

# greenlink

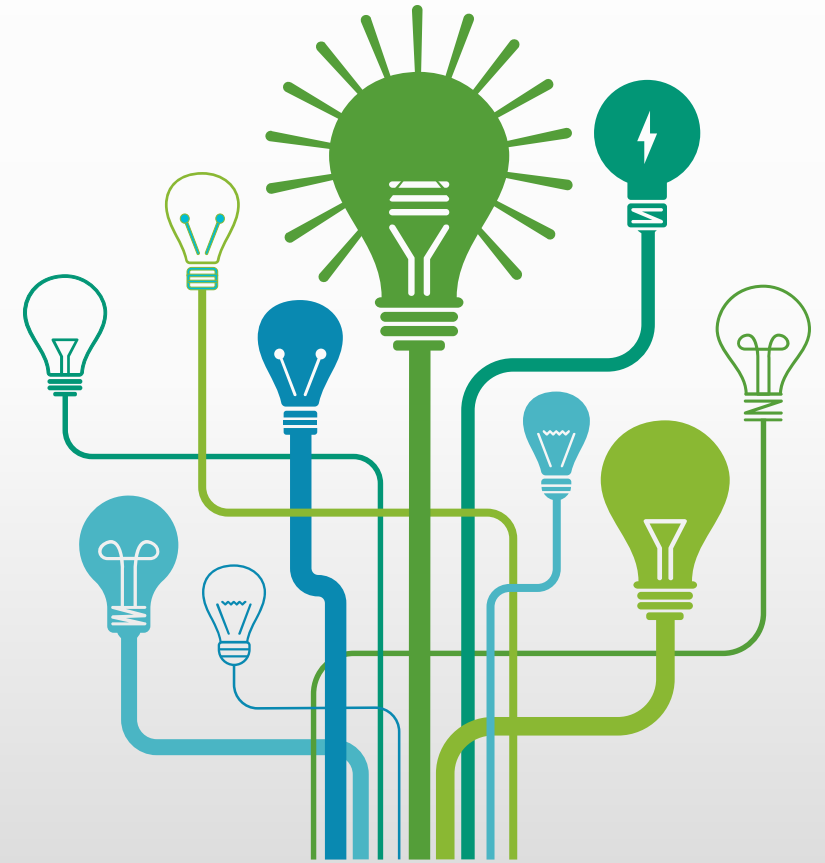
## LEVERAGING 100%: HOW CITIES ARE LEADING THE CLEAN ENERGY REVOLUTION

MATT COX

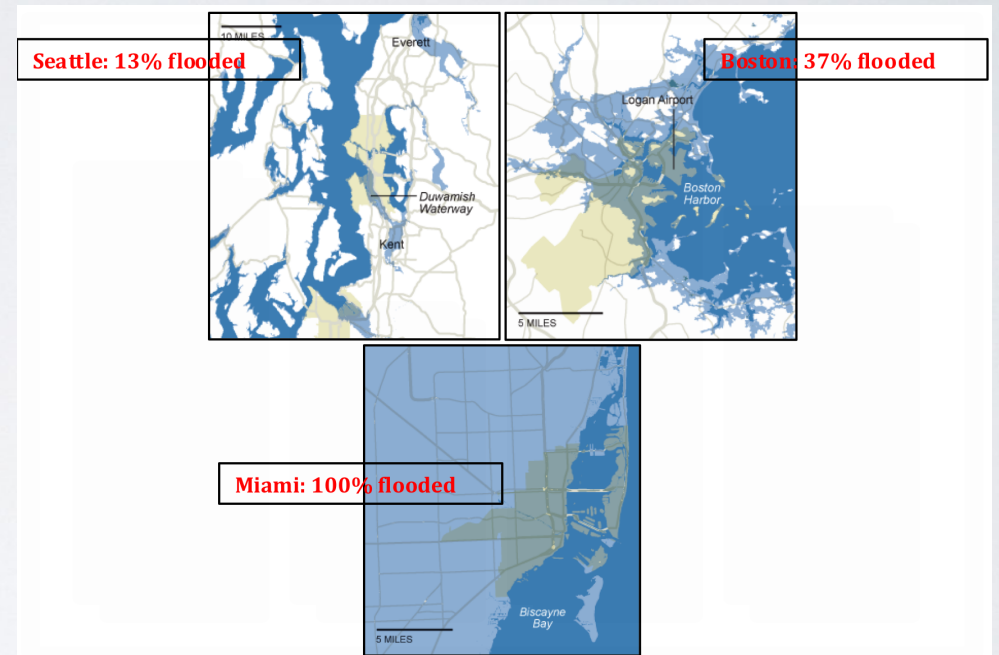
08.16.19

# greenlink

- A clean energy research and consulting 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 100 publications on the subjects of energy, climate, and city sustainability
- Industry-leading data tools and analytics
- Active as advisors and data providers in several dozen cities, about 20 states, and the national labs



# WHY CLIMATE?

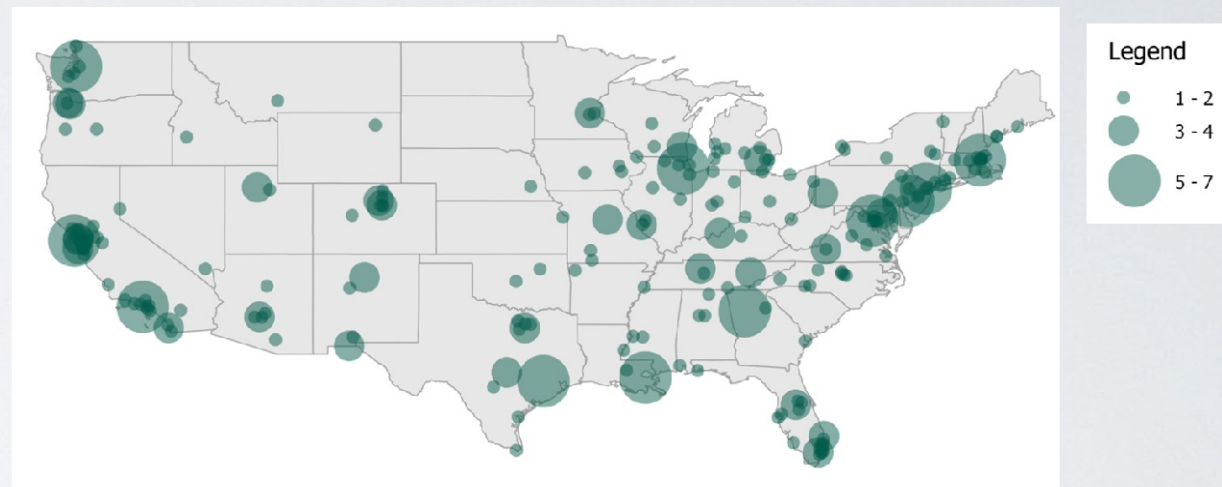


# WHAT IS 100% AND WHY 100%?

- Good question 🙄
- But there are real reasons

# CITY CLIMATE NETWORKS ARE MANY

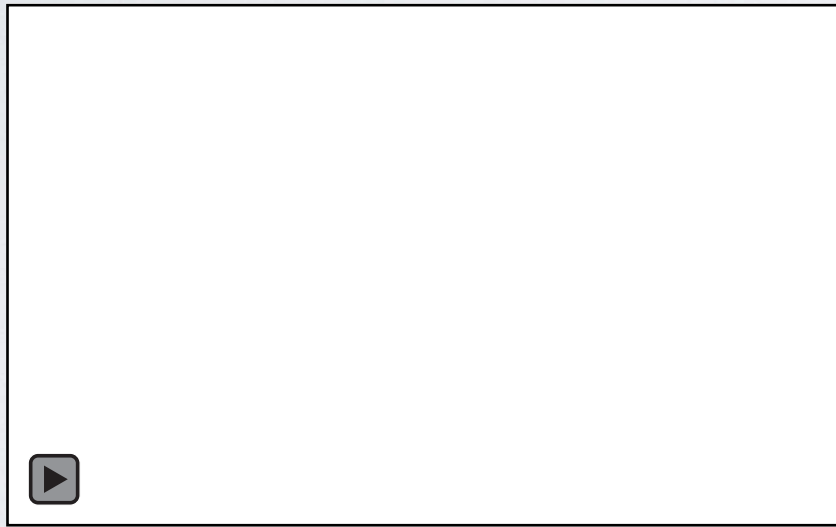
- Danger of joining and doing little
- More successful networks have focused on policy adoption and implementation



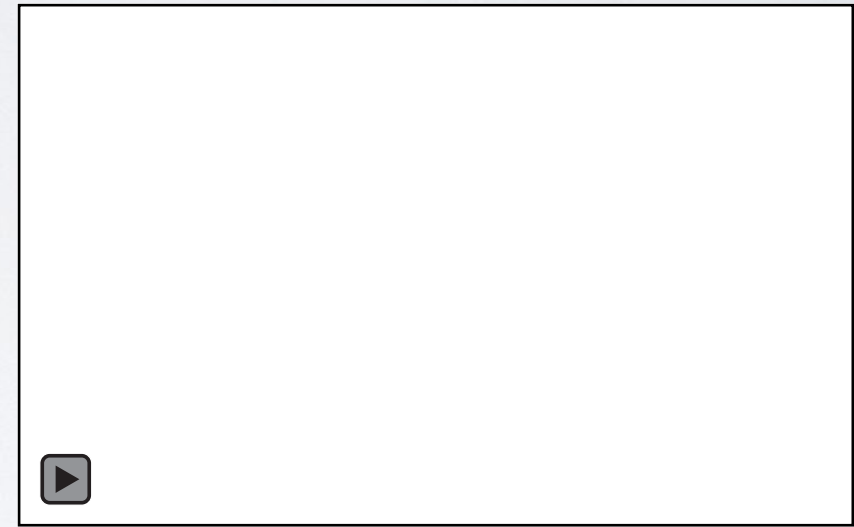
Networks included: 100 Resilient Cities, City Energy Project, Better Buildings Challenge, C40, Urban Sustainability Directors Network, Covenant of Mayors.

Source: French, Sudharsan, and Clark, 2018

# HIGH QUALITY ENERGY AND CLIMATE DATA IS SCARCE; EVEN MORE SO AT THE CITY SCALE



100 Largest MSAs



30 Largest MSAs

# WHY FOCUS ON THIS AREA TO BEGIN WITH?

- Energy interfaces with almost every social and economic activity
  - Enabler of most activities
  - Causes many problems, too!




# SUCH AS...JOBS AND ECONOMIC DEVELOPMENT

Economic Development from Clean Energy in NC



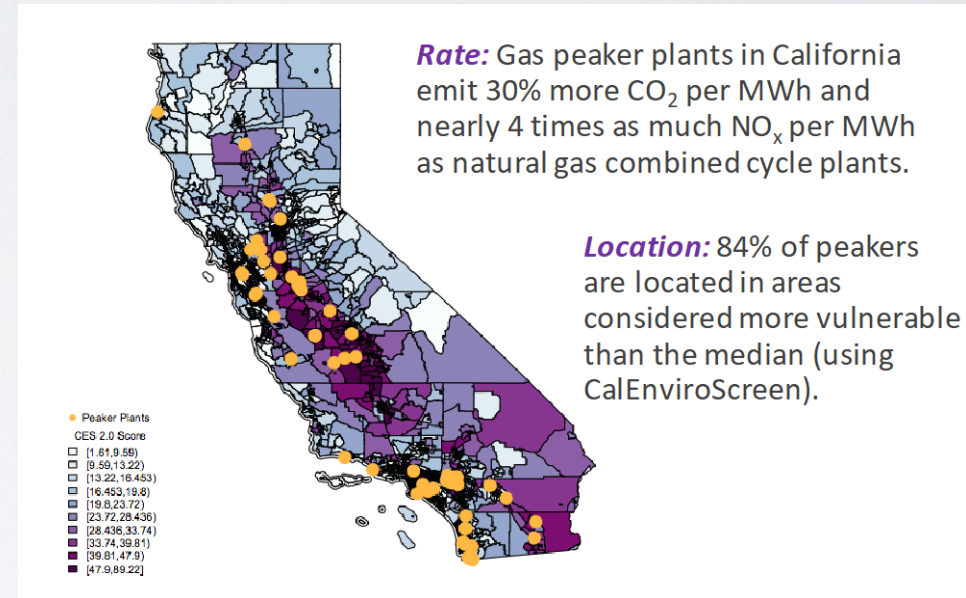
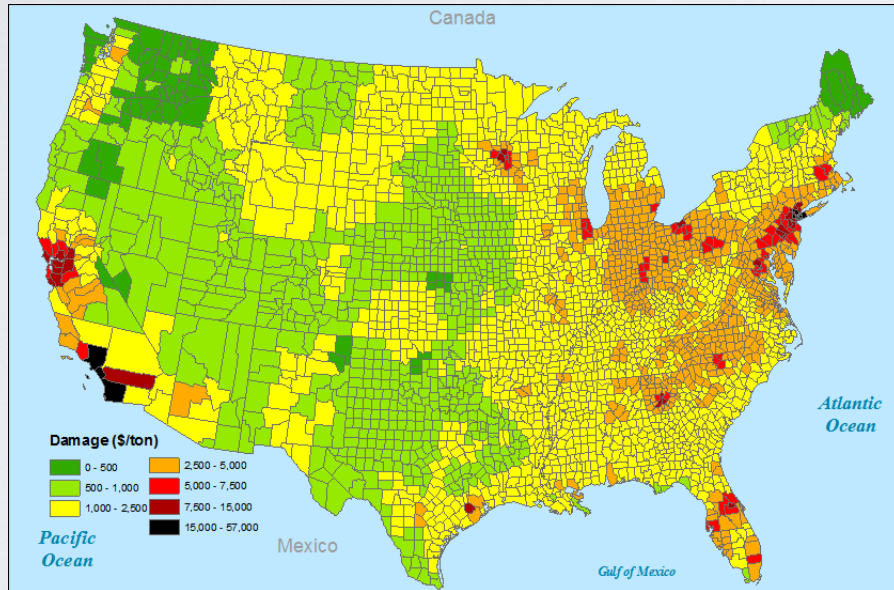
## Economics

The Atlanta Better Buildings Challenge (ABBC) is improving our economy by creating or sustaining jobs every year and stimulating local and regional economic growth. The economic development metrics for the ABBC are estimated using the IMPLAN econometric modeling system with local data sets to represent Atlanta's economy.

 <p><b>103.17</b></p> <p>Annual Average Number of Jobs Sustained or Created</p> <p>Since the program's inception, ABBC has sustained or created approximately 619 total jobs</p>	 <p><b>\$4.11 Million</b></p> <p>Annual Average Impact on Income</p> <p>Since the program's inception, ABBC has increased incomes in Atlanta by approximately \$24.64 Million</p>	 <p><b>\$8.19 Million</b></p> <p>Annual Average Impact On Gross Regional Product</p> <p>Since the program's inception, ABBC has added approximately \$49.13 Million to Atlanta's Gross Regional Product</p>
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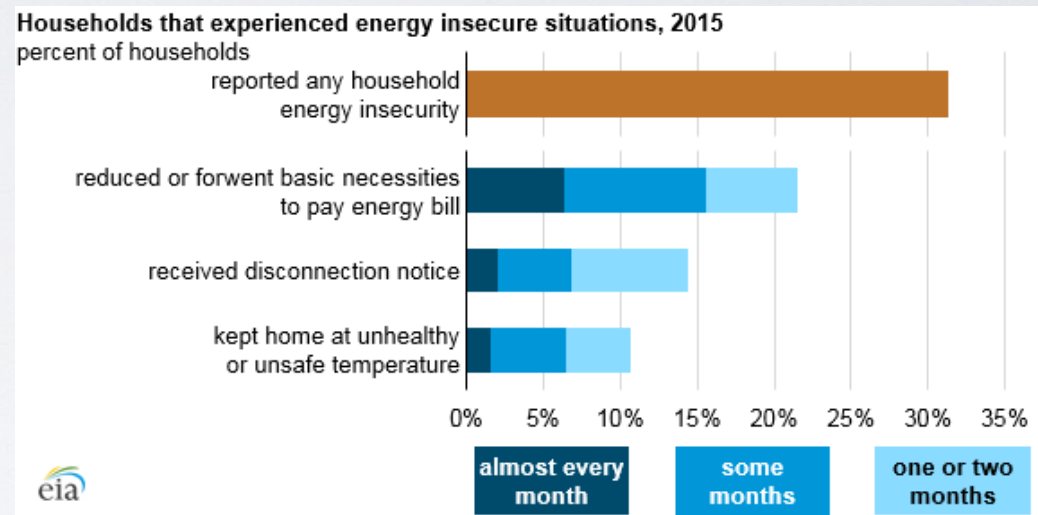
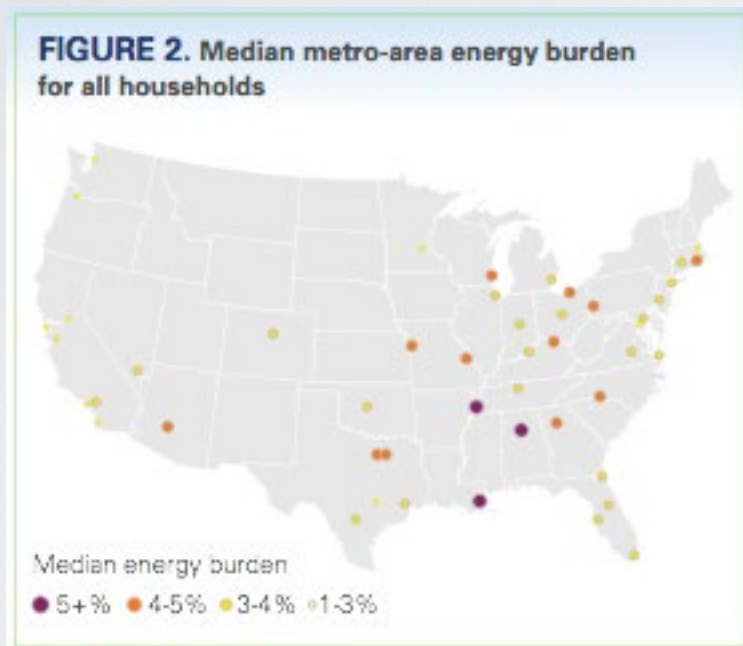


# SUCH AS...PUBLIC HEALTH

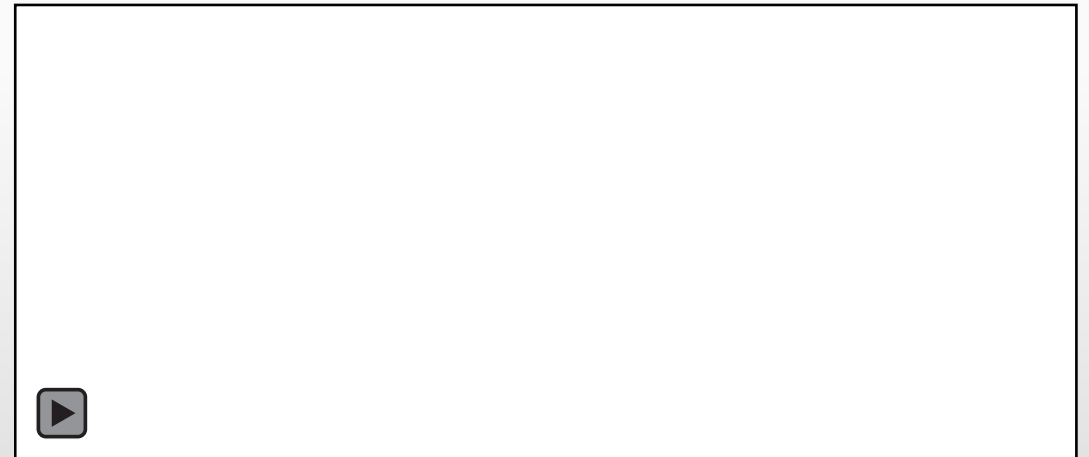
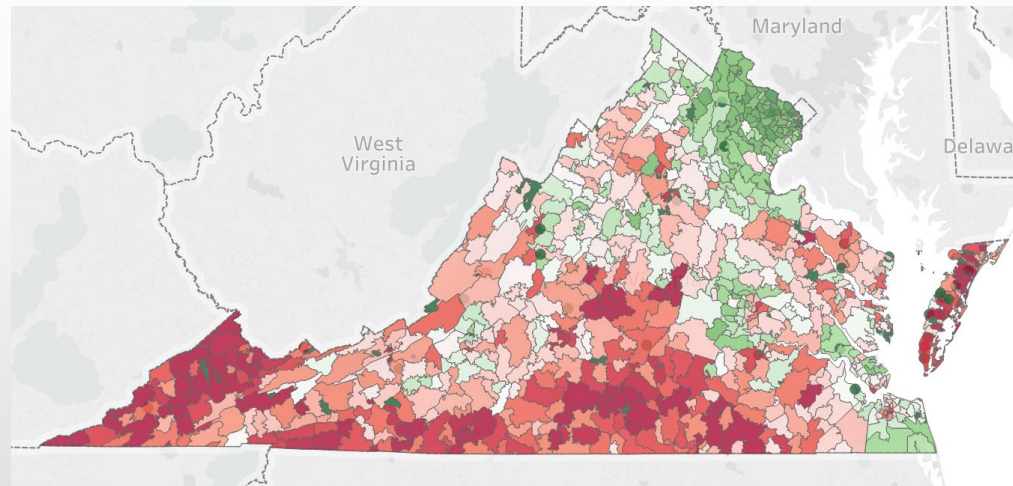


## Health Savings

# SUCH AS...POVERTY

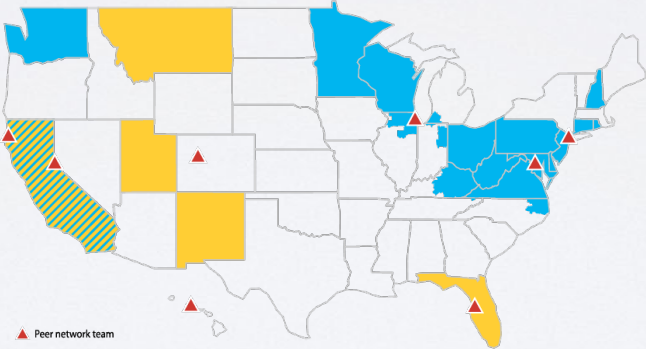


# EQUITY CONSIDERATIONS AND NEW METHODS



# NETWORKS AS ENABLERS

## American Cities Climate Challenge

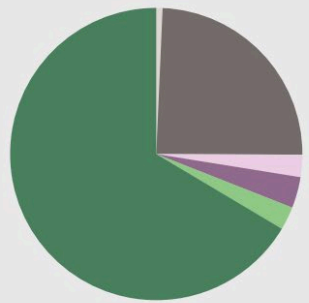
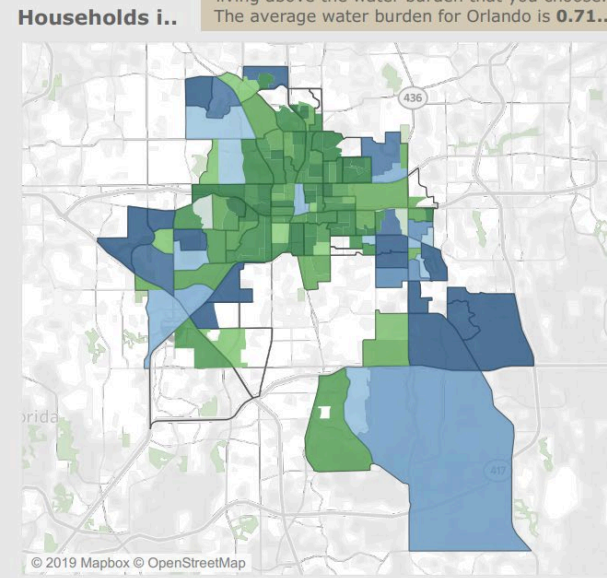
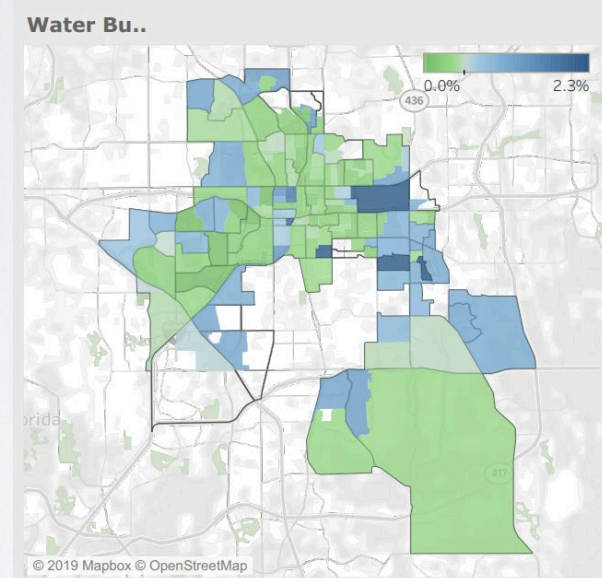
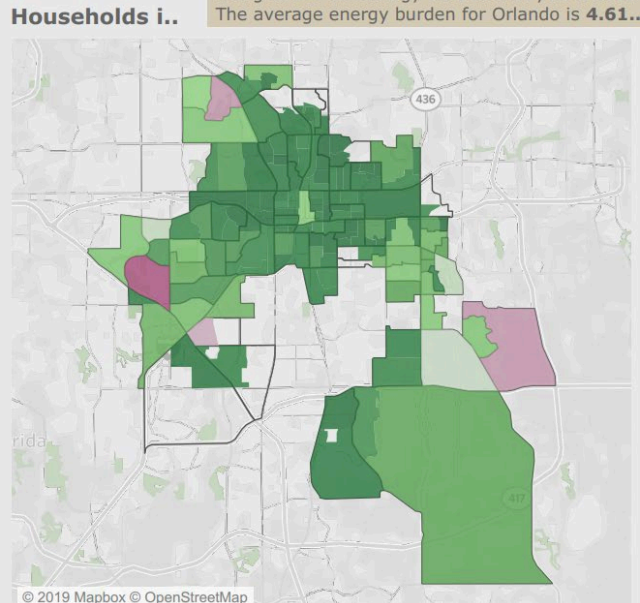
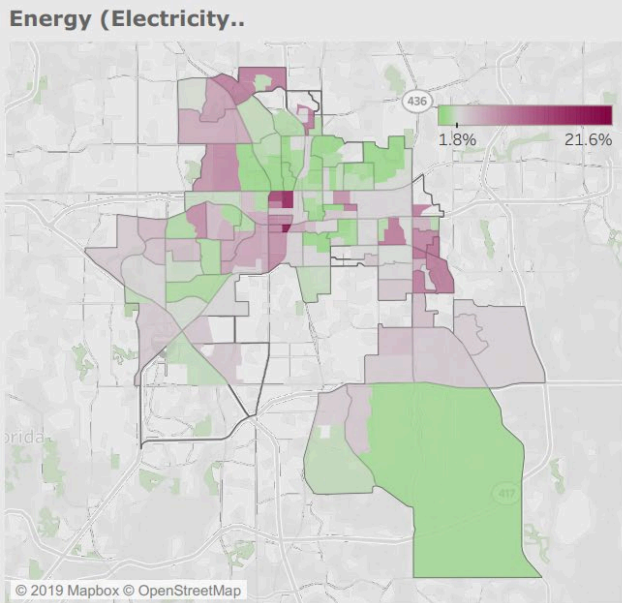


▲ Peer network team

**Options Analysis**  
Improving reliability and affordability of solar energy through options analysis and systems design

**Grid Flex**  
Improving grid flexibility and resiliency through advanced siting and operations of solar + DER

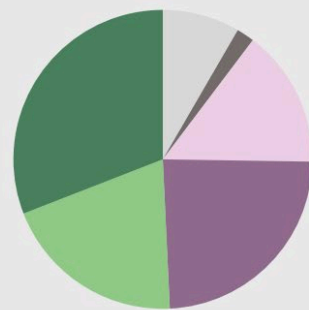
# ORLANDO EQUITY MAPS



- 2 Units
- 20 to 49 Units
- 3 or 4 Units
- 5 to 9 Units
- 50 Or More Units
- Detached

Owner-Occupied Housing

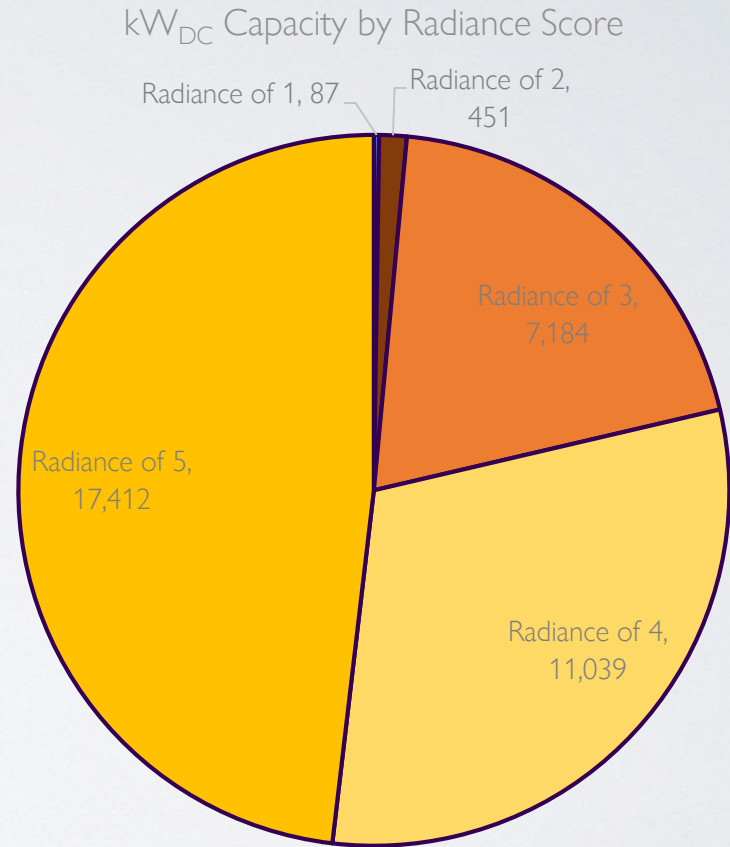
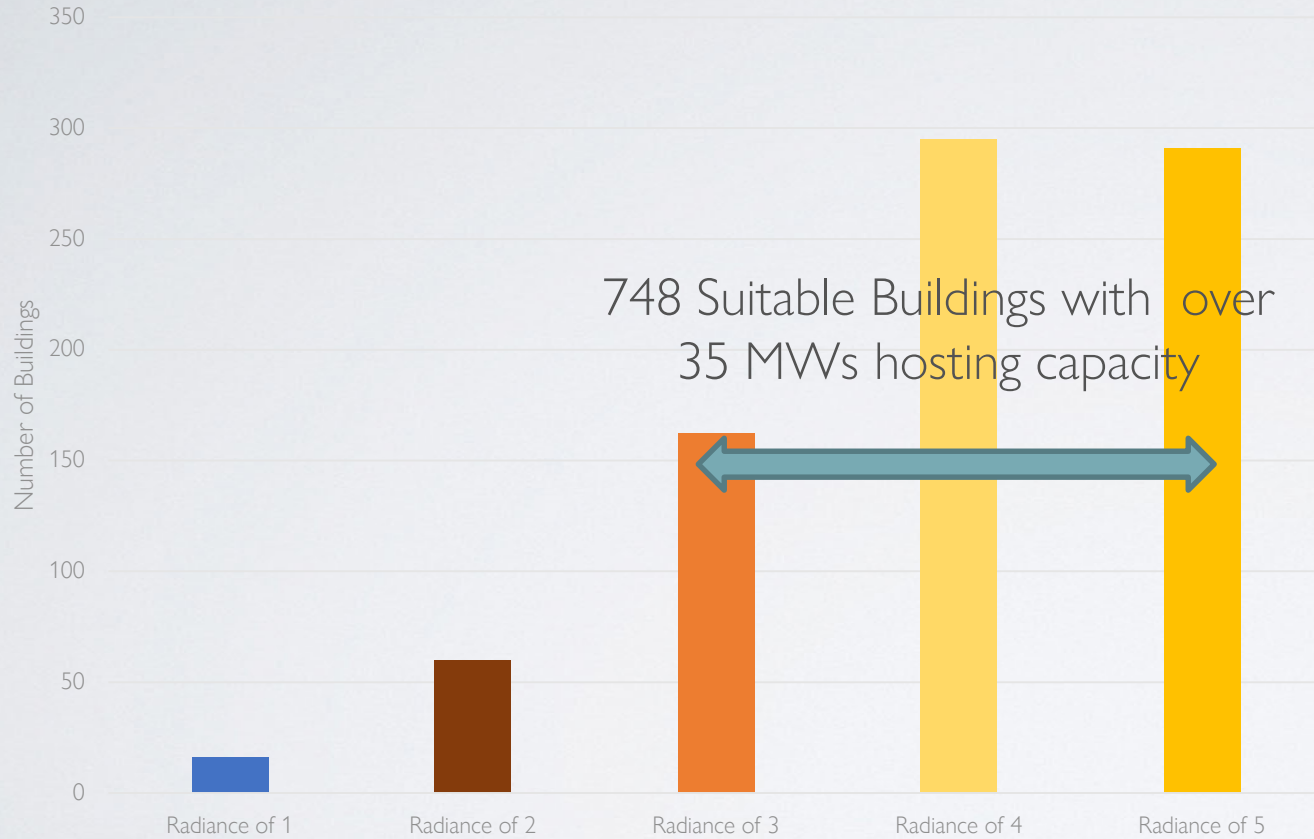
48,289



Renter-Occupied Housing

78,194

# ORLANDO MUNICIPAL ROOFTOP SOLAR POTENTIAL



Radiance Score combines current unobstructed rooftop potential with the likelihood for future obstructions. Current potentials are obtained via LIDAR/Satellite data in combination with NREL's PVWatts and SAM tools. Likelihood for future obstructions assessed by the team by observations of recent development trends, site reviews, and City of Orlando staff. Ultimately, two reviews were produced: a technical maximum and a technical recommendation

# ONLINE INTERACTIVE POLICY PACKAGE



ption, while taller bars  
indicate that they are generally easier to implement.

# OACES



**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

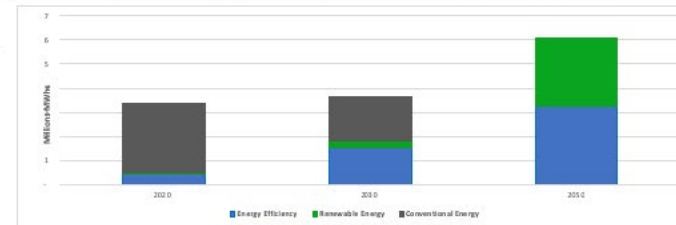
### Electric Vehicles Adoption

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

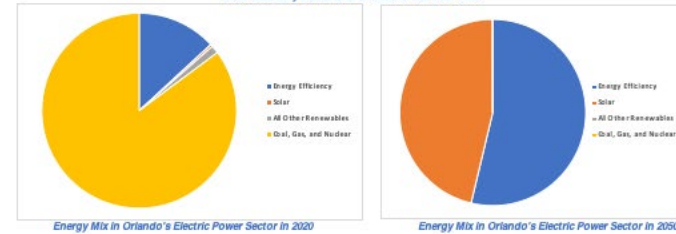


Powered by greenlink

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

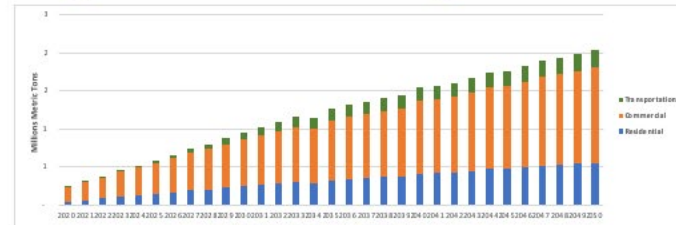


How Electricity Demand in Orlando is Met Over Time



Energy Mix in Orlando's Electric Power Sector in 2020

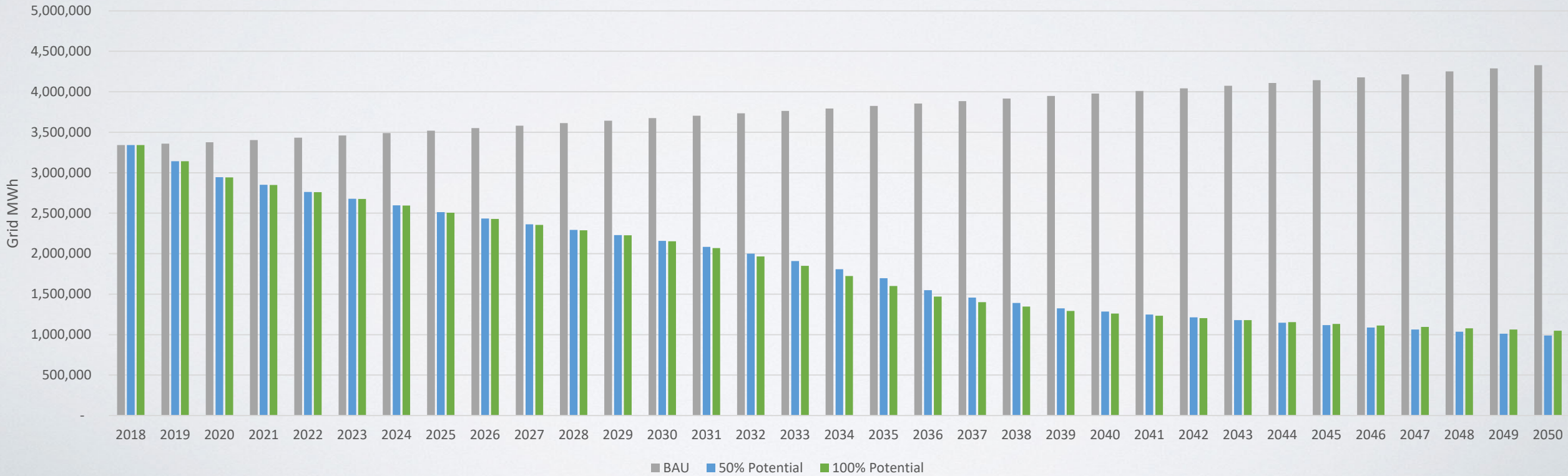
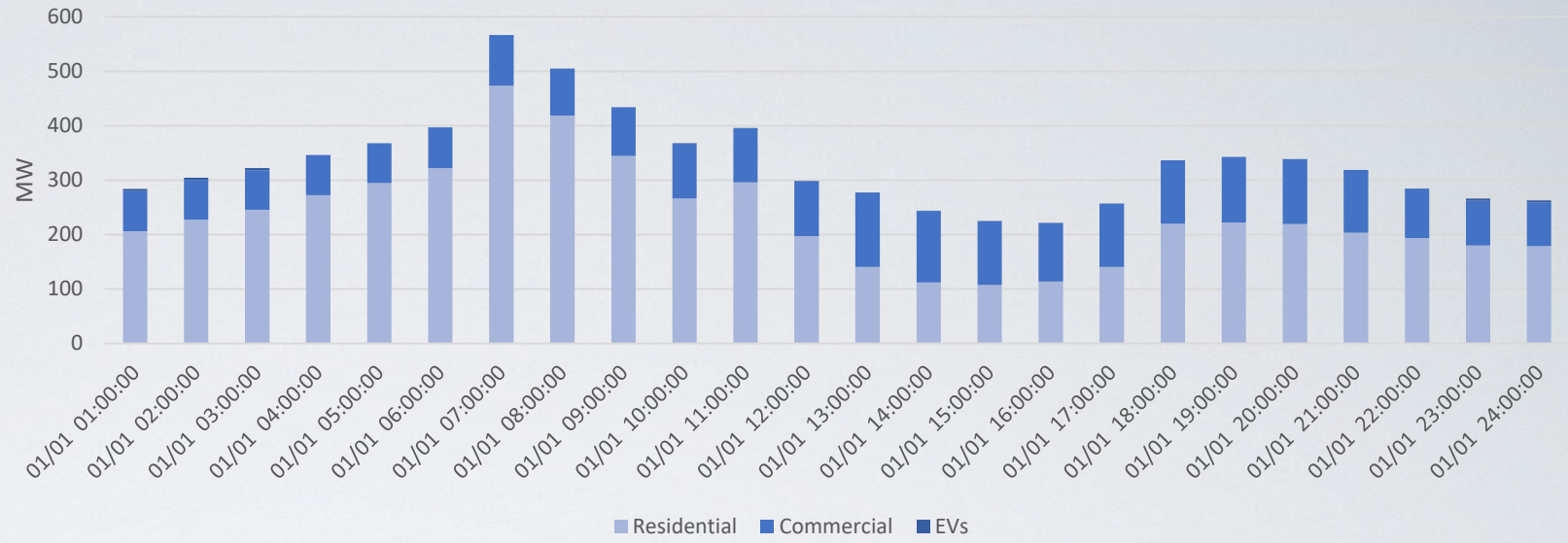
Energy Mix in Orlando's Electric Power Sector in 2050



CO<sub>2</sub> Reduction in Orlando, 2020 - 2050



# LOAD PROJECTIONS



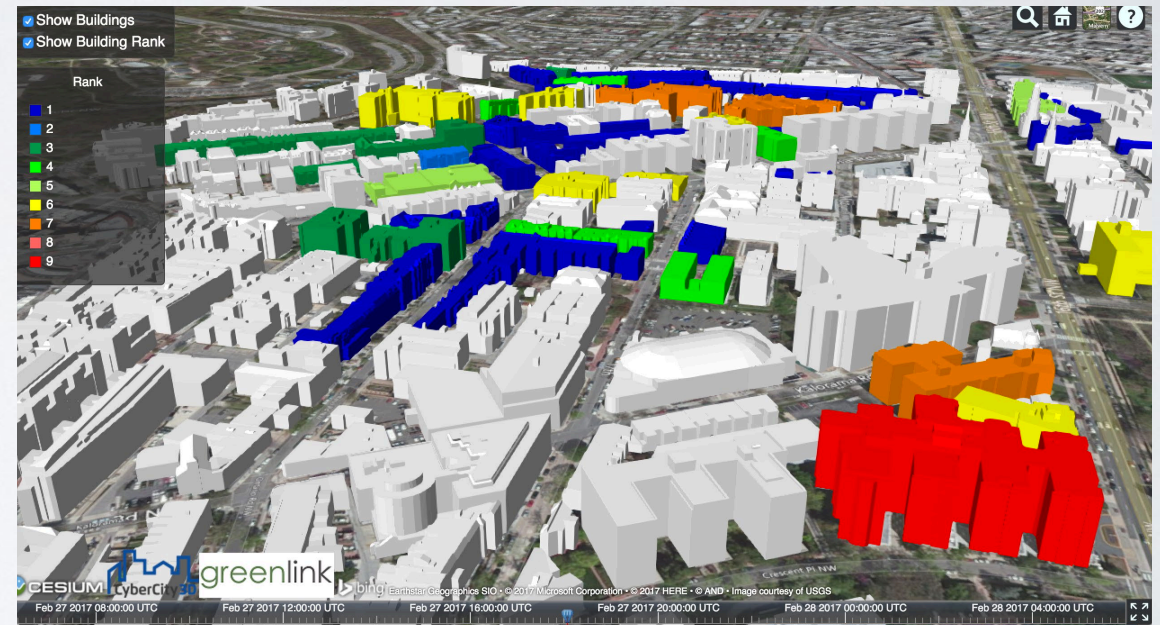
THANKS FOR YOUR ATTENTION!

Contact Details:

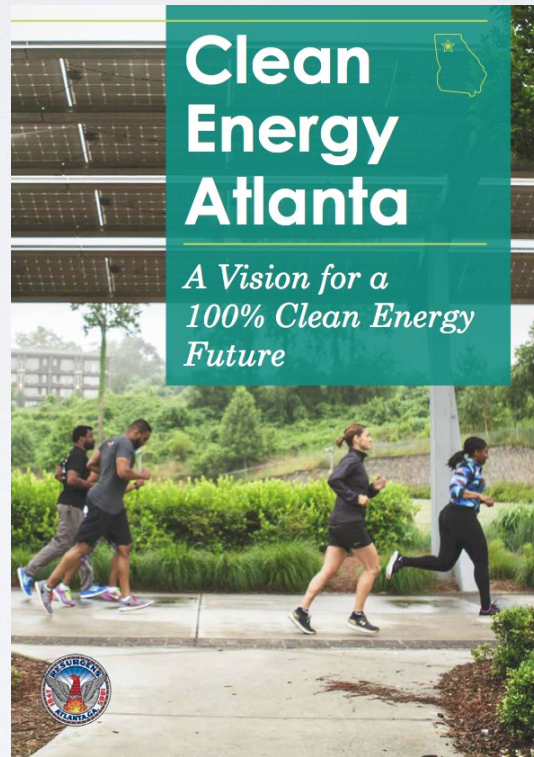
Matt Cox, CEO and Co-Founder

[mcox@thegreenlinkgroup.com](mailto:mcox@thegreenlinkgroup.com)

@GreenLinkGroup



# ATLANTA EXAMPLE: CLEAN ENERGY ATLANTA



# RESILIENT ATLANTA

Actions to Build an Equitable Future

## RESILIENT ATLANTA'S VISIONS

### VISION 01:

#### **PRESERVE AND CELEBRATE WHO WE ARE**

Preserve and enhance Metro Atlanta's culture, shared identity, and history to build social cohesion and cultivate the creative economy

### VISION 02:

#### **ENABLE ALL METRO ATLANTANS TO PROSPER**

Reduce the barriers preventing Atlantans from achieving economic stability and security to increase access to opportunity and move Atlanta out of the nation's top 10 cities ranked for income inequality

### VISION 03:

#### **BUILD OUR FUTURE CITY TODAY**

Facilitate the development of an equitable and inclusive city while preserving and expanding Atlanta's natural environment

### VISION 04:

#### **DESIGN OUR SYSTEMS TO REFLECT OUR VALUES**

Adapt Atlanta's civic systems to enable the City to become a leader in equity, sustainability, and resilience

100 RESILIENT CITIES



# City Pledges to Achieve 100% Clean Energy by 2035 (17-R-3510)

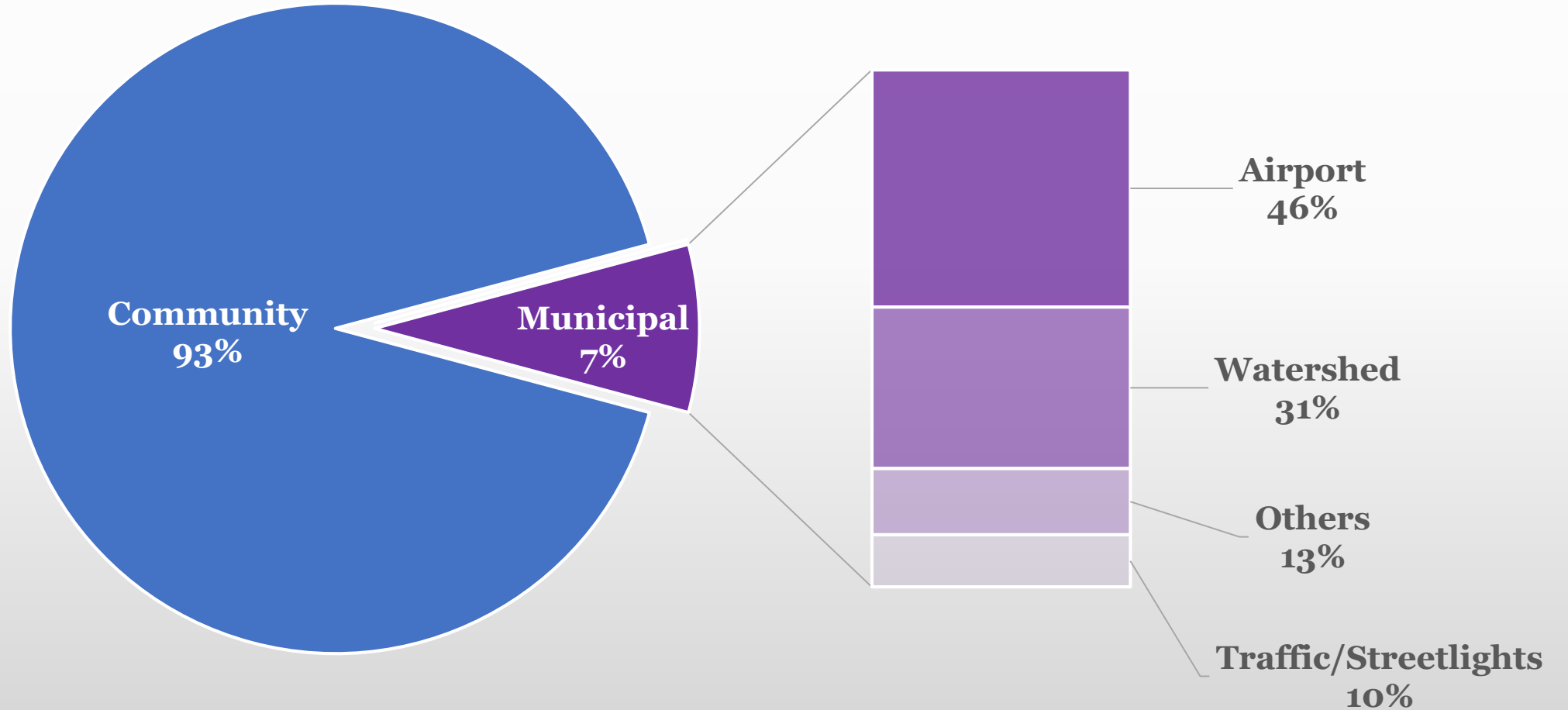


100% of **electricity** consumed in Atlanta will be  
“generated” from clean energy resources



To be enacted by the Mayor’s Office of Resilience

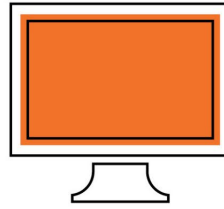
# Current Electricity Consumption



# Stakeholder Outreach

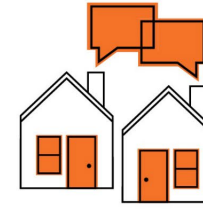


Over  
**3,500**  
People  
Engaged



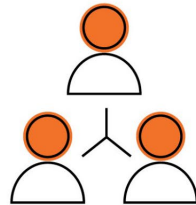
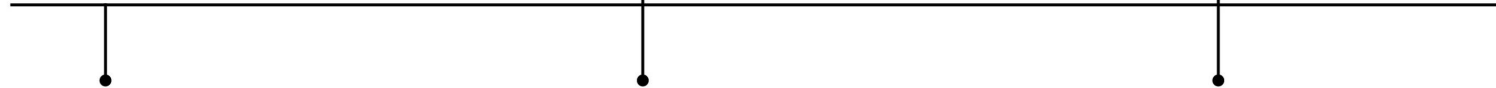
Survey

**1,750 Responses**



25 NPU Meetings

**1,000 Residents**



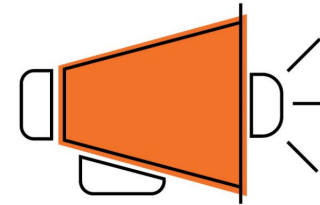
Six Stakeholder Sessions

**100 Experts**



Dozens of Focused Meetings

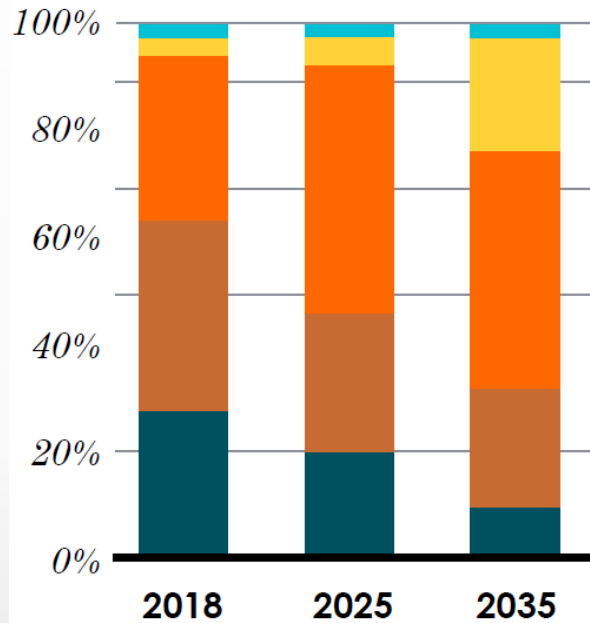
**100 Leaders**



Seven Community  
Conversations & Two  
Partner Events

**500 Participants**

# Our values



Current and Projected Sources of Atlanta's Electricity (%)

(Source: The Greenlink Group)

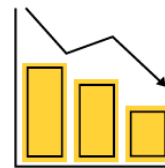


## Priorities

**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

Atlanta has three approaches that can be taken to achieve the 100% clean energy targets



**1st**

Use less energy overall



**2nd**

Generate more clean energy



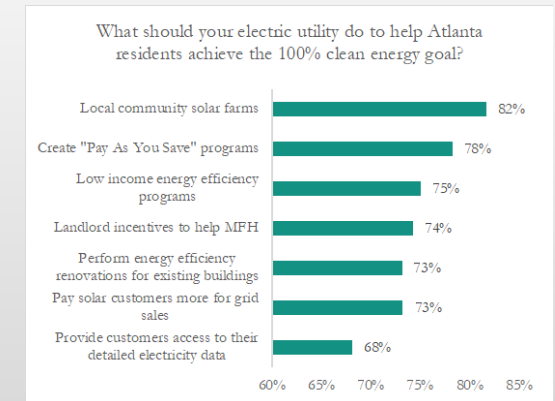
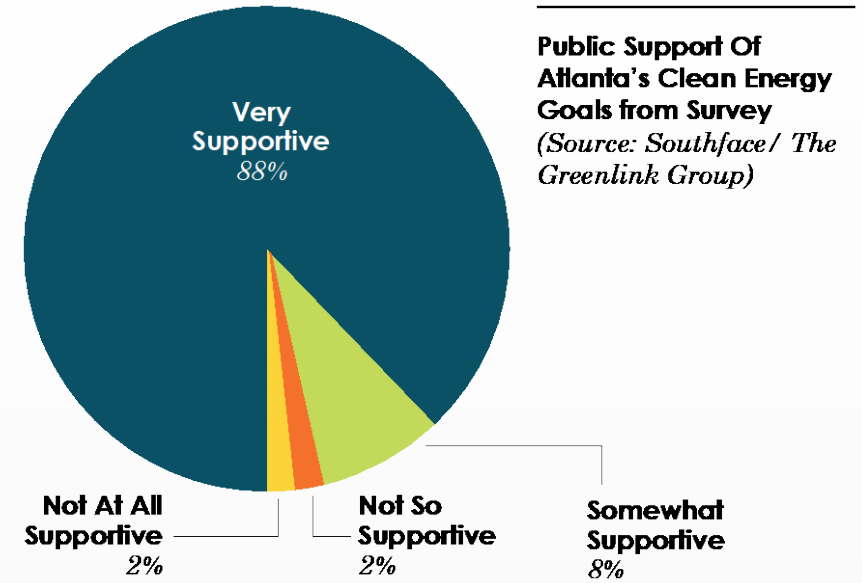
**3rd**

Buy renewable energy credits



# Survey Results

- Over 90% support the goal
- Strong backing for increased efficiency financing and new solar developments
- Slim majority unaware of existing utility programs





# Equity is top of mind for a reason

Atlanta has 4<sup>th</sup> highest energy burden in U.S.

(energy burden = % of household income spent on electricity + natural gas)

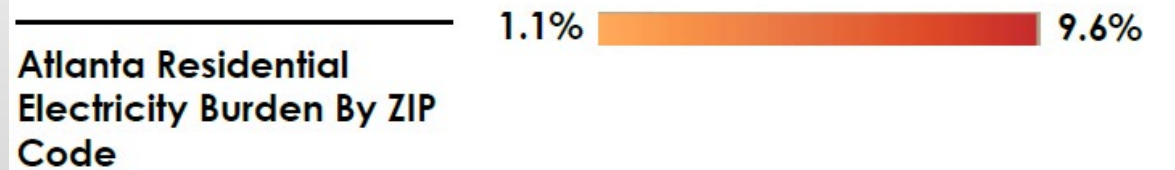
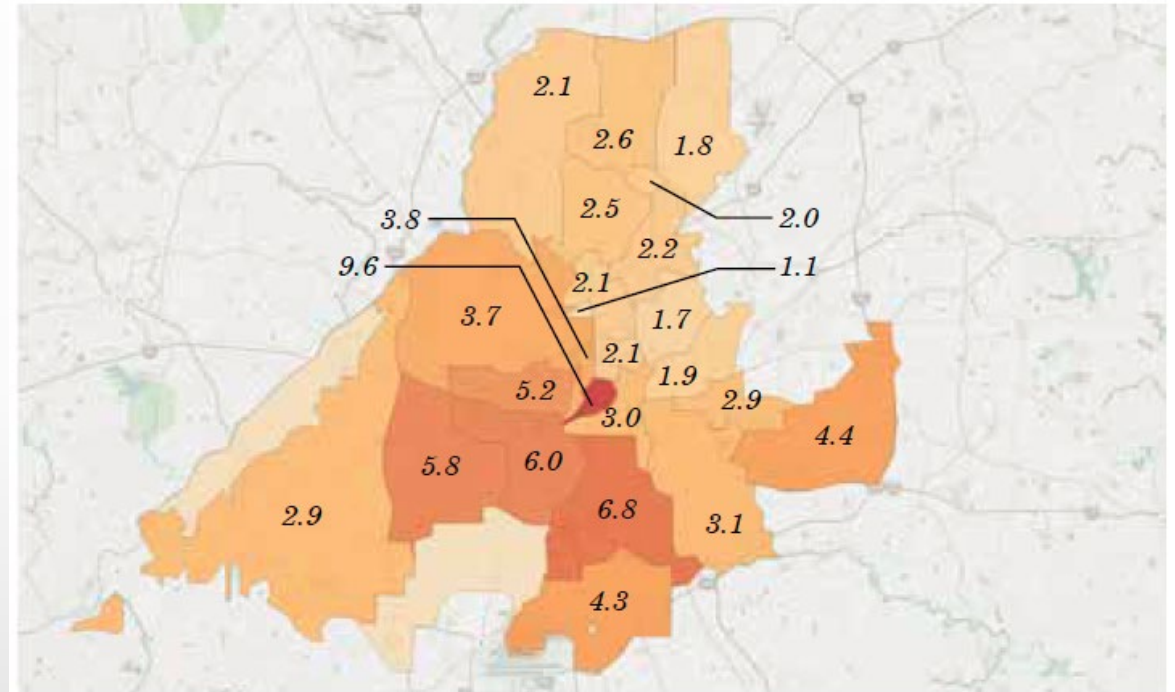
National average is 2.7% of income

Atlanta – up to 9.6% in highest ZIP codes in lower-income, minority areas

## ***Burden highest in low-income neighborhoods***

**\$245/month:** monthly utility bill for **\$26,000** household income (11.3% burden)

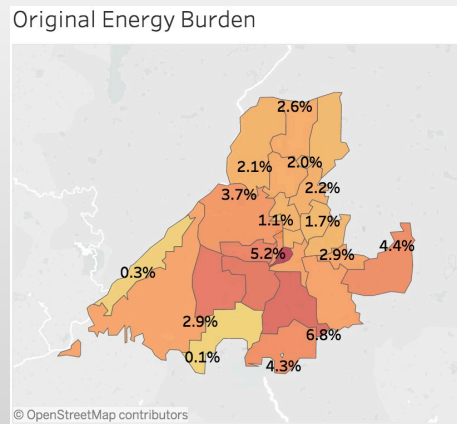
**\$330/month:** utility expenses for **\$90,000** household income (4.4% burden)



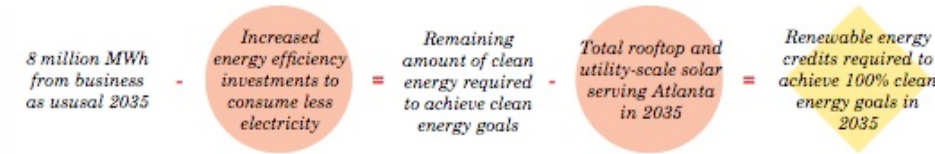
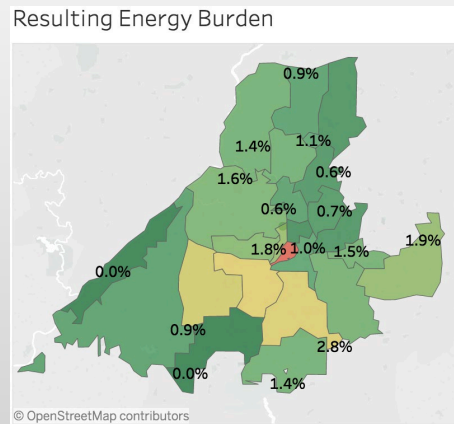
# Projected Impacts

- Many pathways, but there are boundaries
- Equity Impacts vary widely
  - Energy burden could increase w few jobs and no local air quality benefit
  - Energy burden could be massively reduced with many jobs and strong air quality benefits

Today



Sc3



## Renewable Energy Source Key

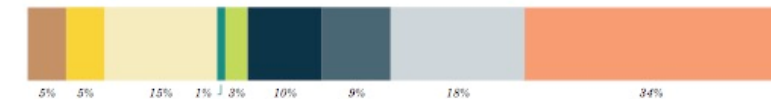


## Scenario No.1: Business As Usual, Renewable Energy Credits Only



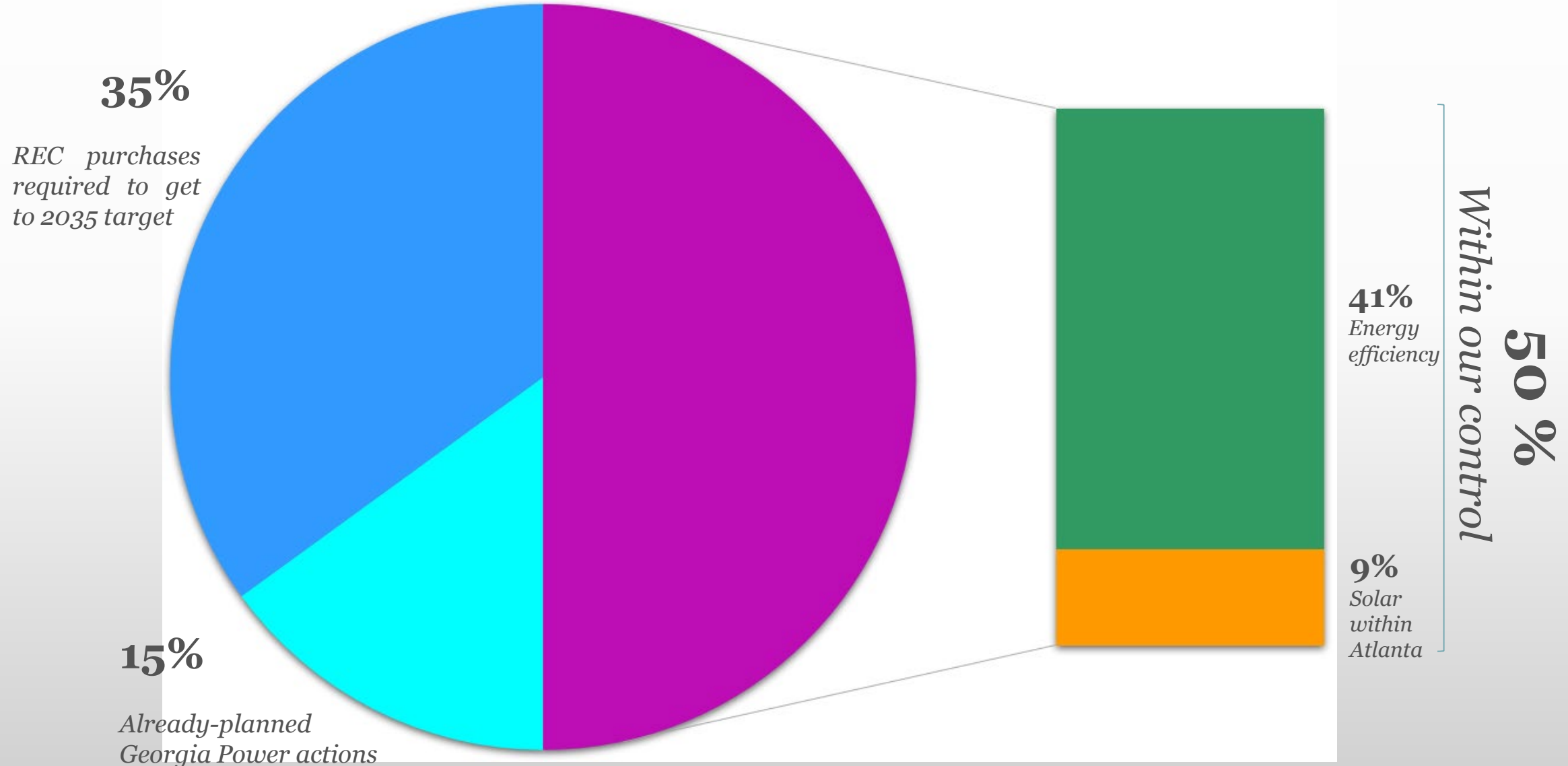
Cumulative Benefit	Through 2035	Full Impact	Equal To
\$0	Local Jobs Created	0	0 Coca Cola HQ
Cumulative Costs	Local Incomes Increased By	\$0	\$0 Per Ad. Citizen per Year
\$1,000,000	Local GDP Growth	\$0	0% Delta Global Revenue
Net Benefit	Public Health Savings	\$0	\$0 Months Health Ins. Savings
-\$1,000,000	Metric Tons CO <sub>2</sub> Reduced	0	0 Months without Cars
Benefit to Cost Ratio			
0	<b>In 2035</b>		
	Household Bill Savings	\$0	
	Monthly Bill Savings: Participants	\$0	0% Home Electricity Savings
	Monthly Bill Savings: Non Participants	\$0	0%
	Commercial Total Bill Savings	\$0	
	Monthly Bill Savings: Participants	\$0	0% Commercial Electricity Savings
	Monthly Bill Savings: Non Participants	\$0	0%

## Scenario No.3: 100% Renewable Energy



Cumulative Benefits	Through 2035	Full Impact	Equal To
\$28.783 Billion	Local Jobs Created	7,775	3.5 Coca Cola HQ
Cumulative Costs	Local Incomes Increased By	\$1.8 Billion	\$213 Per Ad. Citizen per Year
\$1.379 Billion	Local GDP Growth	\$1.5 Billion	25.2% Delta Global Revenue
Net Benefits	Public Health Savings	\$594 Million	\$5.82 Months Health Ins. Savings
\$27.404 Billion	Metric Tons CO <sub>2</sub> Reduced	13.5 Million	17 Months without Cars
Benefit to Cost Ratio			
20.9	<b>In 2035</b>		
	Household Bill Savings	\$2.3 Billion	
	Monthly Bill Savings: Participants	\$234	95% Home Electricity Savings
	Monthly Bill Savings: Non Participants	\$63	26%
	Commercial Total Bill Savings	\$4.4 Billion	
	Monthly Bill Savings: Participants	\$2,040	74% Commercial Electricity Savings
	Monthly Bill Savings: Non Participants	\$929	34%

# Challenges ahead



# ORLANDO: RENEWABLE & RESILIENT

An aerial photograph of the Orlando city skyline. In the foreground, a large, calm lake reflects the sky. A prominent feature is a colorful, rainbow-striped dome structure on a small island in the lake. The city buildings are a mix of modern glass skyscrapers and older, more traditional structures. The sky is blue with scattered white clouds. The overall scene depicts a modern, green city.

**Chris Castro, LEED GA, CPB**  
Director, Office of Sustainability & Resilience  
City of Orlando

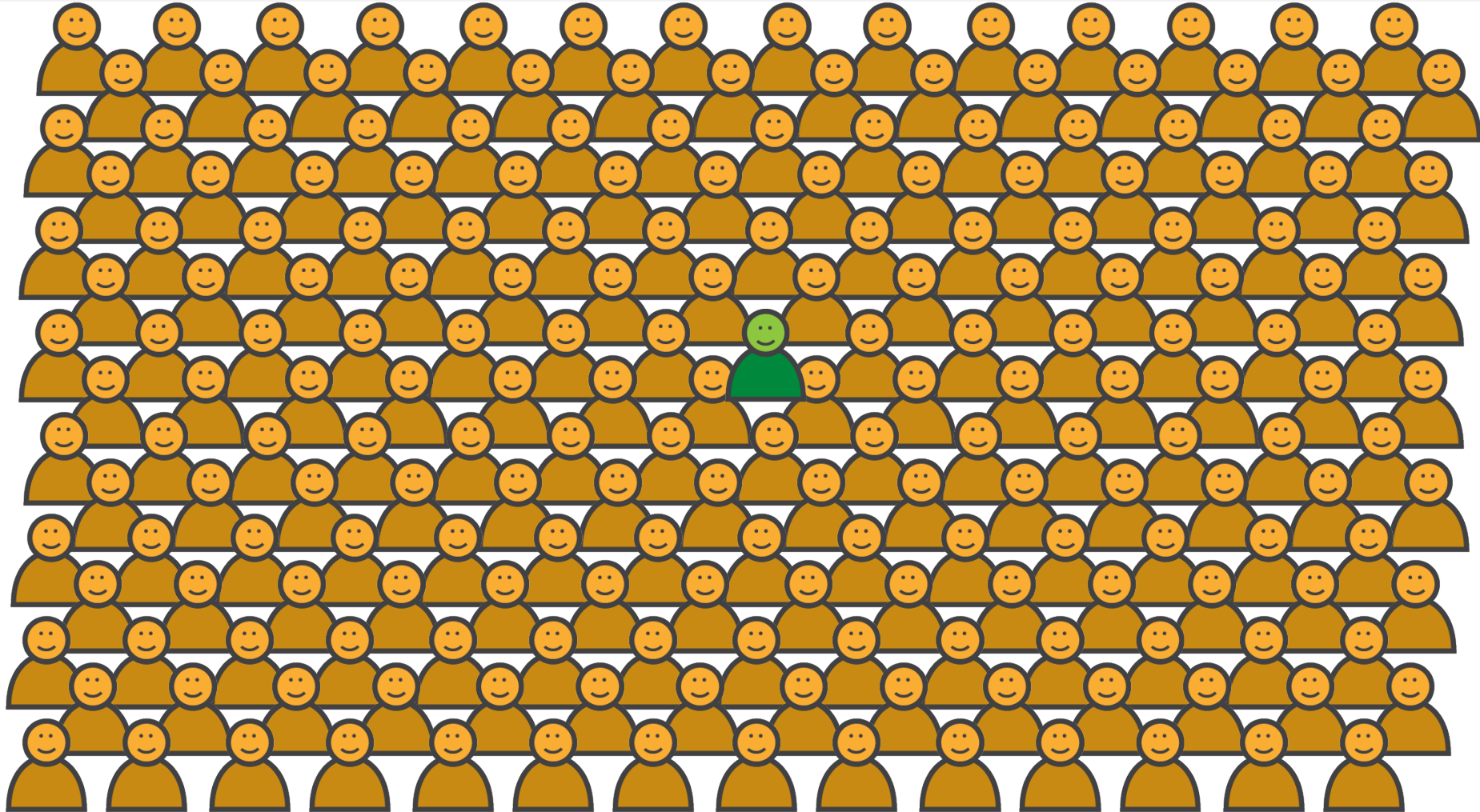
# Orlando's population grows 1,500 people per week



**Top fastest growing MSA in the U.S. – Forbes 2018**



# 1 Resident to 255 Tourists



*“Our vision is to become the most environmentally friendly, socially inclusive, and economically vibrant city in the Southeast...one of the most sustainable cities in the U.S.”*



*– Mayor Buddy Dyer, City of Orlando*





- Award-winning sustainability program launched by Mayor Buddy Dyer in 2007
- Focuses on 7 key areas:
  - Clean Energy
  - Green Buildings
  - Local Food Systems
  - Zero Waste
  - Livability
  - Clean Water
  - Multi-modal Transportation
- Implemented more than 100 strategies throughout municipal operations & city-wide



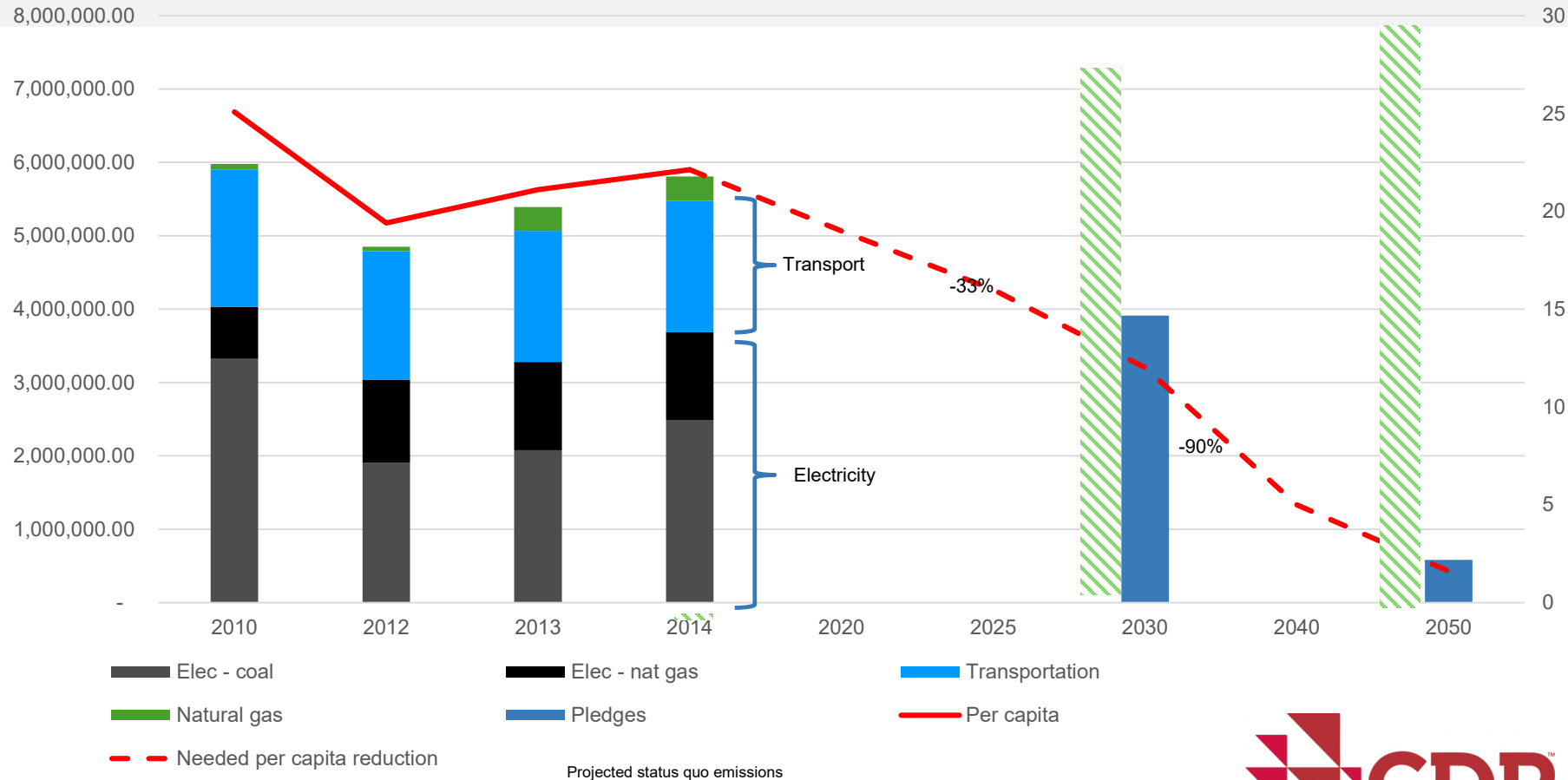
# Clean Energy & Green Buildings Strategic Goals



- 90% Reduction of GHG Emissions by 2040 compared to 2007
- 20% Reduction of Municipal Energy Use Intensity by 2021
- 100% LEED certified municipal buildings (new construction)
- **100% Renewable Electricity**
  - 2030 – Municipal Operations
  - 2050 – City-wide



# Air pollution & Greenhouse gas sources

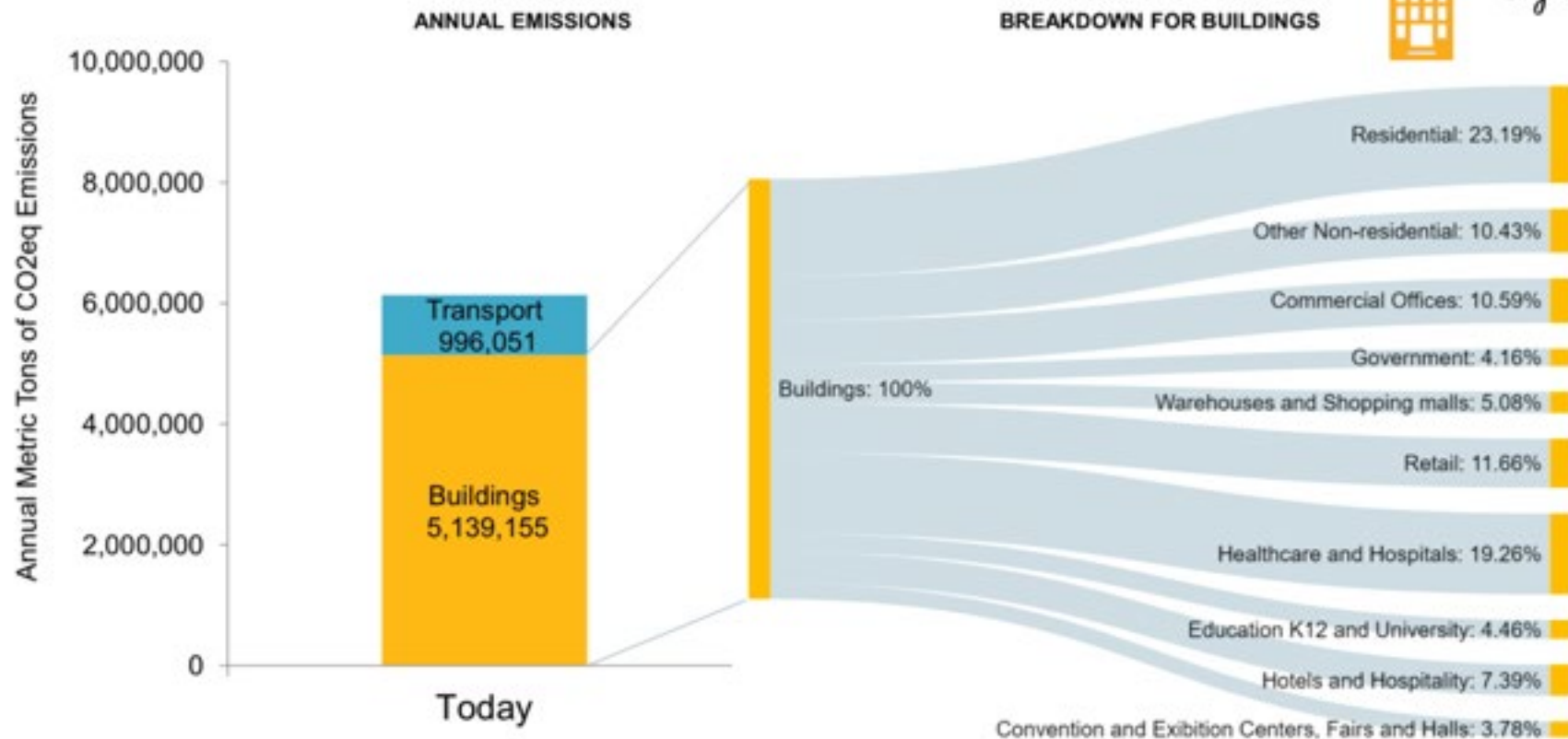


- **Buildings account for:**
  - 57% of total energy use
  - 72% of air pollution
- **OUC has new power generation within their 10 year plan, which will impose a socialized higher cost of on ratepayers.**



# GHG Emissions, 2016 Estimated

CIRIS Building Emissions\*, 2016 – 5,492,192  
 CIRIS Transport Emissions †, 2016 – 1,459,750

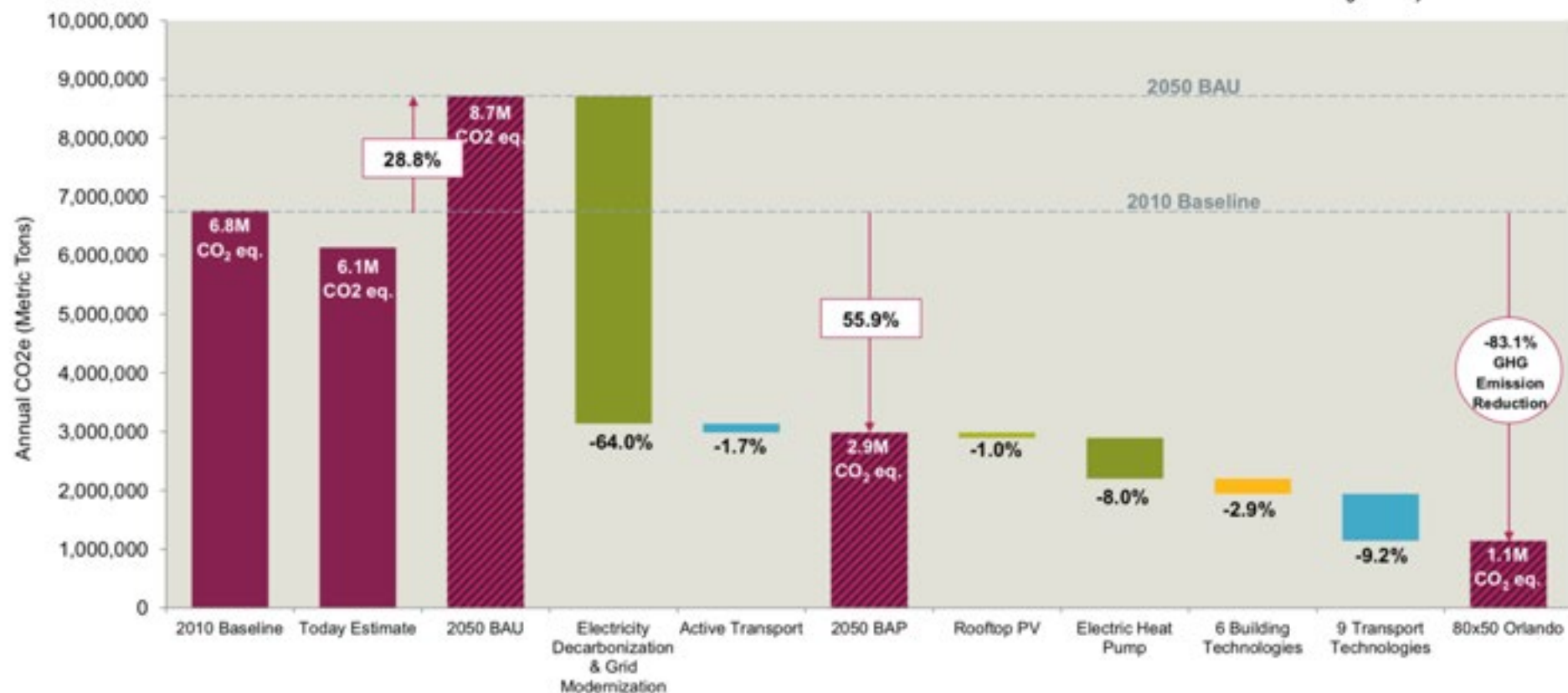


\* Building emissions include Residential and commercial buildings excluding fugitive emissions and industrial emissions  
 † Transport Emissions include On-road transportation  
 Neither of the GPC emissions include scope 3



## Beyond 80x50 Orlando (Comparing with 2010 Baseline)

**SIEMENS**  
Ingenuity for Life



# Orlando has made ambitious commitments to reduce its greenhouse gas emissions from buildings and transportation



Meet municipal electricity demand by renewable energy



Expand community solar projects



Develop a Green Building Incentive program



Pilot the building retrofit accelerator, Driving Efficient Energy Performance” (DEEP)



Electrify city fleets and buses



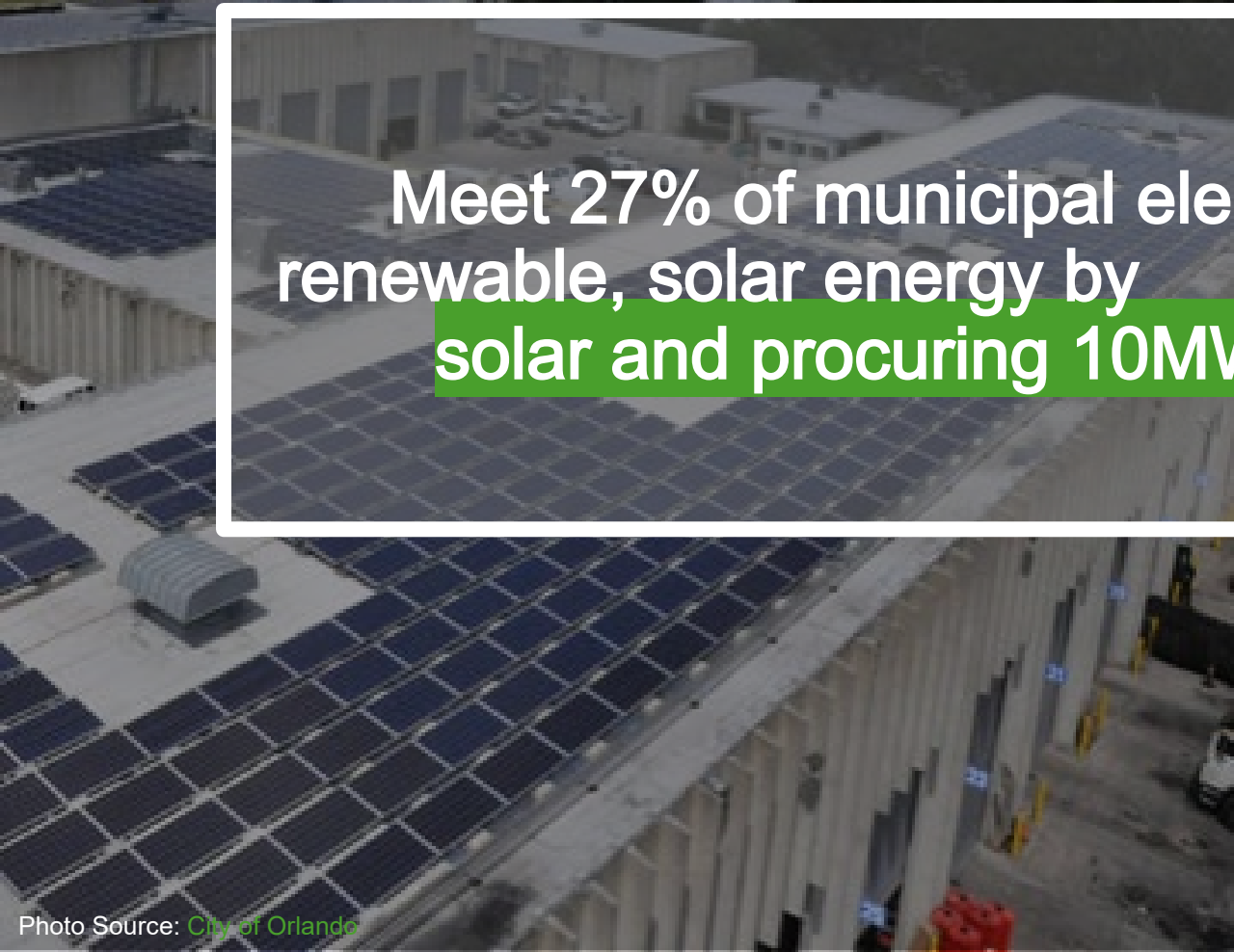
Expand public EV charging infrastructure



Transform the local EV market



Develop local energy resource centers



Meet 27% of municipal electricity demand with renewable, solar energy by installing 5 MW of rooftop solar and procuring 10MW of OUC solar farm



“I am proud to support a vision of transitioning entirely to 100 percent clean and renewable energy in our City.”

—MAYOR BUDDY DYER of Orlando, Florida



# We can move our municipal electricity demand from renewable by the end of 2020!

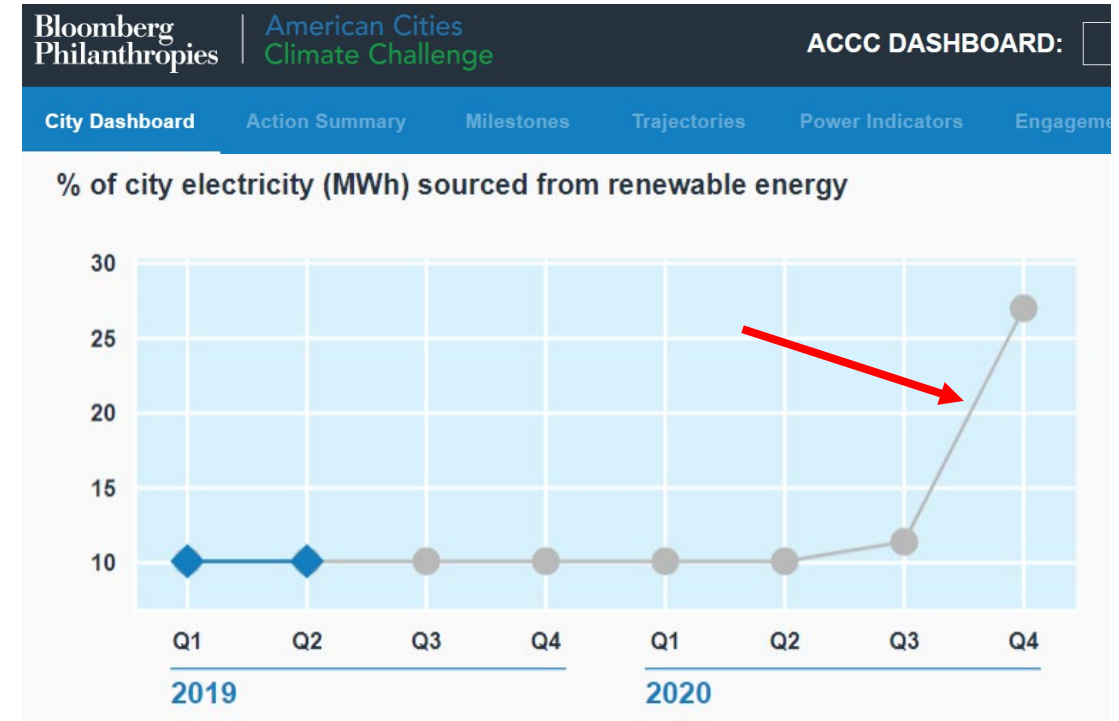
10% to 27%

**Current solar capacity:** 10% of City Ops powered by Solar

- 420 KW Fleet & Facility complex
- 115 KW Permit & Records bldg.
- 5.2 MW OUCommunity Solar (subscription)

**New planned capacity:** 27% of City Ops powered by Solar

- 5 MW City rooftops
- 10 MW OUCommunity Solar (subscription)



Municipal electricity demand met by renewable energy will increase from 10% to 27% by Dec 2020

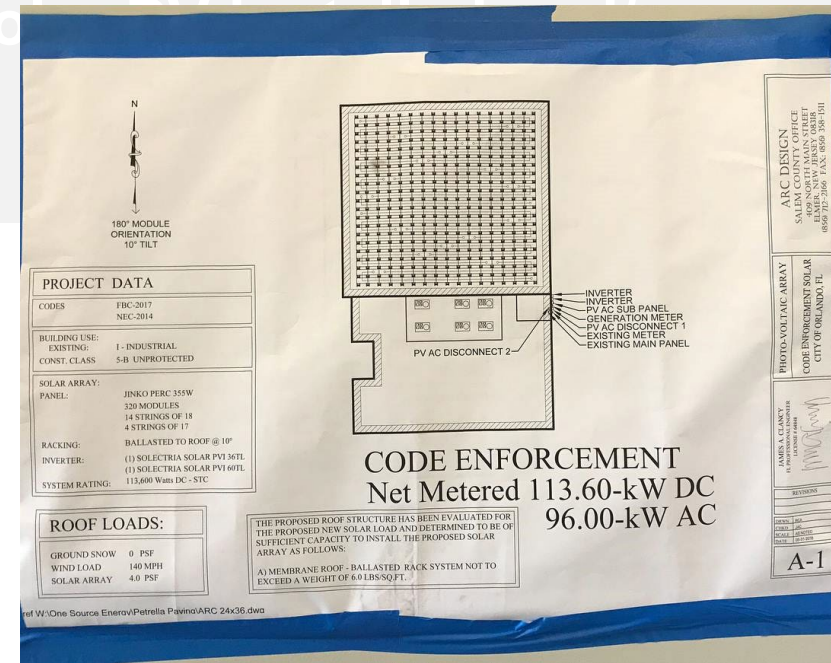
# FLEET & FACILITIES COMPOUND





Over 5.8 MW of Solar Installations,

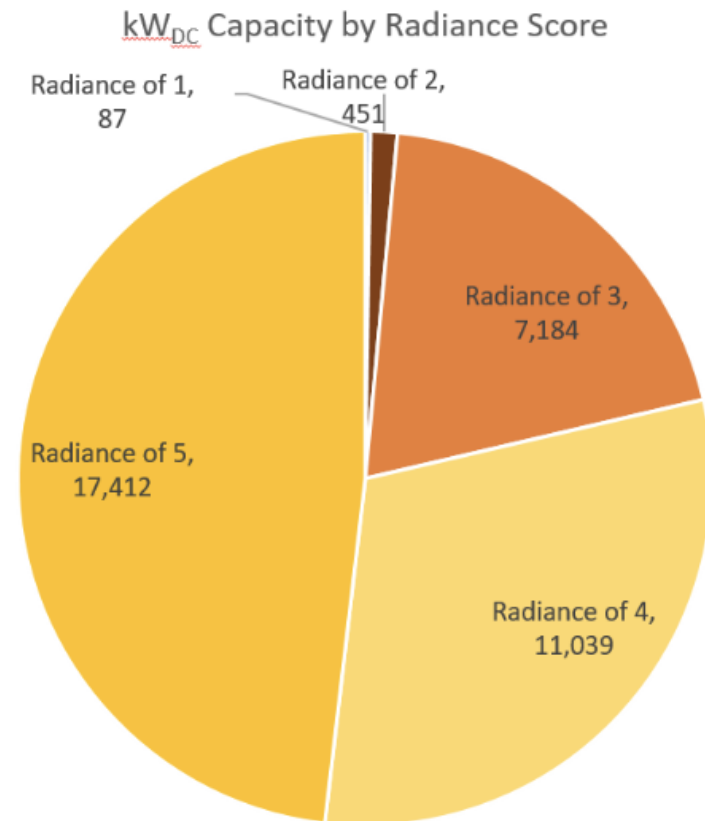
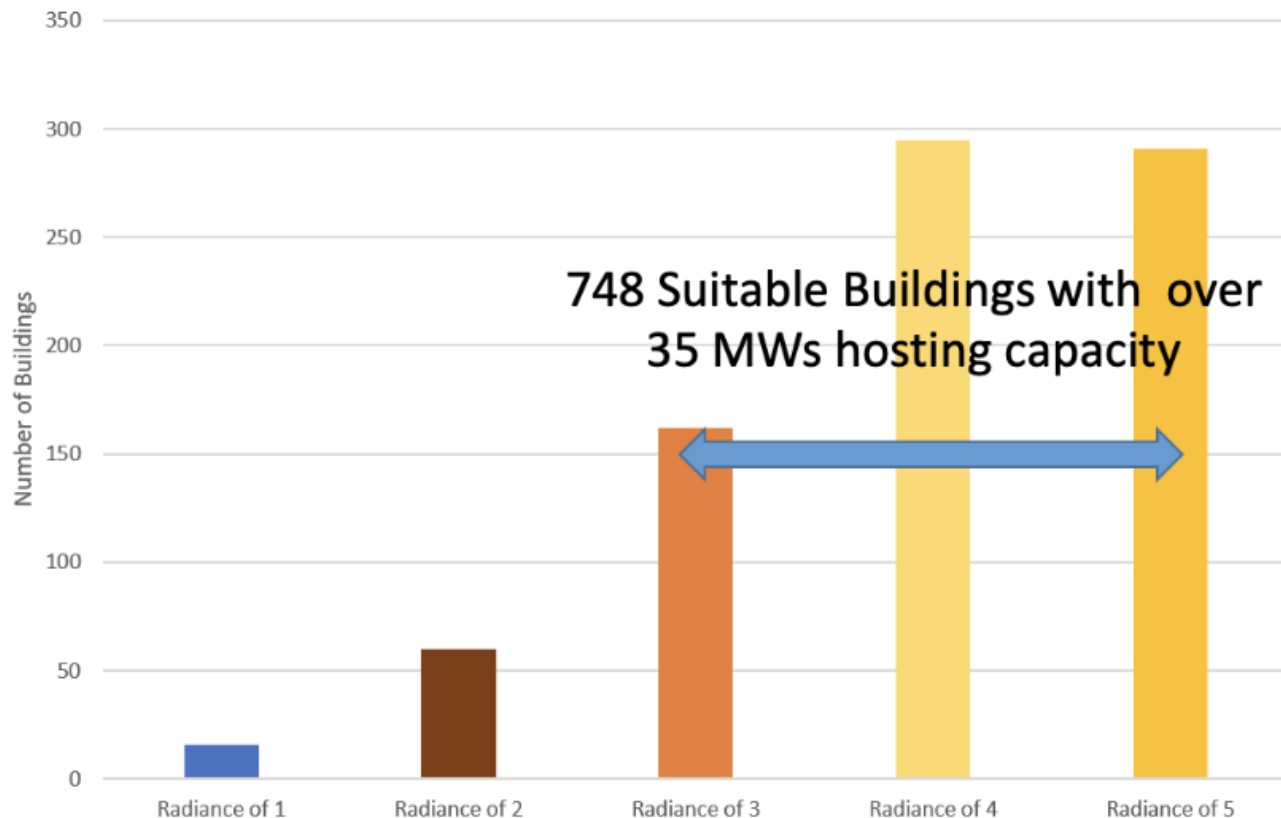
urchased



- New LEED-certified Records & Permit Building
- 114 KW solar PV
- First Net-Zero energy facility for Orlando
- \$112,000 net savings over the lifetime



# Orlando's municipal solar potential is demonstrated by a report by the Solar Energy Innovation Network



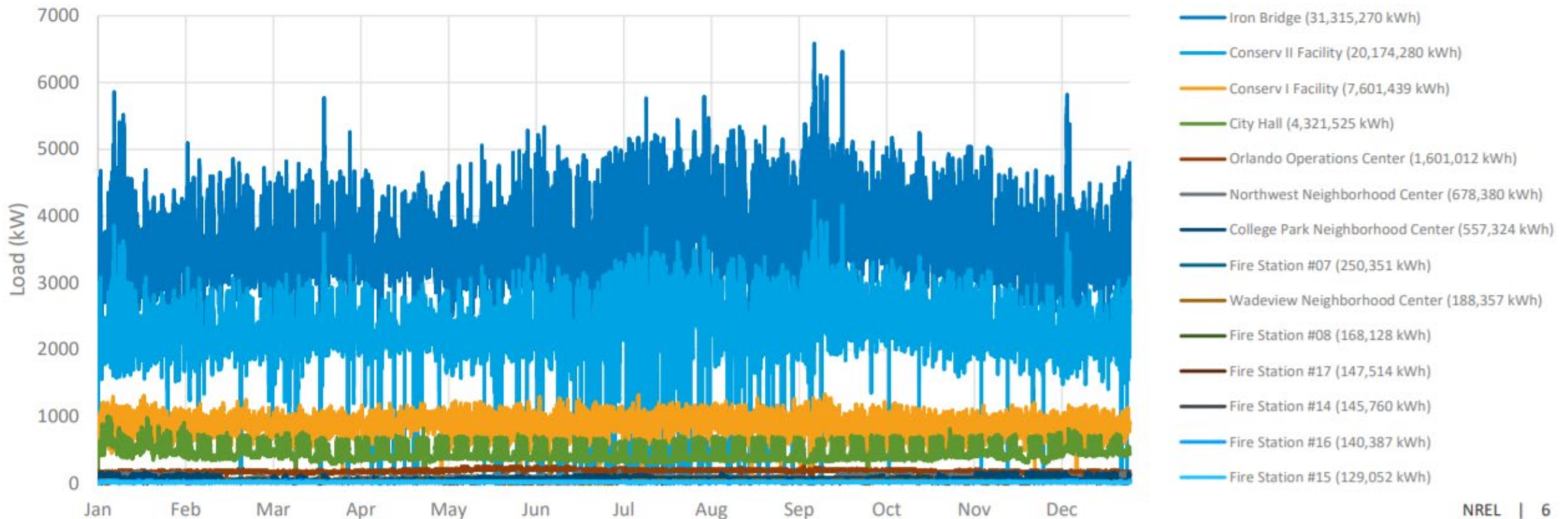
Radiance Score combines current unobstructed rooftop potential with the likelihood for future obstructions. Current potentials are obtained via LIDAR/Satellite data in combination with NREL's PVWatts and SAM tools. Likelihood for future obstructions assessed by the team by observations of recent development trends, site reviews, and City of Orlando staff. Ultimately, two reviews were produced: a technical maximum and a technical recommendation



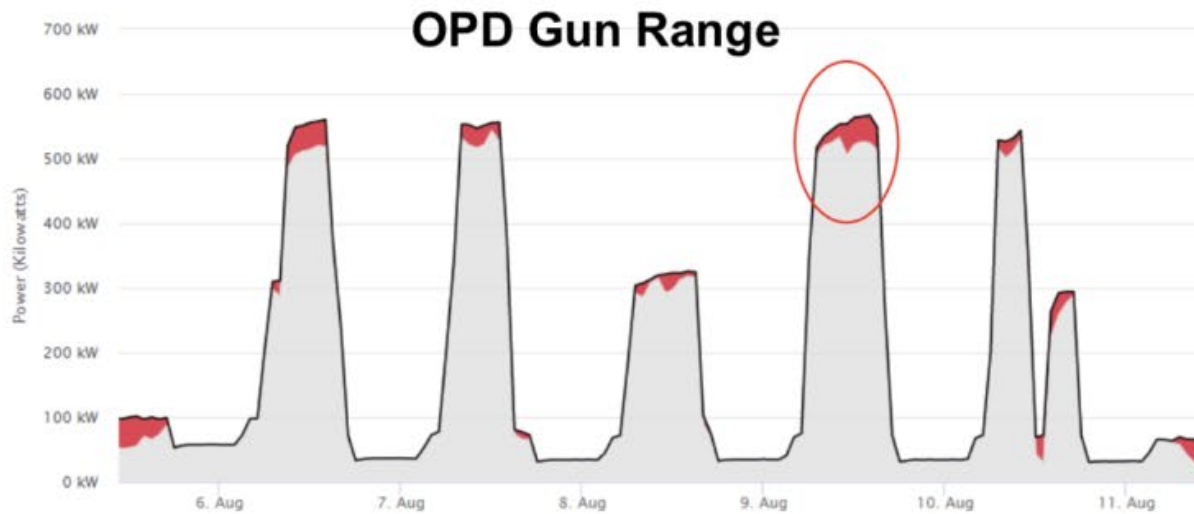
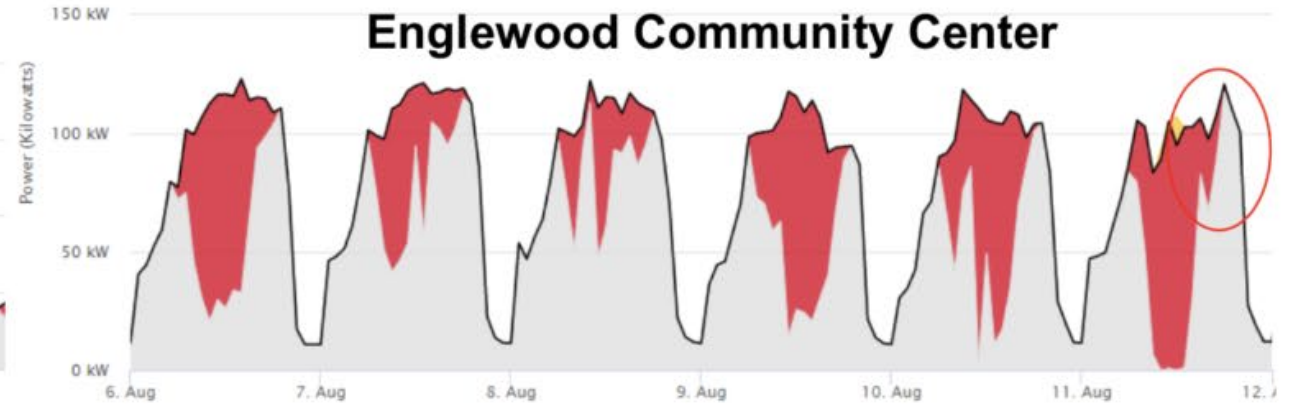
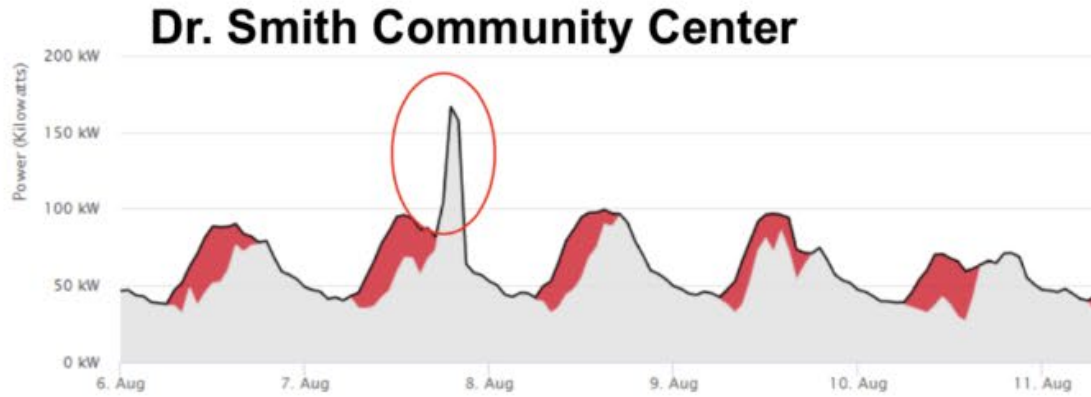
# Load Data

- OUC sites (12): 15-minute interval data from May 1, 2017 – May 1, 2018
- Duke Energy sites (2): NREL synthesized 15-minute load profiles by scaling reference load profiles to monthly consumption data
  - Fire Station #14: monthly totals scaled to shape of Fire Station #08 load profile (selected one fire station load profile rather than average in order to consider full variation of load (spikes/troughs))
  - Iron Bridge Facility: monthly totals scaled to match shape of Conserv II Facility load profile (buildings have similar purposes)

15-minute Load Interval Data, all sites



..and also evaluates solar demand reduction volatility

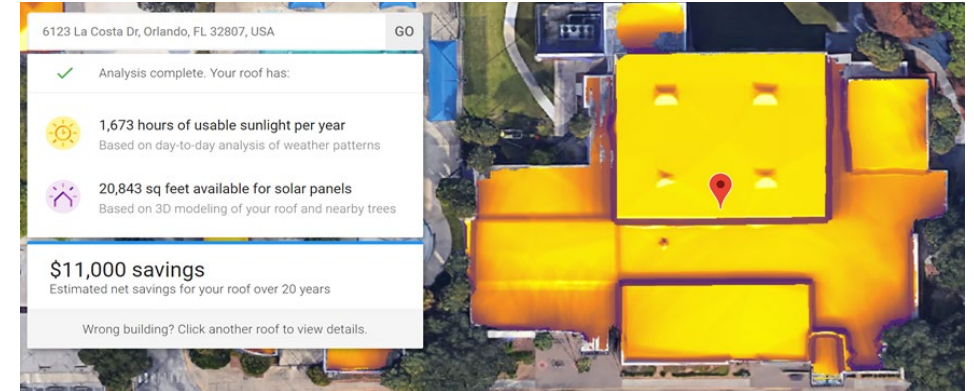


# We are on track to add 15 MW of solar across our municipal buildings

**30 municipal buildings** have been analyzed to assess solar panel suitability. Some of the largest buildings included:

- Engelwood Community Center (163kW)
- Dover Shores Community Center (142kW)
- Rosemont Community Center (79kW)

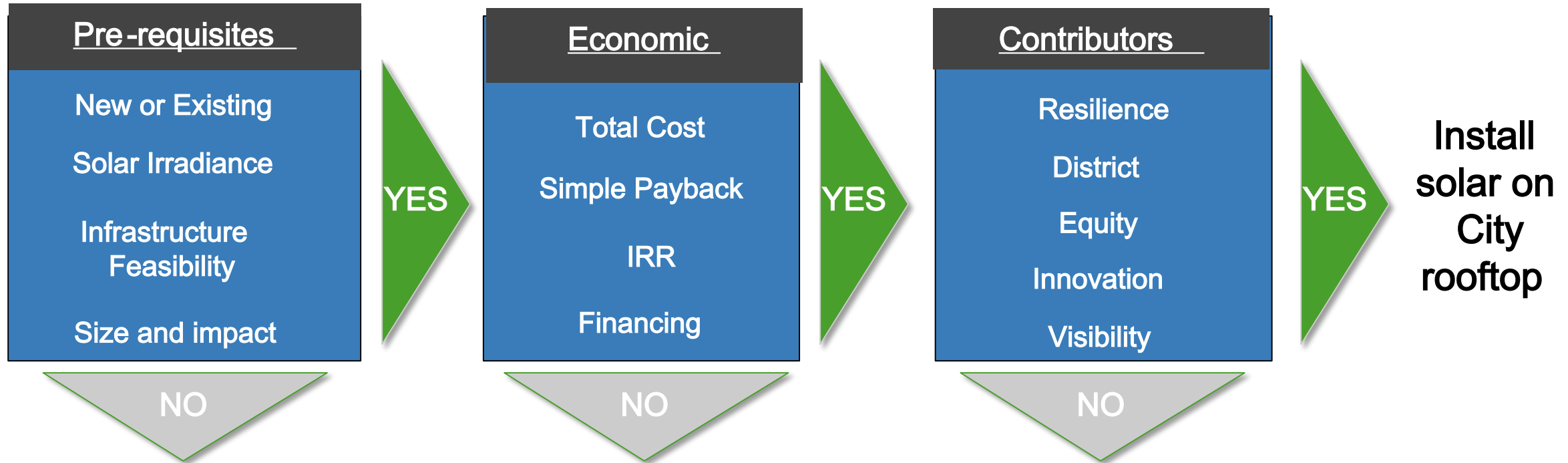
**\$2.3 million** allocated in the FY20 CIP for solar PV installations.



**Fleet and Facilities** will install **250+ kW array** that integrates solar, battery storage, and EV charging (FY19)

We have two pathways to add 15 MW of renewable energy solar panels or subscribe to solar farms

- install



Subscribe to OUCommunity solar

Are there any other priorities that you can think of in making the decision?



A photograph showing several construction workers in safety gear (hard hats and high-visibility vests) working on a rooftop. They are focused on installing solar panels. The scene is set against a clear blue sky. In the background, there are some construction materials and a building structure. The workers are wearing green and white hard hats and yellow safety vests. The solar panels are mounted on a metal frame.

Expand solar projects in our community by increasing **OUCommunity solar farm (subscriptions) by 4.5 MW** and **residential rooftop (installs) by 1 MW**

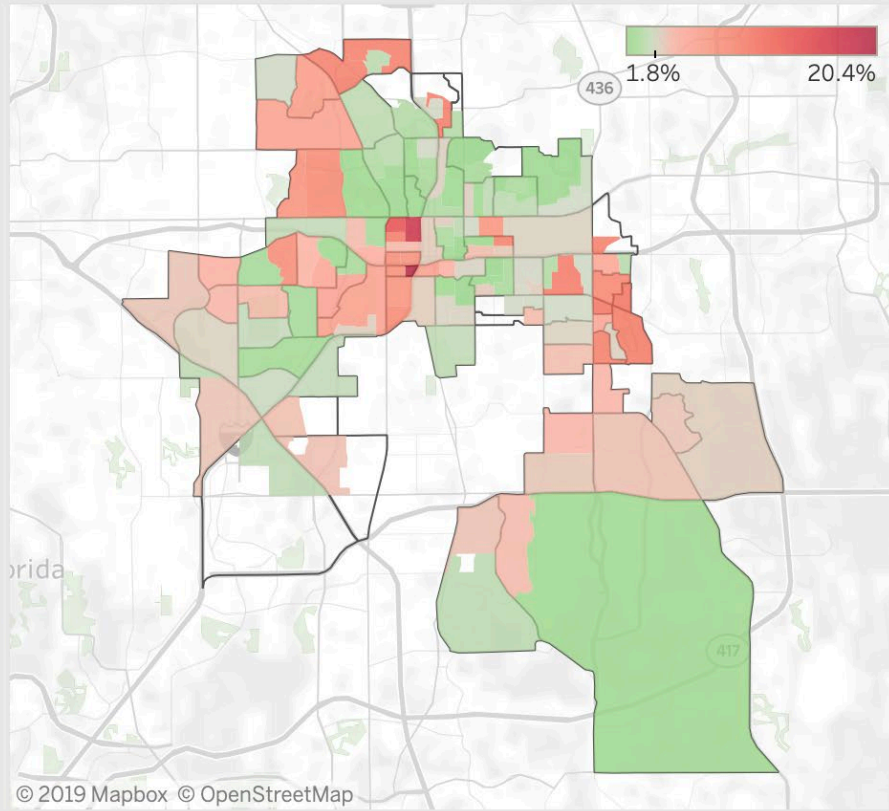


# Orlando Energy Transformation

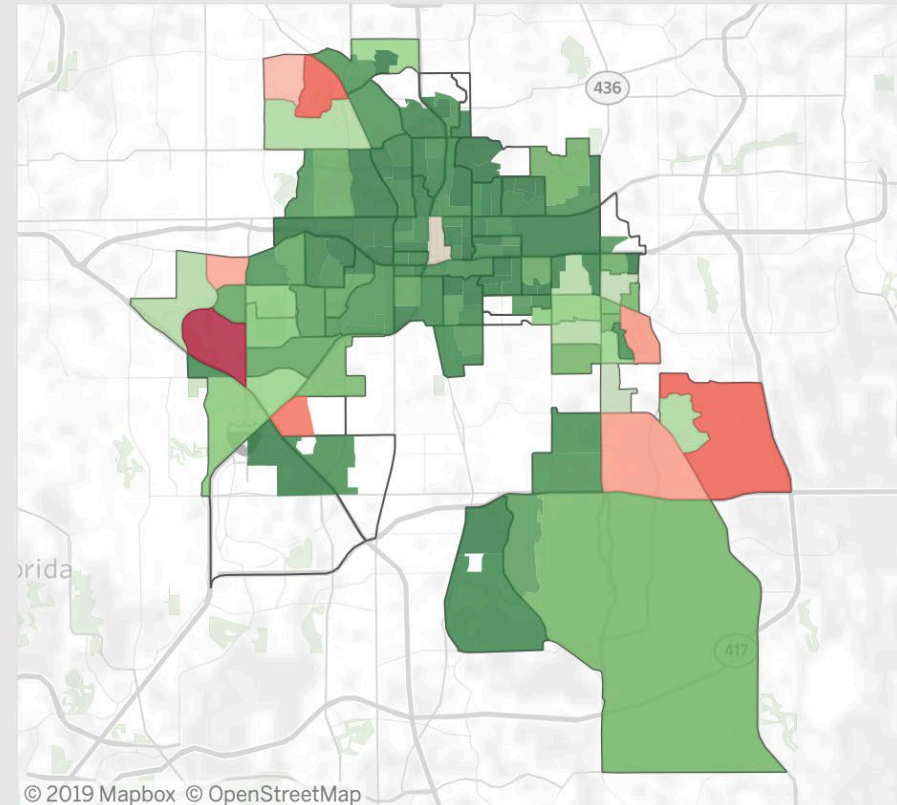


# Energy and Water Equity Mapping

Electricity Burden



Households in Burden



Households Above Electricity Burden

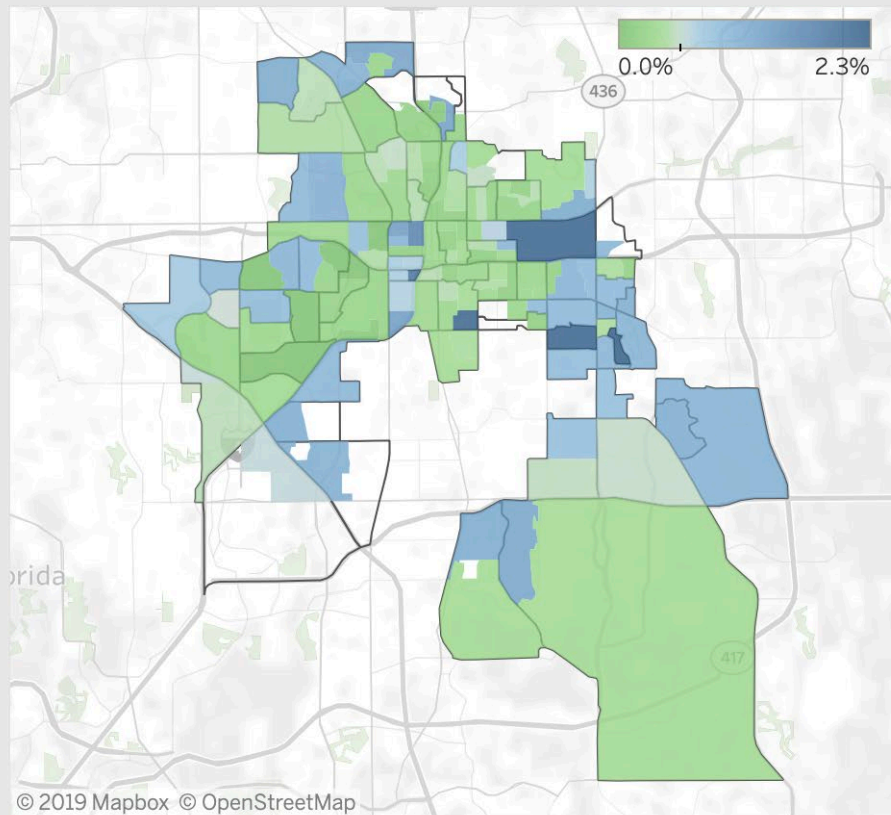
4.5%



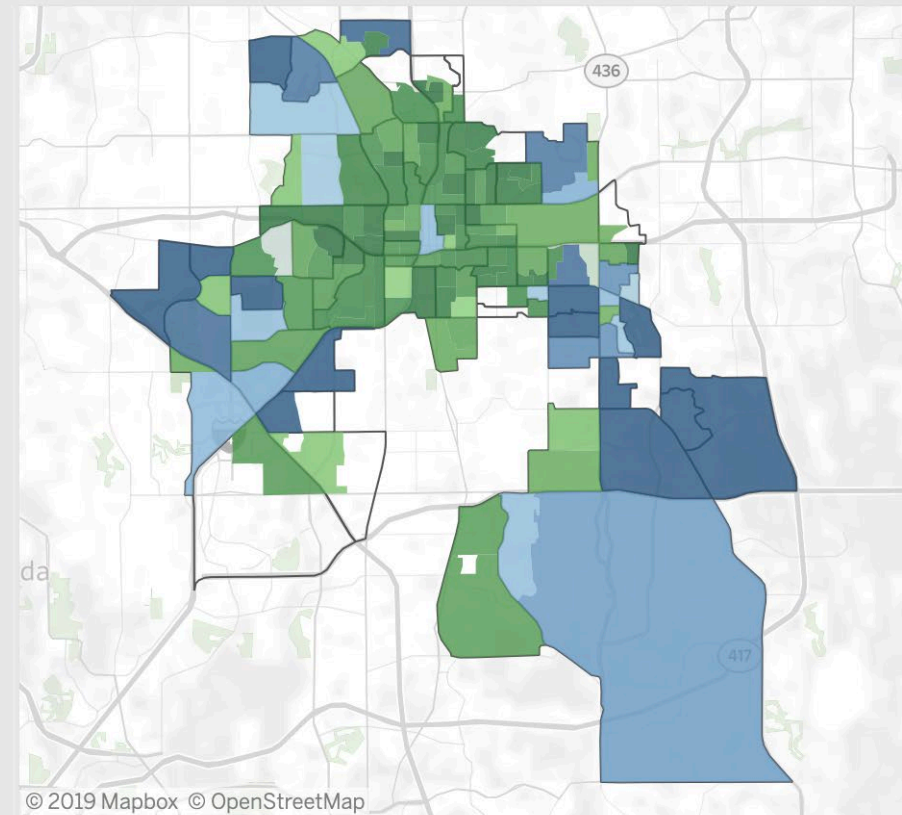
Use the slider to see how many households are living above the electricity burden that you choose. The average electricity burden for Orlando is 4.48%, while the national average is 2.56%.

# Energy and Water Equity Mapping

Water Burden



Households in Burden



**Households Above Water Burden**

0.7%

Use the slider to see how many households are living above the water burden that you choose. The average water burden for Orlando is **0.71%**, while the national average is **1.11%**.

For more information about utility burdens, please visit our website >



# 13MW Community Solar Farm – Dec 2017



Through strategic marketing to increase **OUCommunity** subscribers, we will enable an addition of **4.5 MW of renewable energy**



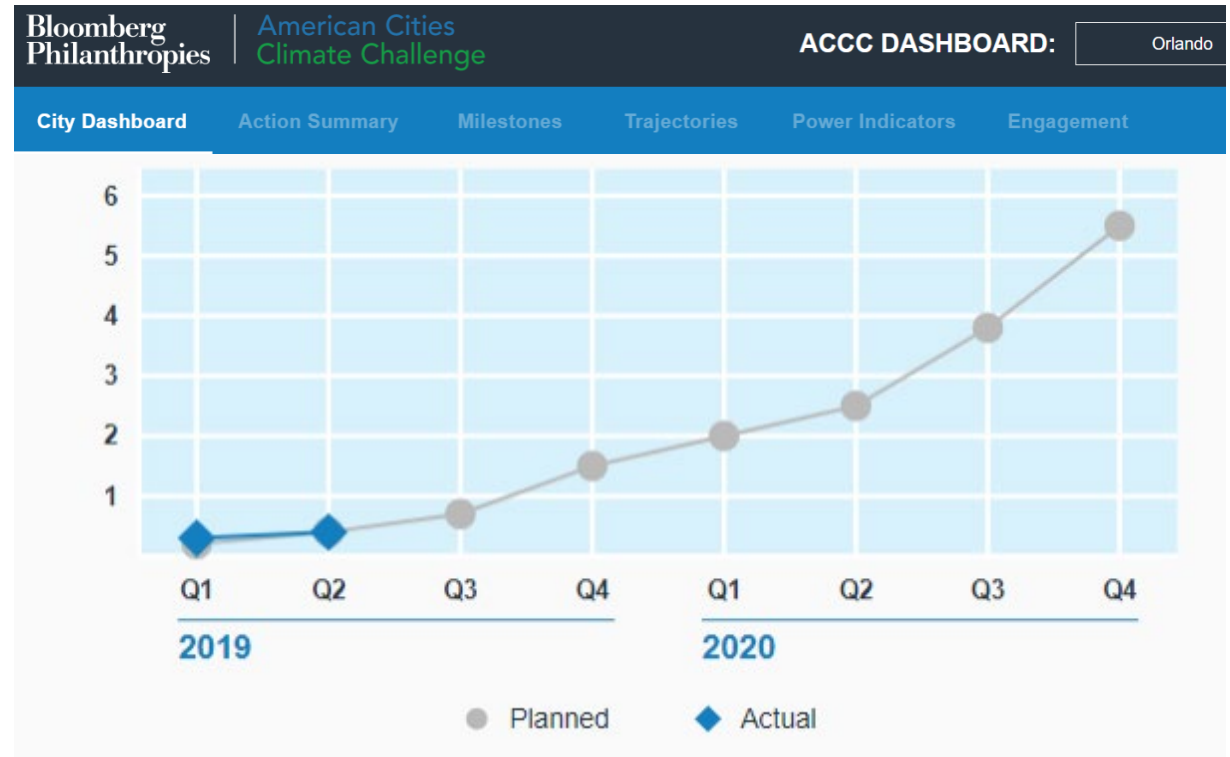
## OUCommunity

- Commercial
- Residential apartment
- Low-income



## Vision Flourish

- Marketing analysis and strategy



OUCommunity Solar currently has **4.5 MW available** for residential and commercial customers. Our goal is to fully subscribe this project by end of 2020.

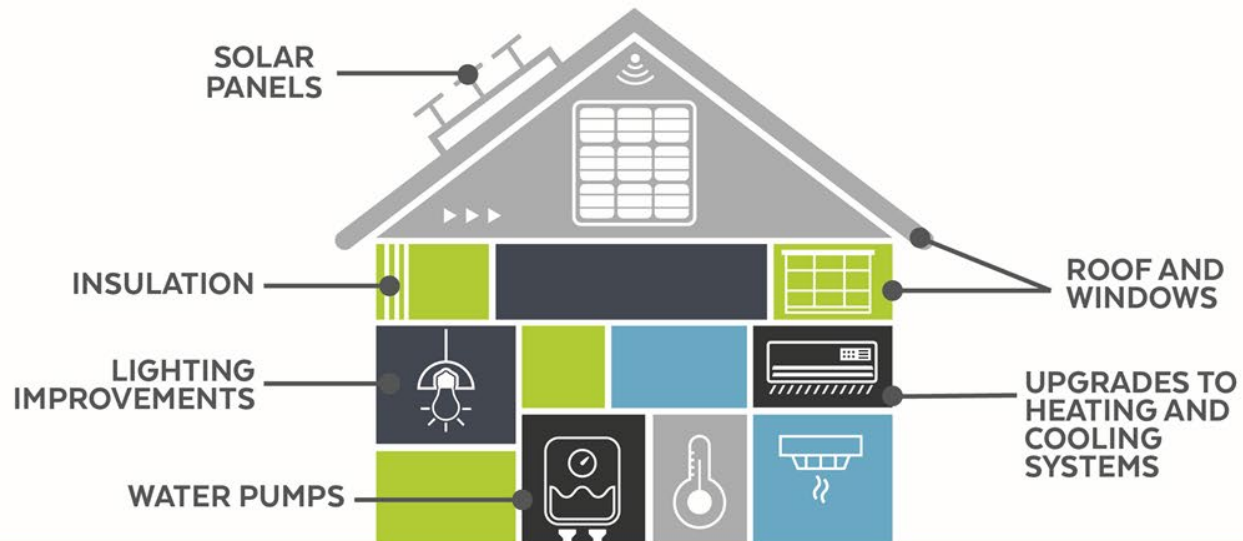
# Enabling Financing Options



Property Assessed  
Clean Energy  
(PACE)



## EXAMPLE OF IMPROVEMENTS:

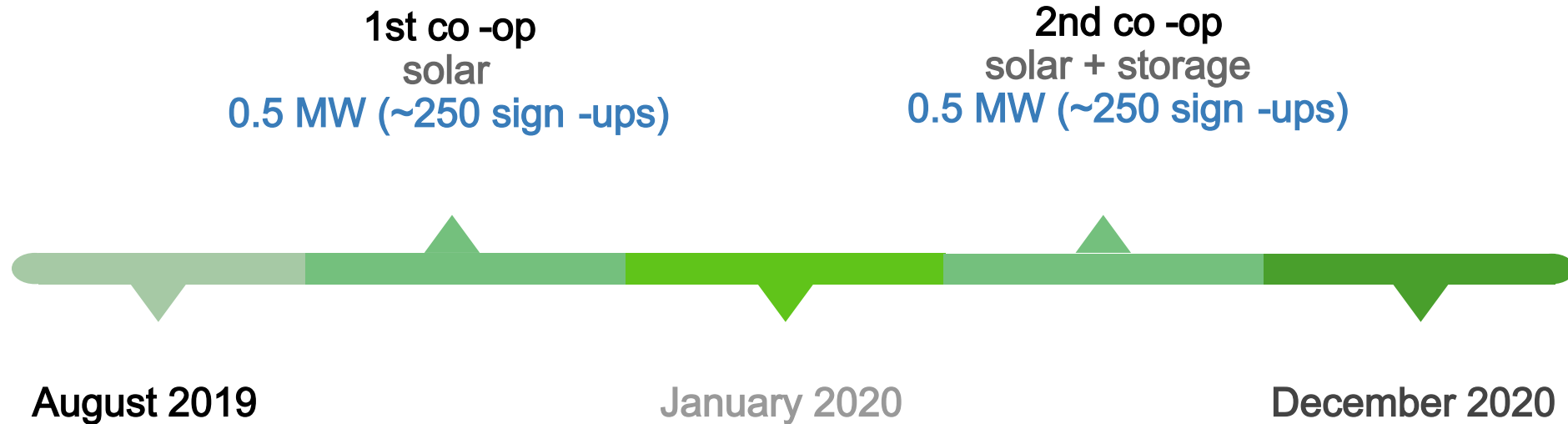


**Pamela Turner**  
Loan Impacts: Safety,  
Health, Quality of life,  
Credit Rebuilding  
Amount of Loan:  
\$7,231.21  
Type of loan: Wind  
Hazard Mitigation  
(Roof Repair)



# 1 MW of additional rooftop solar will be realized by the solar co in partnership with SUN Florida

-ops



1st co-op solar  
0.5 MW (~250 sign-ups)

2nd co-op solar + storage  
0.5 MW (~250 sign-ups)

August 2019

January 2020

December 2020

- 7 residential workshops in Orlando
- 1 City employee dedicated workshop
- Available for Orange County residents

- Kick off: Mayor press conference with testimonials
- Community workshops (TBD)



**SOLAR UNITED  
NEIGHBORS**



# New Horizon's Apartments

## 58 affordable green housing units

- Energy Star appliances
- LED lighting
- Heat pump water heaters
- Low-flow fixtures and faucets
- Ductless HVAC
- Recycling
- Composting
- Community Garden
- Solar power









PROUD TO BE FEATURED IN  
THE BRAND NEW  
DOCUMENTARY



THE CLIMATE FOR CHANGE IS NOW.

# PARIS TO PITTSBURGH



DOCUMENTARY  
FILMS

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# GREEN WORKS ORLANDO

