ORLANDO: SUSTAINABLE & RESILIENT Urban Solutions

Chris Castro, LEED GA, CPB
Director, Office of Sustainability & Resilience
Future-Ready steering committee
City of Orlando

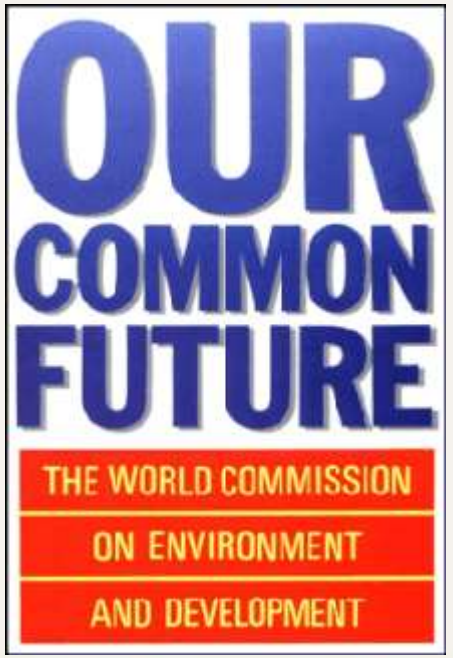
Sustainability is...

“The ability to meet the needs of the present without compromising the ability of future generations to meet their needs.”

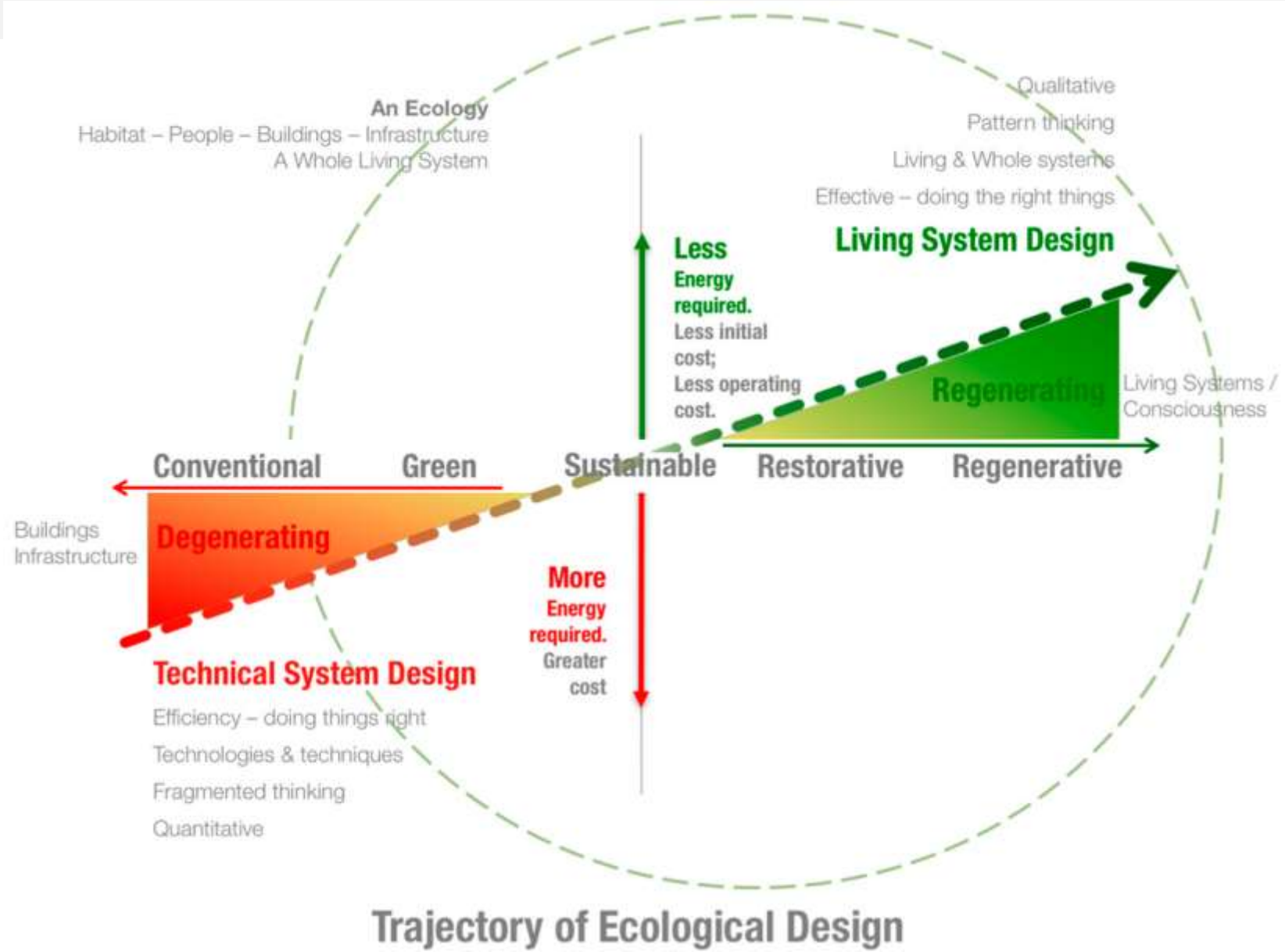
"It's about fostering respect for people and other living things, while at the same time wisely using and managing environmental and economic resources."

- Brundtland Report, United Nations 1987

Gro Harlem Brundtland, Norweigan Prime Minister

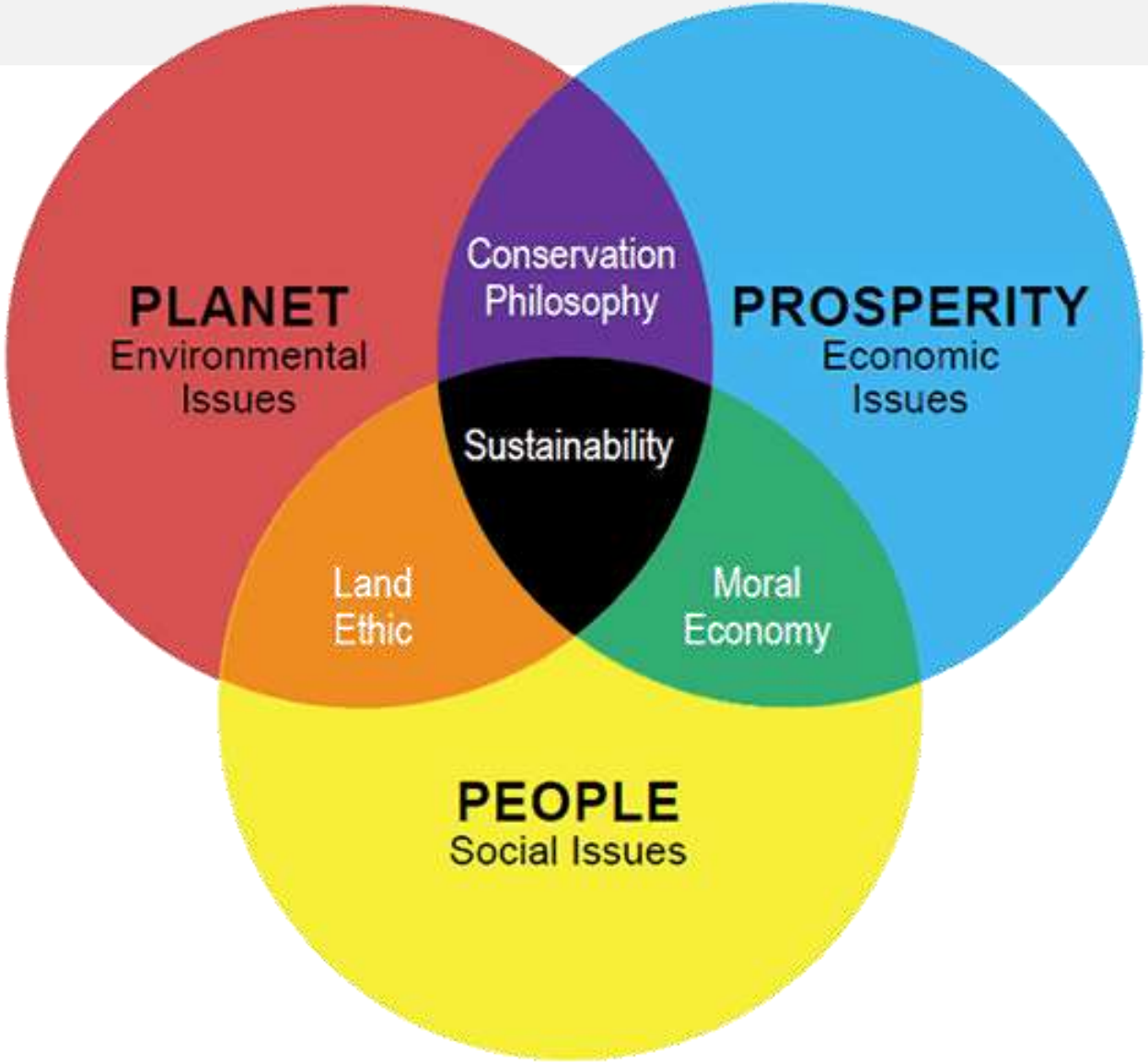


Degeneration to Sustainability to Regeneration



Trajectory of Ecological Design

Three Pillars of Sustainability



"*Triple Bottom Line*"

Office of Sustainability & Resilience

Director: Chris Castro

- Award-winning sustainability program called "**Green Works Orlando**" launched by Mayor Buddy Dyer in 2007

- Develops internal and citywide policies + programs to:
  - Protect natural resources and the environment (air, water, land)
  - Improve public health and social equity
  - Create green economy and green jobs opportunities
  - Reduce air pollution and carbon emissions
  - Enhance city resilience and adapt to climate change impacts

- Focuses on 7 key areas:
  - Clean Energy
  - Green Buildings
  - Local Food Systems
  - Zero Waste
  - Livability
  - Clean Water
  - Electric & Alternative Transportation

- Implemented more than 100+ strategies throughout municipal operations & city-wide


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

ENERGY SECURE CITIES COALITION

CLIMATE MAYORS

CITY ENERGY
A JOINT PROJECT of NRDC + IMT

Clean Cities
U.S. Department of Energy

BATTLE OF THE BUILDINGS
EPA's NATIONAL BUILDING COMPETITION

CDP
DISCLOSURE INSIGHT ACTION

GLOBAL COVENANT of MAYORS for CLIMATE & ENERGY

U.S. GREEN BUILDING COUNCIL
LEED GOLD
USGBC

DRIVE electric
ORLANDO

SOLAR ENERGY INNOVATION NETWORK
U.S. DEPARTMENT OF ENERGY

UNDER 2°
SECRETARIAT THE CLIMATE GROUP

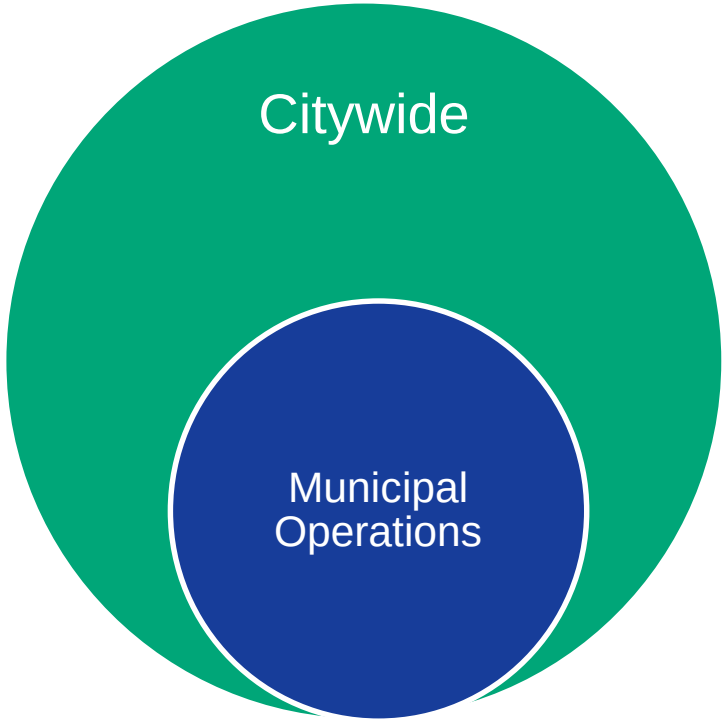
Better Buildings
U.S. DEPARTMENT OF ENERGY

USDN urban sustainability directors network

DRIVE ELECTRIC FLORIDA

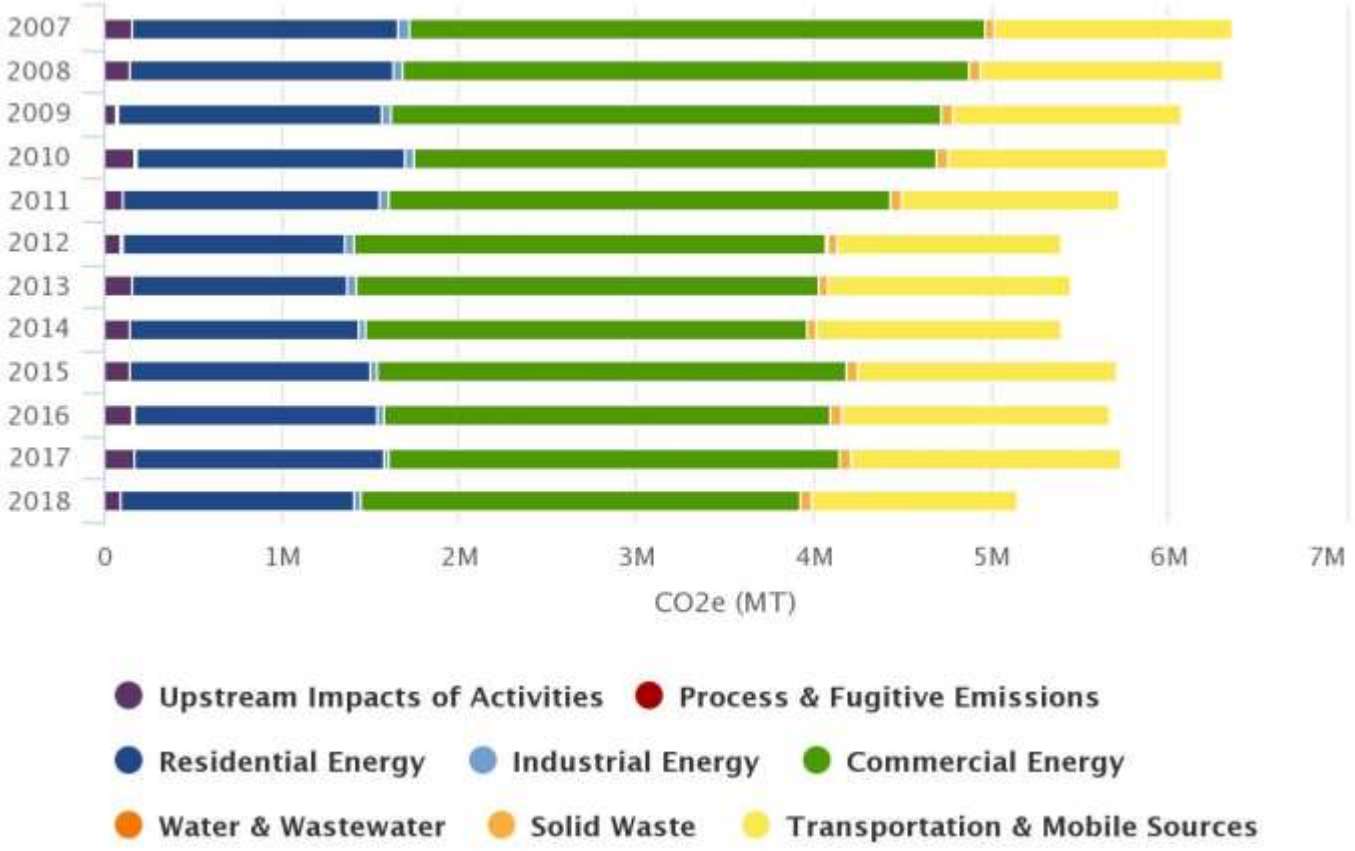
GCoM + Climate Mayors + WASI movement

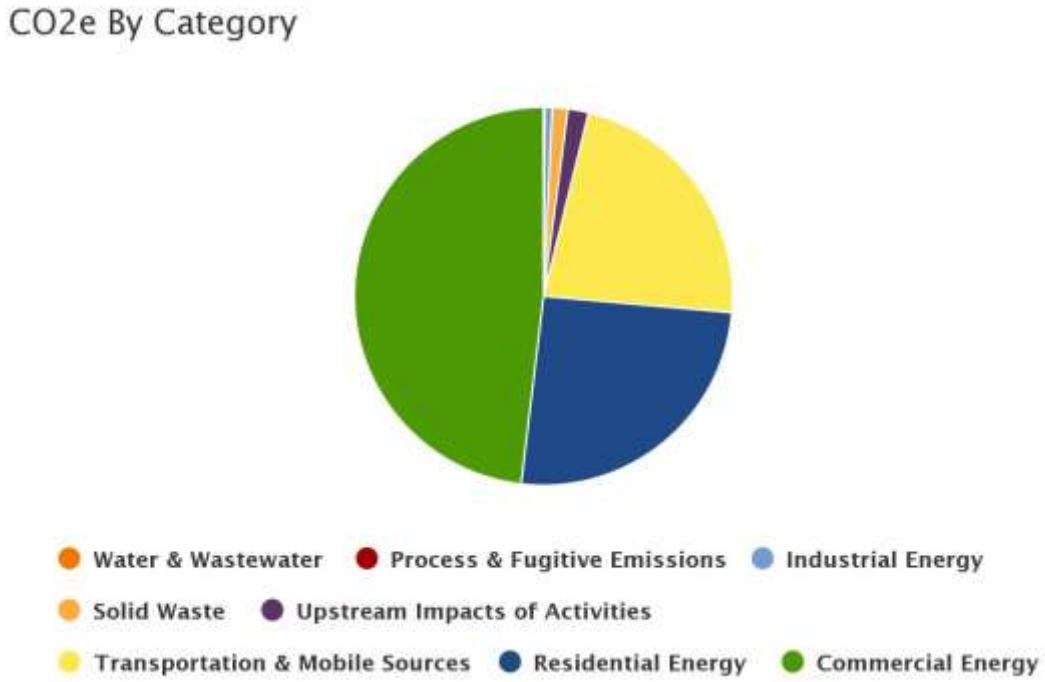
GHG inventory, Compliance with CDP and GCoM



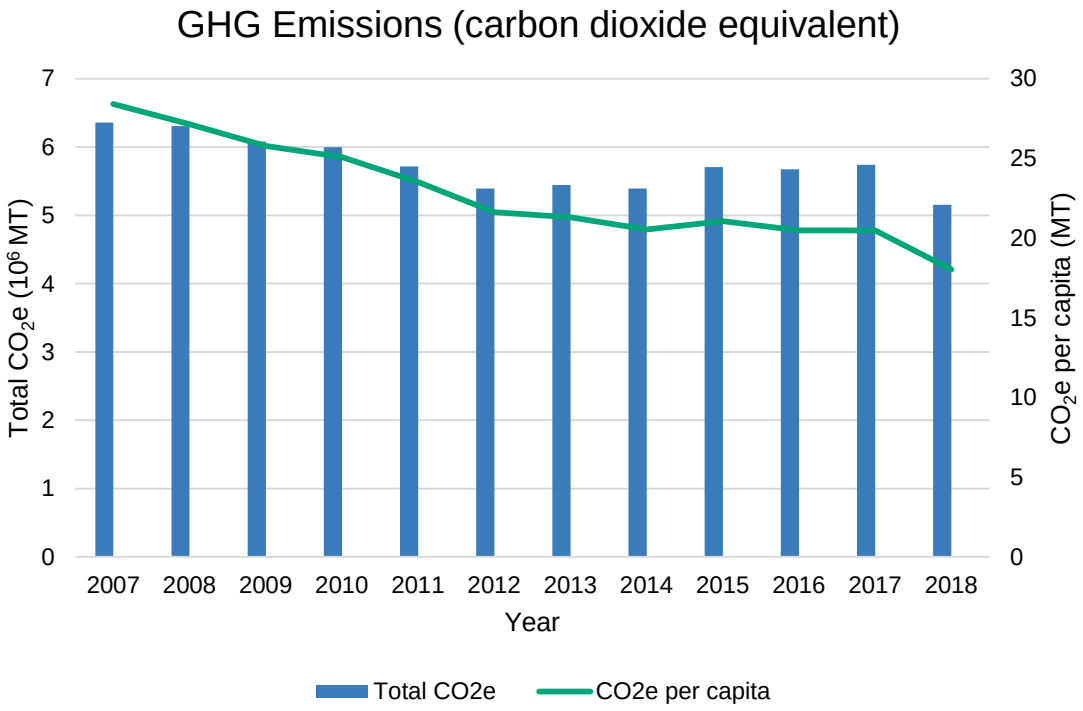
- Stationery
  - Residential Buildings
  - Commercial Buildings
  - Industrial Energy
  - Fugitive emissions, T&D losses
- Transportation
  - On road transportation
- Waste
  - Solid waste
  - Wastewater

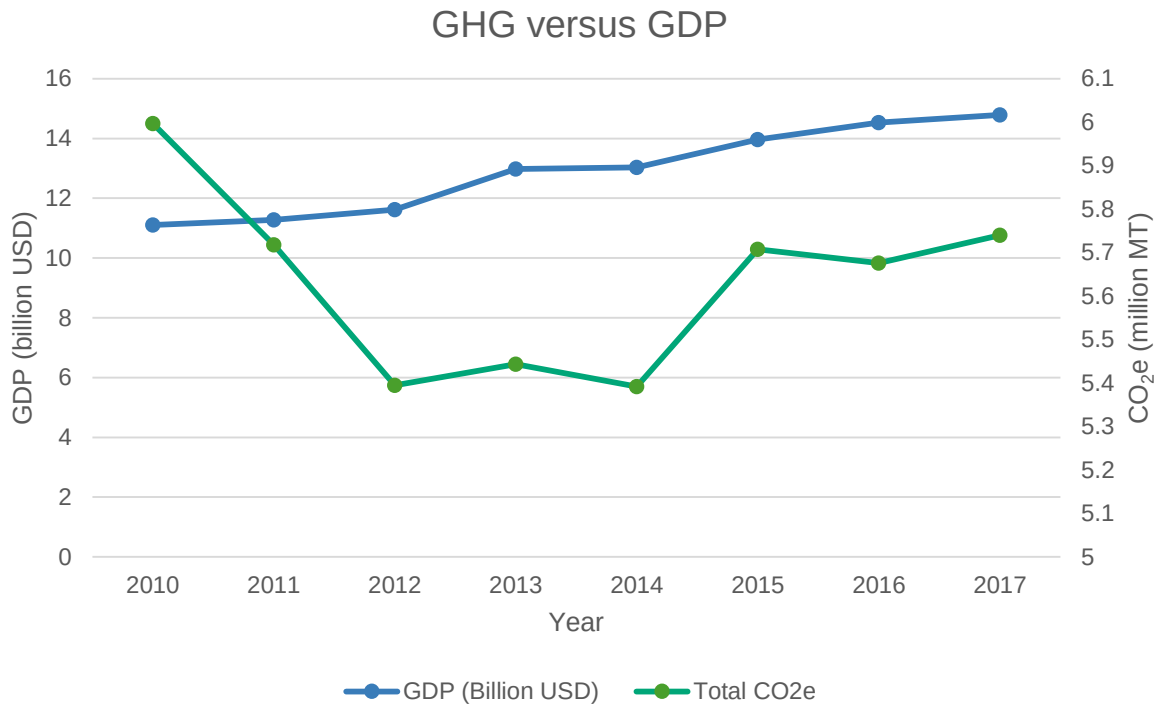
Orlando's Citywide yearly emissions by sector / source





Other trends: Per capita and GDP comparisons





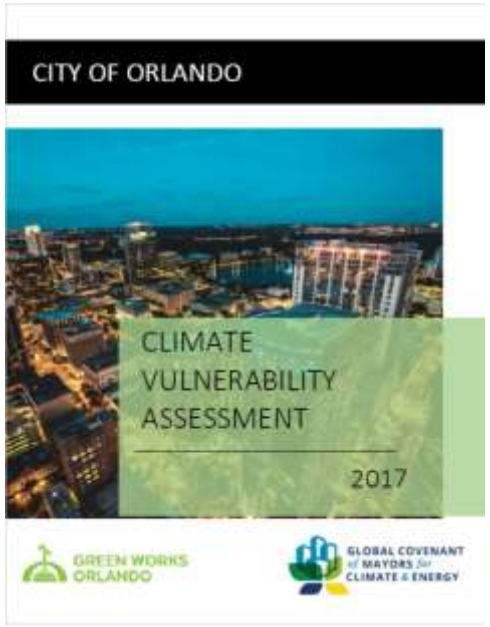
From 2007-2018, City of Orlando has seen:

- 18.96% decline in total CO2e emissions
- 36.52% in per-capita CO2e emissions

Pathway towards Climate Resiliency

Municipal Operations Sustainability Plan (2012, updated in 2017)

Climate Vulnerability Assessment (2017)



Greenhouse Gas Inventory (2018)

Community Sustainability Action Plan (2013, updated in 2018)

SIEMENS
Ingenuity for life

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

FLORIDA SOLAR ENERGY CENTER

OUC
The Reliable One

Orlando's Green Future

Technology Pathways for Building a Sustainable Future

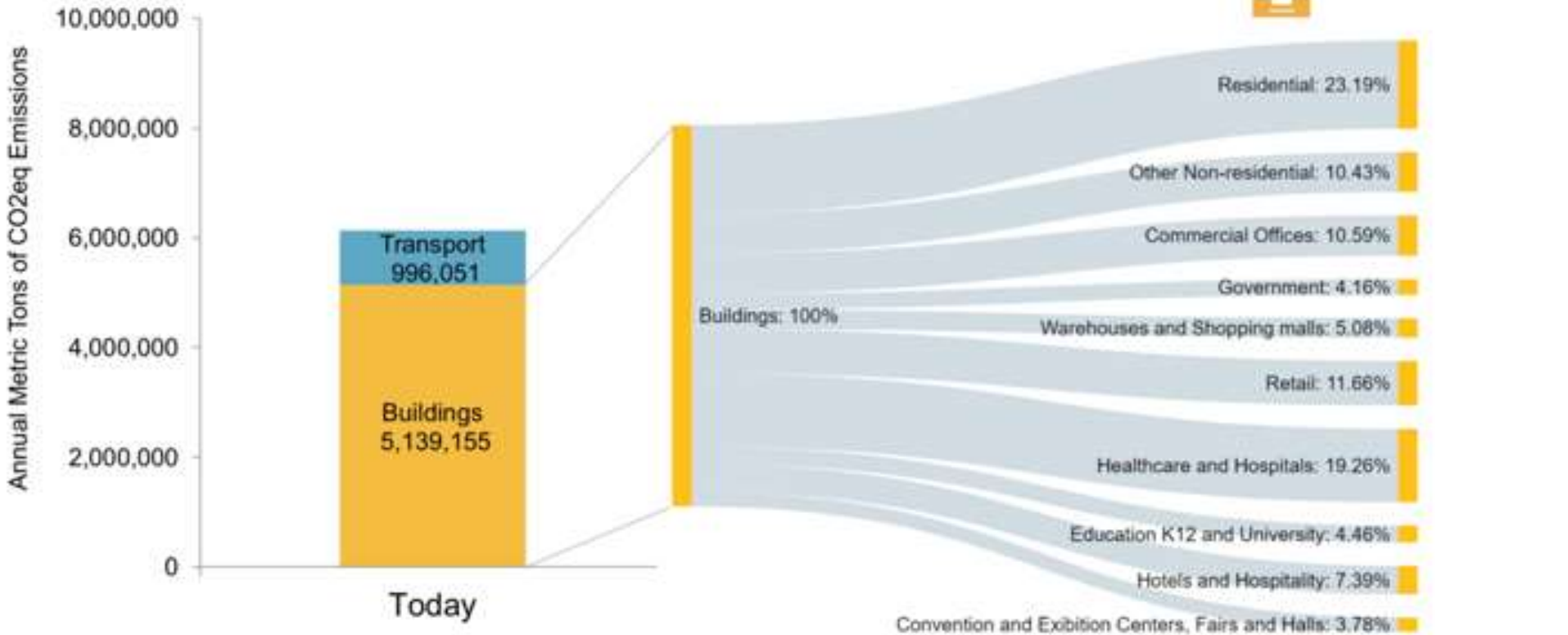
Siemens Center of Urban Development

Pathway to 90 x 2040

GHG Emissions, 2016 Estimated

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

SIEMENS
Ingenuity for life



* 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

Orlando's Climate Action Strategy

Through the **American Cities Climate Challenge,** the City of Orlando has launched an effort to accelerate and deepen our climate actions to create the greatest climate impact through 2030 and showcase the benefits – **good jobs, cleaner air, and cost savings** – that climate solutions brings.

Reduce building energy use

Increase renewable energy

Reduce vehicle travel

Electrify vehicles

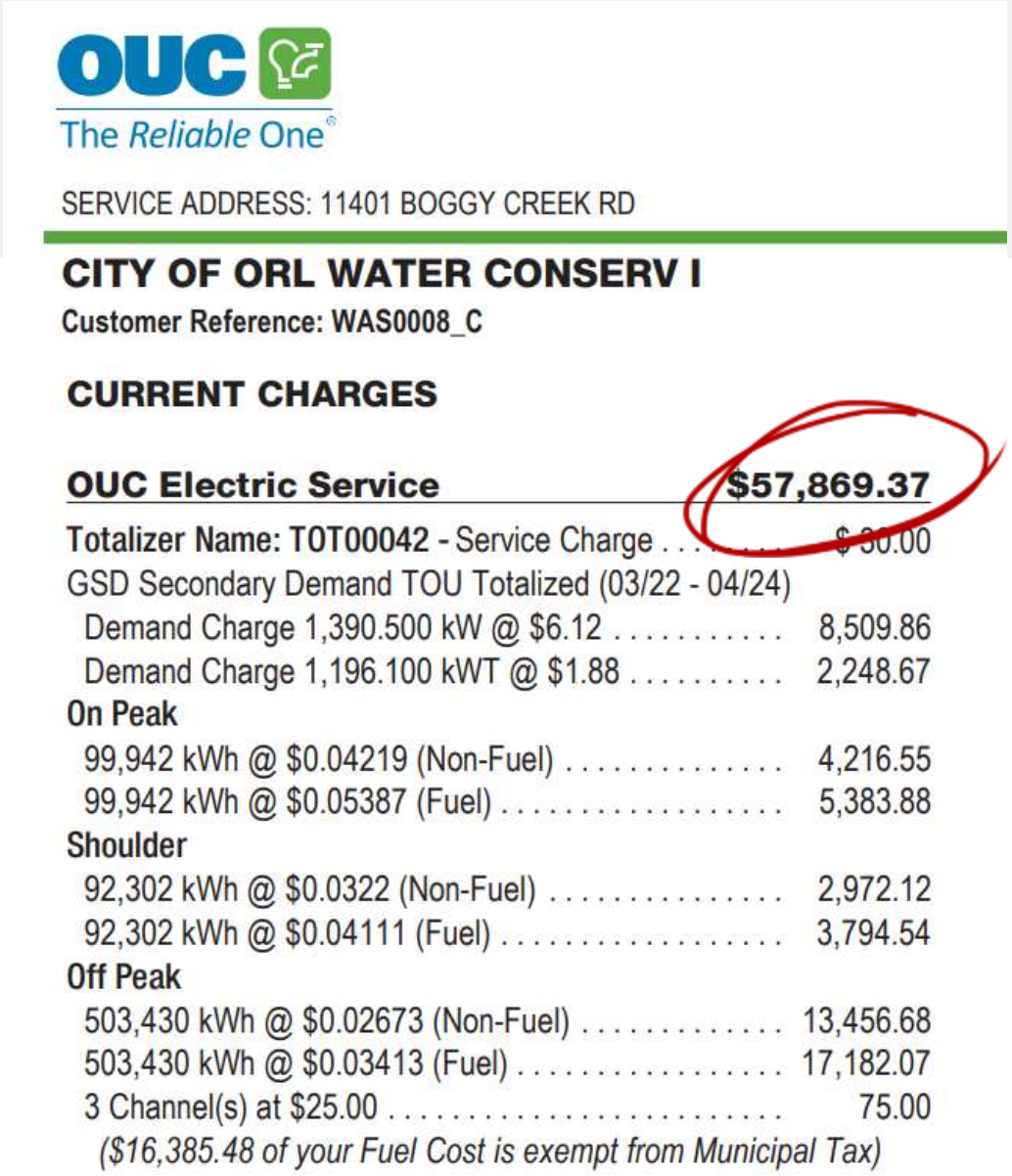
Cities Reach Paris Climate Goals


Green Buildings

Mandatory LEED certification for City buildings

Municipal Energy Efficiency Program

- Our power bill is **$19,000,000** per year
- Hired full-time **Energy Manager** in 2011 as result of EECBG during ARRA
- **Invested $17.5 million municipal green bond in 2016**
  - Phase I – 55 Buildings
  - Tracking at 23% EUI savings compared to 2011 baseline of 7.2M sf.
  - $2M per year in annual savings to pay debt



OUC The Reliable One

SERVICE ADDRESS: 11401 BOGGY CREEK RD

CITY OF ORL WATER CONSERV I

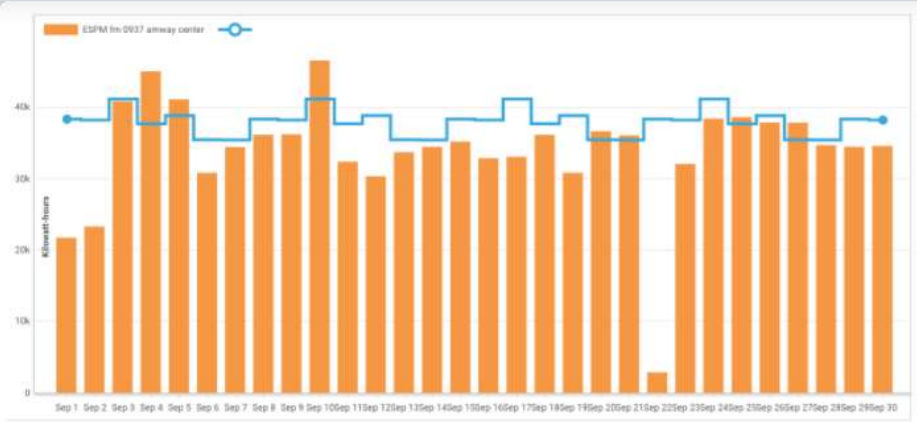
Customer Reference: WAS0008_C

CURRENT CHARGES

OUC Electric Service	**$57,869.37**
Totalizer Name: TOT00042 - Service Charge	$ 30.00
GSD Secondary Demand TOU Totalized (03/22 - 04/24)	
Demand Charge 1,390.500 kW @ $6.12	8,509.86
Demand Charge 1,196.100 kWT @ $1.88	2,248.67
On Peak	
99,942 kWh @ $0.04219 (Non-Fuel)	4,216.55
99,942 kWh @ $0.05387 (Fuel)	5,383.88
Shoulder	
92,302 kWh @ $0.0322 (Non-Fuel)	2,972.12
92,302 kWh @ $0.04111 (Fuel)	3,794.54
Off Peak	
503,430 kWh @ $0.02673 (Non-Fuel)	13,456.68
503,430 kWh @ $0.03413 (Fuel)	17,182.07
3 Channel(s) at $25.00	75.00

($16,385.48 of your Fuel Cost is exempt from Municipal Tax)

Municipal Energy Efficiency cont.



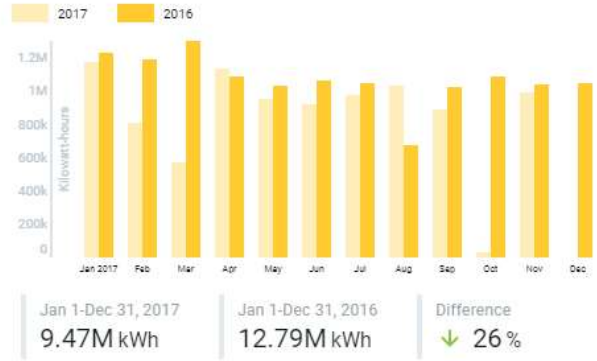
10% Energy Savings Realized in the First Month

Using historical electricity trends at the Amway Center, a weather normalized pre-LED lighting retrofit baseline was created. This graph shows the electricity use for the first month after the LED retrofit was completed compared to that baseline.

Persisting Savings

12+ months after the completion of the LED retrofit, the electricity savings are persisting. In that first year, 11% electricity savings - or 3,577,740 kWh have been realized. That is enough energy to power the average household for over 332 years!

Year-over-Year Total Electricity Use / 2017 compared to 2016

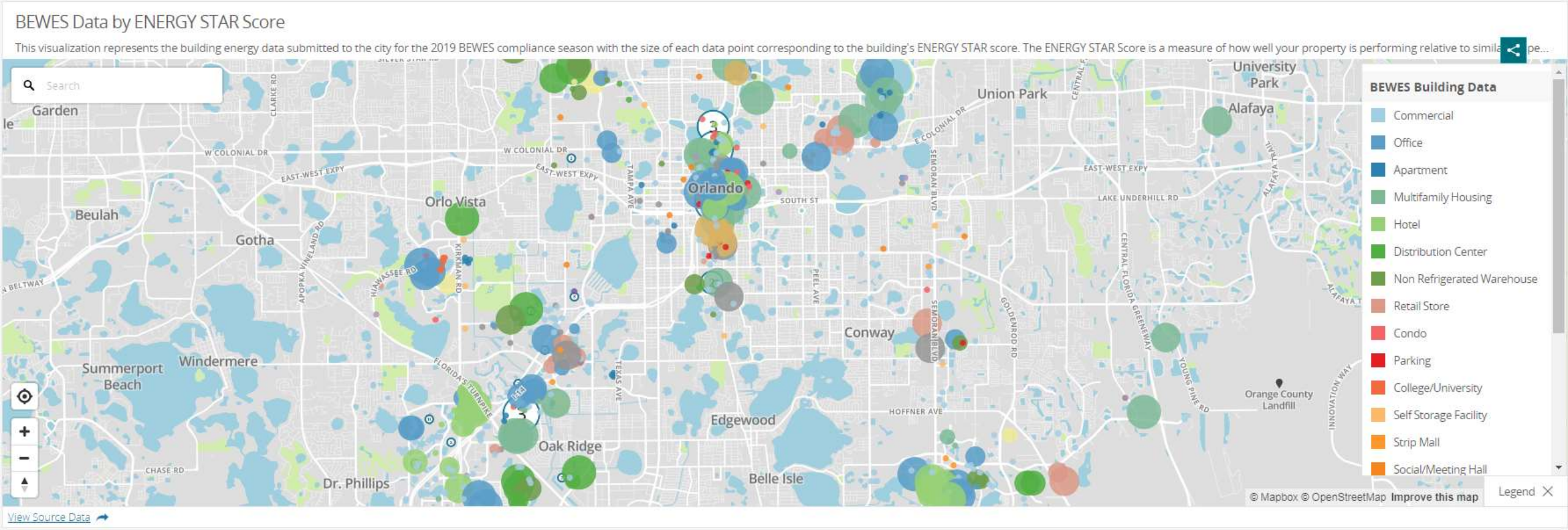


Jan 1-Dec 31, 2017	Jan 1-Dec 31, 2016	Difference
9.47M kWh	12.79M kWh	↓ 26 %

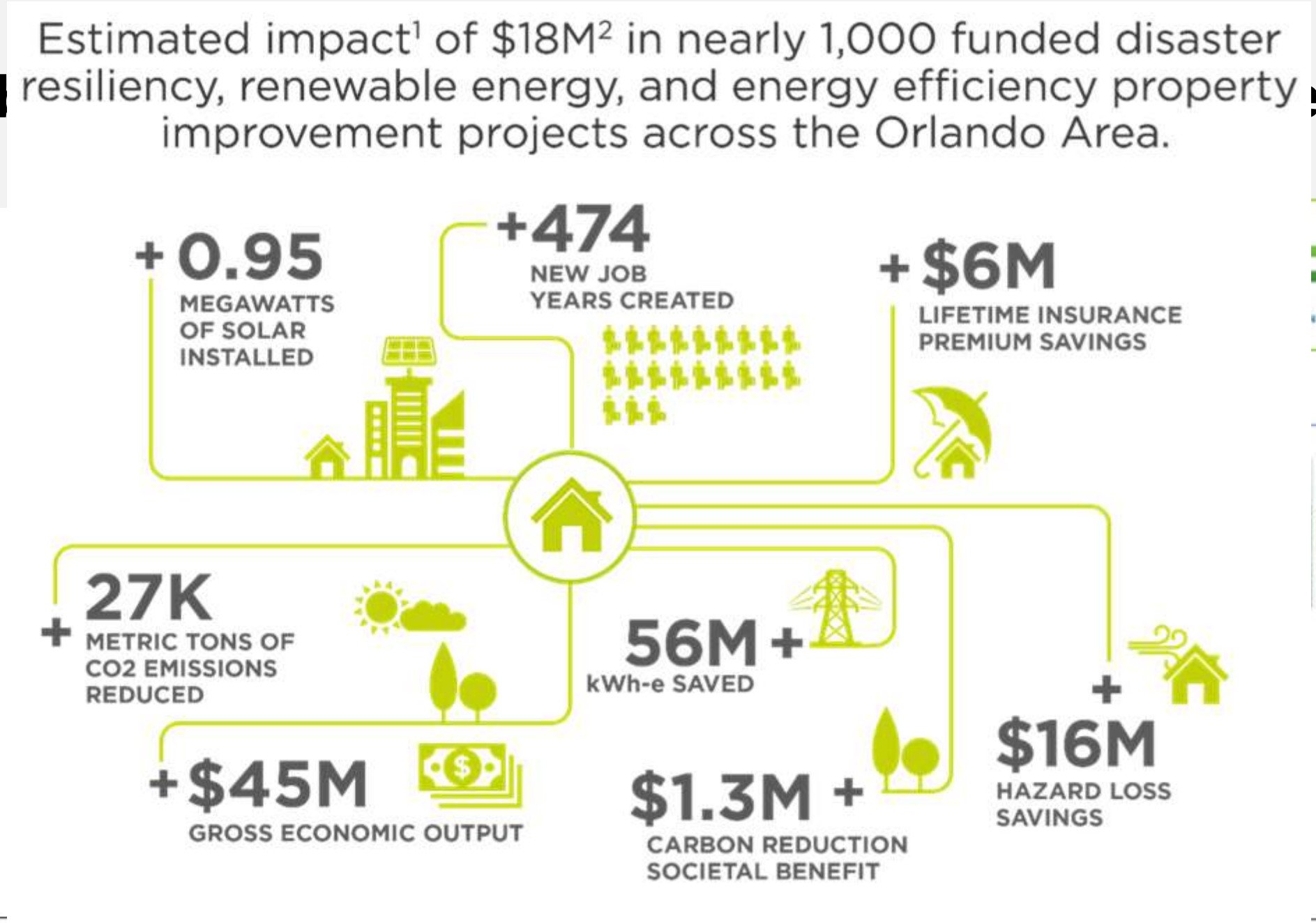
Amway Center's Electricity Use Post LED Retrofit

Last 12 months

Building Benchmarking, Energy Audits, & Transparency Policy (BEWES)



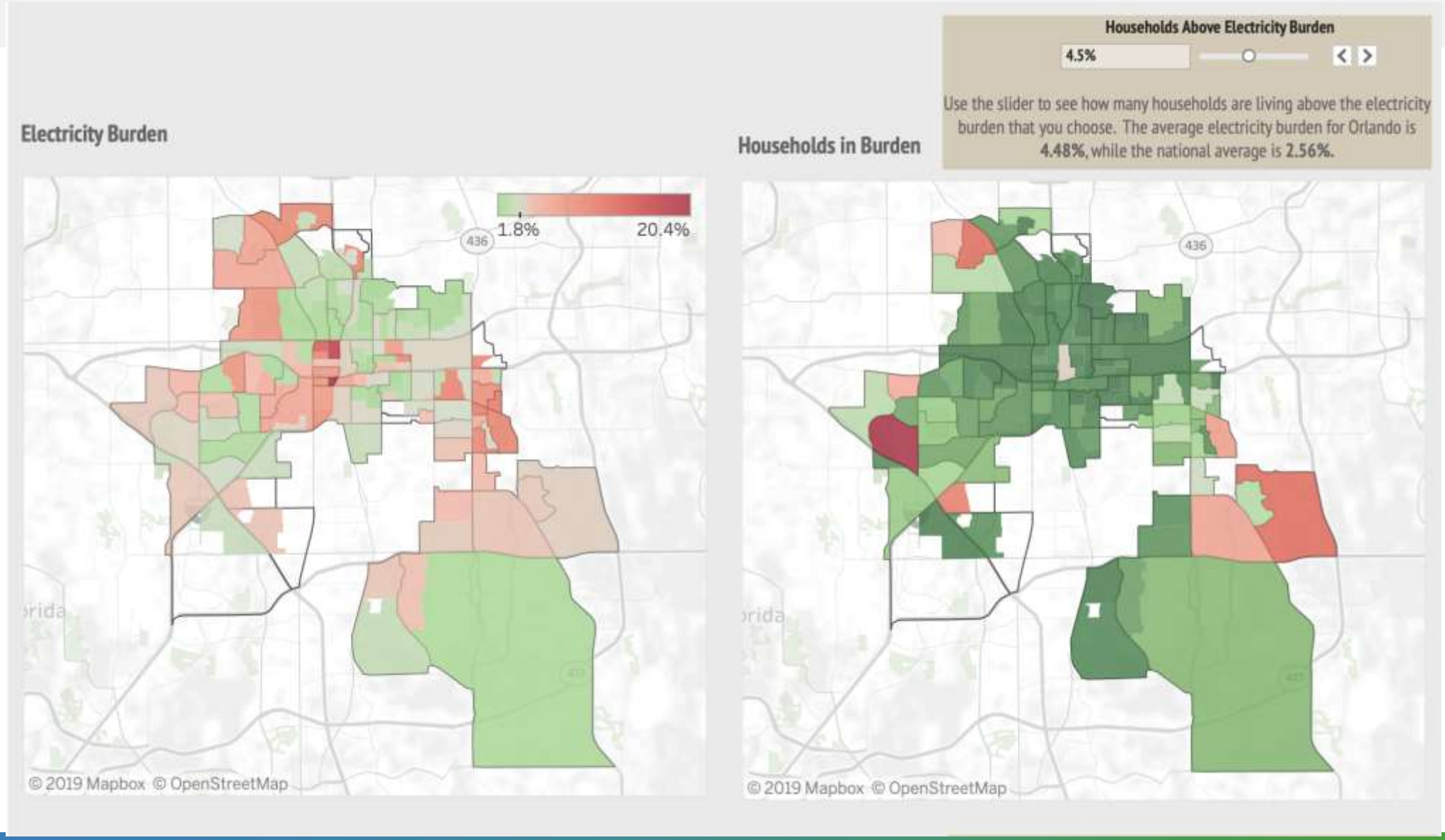
Enal esses



[1]Data based on University of Southern California Schwarzenegger Institute research, "Impacts of the Property Assessed Clean Energy (PACE) Program on the Economies of California and Florida," utilizing, in part, Ygrene's proprietary impact model. This represents estimated lifetime impacts of PACE projects completed by Ygrene from inception through October, 2019. The research report can be accessed here: http://schwarzenegger.usc.edu/research

[2]Represents rounded dollar amount of PACE contracts funded by Ygrene through October, 2019.

Energy and Water Equity Mapping




Clean Energy

Orlando Energy Transformation

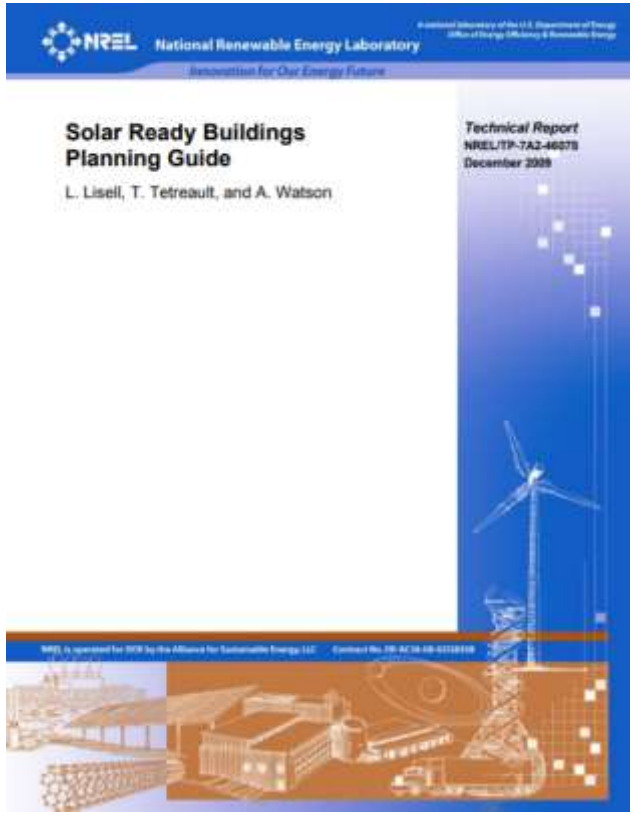
On August 8th, 2017, the City of Orlando adopted **100% Renewable Electricity Policy**:

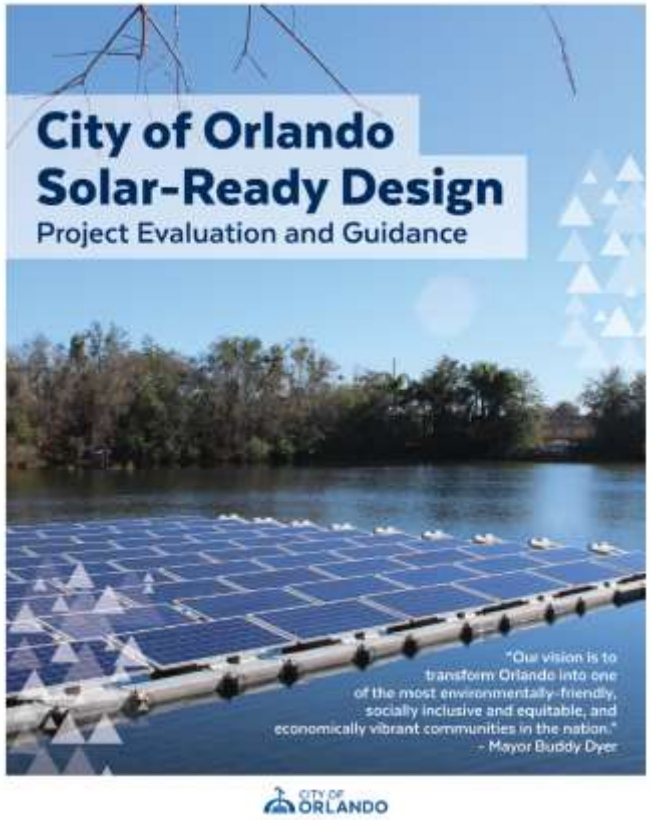
Municipal operations by 2030

Citywide by 2050

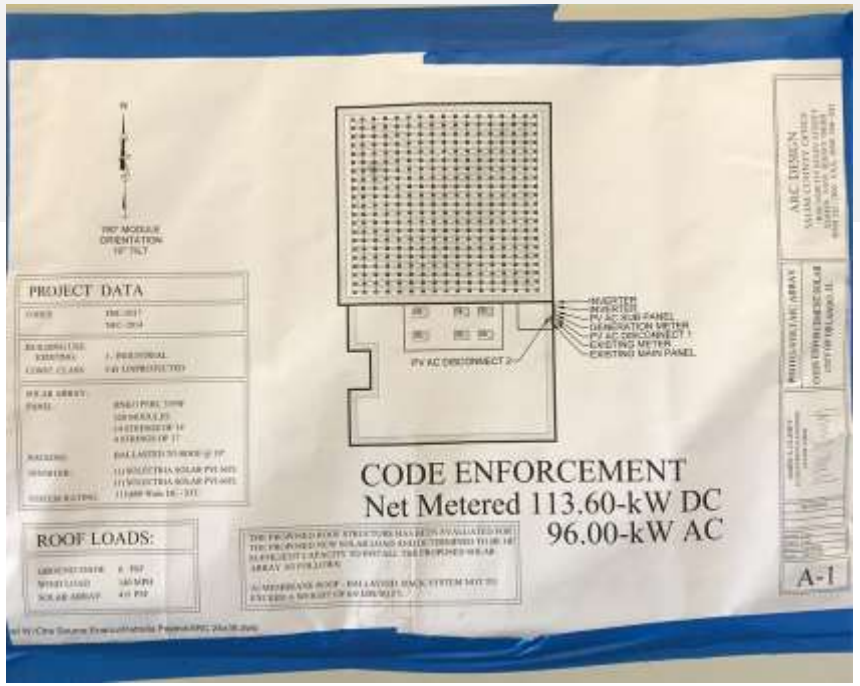
SOLAR & EV-READY GUIDELINES FOR CITY BUILDINGS

- Tailored “solar-ready” designs for Florida Building market
- Ensure proper weight load requirements for the roof
- Inverter pad placement
- Electrical panel capacity
- Conduit to the rooftop



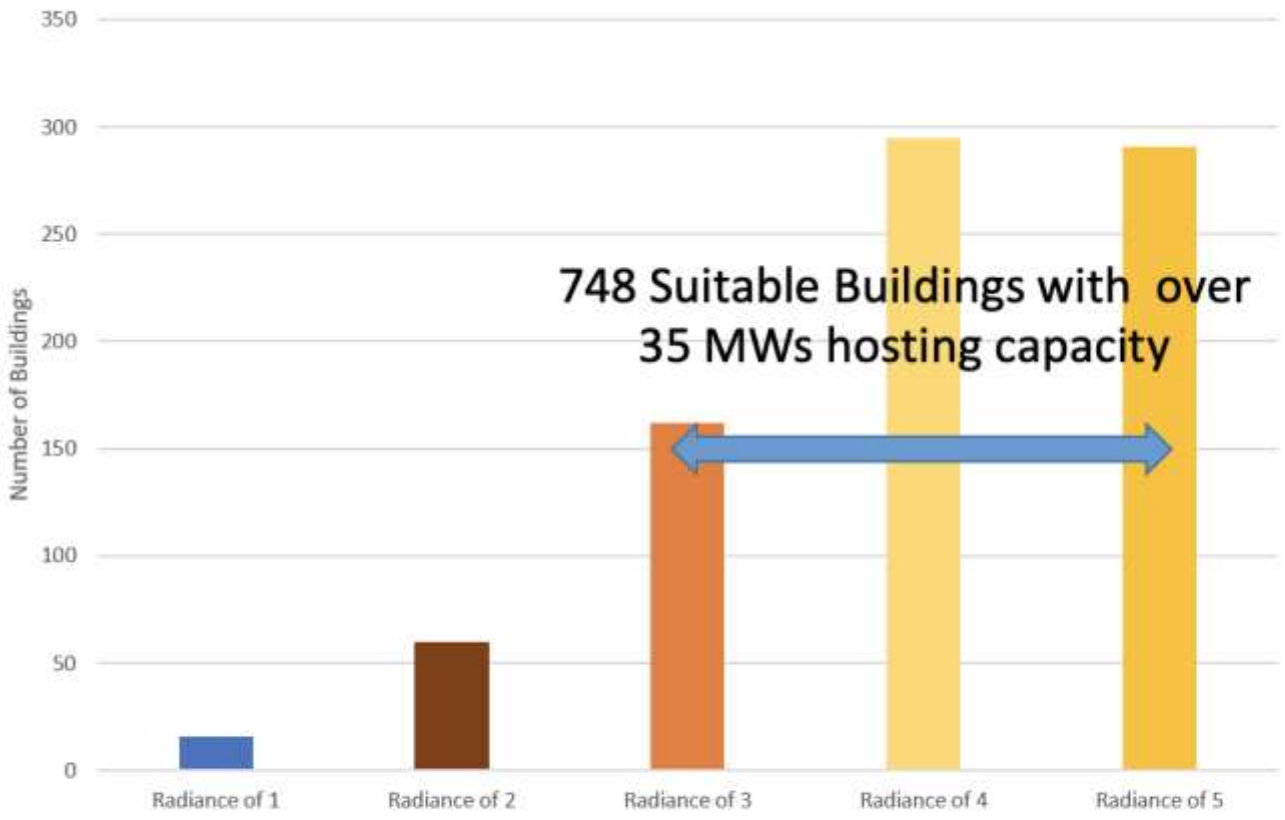


FLEET & FACILITIES COMPLEX

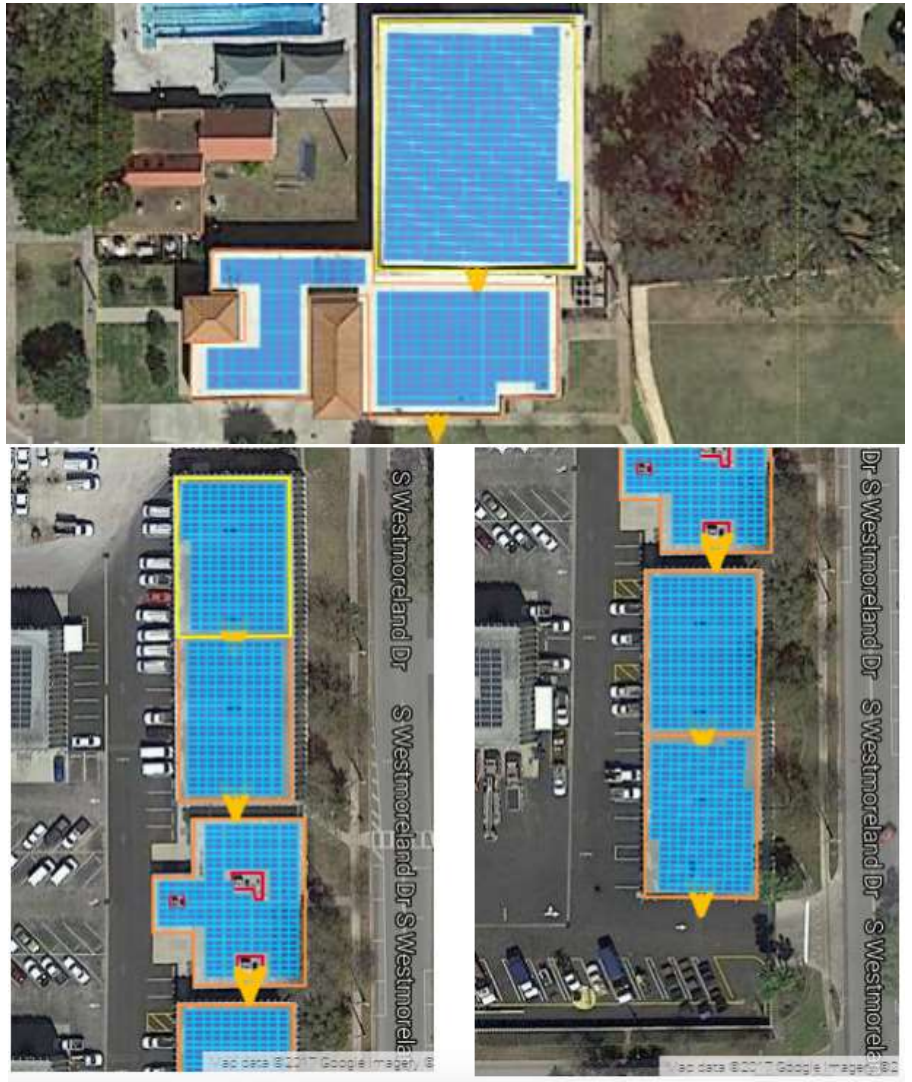


- New LEED-certified Records & Permit Building
- 114 KW solar PV
- First Net-Zero energy facility for Orlando
- $112,000 net savings over the lifetime

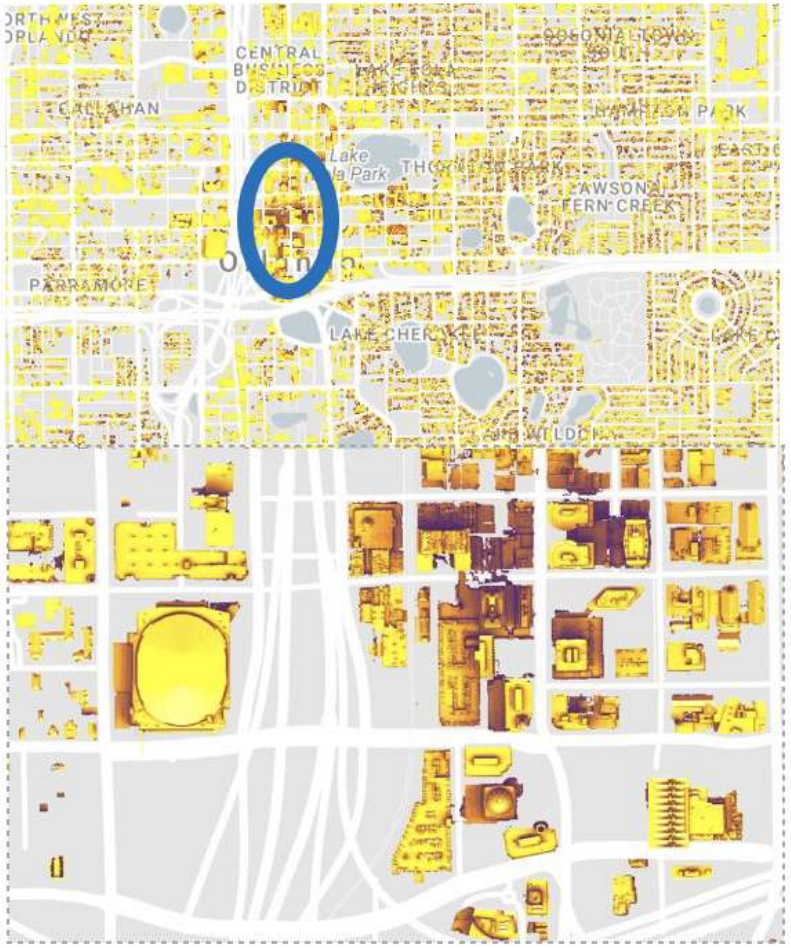
$2.3M in Solar Project in 2020 – City Ops

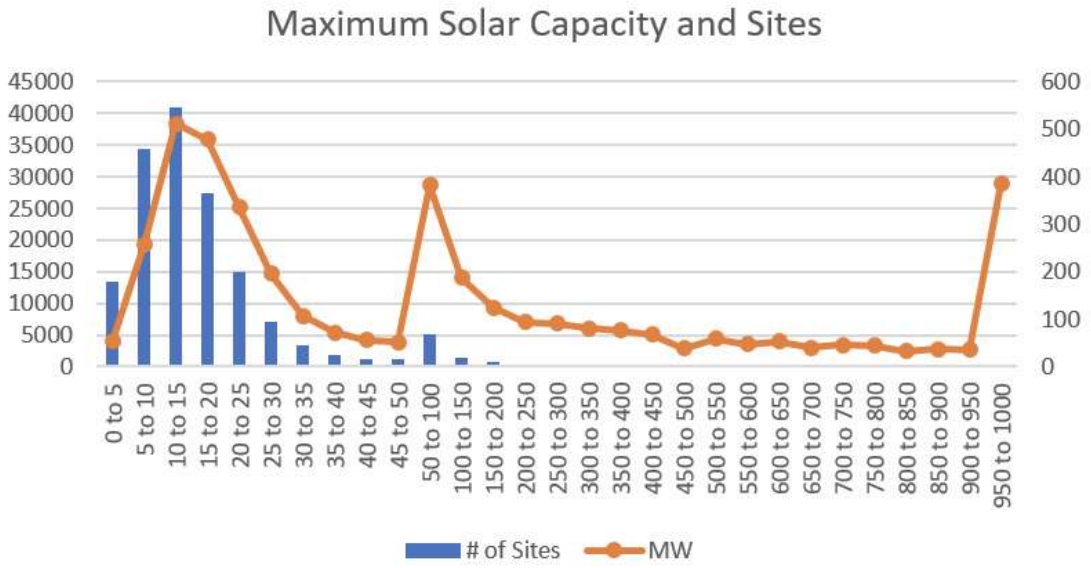


Radiance Score combines current unobstructed rooftop potential with the likelihood for future obstructions.
Current potentials are obtained via LIDAR/Satellite data in combination with NREL's PVWatts and SAM tools.
Likelihood for future obstructions assessed by the team by observations of recent development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



Solar Potential Study – 4+ GW City-wide





Sectoral Splits	MW
R	822.1
C	3217.4

greenlink

SOLAR UNITED NEIGHBORS

Established 2 solar co-ops (’19 / ’20)

Goal: 1 MW new rooftop solar by end of 2020

Avg. Price: $1.87/watt - $2.15/watt

250+ members

ORLANDO SOLAR CO-OP

INFORMATION SESSIONS WITH SOLAR UNITED NEIGHBORS

What is a solar co-op? An opportunity for homeowners who are interested in going solar to save money by leveraging the power of bulk negotiation.

By joining forces, residents in a co-op can ensure they get the right home system, a strong warranty, quality installation and unbiased support for a discounted price.

Come learn more about:

Solar energy 101: How solar works, saves money, promotes energy independence, creates new jobs, and reduces pollution.

Solar co-op process: How to join the co-op (at no cost), and how the co-op will work to guide and inform you through the process to go solar.

Economics: Review the economic benefits of installing solar through bulk-purchase provided by the co-op and about a variety of finance options in a zero-pressure unbiased setting.

Saturday, August 24 · 10 a.m. - 12 p.m.
College Park Neighborhood Center
2393 Elizabeth Avenue, Orlando, FL 32804

Tuesday, September 17 · 6 - 8 p.m.
Audubon Park Covenant Church
3219 Chelsea Street, Orlando, FL 32803

Saturday, September 21 · 10 a.m. - 12 p.m.
Beardall Senior Center
800 Delaney Avenue, Orlando, FL 32801

Wednesday, September 25 · 6 - 8 p.m.
John H. Jackson Neighborhood Center
1002 West Carter Street, Orlando, FL 32805

Thursday, September 26 · 6 - 8 p.m.
Lakehouse Lake Nona
13623 Sachs Avenue, Orlando, FL 32827

Tuesday, October 15 · 6 - 8 p.m.
Dover Shores Neighborhood Center
1400 Gaston Foster Rd, Orlando, FL 32812

Saturday, October 19 · 10 a.m. - 12 p.m.
Dr. James R. Smith Neighborhood Center
1723 Bruton Blvd, Orlando, FL 32805

SOLAR UNITED NEIGHBORS · GREEN WORKS ORLANDO · ORANGE COUNTY GOVERNMENT FLORIDA

RSVP today for any meeting at SolarUnitedNeighbors.org/orlando.

20MW+ Community Solar program — 250MW in pipeline


Ox Blue®

Transportation

Alternative Transportation & Mobility

- 350 miles of sidewalks & bike paths
- E-Bike + E-Scooter Share
- SunRail Commuter Train
- Lymmo BRT (free)
- LYNX transit bus system
- AV shuttle pilots
- Virgin Train – coming soon!

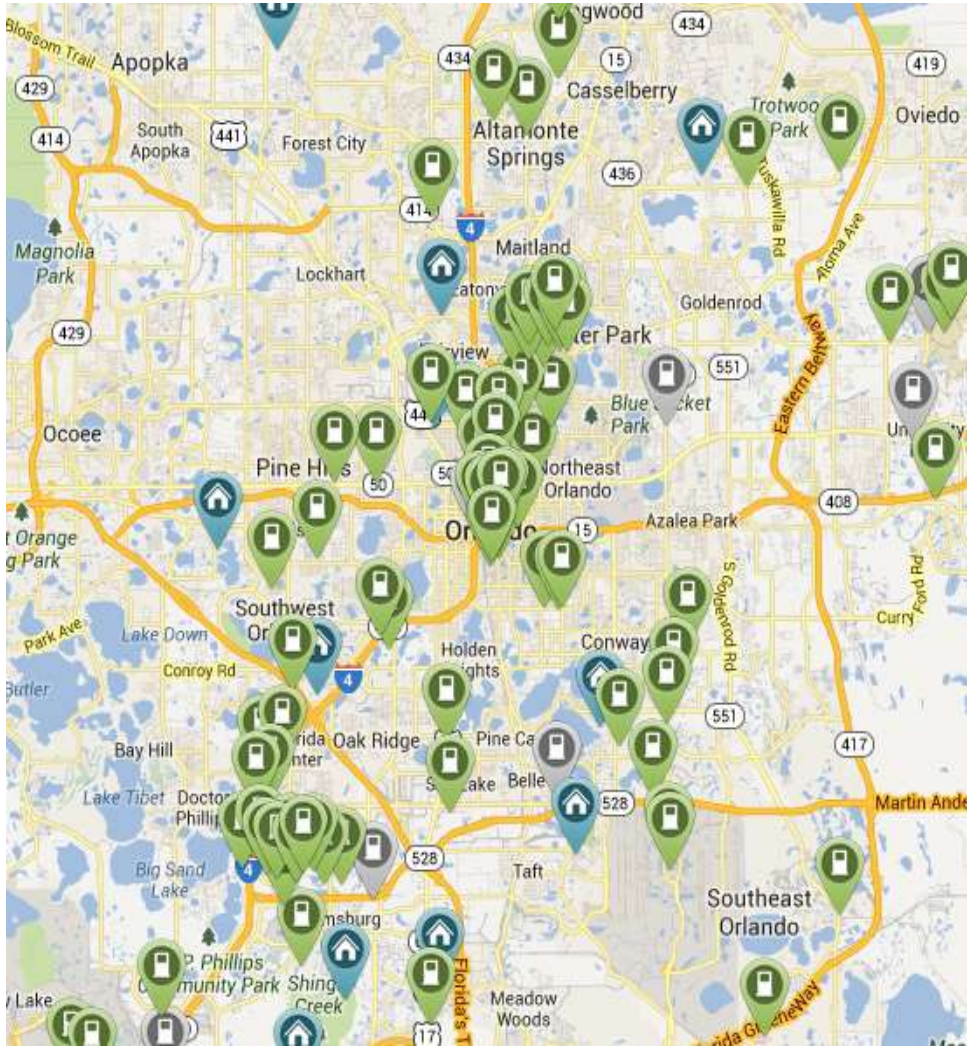
Municipal EV Fleet - ~3,000 vehicles

- **Goal:** 100% Electric and Alt. Fuel for all City Fleet by 2030

- **180+ EV & Hybrids in City Fleet**
  - 15 new Chevy Bolts EV's for City Hall motor pool
  - 15 Nissan Leafs
  - 4 EV Motorcycles for OPD
  - Solar golf cart pilots

- Submitted LOI for 100 F-150 EV Trucks

- **EV Purchasing Collaborative with Climate Mayors**



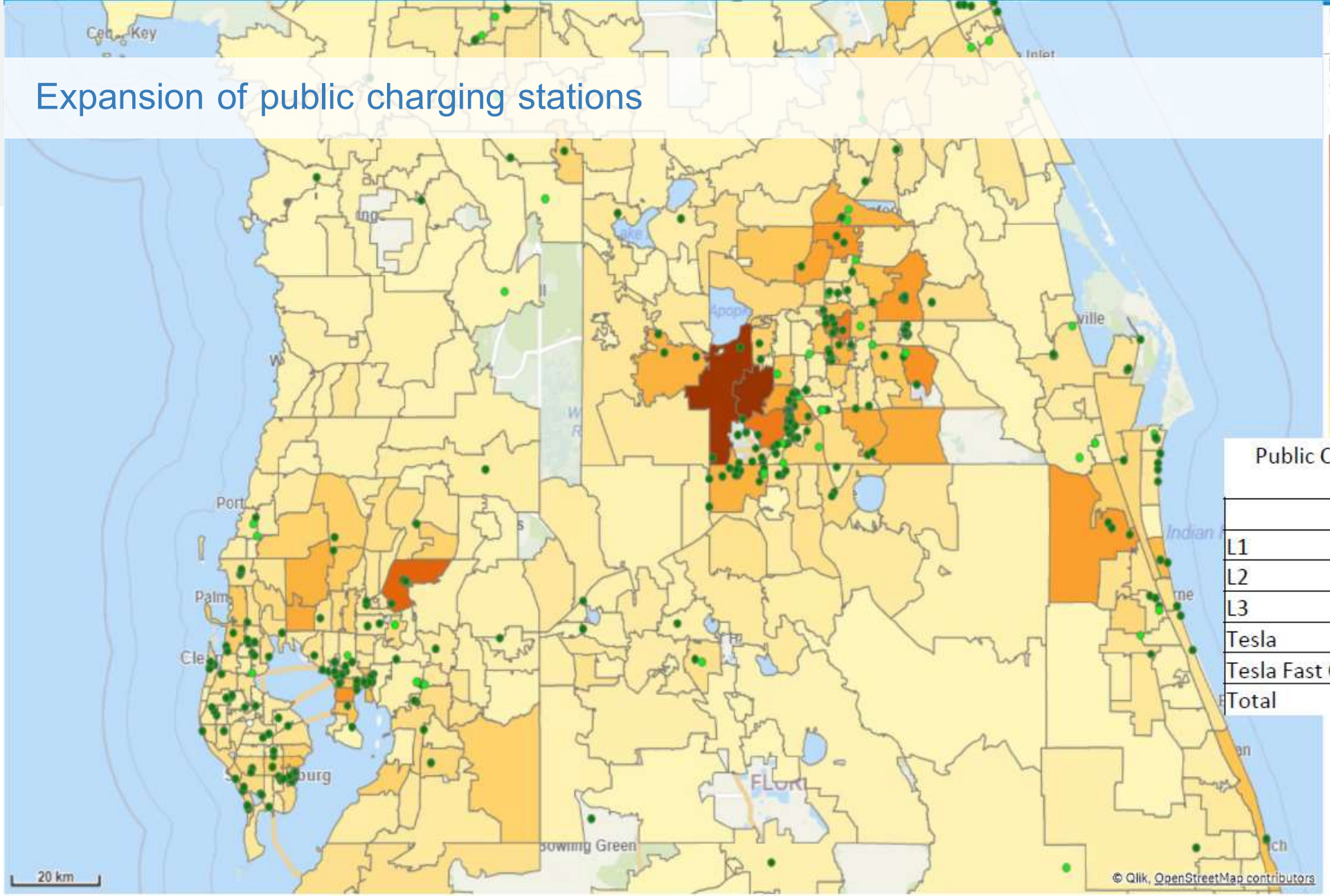
DRIVE electric ORLANDO

RENT A CHEVY VOLT

It Doubles as a VIP Pass

LEARN MORE

Expansion of public charging stations

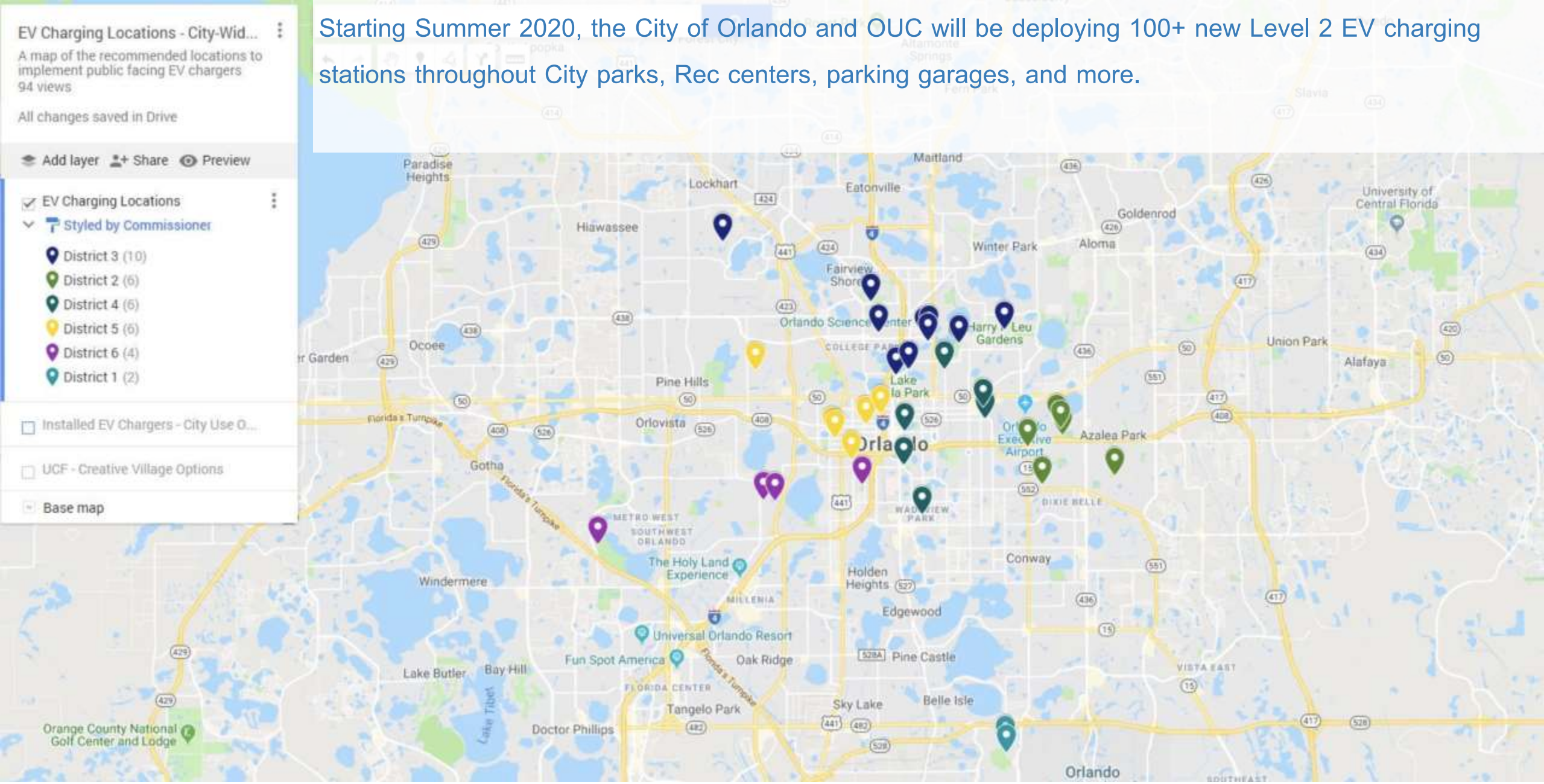


Public Charging Stations in OUC Territory

	Stations	Ports
L1	11	12
L2	109	263
L3	9	18
Tesla	16	37
Tesla Fast Charge	3	28
Total	148	358

** Currently showing a limited data set.*

Starting Summer 2020, the City of Orlando and OUC will be deploying 100+ new Level 2 EV charging stations throughout City parks, Rec centers, parking garages, and more.



OUCharge-It Program

- **Charge-It**
  OUC Owns, Installs & Maintains Stations
  You can obtain electric vehicle charging services from OUC for a fixed monthly fee over a contracted period of time.
  - The fee is based on specific characteristics of your site and the equipment type.

- **Own-It**
  OUC Designs, Procures & Installs Stations
  You pay for the equipment and installation that OUC provides, then you own it immediately.

CHARGING OPTION	POWER REQUIRED	CHARGING TIME*
Level 2	208 or 240-volt	3.5+ hours
Level 3	480-volt	30+ minutes

Recharge Mobility Hubs®

Lymmo Electric Bus Expansion

- **Goal:** 100% of Lymmo BRT powered by zero-emission EV by 2025
- Adding 8 new EV buses in 2020
- 100% Grapefruit, Lime, and partial Orange lines

LYNX®

OUC The Reliable One®

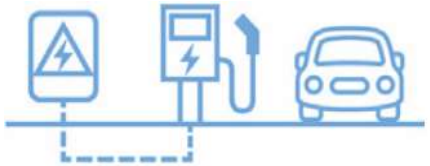
metroplan orlando

EV Readiness policy

- An EV readiness ordinance requires a percentage of parking spaces built to include electrical infrastructure that enables future EV charging.
- There are different “levels” of EV readiness.
- Covered types can include:
  - Commercial, Multi-family, Single-family
  - New construction
  - Significant modifications

EV Capable: Install electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to the future EV parking spot.

EV Ready: Install electrical panel capacity and raceway with conduit to terminate in a junction box or 240-volt charging outlet (typical clothing dryer outlet).



EVSE Installed: Install a minimum number of Level 2 EV charging stations.

Graphics: Sacramento, CA. Definitions: SWEEP.

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