



Carbon Neutral: Regional & National Strategies

Panelists: Kate Bowman, Matt Cox

Moderator: Joyce McLaren

GreenTown: Climate Crisis Event

September 23, 2020

National Renewable Energy Laboratory

2,307

Employees

plus more than

460

early-career researchers
and visiting scientists



World-class

facilities, renowned
technology experts

about
900

Partnerships

with industry,
academia, and
government



Campus

operates as a
living laboratory

NREL Science & Partnerships Drive Innovation



Renewable Power

Solar
Wind
Water
Geothermal
Hybrid Systems



Sustainable Transportation

Bioenergy
Vehicle Electrification
Hydrogen for Transport
Vehicle-Grid Interactions



Energy Efficiency

Buildings Technology
Advanced Manufacturing
Government Energy Management
Grid-Interactive Efficient Buildings



Energy Systems Integration

Grid Integration
Energy Security
Resilience
High Performance Computing



SOLAR ENERGY INNOVATION NETWORK

A collaborative research program that supports multi-stakeholder teams to research and share innovative solutions to real-world challenges associated with solar energy adoption.

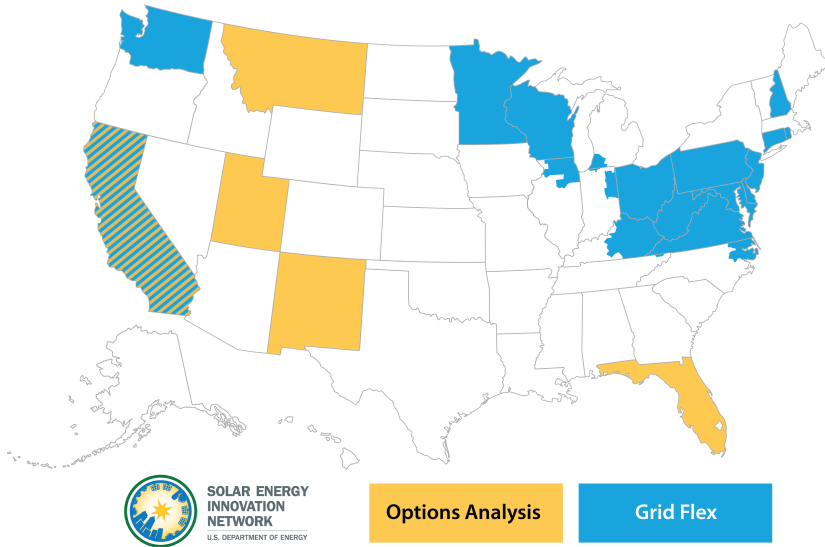
- Multi-stakeholder teams identify local and regional challenges
- Teams receive technical and financial assistance to formulate and test solutions and validate new models
- Teams meet regularly and attend quarterly workshops to gather feedback and learn from other teams
- Research and solutions shared with other stakeholders nationally



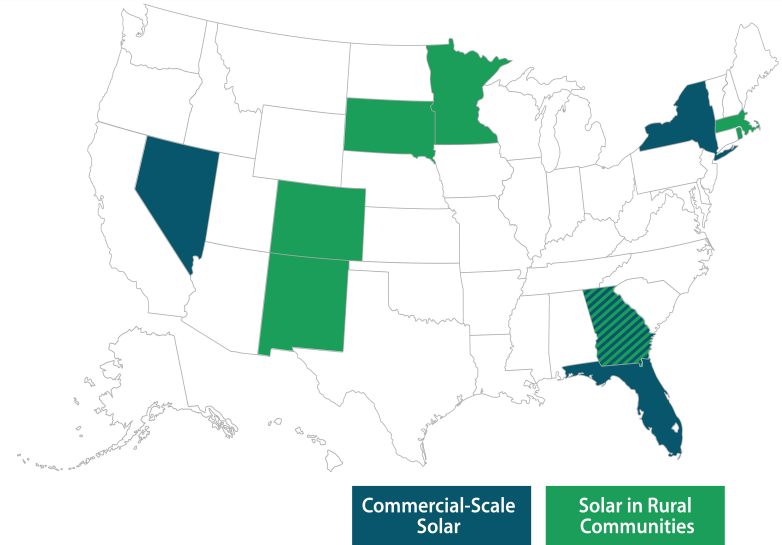
Lawrence Berkeley
National Laboratory



SEIN Round 1 & Round 2 Teams



Solar for System Resilience & Restoration
Locational Value of Solar
Advanced Rate Structure Design
Solar for Clean Electric Transportation
Prioritizing Energy Goals and Pathways



Solar Interconnection Cost Reduction
Community-led Solar Planning
Solar + Storage for Microgrids & Facility Backup
Overcoming Barriers to Community-Solar



Joyce McLaren (Moderator)

Research Analyst

National Renewable Energy Laboratory

Kate Bowman (Panelist)

Renewable Energy Program Manager

Utah Clean Energy

Matt Cox (Panelist)

Founder & CEO

Greenlink Analytics



**UTAH
CLEAN
ENERGY**

KATE BOWMAN

RENEWABLE ENERGY
PROGRAM MANAGER



STOP
ENERGY WASTE



CREATE
CLEAN ENERGY



BUILD
A SMART ENERGY FUTURE

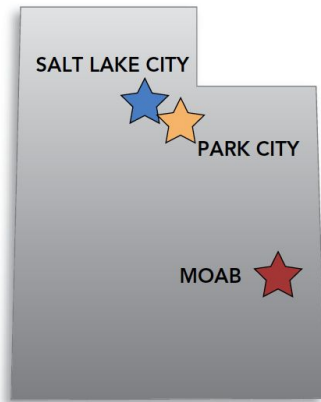




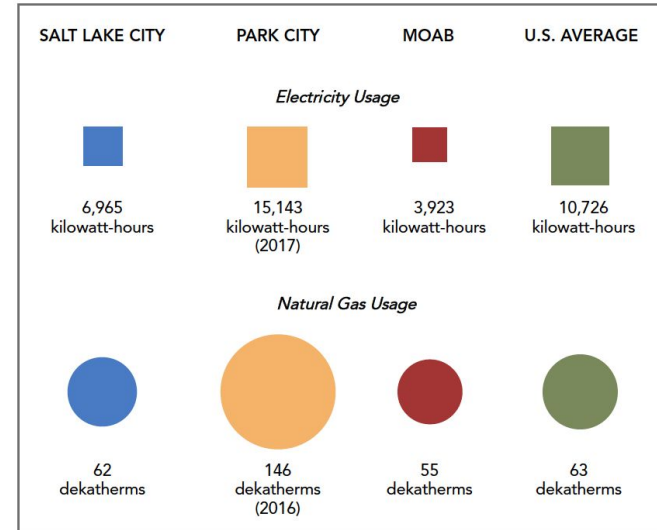
Charting a Path for Reliable, Resilient and Affordable Clean Energy

A Roadmap for
Three Communities in Utah

Community Characteristics and Energy Usage



	POPULATION	HOUSEHOLDS
Salt Lake City	200,591	75,430
Park City	8,504	3,407
Moab	5,322	1,953

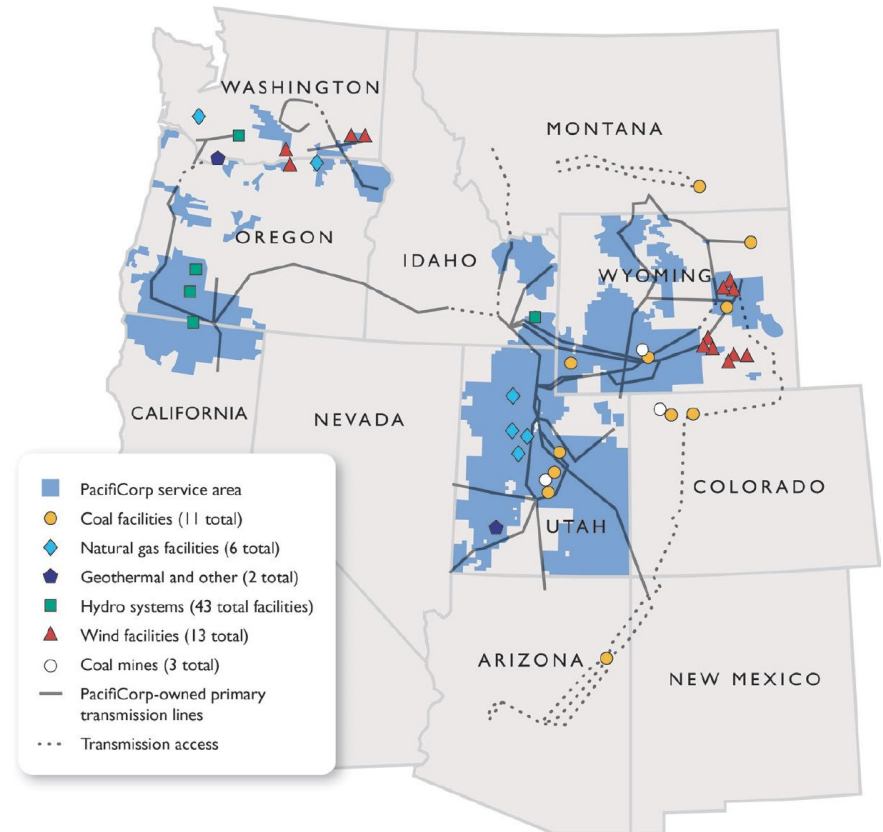


Key takeaways:

- Park City homes have higher than average per-household energy usage, whereas homes in Moab use less than half as much electricity as the national average.
- Housing density is increasing in Salt Lake City and the majority of new construction is multi-family housing, but the city's housing is largely composed of single-family homes many of which are 100 years old or more.
- All three communities are experiencing growth, creating opportunities to ensure that new homes and buildings are built to ultra-efficient standards.

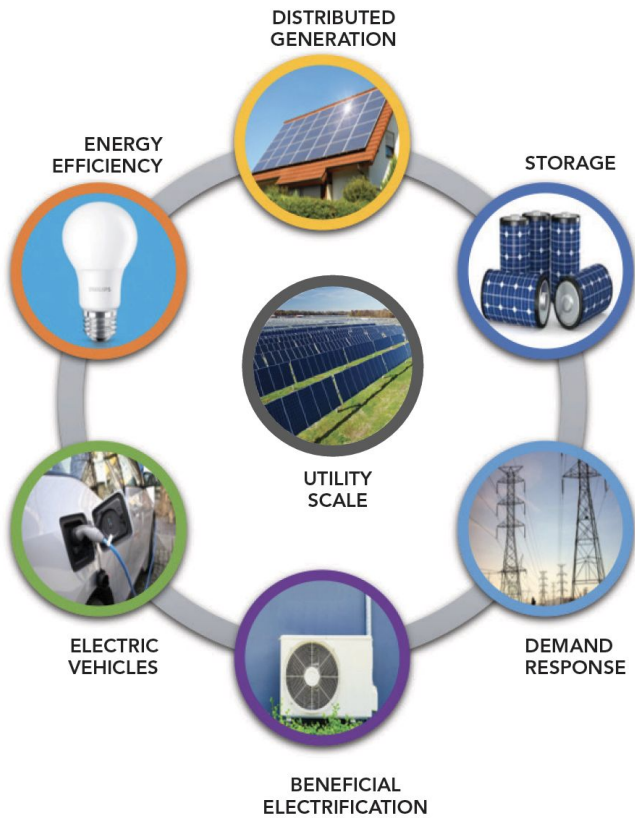
Community Energy Goals and Current Resource Mix

- Salt Lake City**
50% GHG reduction community-wide by 2030 and 80% GHG reduction by 2040
- Park City**
Net-zero carbon emissions for municipal operations by 2022 and community-wide by 2030
- Moab**
50% GHG reduction for municipal operations by 2027 and community-wide by 2032; 80% GHG reduction community-wide by 2040



Resource Options

Distributed Energy Resources



SOLEIL LOFTS, POWERED BY SOLAR & STORAGE Herriman, Utah



ZERO-EMISSIONS TRANSIT Park City, Utah

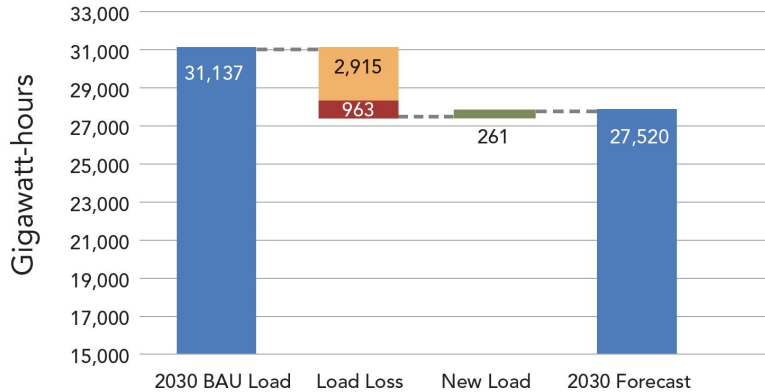


FIRST NET-ZERO FIRE STATION Salt Lake City, Utah



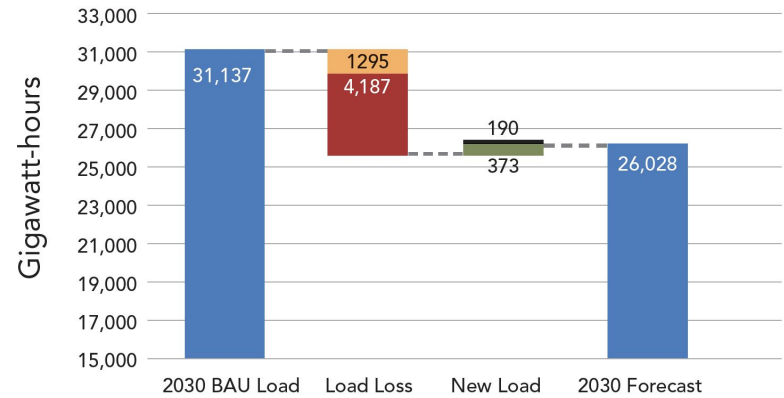
Distributed Energy Resource Scenario Analysis

Business as Usual
Annual Energy Usage in Utah

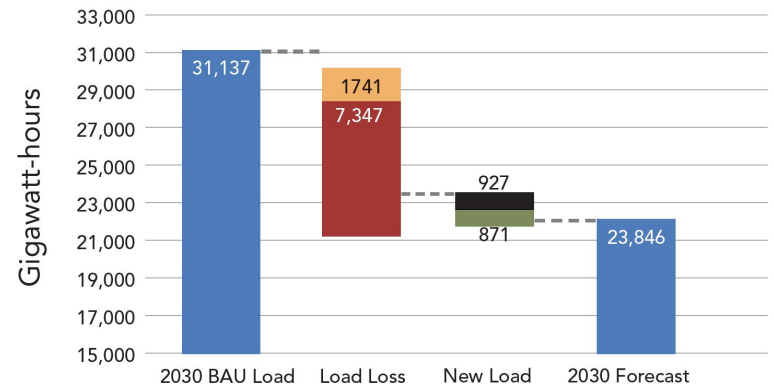


- Efficiency
- Distributed Generation
- Electric Vehicles
- Electrification

Medium
Annual Energy Usage in Utah



Ambitious
Annual Energy Usage in Utah





Strategies to Achieve Net 100% Renewable Electricity by 2030

Categories of Distributed Energy
Resource Strategies for Achieving
Renewable Energy Goals

ENERGY EFFICIENCY

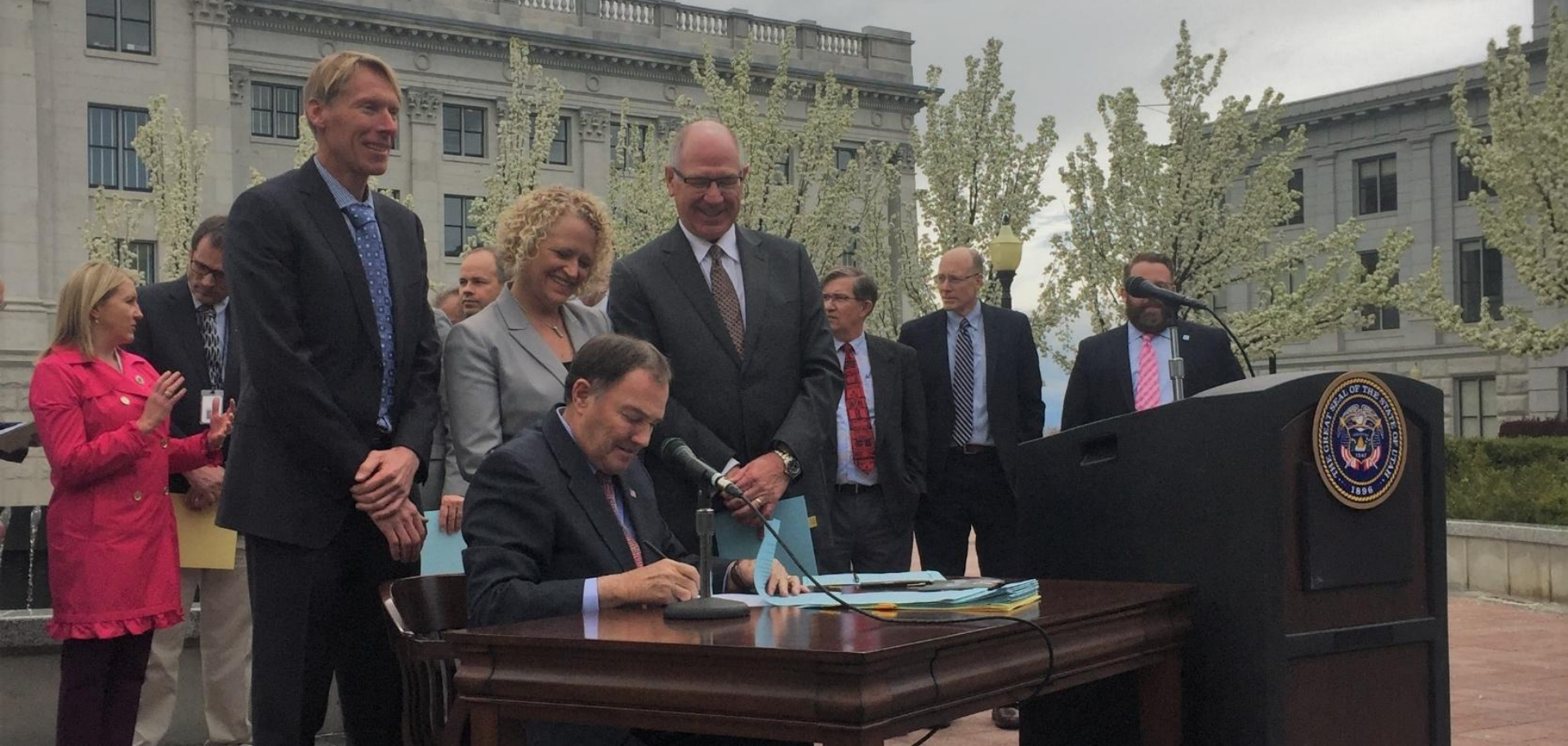
DISTRIBUTED GENERATION

BENEFICIAL ELECTRIFICATION

ELECTRIC VEHICLES

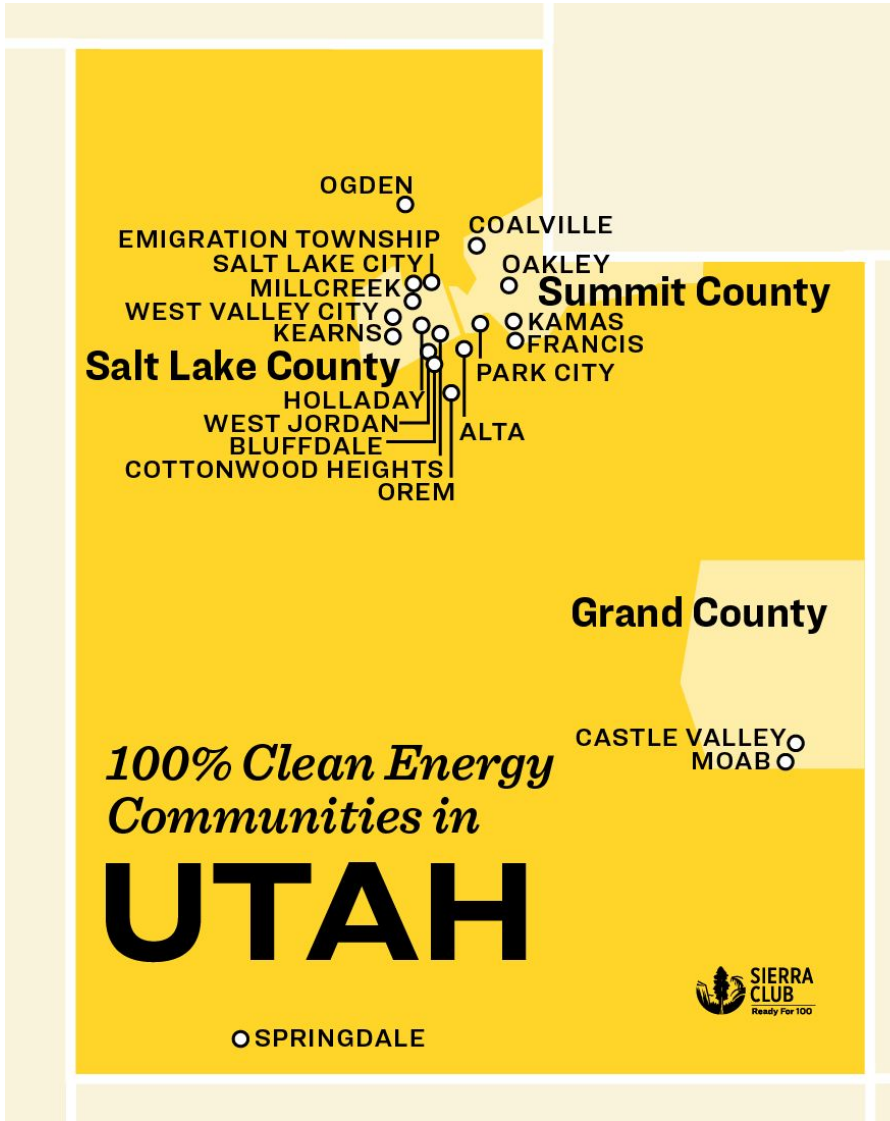
CUSTOMER EQUITY & ACCESS

FINANCIAL TOOLS



COMMUNITY RENEWABLE ENERGY ACT (HB 411)

Enables communities who desire renewable energy to obtain net-100% renewable electricity by 2030



Community Renewable Energy Act

Currently applies to 23 cities and counties in Utah

EmpowerSLC 
www.empowerslc.org



Annual Savings
\$12
Per Bulb

Swap light bulbs



OVER \$100 DISCOUNT ON A
SMART THERMOSTAT

SUMMER 2019 | ENDS AUGUST 17

VISIT EMPOWERSLC.ORG



EmpowerSLC 

UCAIR

EmpowerSLC 



Kate Bowman

Renewable Energy Program Manager

Utah Clean Energy

(801) 903-2031

kate@utahcleanenergy.org

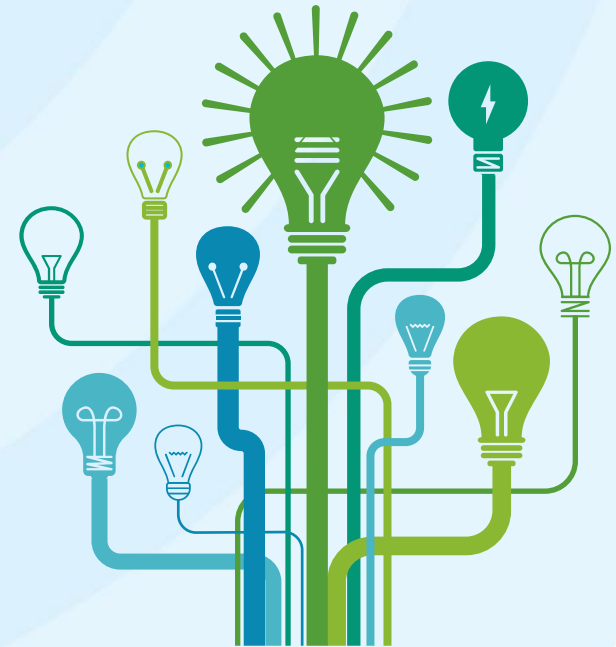


GreenTown Climate Crisis: Equitable, 100% Renewable, Carbon Neutral Cities

Matt Cox, PhD

greenlink

- A clean energy research and advisory organization based in Atlanta, Georgia
- Led by Ph.D economists, engineers, and policy experts.
- Over 20 years combined experience in energy and climate policy
- Over 125 publications on the subjects of energy, climate, and city sustainability
- Industry-leading data tools and analytics
- Active as advisors and data providers in 75 cities, about 20 states, and the national labs



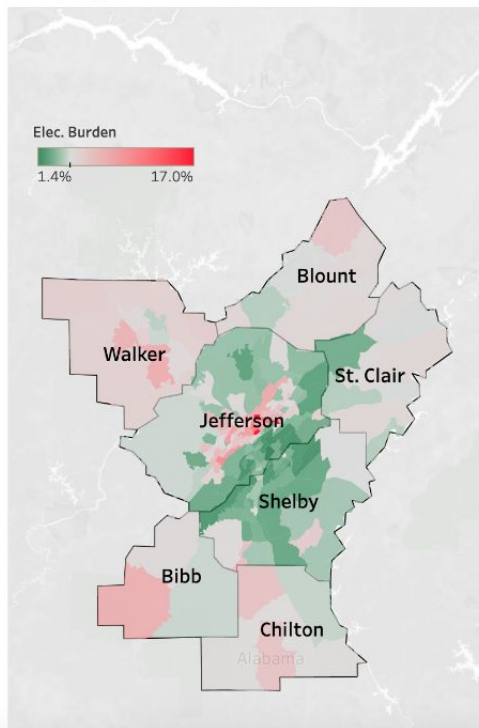


Major Areas of Concern: Climate Change and Equitable Development

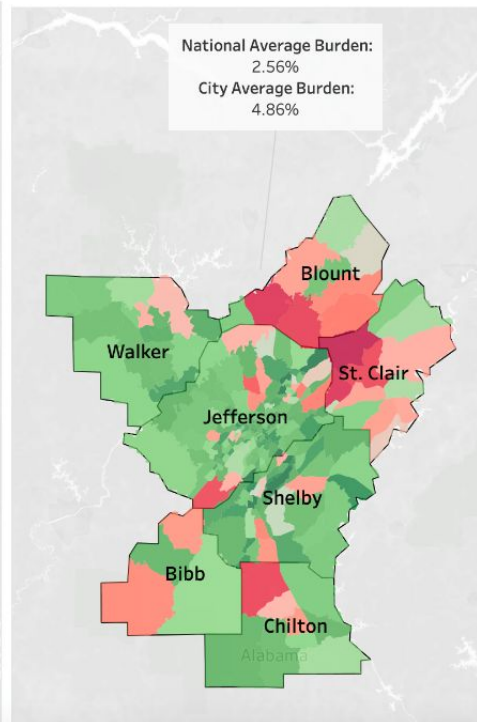
Energy Burden as an Intersectional Issue

- Utility burden
 - % of household income spent on utilities – electricity, gas, water
 - Data access and resolution are key challenges

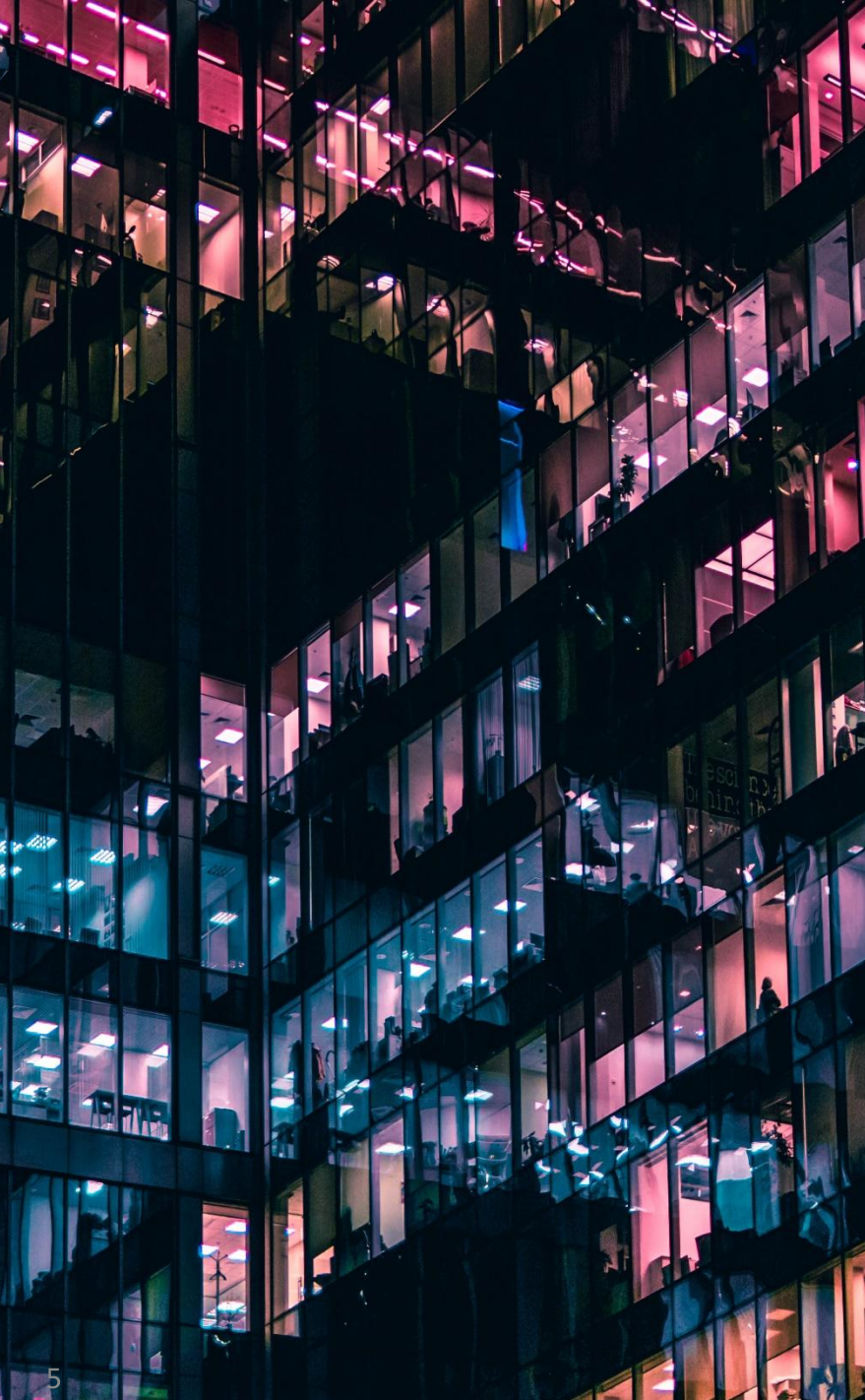
Electricity Burden



Electricity Burden (by Population)



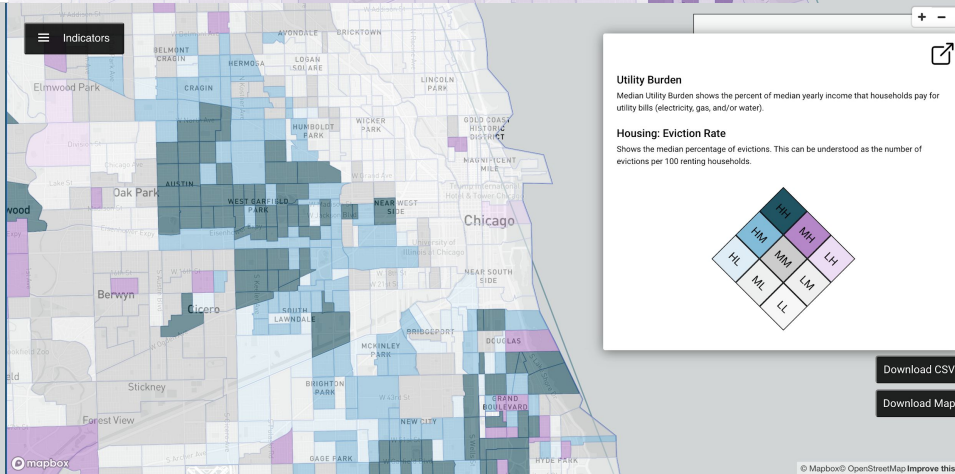
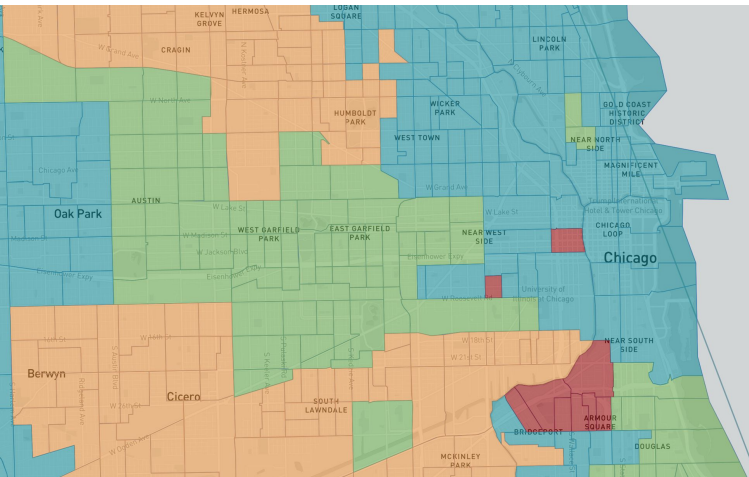
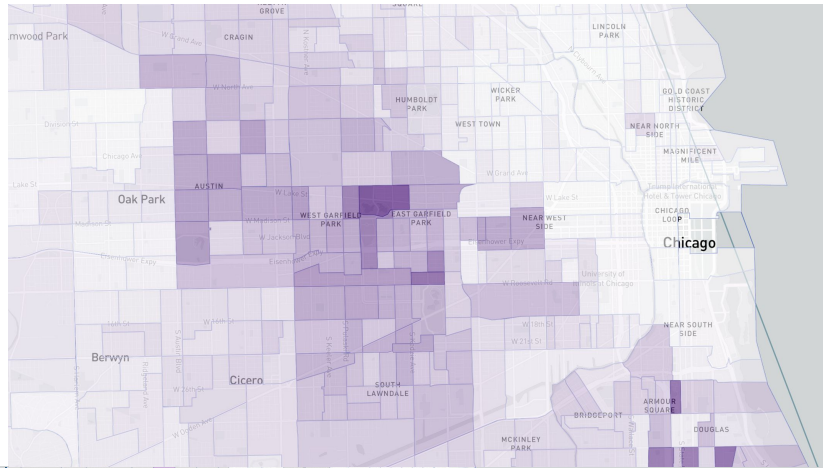
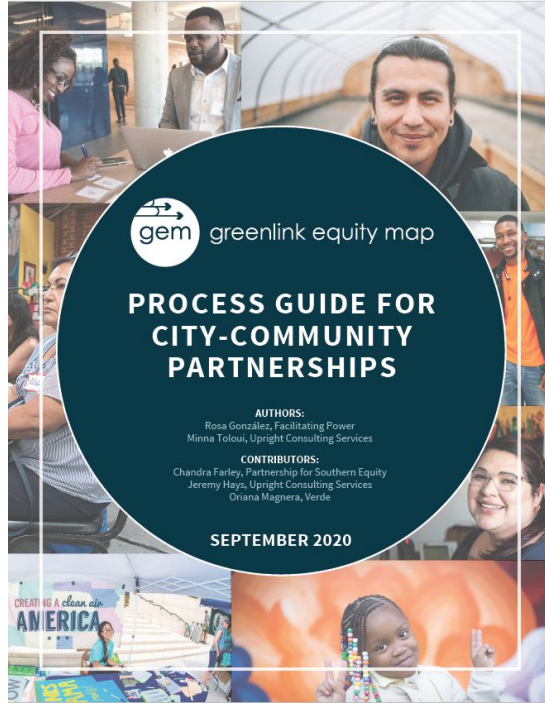
Birmingham, AL



General Approaches and Tools

- **Collaborative, Community-Focused Data Analysis**
 - Understand the baseline
 - Discuss and embed values into policy
 - Assess potential opportunities and projected results
 - Implement, Deliver, and Evaluate
- **Tools**
 - GEM and GEM Process Guide
 - ACES
 - Clean Energy Policy Toolkit

Where are we? What should we do?



How far can we go?



ABOUT THIS TOOL

This tool allows you to design 100% renewable energy pathways in the City of Orlando. It covers all sectors of the Orlando economy, including the residential, commercial, transportation and power utility sectors. The tool is powered by The Greenlink Group's ATHENA model, which is translating clean energy actions into energy, carbon, economic, and social impacts for Orlando.

USERS' GUIDE

You can create your own low-carbon vision for Orlando by inputting the values in the ACTION cells. After entering your target values, your report card will give a deeper breakdown of the impacts.

Actions and Impacts

ENERGY EFFICIENCY

Residential Energy Efficiency		Commercial Energy Efficiency	
	ACTION		ACTION
Residential Potential Achieved	100%	Commercial Potential Achieved	100%
	IMPACT		IMPACT
# of homes cutting electricity by half	162,859	kWh-saved per sqft	23.1

SOLAR POWER

Residential Solar Power		Commercial Solar Power	
	ACTION		ACTION
Residential Solar Potential Achieved	100%	Commercial Solar Potential Achieved	100%
	IMPACT		IMPACT
Homes adding solar	18,600	Buildings adding solar	35,521
Utility Scale PV		ACTION	
Utility Scale PV Potential			100%
	IMPACT		
Number of homes powered by greenspace solar			122,800

Electric Vehicles Adoption

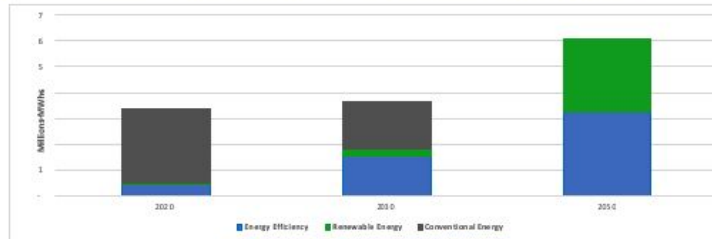
Electric Vehicle		ACTION
EV Potential Achieved		100%
	IMPACT	
# of Electric Vehicles in Orlando		442,373



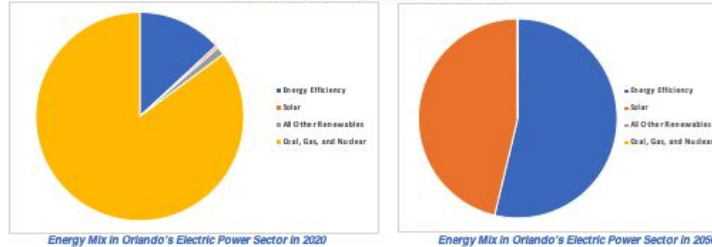
Powered by greenlink



ORLANDO'S ENERGY USE AND CARBON EMISSIONS UNDER THE LOW CARBON PATHWAY

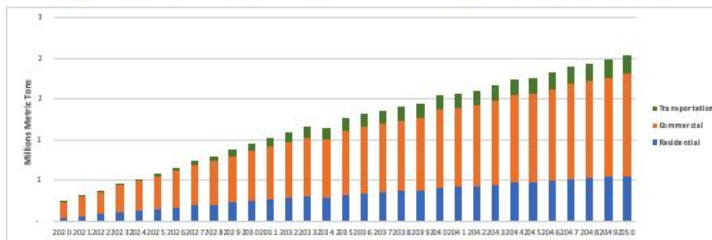


How Electricity Demand in Orlando Is Met Over Time



Energy Mix in Orlando's Electric Power Sector in 2020

Energy Mix in Orlando's Electric Power Sector in 2050



CO₂ Reduction in Orlando, 2020 - 2050

Put in Action: Atlanta and Honolulu

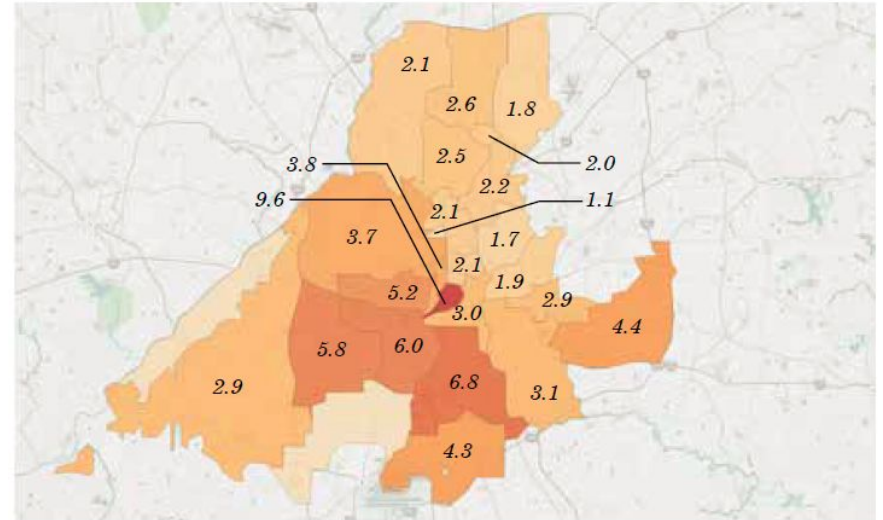
Priorities

100% of Atlantans have a right to 100% clean energy

- 01** Energy equity must be a priority
- 02** Investments in energy efficiency must be increased
- 03** Local investments in renewable energy must be prioritized over investments outside of the Atlanta Metro

30310, 30311, 30314 Structure Age and Occupancy

Date of Construction	# Owned	# Rented	Total Units	%
not available	10	25	35	0%
1840 - 1939	2,119	2,984	5,103	24% *
1940 - 1949	1,816	2,068	3,884	18% * 70%
1950 - 1959	3,378	2,663	6,041	28% *
1960 - 1969	1,652	832	2,484	12%
1970 - 1979	662	326	988	5%
1980 - 1989	354	225	579	3%
1990 - 1999	497	176	673	3%
2000 - 2009	772	930	1,702	8%
Total	11,260	10,229	21,489	100%

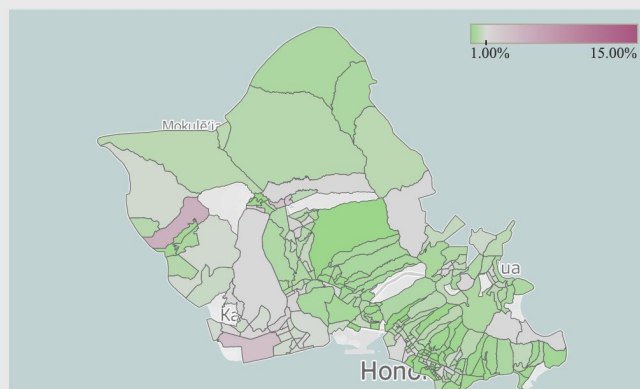
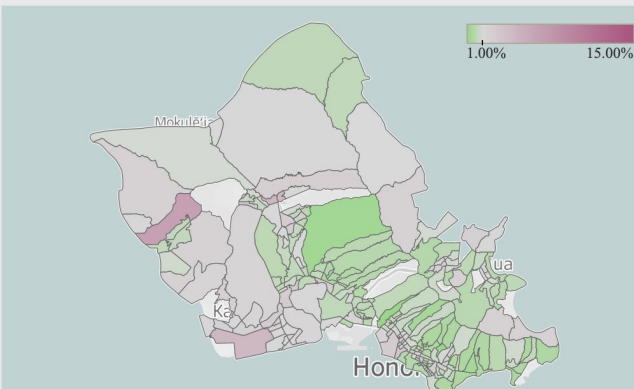


Atlanta Residential Electricity Burden By ZIP Code



Median Energy Burden for Each Census Tract (BAU 2030)

Median Energy Burden for Each Census Tract (Scenario Impact 2030)



Your 2030 Pathway Report Card

Cost Overview		2030 Clean Energy Summary	
Total Investment	\$0	Energy Demand Met by Efficiency	0%
Total Benefit	\$0	Residential Solar Capacity Installed (MW)	0
Net Benefits (\$M)	\$0	Commercial Solar Capacity Installed (MW)	0
Benefit-Cost Ratio	0.0	Avoided Climate Damages (\$)	\$0
Net Jobs Created	0	Metric Tons CO2 Avoided Through 2030	0

Your 2030 Pathway Report Card

Cost Overview		2030 Clean Energy Summary	
Total Investment	\$1,276,000,000	Energy Demand Met by Efficiency	28%
Total Benefit	\$1,546,000,000	Residential Solar Capacity Installed (MW)	3
Net Benefits	\$270,000,000	Commercial Solar Capacity Installed (MW)	100
Benefit-Cost Ratio	1.2	Avoided Climate Damages (\$)	\$308,000,000
Net Jobs Created	10,000	Metric Tons CO2 Avoided	5,174,000

An aerial photograph of a city skyline, likely Atlanta, Georgia, featuring several prominent skyscrapers. In the foreground, there is a large, modern building with a flat roof covered in solar panels. A semi-transparent teal overlay is positioned in the center-right of the image, containing the text 'Thank You!' and contact information for Dr. Matt Cox.

Thank You!

• Dr. Matt Cox, CEO and Co-Founder

• mcox@greenlinkanalytics.org

• @GreenlinkGroup