Download Chart



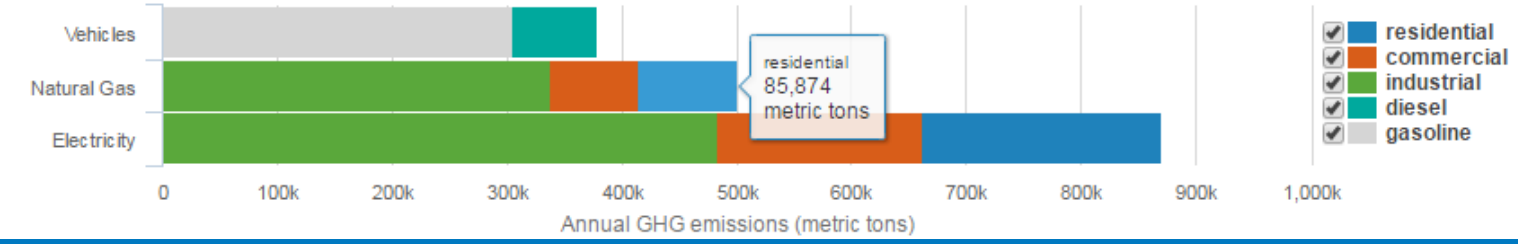
Annual Energy GHG Emissions for Canton, Ohio derived

Total GHG: 1,750,200 metric tons

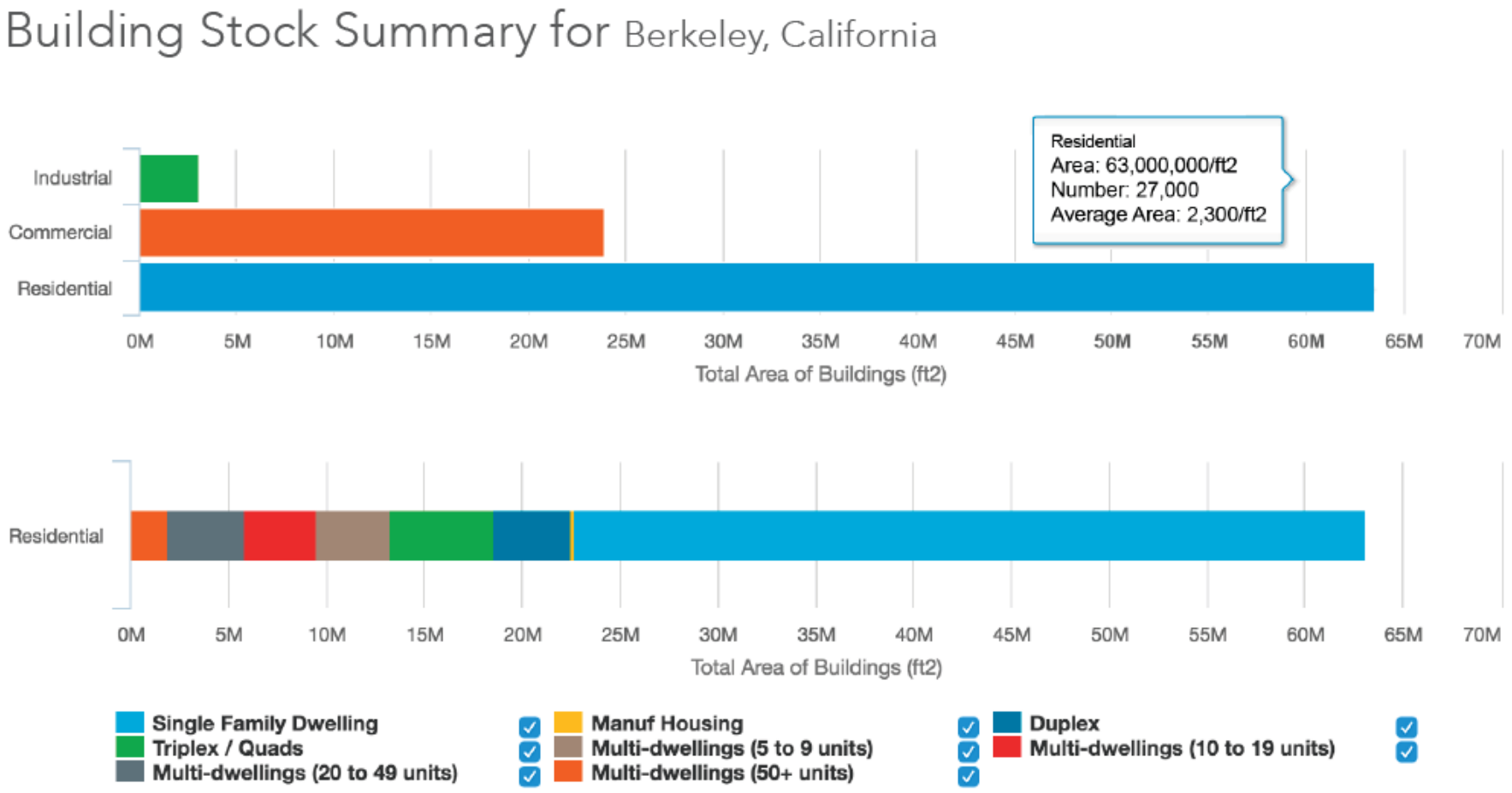
GHG per capita: 23 metric tons/person

GHG per BTU: 0.10 metric tons/MMBTU

Download Chart



City Energy Profiles: Building Stock Characterization



http://apps1.eere.energy.gov/sled/#/.

City Energy Profiles: Commercial & Industrial Activity

Commercial Activities for Port St. Lucie, Florida derived

Commercial Activities - Top 5 Electricity Users	Number of Establishments	Electricity Use (MWh)	Rank	Electricity Use per Establishment	Rank
Hospitals	2	14,263	1	7,131	1
Nonstore Retailers	30	13,153	2	438	4
General Merchandise Stores	13	11,611	3	893	2
Administrative and Support Services	256	6,650	4	25	22
Food and Beverage Stores	41	4,968	5	121	10

Commercial Activities - Top 5 Natural Gas Users	Number of Establishments	Natural Gas Use (Mcf)	Rank	Natural Gas Use per Establishment	Rank
Hospitals	2	57,073	1	28,536	1
Nonstore Retailers	30	17,019	2	567	3
Nursing and Residential Care Facilities	30	13,702	3	456	4
Ambulatory Health Care Services	279	8,549	4	30	25
Educational Services	28	6,651	5	237	7

◉ **total usage**

○ **per establishment**

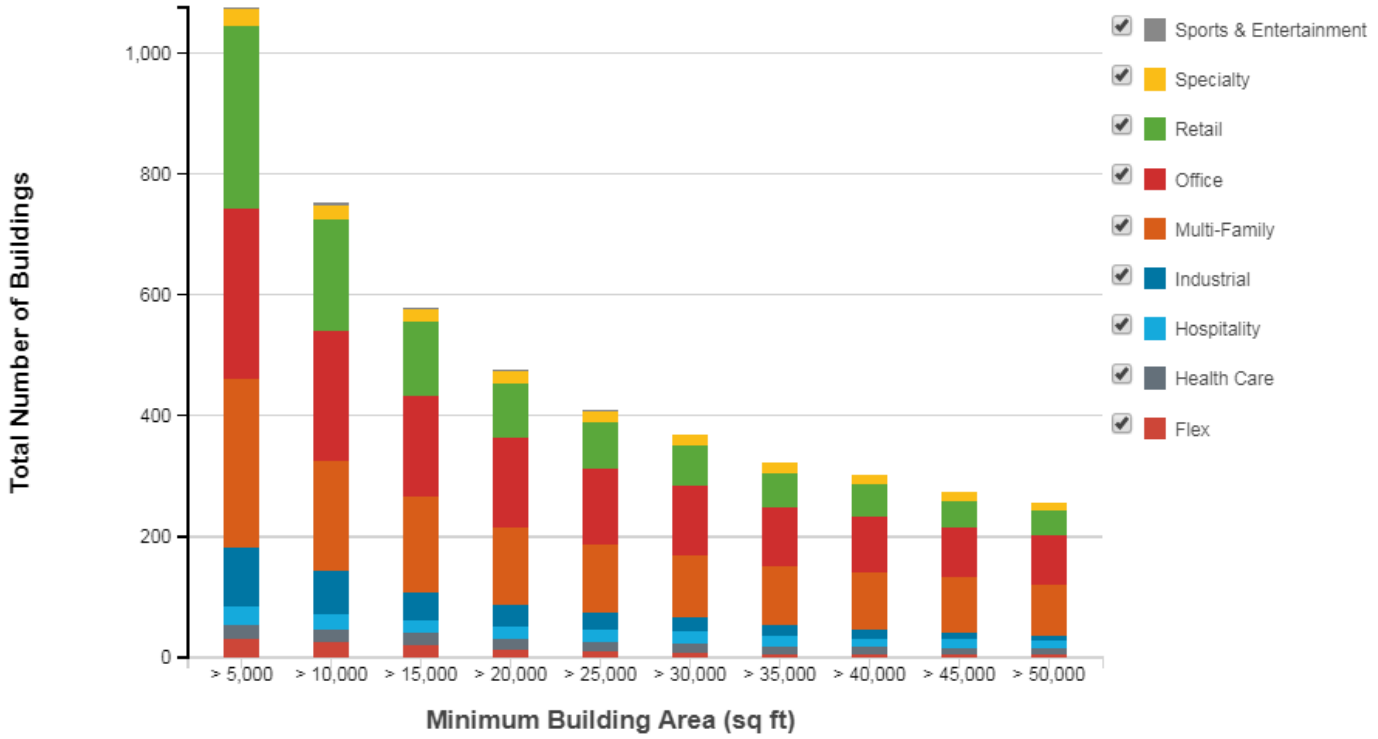
City Energy Profiles: Commercial Building Energy Benchmarking

Commercial Building Energy Benchmarking for Lakewood, Colorado

derived

The following chart shows commercial properties from CoStar Realty Information, Inc. (www.costar.com) by building area and property type. Cities can use this data to estimate the potential scope and impact of building energy benchmarking policies or programs.

Download Chart



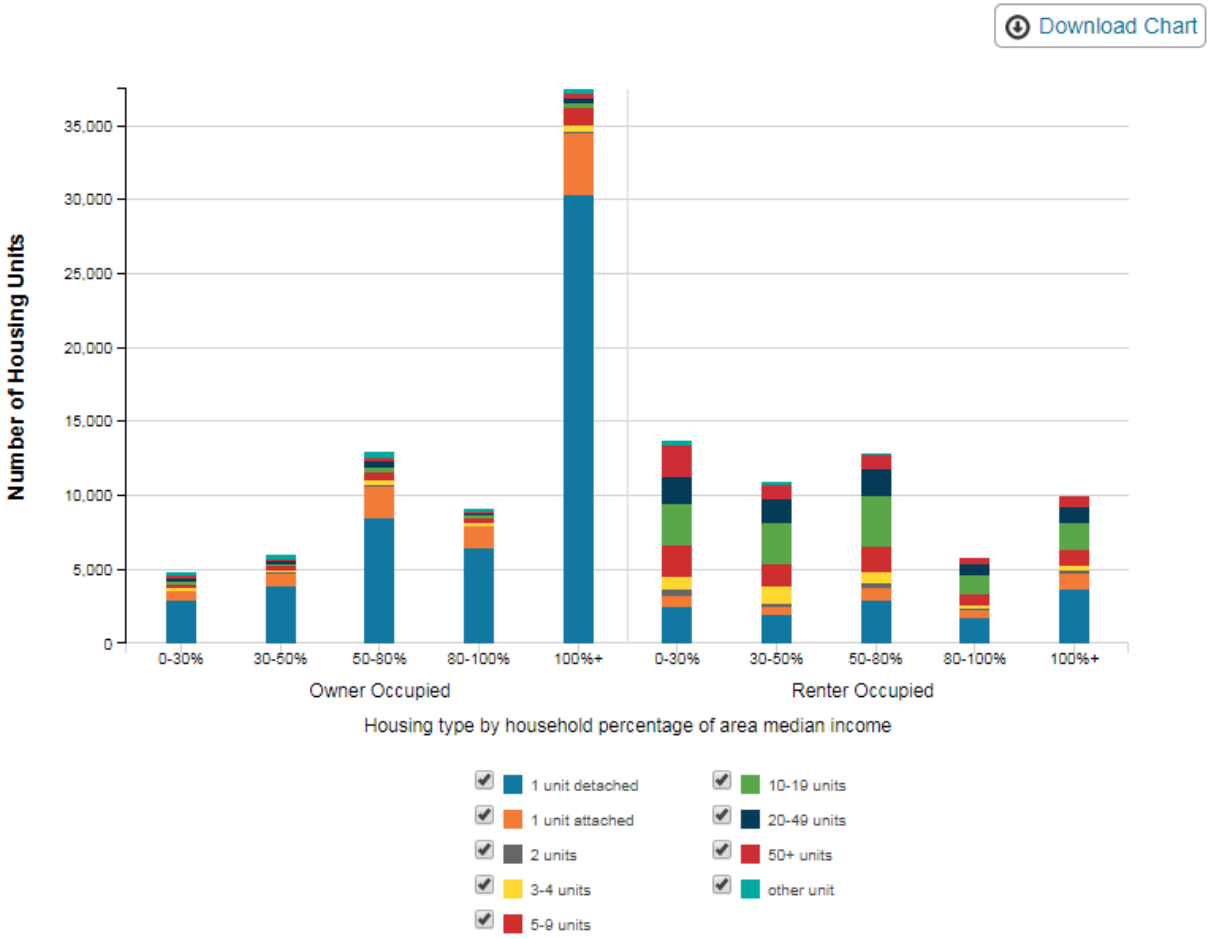
Building Area

Number of Buildings

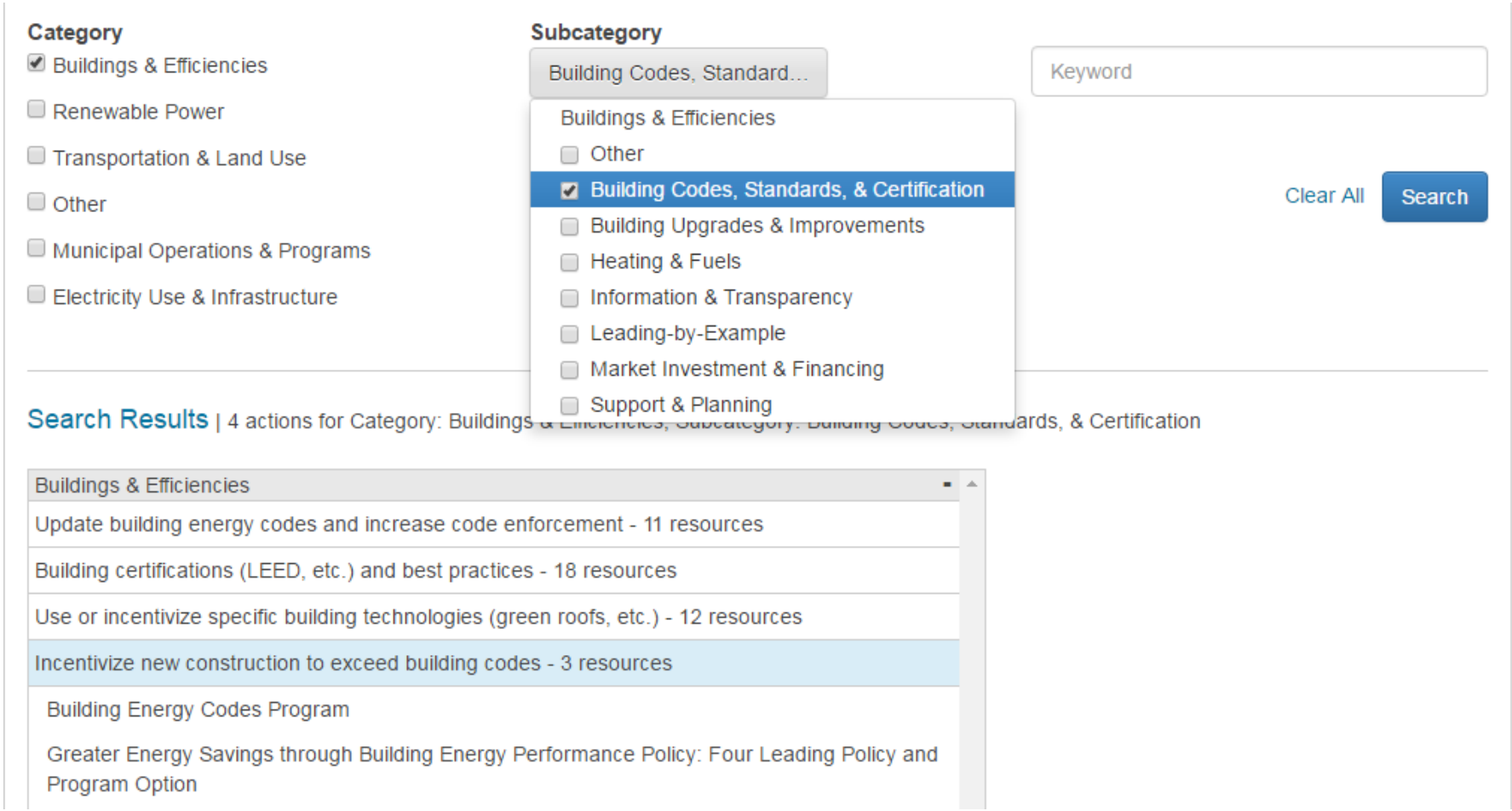
City Energy Profiles: Housing Data

Estimated Housing Units by Type and Area Median Income for Aurora, Colorado in 2015

The following chart provides estimated housing types by area median income (AMI) and tenure (renter- or owner-occupied). The U.S. Department of Housing and Urban Development (HUD) defines "very-low income" as households earning 50% or less of AMI for a given location. Income and housing data can help cities understand their low- and moderate-income community characteristics and design programs, policies, and goals to benefit lower income residents. Additional data and analysis may be found on the Low-Income Energy Affordability Data (LEAD) Tool on OpenEI.



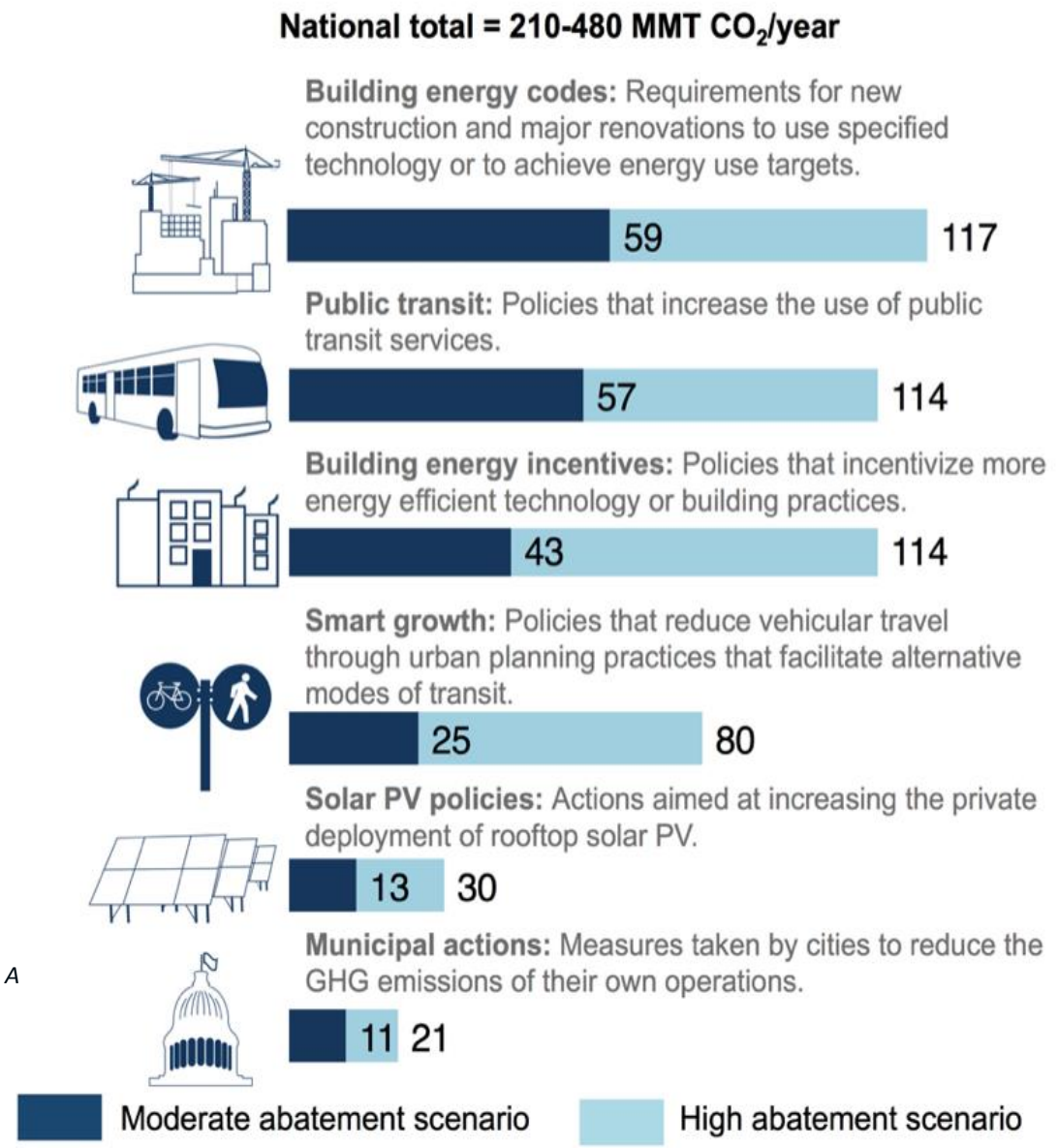
Cities-LEAP Local Energy Action Toolbox



https://apps1.eere.energy.gov/sled/cleap.html

Carbon Pollution Reduction Potential of City Actions

Commonly implemented city actions have the potential to achieve 35% of the remaining US COP21 target.

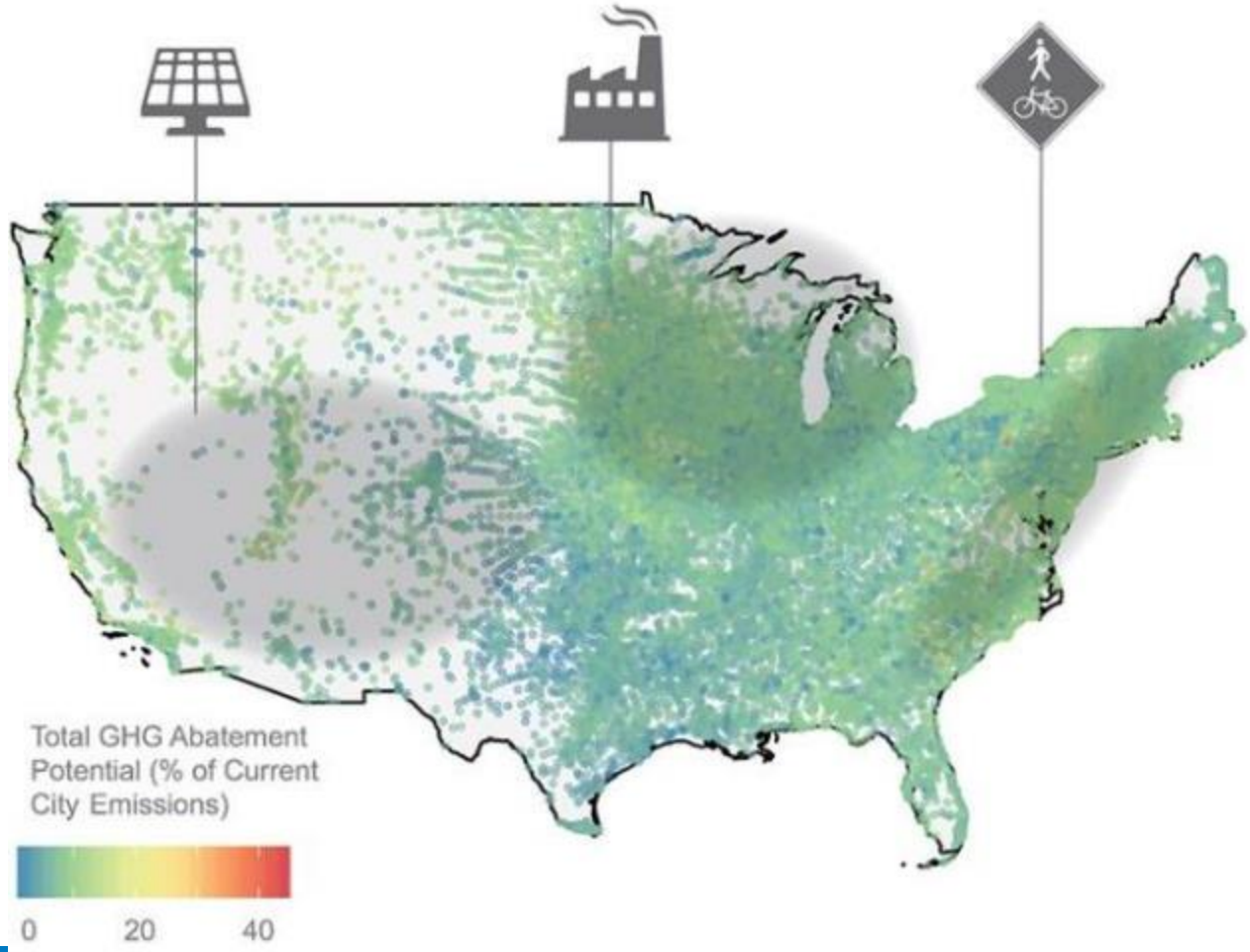


O'Shaughnessy, E., et al. (2016). *Estimating the National Carbon Abatement Potential of City Policies: A Data-Driven Approach*. NREL: http://www.nrel.gov/docs/fy17osti/67101.pdf.

The excellent solar resource in southwestern cities provides an opportunity to use distributed solar PV policies for CO_2 abatement. The CO_2 abatement potential of solar PV policies in Arizona and California was about 20% greater than other cities.[v]

Building energy policies may be more impactful in midwestern and northern cities where buildings use more natural gas for heating during colder winters. The estimated CO_2 abatement potential of building energy requirements is about 50% higher in midwestern cities than other cities.[v]

Transportation-related policies may be more effective in eastern coastal cities where large urban areas result in higher vehicle miles of travel. The estimated CO_2 abatement potential of smart growth policies was about twice as high in eastern coastal cities than other cities.[v]



Cities-LEAP Micro Technical Assistance

City Energy: From Data to Decisions

Partnered with ten cities to demonstrate pathways to apply Cities-LEAP and SLED data and analysis to inform energy planning and decision making

- **Asheville, NC** Building energy efficiency
- **Boise, ID** Reducing vehicle fuel consumption
- **Carrboro, NC** Targeting efficiency for low income households
- **Columbia, MO** GHG reduction, efficiency for low income households
- **Denton, TX** Reducing vehicle miles traveled and fuel consumption
- **Lafayette, CO** Planning for EV infrastructure
- **Moab, UT** Building energy efficiency
- **New Haven, CT** Targeting efficiency for low income households
- **San Jose, CA** Rooftop PV market potential
- **South Lake Tahoe, CA** EE for buildings and local industries

https://energy.gov/eere/analysis/downloads/city-energy-data-decisions

City Energy: From Data to Decisions

"The Cities-LEAP analysis will help the City of San Jose make critical decisions in developing renewable energy programs, moving toward its renewable energy and energy efficiency goals, and ultimately allowing San Jose to reach its greenhouse gas reduction targets."

— Ken Davies, Sustainability and Compliance Manager, City of San Jose

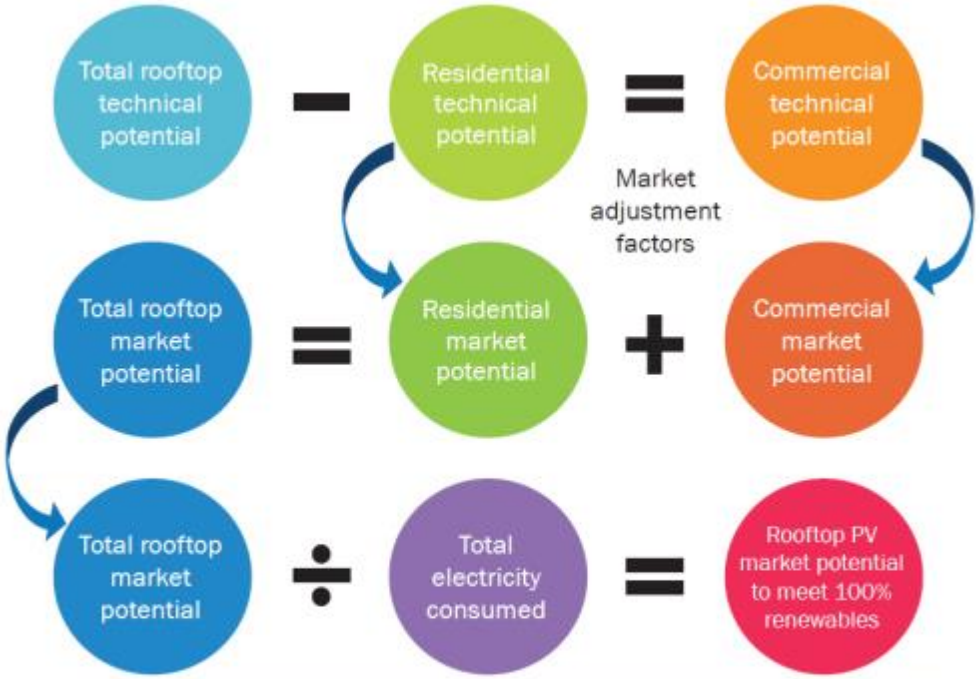
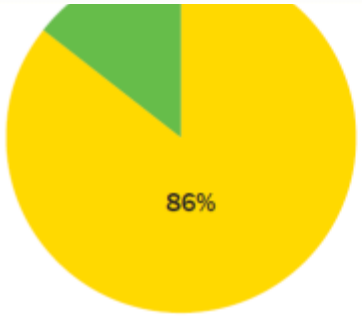


Figure 1. Conceptual framework for estimating rooftop PV market potential to meet 100% renewable goals (Source: NREL)



Suitable small buidings 194,900 buildings

Unsuitable small buidings 32,400 buildings

Suitable area	11,518,500 m^2
Capacity potential	1,638,500 kW
Energy generation potential	2,420,600 MWh

Figure 3. Small building/residential rooftop PV technical potential in San Jose, California (Source: SLED)

https://energy.gov/eere/analysis/downloads/city-energy-data-decisions

Columbia, Missouri: Using Energy Data to Reduce Emissions and Achieve Low-Income Household Energy Savings

The U.S. Department of Energy's (DOE's) Cities Leading through Energy Analysis and Planning (Cities-LEAP) and the State and Local Energy Data (SLED) programs partnered with 10 U.S. cities to demonstrate ways SLED data and analysis could inform more strategic energy decisions. Cities across the country can use SLED data and follow this pattern as part of their own energy planning.

City Energy Questions

The City of Columbia, Missouri, wanted to inform its energy goal setting with a better understanding of the following:

1. What kinds of energy actions and policies would have the greatest impact in reducing the city's greenhouse gas (GHG) emissions?
2. Which energy actions and policies would have the greatest benefit for low- and moderate-income households, particularly renter-occupied households?

Smaller to mid-sized communities like Columbia often don't have the resources they need to determine the answers to these questions on their own.

"The Cities-LEAP and SLED data helped Columbia focus efforts to achieve our strategic plan's goal of reducing our carbon footprint. The data collected and analyzed helps staff focus on the actions that will have the greatest impact on this goal while benefiting low-income residents. It also gave us some great examples of best practices other cities are using to address the same community concerns."

— Barbara Buffaloe, Sustainability Manager, City of Columbia

Columbia is a college town with a large transient population and a relatively high percentage of renters. The city also has a higher-than-average percentage of the population living below the poverty level, as well as higher-than-average residential energy expenditures. As such, the city is prioritizing residential energy efficiency programs, particularly in the rental sector.

Data and Analysis

In conducting the analysis for Columbia, the National Renewable Energy Laboratory (NREL) evaluated data available on the SLED website (eere.energy.gov/sled), including demographic data on income and housing occupancy, per capita residential electricity usage and expenditures, residential building stock, building area by type of building, and current GHG emissions levels. Columbia provided measured data where available to replace the estimated data from SLED in the analysis. NREL then compared these Columbia-specific data points to both national averages and cities with similar populations and climate zones (cohort cities) to place the Columbia data into context.

The SLED data, along with the SLED toolbox of resources for city-level energy actions (apps1.eere.energy.gov/sled/cleap.html) informed the analysis, which provided a menu of options for Columbia.

Reducing GHG Emissions

To answer Columbia's first question, NREL adjusted the GHG emissions summary for Columbia provided on SLED to

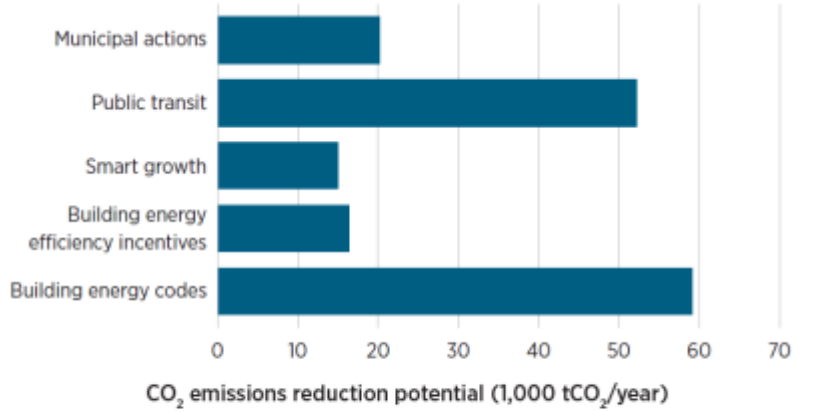
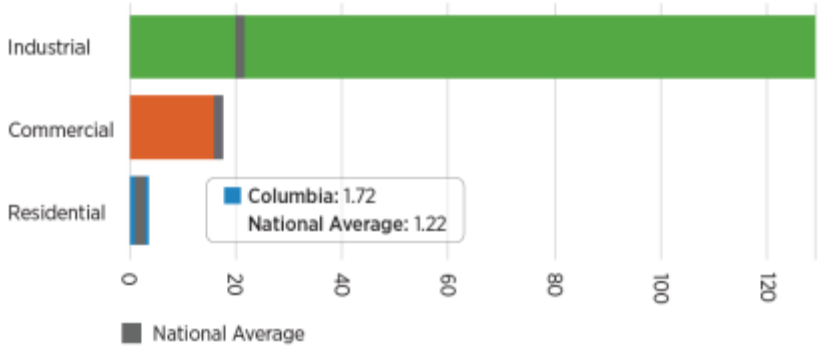


Figure 2. Annual GHG reduction potential of city actions for Columbia, Missouri, based on a carbon abatement potential study (energy.gov/eere/study-shows-carbon-emission-reductions-city-energy-actions), city-provided data, and SLED data (eere.energy.gov/sled)



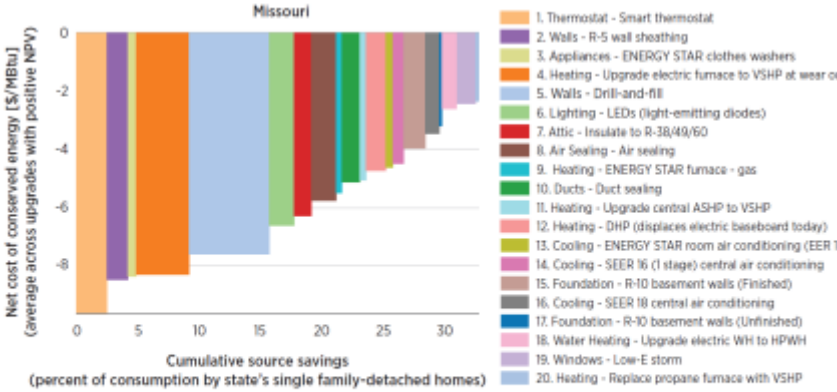
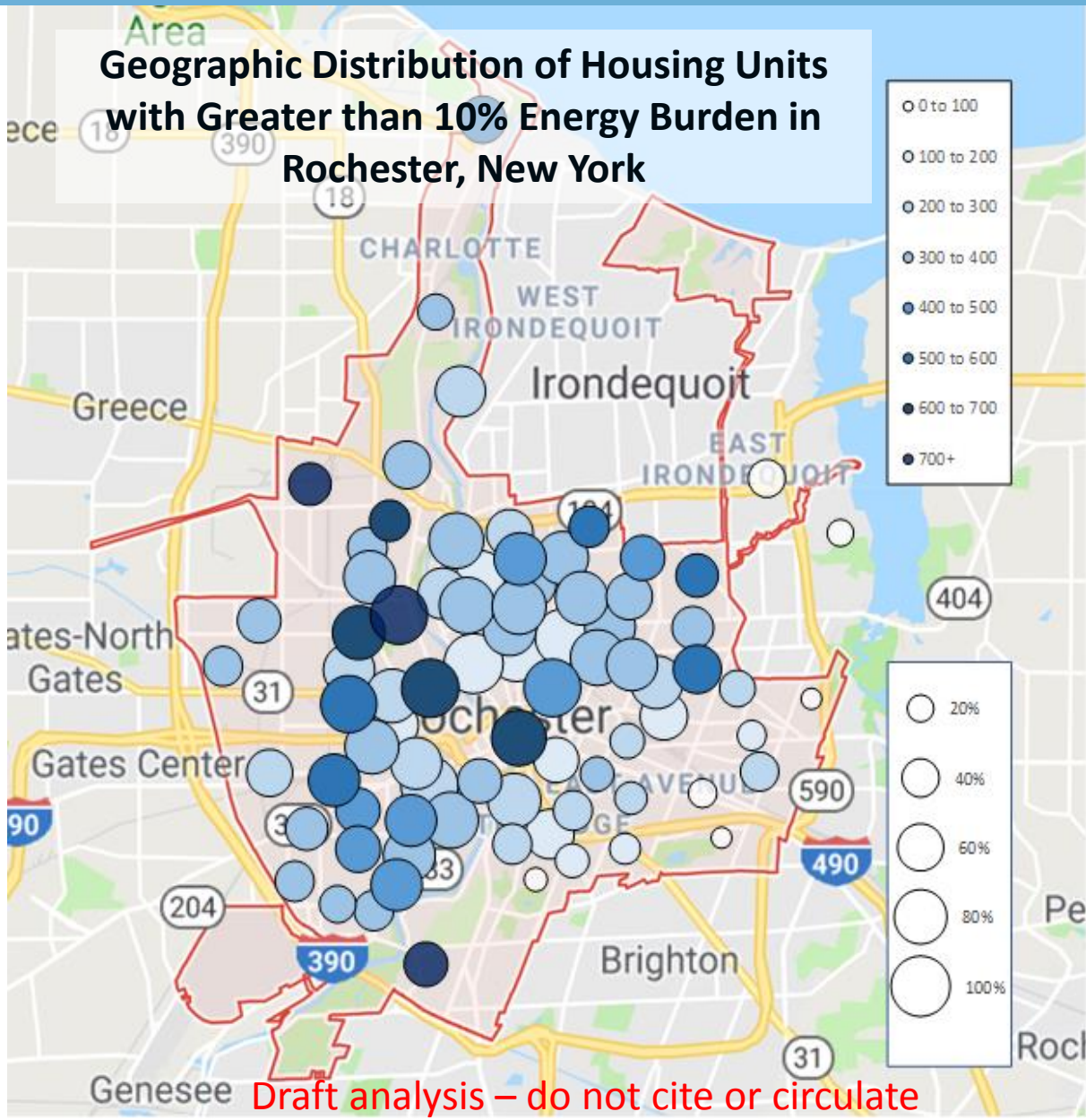


Figure 5. Energy efficiency supply curve for Missouri. Data from the NREL analysis of possible electricity cost savings (http://www.nrel.gov/docs/fy17osti/65667.pdf).

NPV = net present value; VHSP = variable-speed heat pump; ASHP = air-source heat pump; WH = water heater; HPWH = heat pump water heater.

New Data to Decisions Cities for FY18

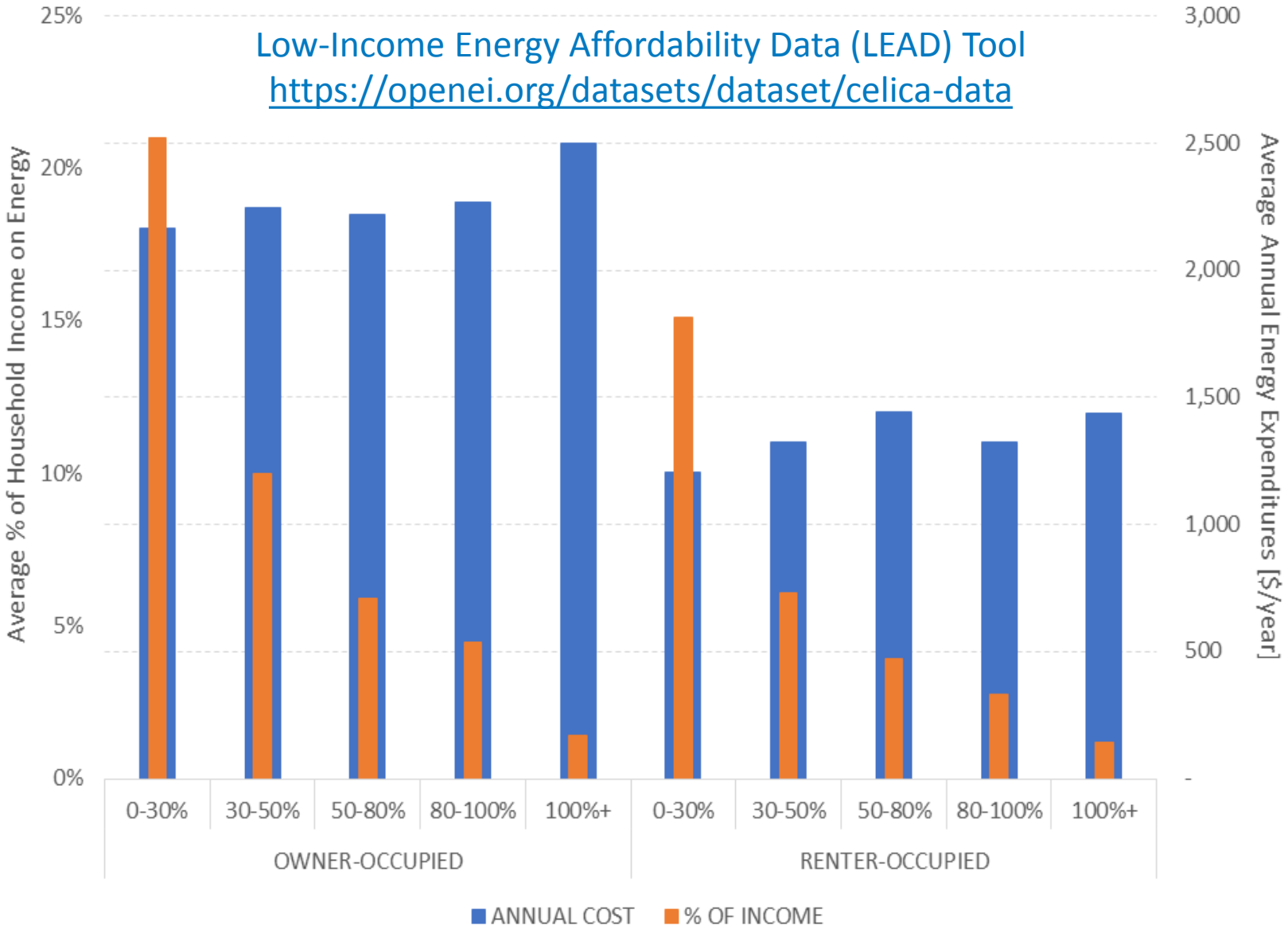
- Rochester, NY
- Hutchinson, MN



Cities-LEAP Analysis – Available on OpenEI

Energy Burden Estimates, Carrboro, NC (2015)

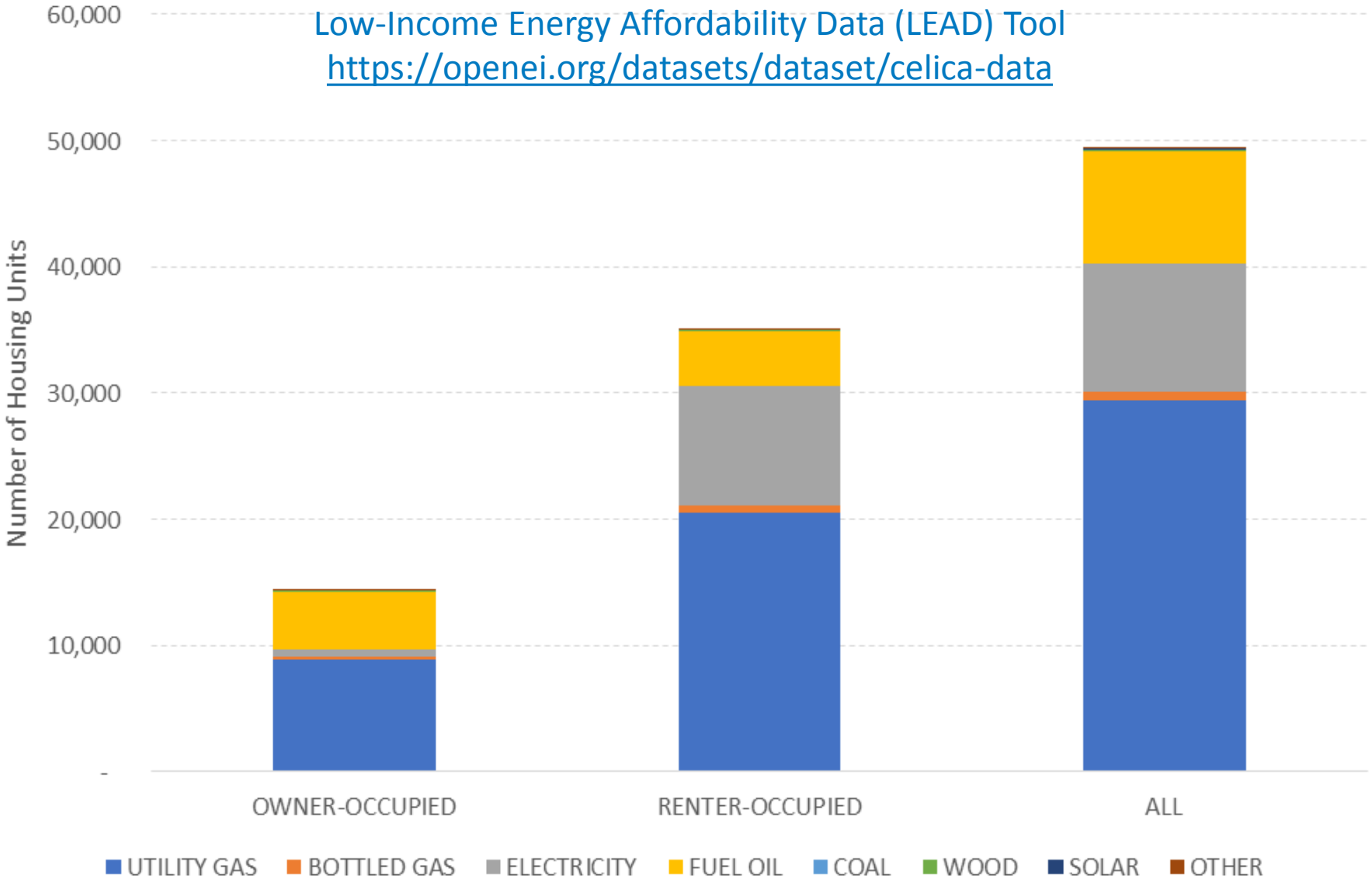
Low-Income Energy Affordability Data (LEAD) Tool
https://openei.org/datasets/dataset/celica-data



Additional Analysis Available on OpenEI

Number of Housing Units by Heating Fuel Type, Tenure in New Haven, CT (2015)

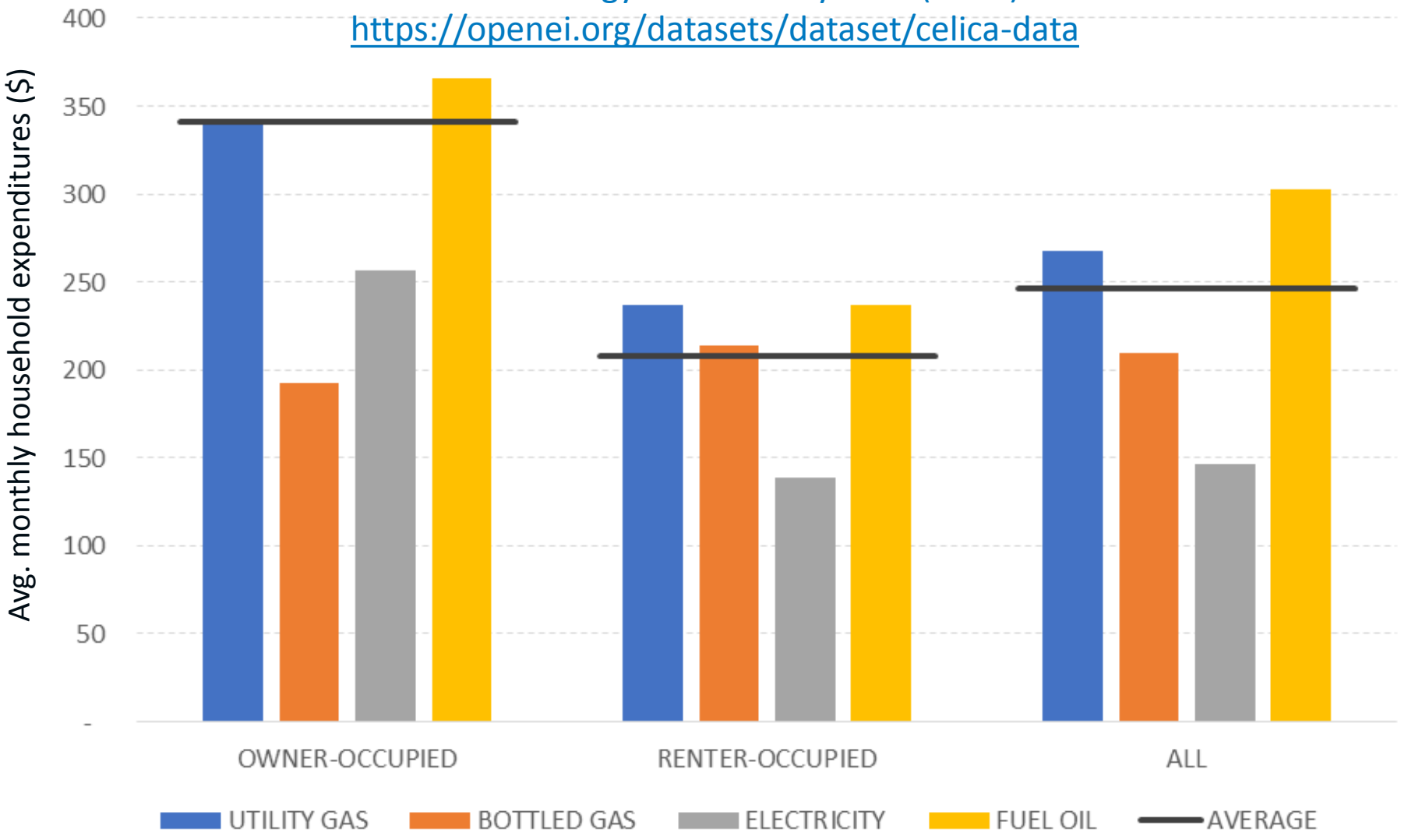
Low-Income Energy Affordability Data (LEAD) Tool
https://openei.org/datasets/dataset/celica-data



Additional Analysis Available on OpenEI

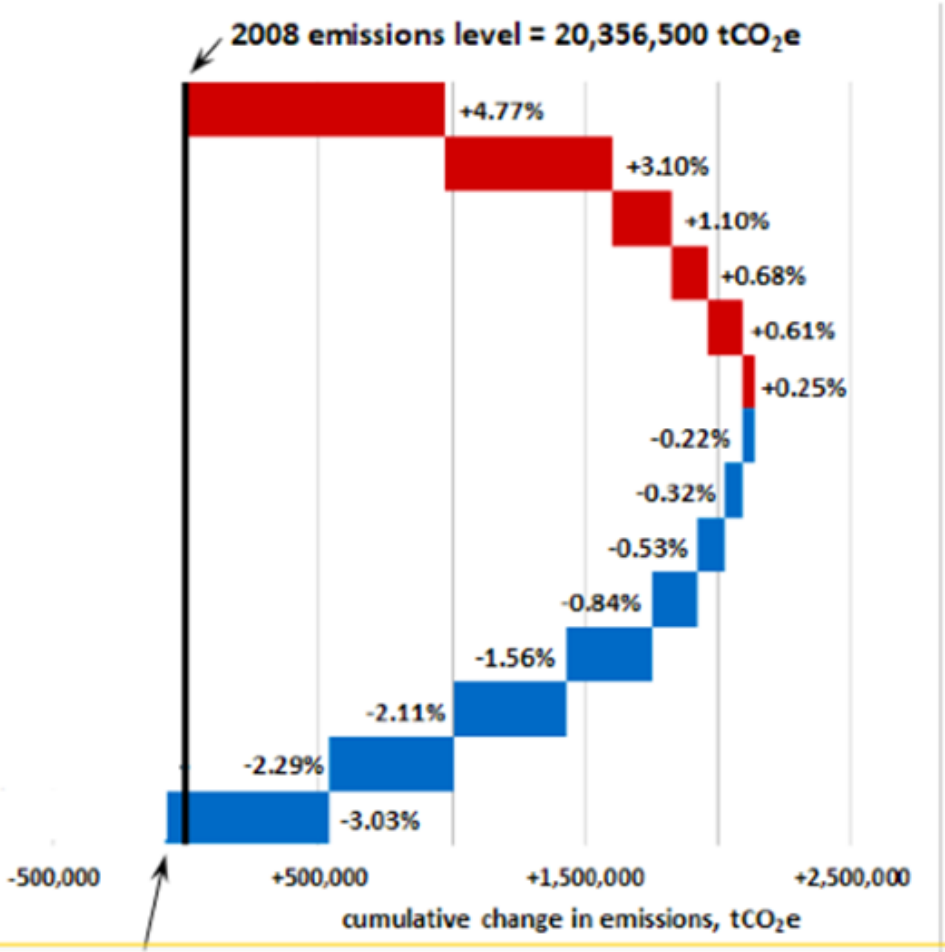
Average monthly expenditures by heating fuel type in New Haven, CT (2015)

Low-Income Energy Affordability Data (LEAD) Tool
https://openei.org/datasets/dataset/celica-data



Cities-LEAP FOA Awardee Projects

2008-2015 Drivers of Change



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Cities-LEAP FOA Awardee Projects

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Cities-LEAP

April 17, 2018

Register for the May 22 Webinar on the DOE Asset Score Tool

Under a cooperative agreement with the U.S. Department of Energy (DOE) through the Cities Leading through Energy Analysis and Planning (Cities-LEAP) project, the City of Portland has been exploring strategies to leverage annual benchmarking and disclosure data with the use of permit data, the DOE Standard Energy Efficiency Data Platform (SEED) database and the DOE Building Energy Asset Score Tool. This project has extensively examined the relationship between Asset Scores generated on a subset of city buildings and the actual benchmarking data collected on the buildings. The goal was to use Asset Score to help identify building characteristics that might predict or correlate with actual building performance data.

This webinar will discuss how the project was implemented and the results of the analysis, with a focus on opportunities to develop policies and programs to more effectively leverage existing data tools. Presenters will discuss data, tools, and findings, as well as take questions from webinar participants. The webinar runs from 10:00–11:30 a.m. Pacific Daylight Time.

Presenters:

- Vinh Mason, City of Portland
- Supriya Goel, Pacific Northwest National Laboratory
- Alex Novie, Energy Trust of Oregon
- David Heslam, Earth Advantage
- Mark Frankel, New Buildings Institute
- Ookie Ma, DOE

CONTACT

Megan Day, Megan.Day@nrel.gov

ACCESS CITY ENERGY PROFILES, TOOL BOX

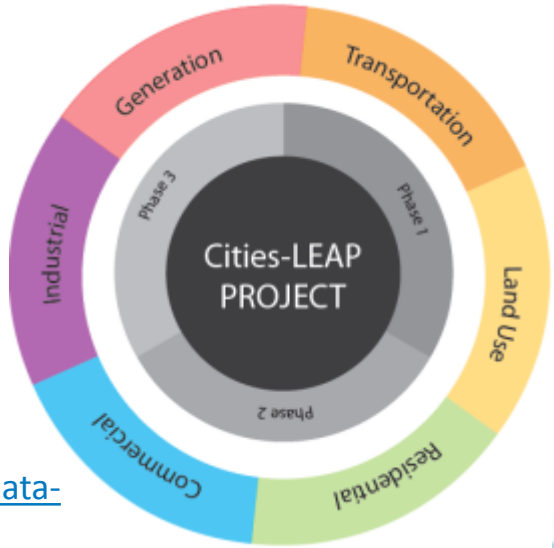
apps1.eere.energy.gov/sled

ACCESS THE REPORTS

City Energy: From Data to Decisions
https://www.energy.gov/eere/analysis/downloads/city-energy-data-decisions

City-Level Energy Decision Making: *Data Use in Energy Planning, Implementation, and Evaluation in U.S. Cities*
http://www.nrel.gov/docs/fy15osti/64128.pdf

Estimating the National Carbon Abatement Potential of City Policies:
A Data Driven Approach
http://www.nrel.gov/docs/fy17osti/67101.pdf



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