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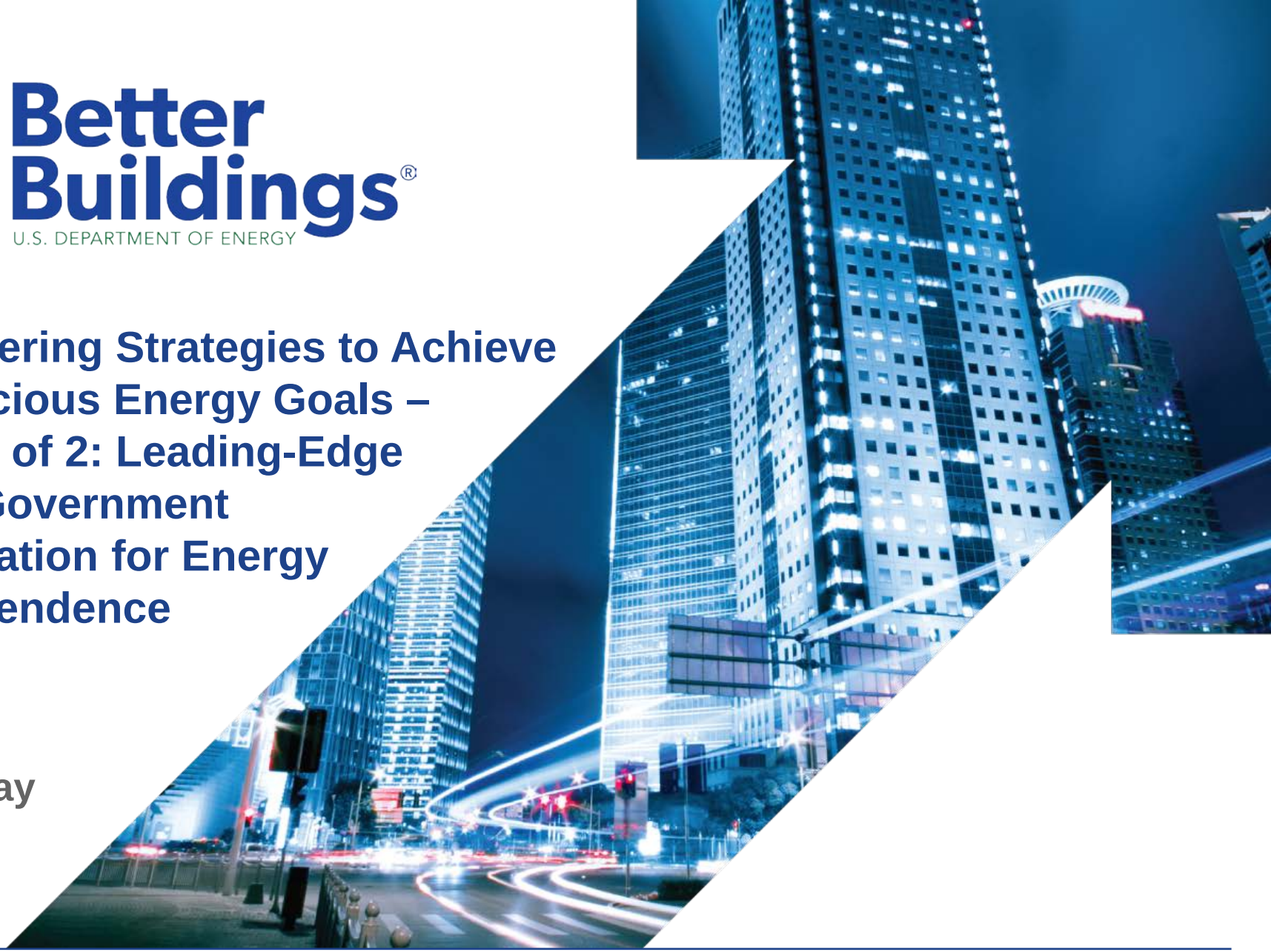

Pioneering Strategies to Achieve Audacious Energy Goals – Part 1 of 2: Leading-Edge City Government Innovation for Energy Independence

Tuesday

2pm

U.S. DEPARTMENT OF ENERGY

Panelists

- David Nemtzow, Director, Buildings Technology Office, DOE
- Johanna Partin, Director, Carbon Neutral Cities Alliance
- Jessie Denver, Energy Program Manager, San Francisco, CA
- Molly Simpson, Housing Affordability and Green Building Program Analyst, District of Columbia
- Jenna Tatum, Senior Policy Advisor, New York, NY

David Nemtzow

Director, Buildings Technology Office
U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

Johanna Partin

Director, Carbon Neutral Cities Alliance

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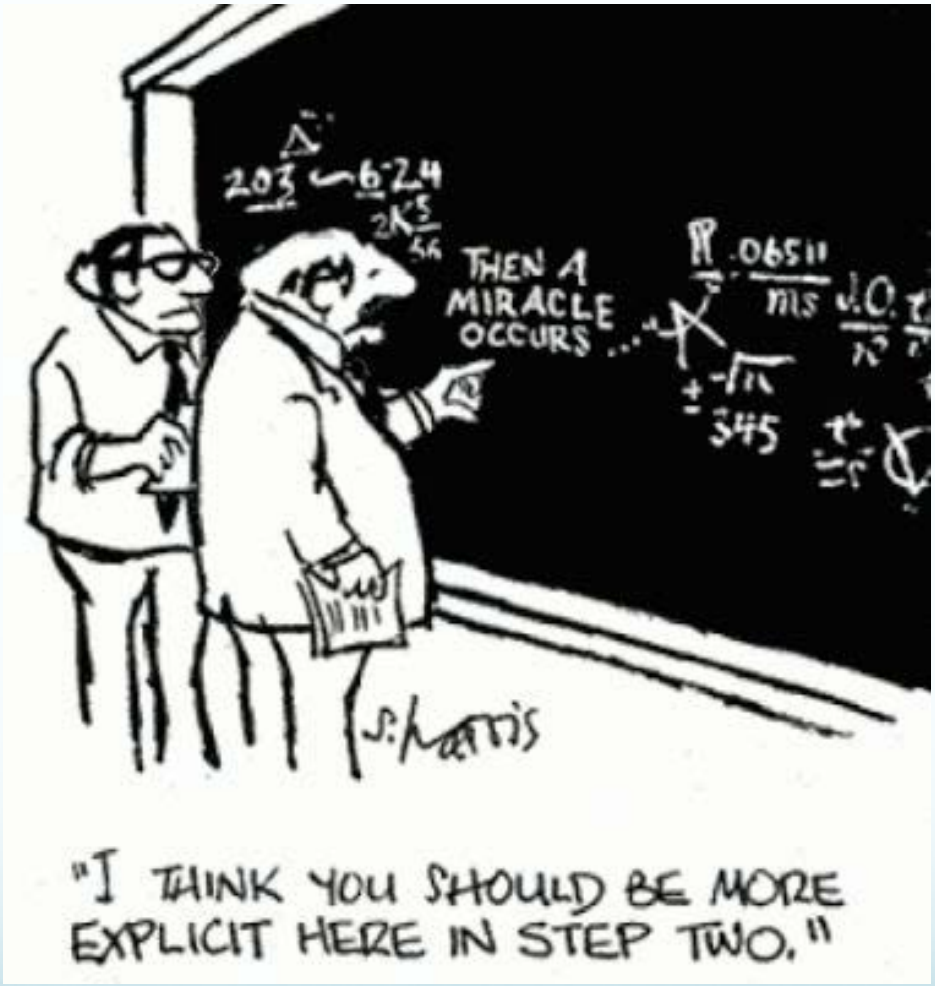
How are Cities Going to Get to Carbon Neutral?



Johanna Partin, Director
Carbon Neutral Cities Alliance

CNCA

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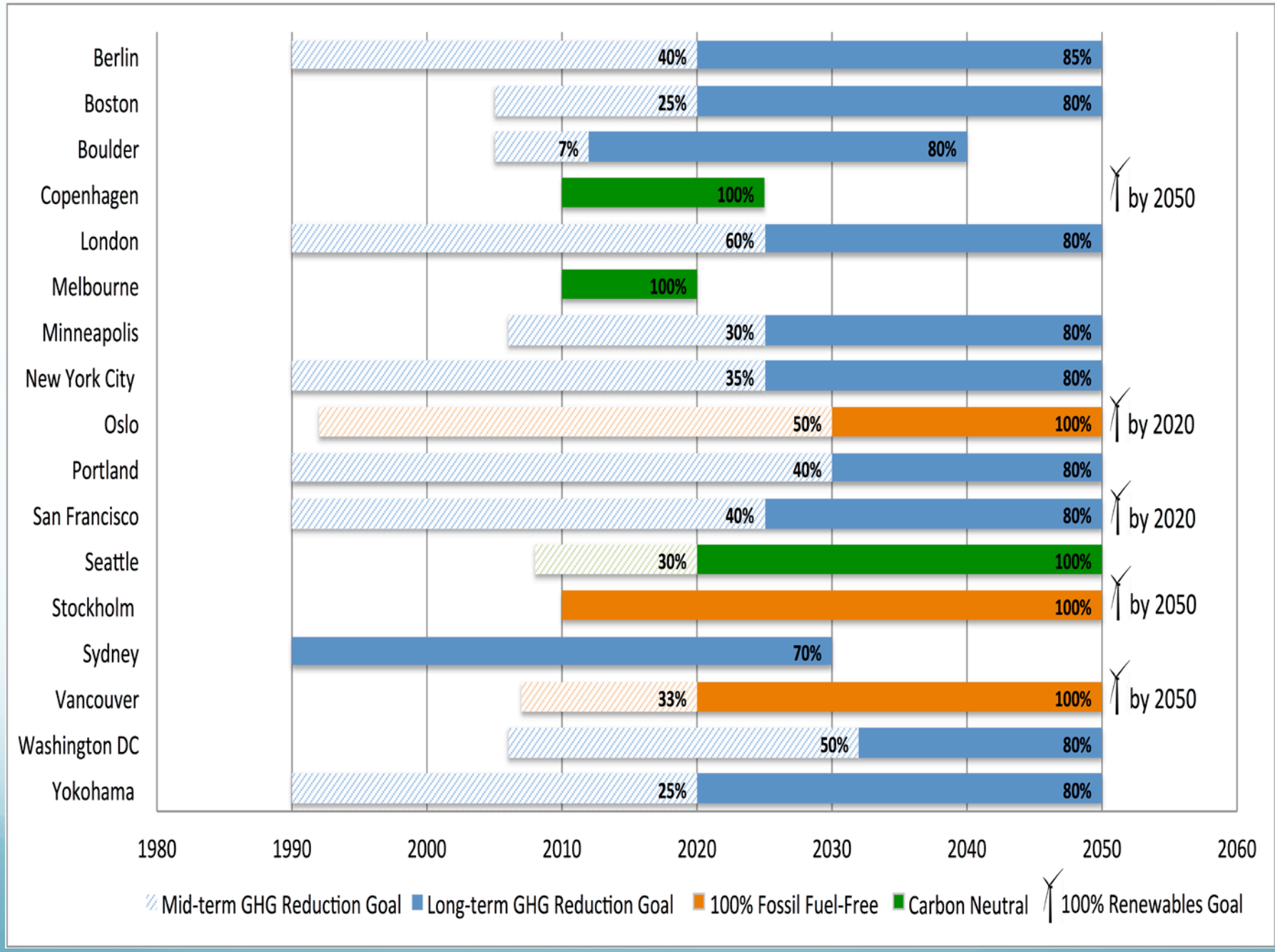
CARBON NEUTRAL CITIES ALLIANCE


Berlin
Boston
Boulder
Copenhagen
London
Melbourne
Minneapolis
New York City
Oslo
Portland
San Francisco
Seattle
Stockholm
Sydney
Vancouver
Washington DC
Yokohama
40%
85%
25%
80%
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25%
80%
by 2050
by 2020
by 2020
by 2050
by 2050
1980
1990
2000
2010
2020
2030
2040
2050
2060
Mid-term GHG Reduction Goal
Long-term GHG Reduction Goal
100% Fossil Fuel-Free
Carbon Neutral
100% Renewables Goal

City	GHGs	Local Economy
Berlin	⇩ 29%	⇧ 19%
Copenhagen	⇩ 31%	⇧ 18%
London	⇩ 11%	⇧ 30%
Minneapolis	⇩ 9%	⇧ 22%
Portland	⇩ 14%	⇧ 20%
San Francisco	⇩ 23%	⇧ 49%
Seattle	⇩ 4%	⇧ 14%
Stockholm	⇩ 9%	⇧ 3%
Sydney	⇩ 12%	⇧ 23%
Vancouver	⇩ 7%	⇧ 30%
Washington DC	⇩ 16%	⇧ 9%

How are Cities Going to Get to Carbon Neutral?

- Have access to or convert to emissions-free sources
  - Electricity: Most often hydro
  - Thermal: Biogas DE (Copenhagen, London); electrification (Oslo, SF exploring)
  - Transportation: Electrification, biogas, hydrogen
- Muni – greater control (but come with their own challenges)
- But most don't have access to either – dependent on decisions by IOUs, suppliers, other levels of government, regulatory agencies they don't control
  - Electricity: Some control
  - Thermal: Less control
  - Transportation: Least control
- Traditionally, these cities could not achieve 100% renewables unless these other entities strive for (or are mandated to achieve) the same goal
- *However, this conventional utility model is starting to change*

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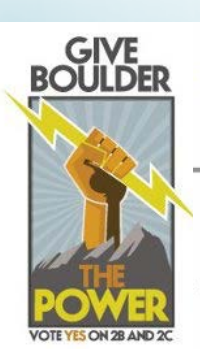
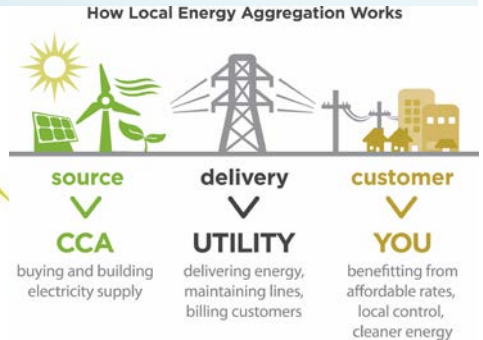
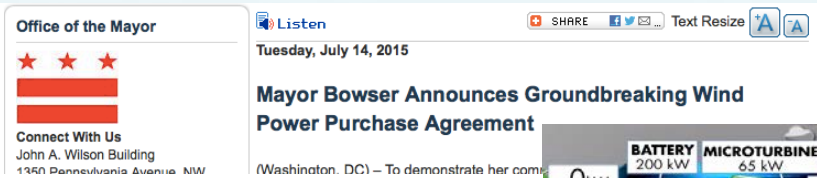
How are Cities Getting to 100% RE?

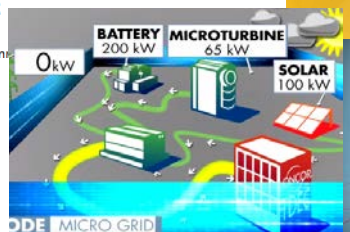
Some cities are starting to drive the redesigning of the conventional energy supply utility model, and creating a new vision for an energy system transformation

- Municipalization (Sacramento, Boulder)
- Community Choice Aggregation (Marin, SF, San Diego, San Jose, Chicago, Cleveland)
  - Allowed in: California, Illinois, Massachusetts, New Jersey, Ohio, New York & Rhode Island
  - States considering: Utah, Delaware & Minnesota
- Decentralization via micro-grids, district heating & cooling, tri-generation (Sydney, Copenhagen, Boston, Yokohama), thermal decarbonization (NYC, Boston, Boulder, WDC, Burlington)
- Maximizing energy efficiency (LA), energiesprong (Netherlands, London, SF, NY), pooled large-scale RE purchases (Washington DC, Melbourne), distributed renewable energy systems





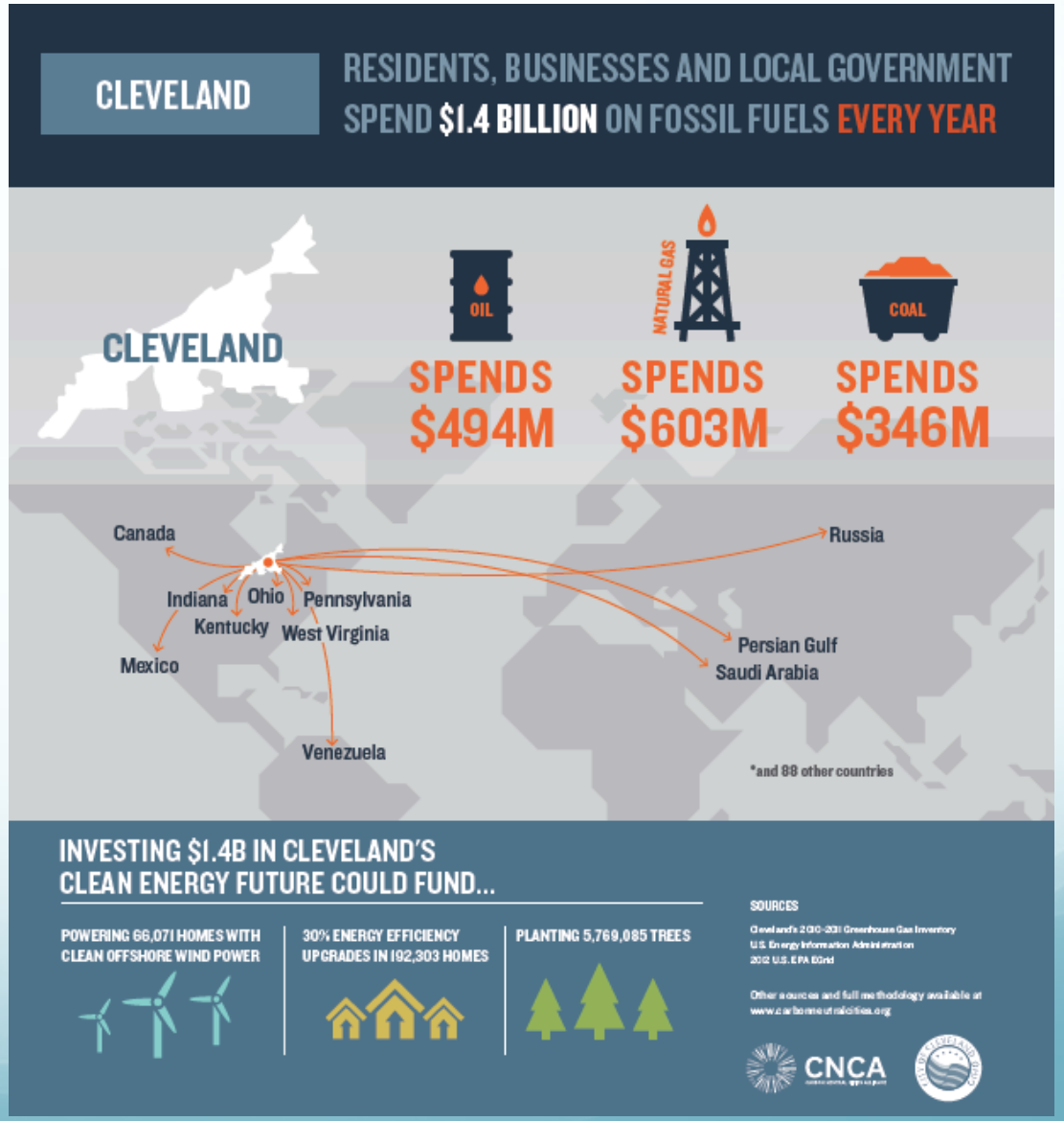




Resources/Tools

Tools/Resources:

- Sierra Club/HereNow "American Views on 100% Clean Energy" national survey findings and messaging tips
- ecoAmerica public opinion research data (~$2500/city)
- CNCA Infographic (communicating/messaging tool) and the 100% Cities strategies being developed to support cities' moves toward just transition to 100% renewables (~$500/city)
- 100% Cities Initiative
- Cities ZNE initiative
- Comms orgs: Climate Nexus, Resource Media



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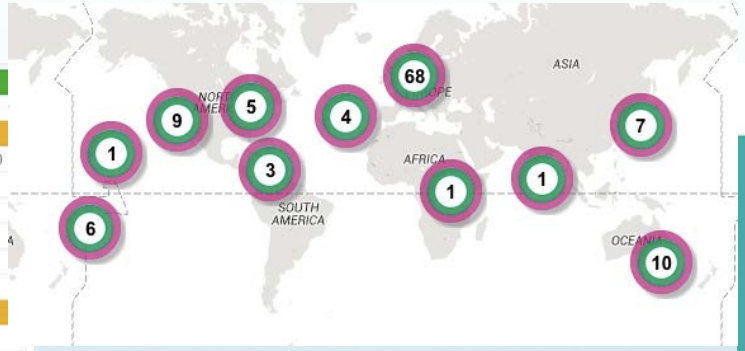
Resources/Tools (cont.)

- USDN & CNCA “Innovation Products”
  - usdn.org
  - carbonneutralcities.org
- CNCA Deep Carbon Reduction Planning Framework & “80x50” Plan outline
- http://track0.org/cities-regions/
- http://www.go100re.net/map/
- RE 100

#	City/Region	Country	Long-term Goal	Renewables Target
1	Aarhus	Denmark	CO2 neutral by 2030	
2	Adelaide	Australia	100% GHG reduction by 2050	
3	Alzey-Land Region	Germany		100% Renewable Energy (already achieved)
4	Amuwo-Odofin	Nigeria		60% Renewable Energy by 2014
5	Ann Arbor	US	90% GHG reduction by 2050	
6	Antioch	US	80% GHG reduction by 2050	
7	Antwerp	Belgium	100% GHG reduction by 2050	
8	Aomori	Japan	80% GHG reduction by 2050	
9	Arendal Municipality	Norway	90% GHG reduction by 2017	
10	Asheville	US	80% CO2 reduction by 2030	
11	Aspen	US	80% GHG reduction by 2050	100% renewable energy by 2015
12	Atlanta	US	80% GHG reduction by 2040	
13	Auckland	New Zealand	50% GHG reduction by 2050	
14	Austin	US	Net zero GHG emissions by 2050	
15	Australian Capital Territory	Australia	100% GHG reduction by 2060	100% renewable energy by 2025
16	Bacalar	Mexico	40% CO2e reduction by 2030	
17	Baden-Württemberg	Germany	90% GHG reduction by 2050	
18	Bamberg	Germany		100% Renewable Energy by 2035
19	Bandung	Indonesia	30% CO2e reduction by 2030	



RE 100

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CARBON NEUTRAL CITIES ALLIANCE

Framework for Long-Term Deep Carbon Reduction Planning

Developed for the Carbon Neutral Cities Alliance by the Innovation Network for Communities

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Director

Carbon Neutral Cities Alliance

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Energy Program Manager
San Francisco, CA

U.S. DEPARTMENT OF ENERGY

SF Environment

Our home. Our city. Our planet.

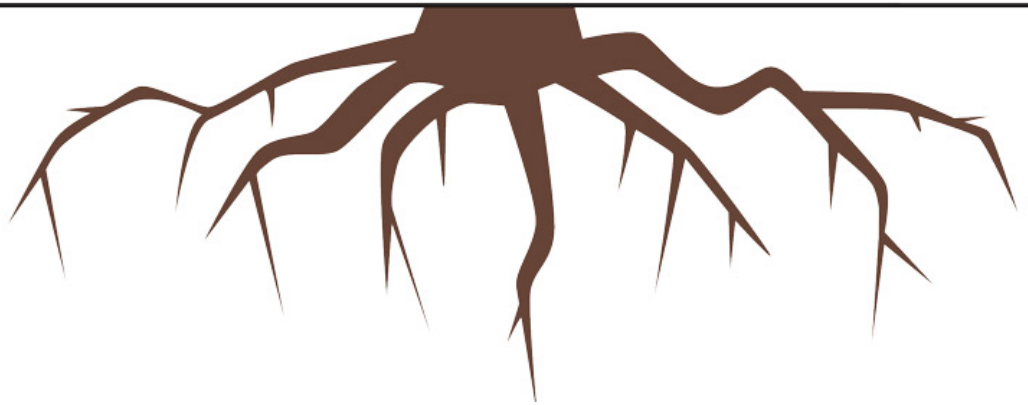
A Department of the City and County of San Francisco

Getting to 80x50 in San Francisco

Communicating Climate Change

SAN FRANCISCO CLIMATE ACTION

0 50 100



Inside the Bubble

Trends: 1990 to 2015

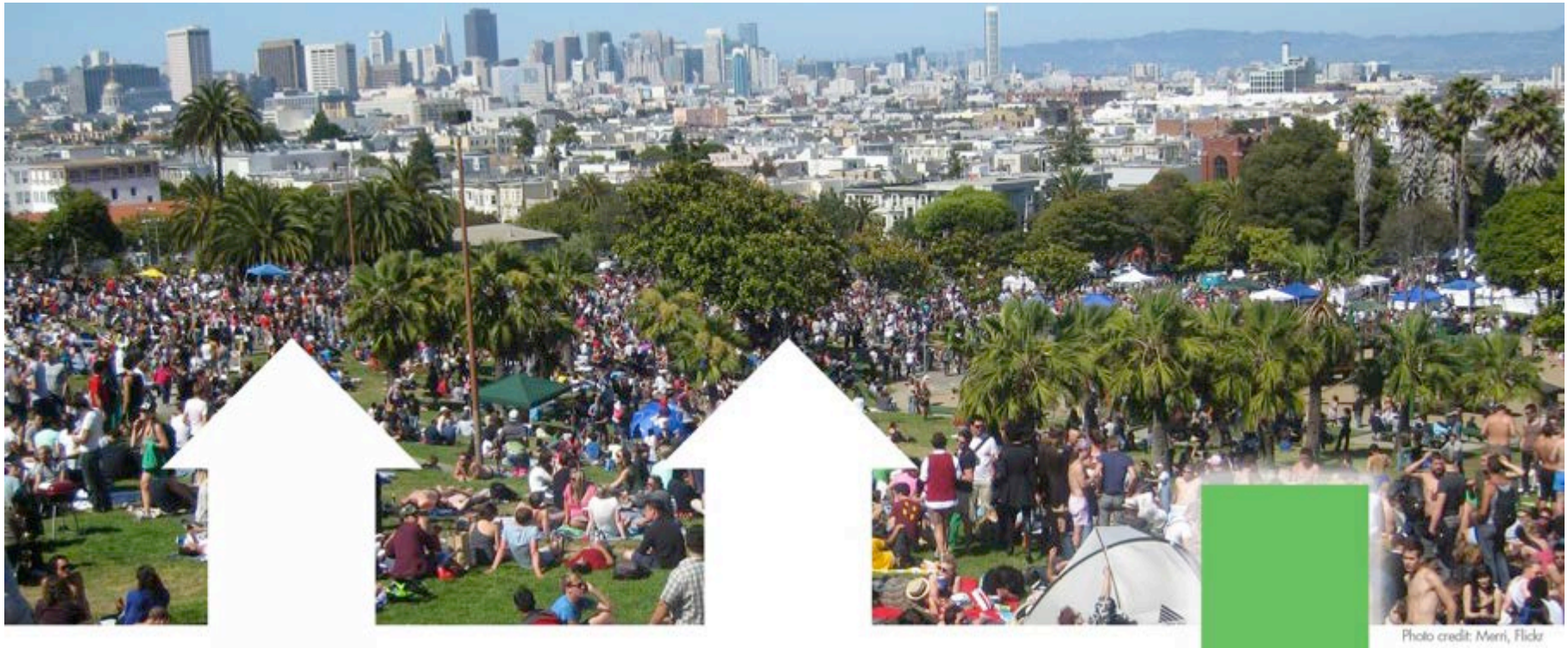


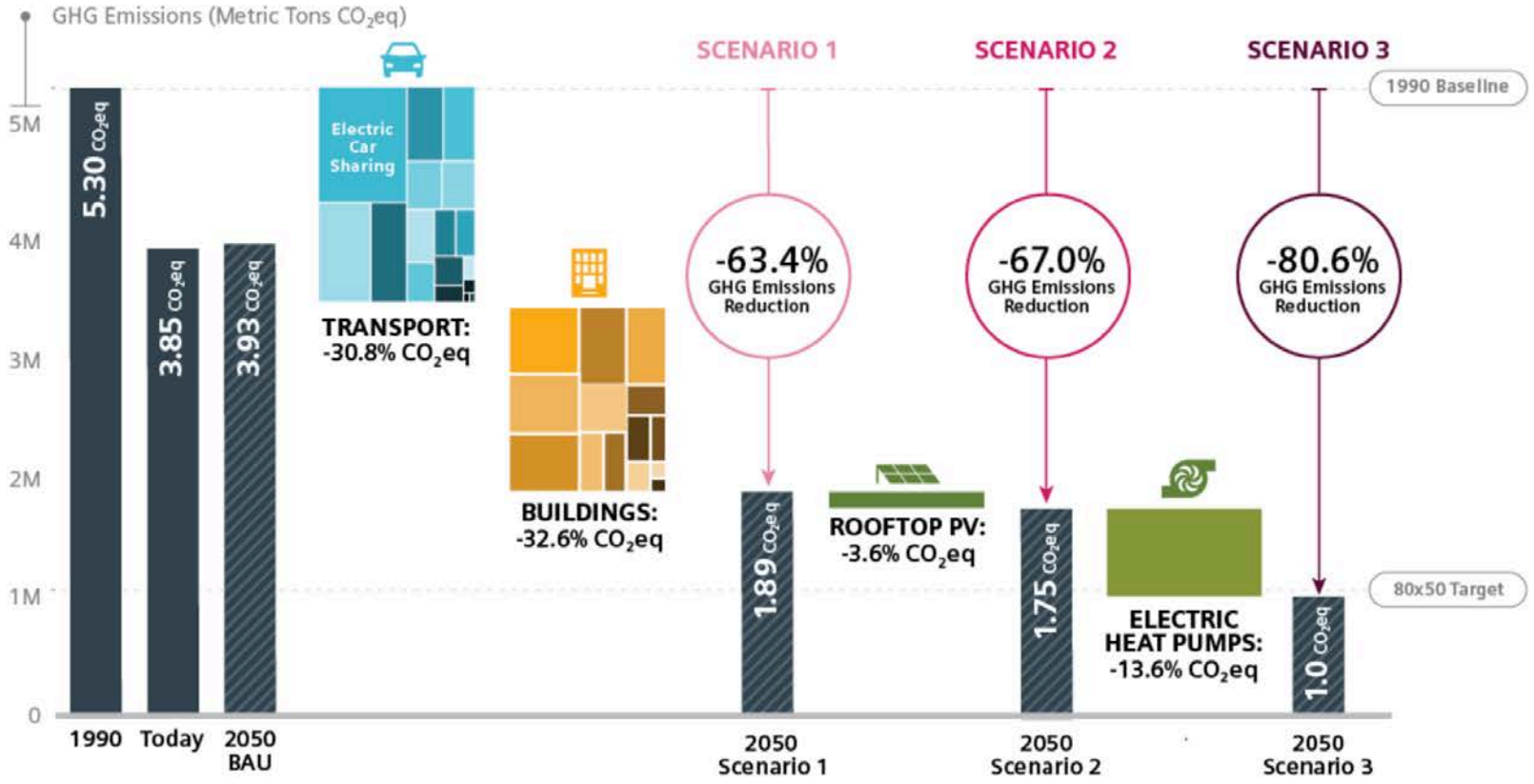
Photo credit: Merri, Flickr

19.5%
Population

78%
GDP

28%
GHG Emissions

80 x 50 is Viable



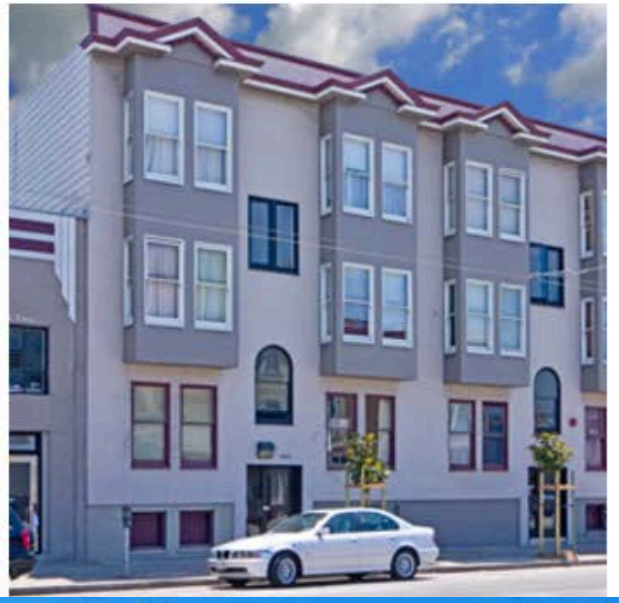
Siemens, Reaching 80x50: Technology Pathways to a Sustainable Future in San Francisco – sfenvironment.org/climate_reports

EE: One size doesn't fit all

Deliverable 1: Supply-side convening

Deliverable 2: Demand-side convening

Deliverable 3: Housing stock analysis



Deliverable 4: Go-to-market strategy

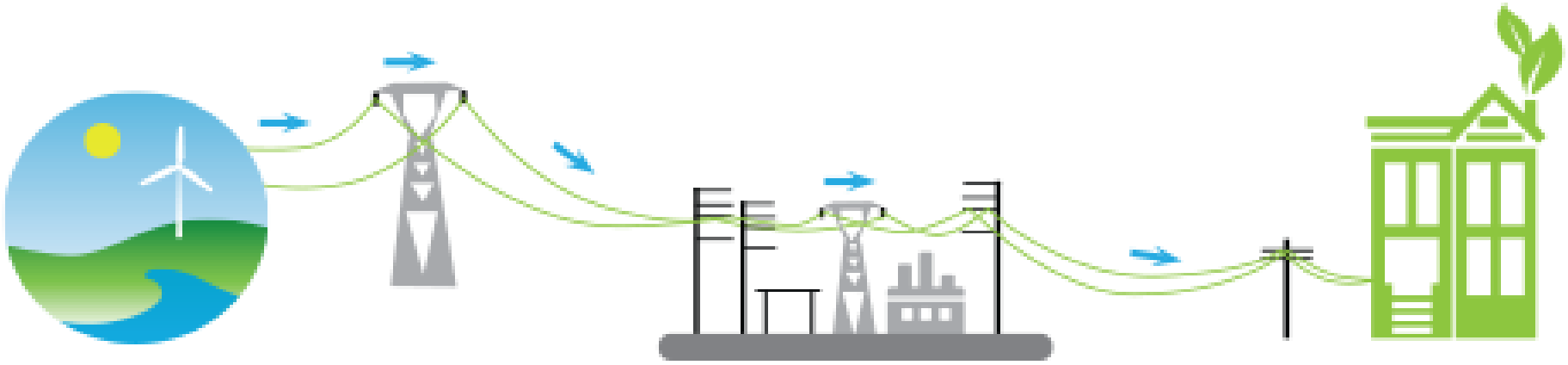
Decarbonization of Electricity Supply

Decarbonization of Electricity Supply

CleanPowerSF

COMMUNITY CHOICE AGGREGATION:

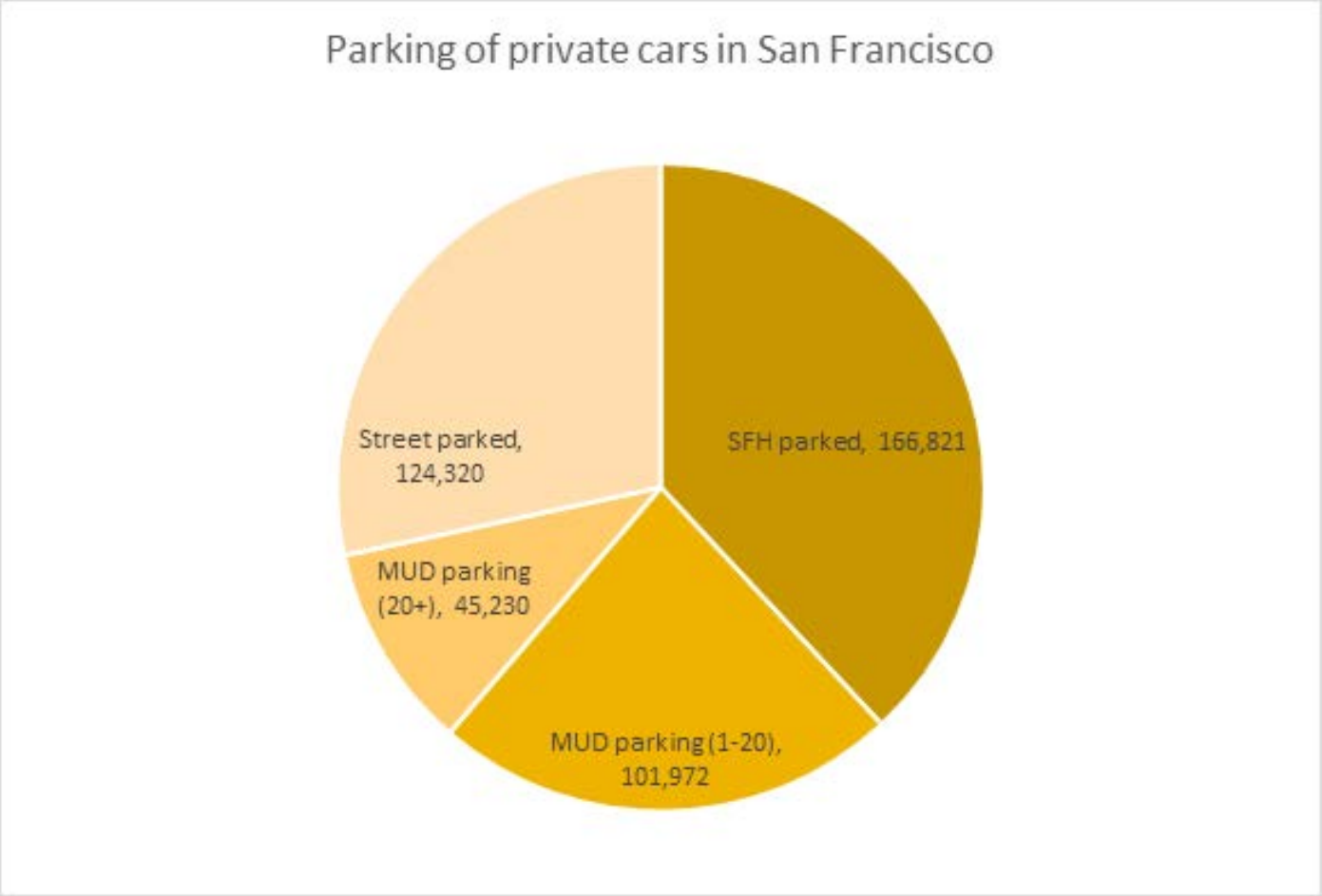
100% Renewable Energy Option



Zero Emission Vehicles

Source: PG&E

Current Vehicle Ecosystem in SF



EV Readiness Ordinance

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Molly Simpson

Housing Affordability and Green Building
Program Analyst
District of Columbia

U.S. DEPARTMENT OF ENERGY

PIONEERING STRATEGIES TO ACHIEVE AUDACIOUS ENERGY GOALS

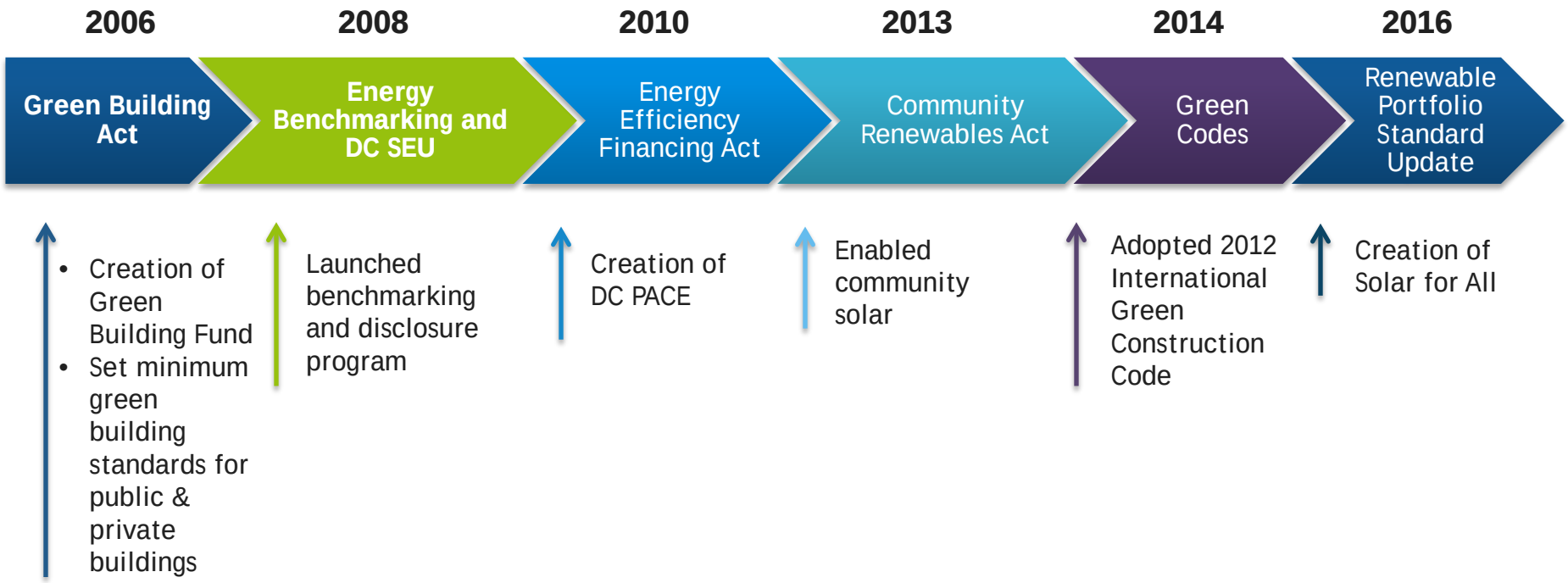
LEADING-EDGE CITY GOVERNMENT INNOVATION FOR ENERGY INDEPENDENCE

2017 BETTER BUILDINGS SUMMIT

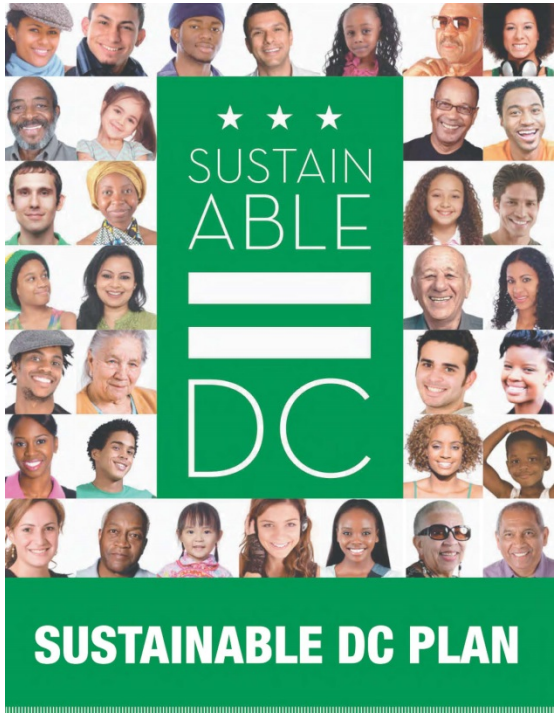
DEPARTMENT OF ENERGY & ENVIRONMENT

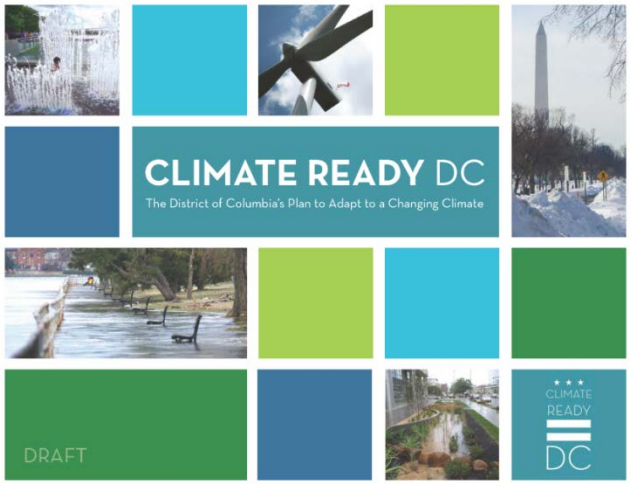
BACKGROUND

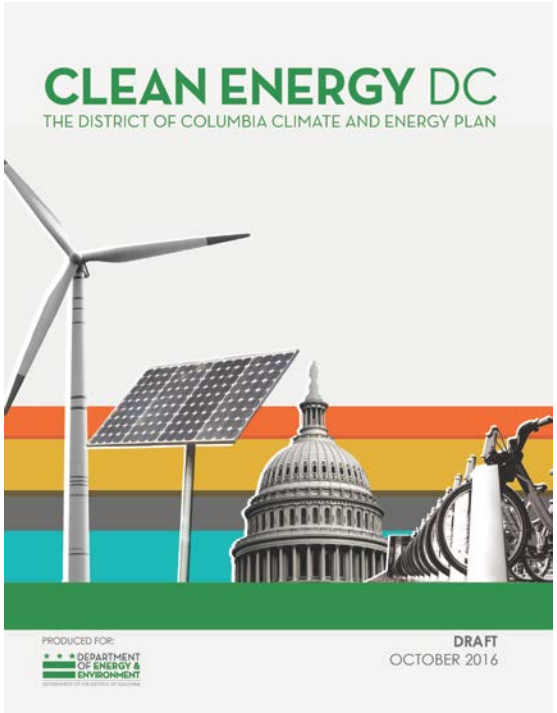
Policy Timeline



SUSTAINABLE DC +



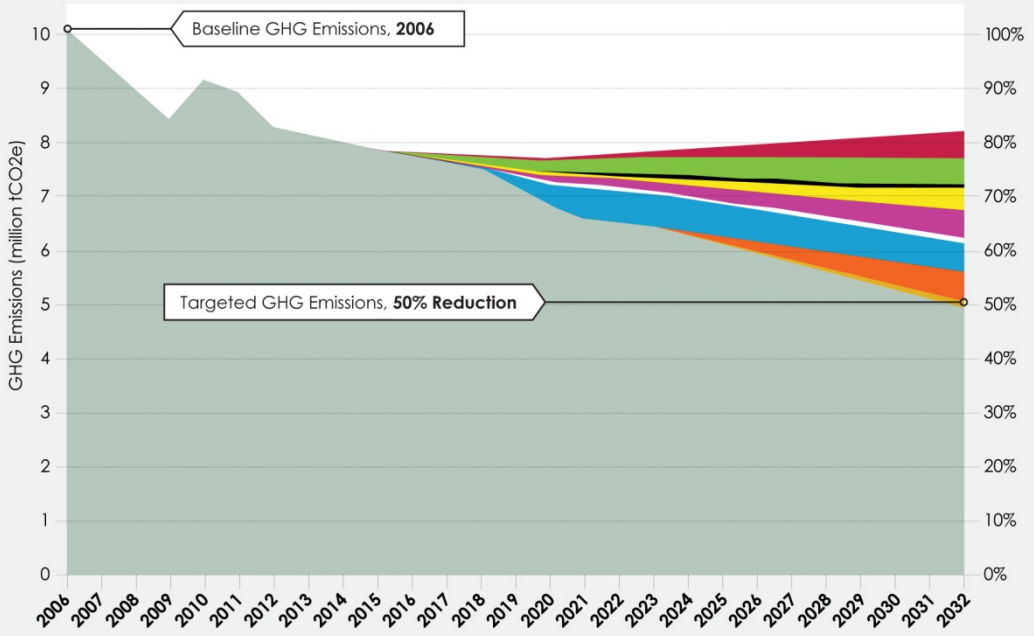




@DOEE_DC

CLEAN ENERGY DC

Figure 6: GHG Reduction Projections by Strategy



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CLEAN ENERGY DC

GHG Reduction Wedge	GHGs Reduced from 2032 BAU (tCO_2e)	Percent GHGs Reduced from Total 2032 BAU
Federal Fuel Efficiency Regulations - Corporate Average Fuel Economy (CAFE) Standard	473,000	5.8%
Walking, Cycling and Public Transit (mode share change)	528,000	6.4%
Electric Vehicle Adoption	34,000	0.4%
Getting to "Net-Zero" in New Construction (New Construction Actions)	430,000	5.2%
Energy Efficiency in Existing Buildings (Existing Buildings Actions)	544,000	6.6%
Neighborhood-Scale Energy Systems	44,000	0.5%
Prioritizing low carbon energy in electrical Standard Offer Service (Power Purchase Agreements for Standard Offer Service)	543,000	6.6%
Mandating electricity suppliers to Procure Renewable Energy (Renewable Portfolio Standard)	581,000**	7.1%
Renewable Portfolio Standard's Local Solar Requirement	87,000**	1.2%
Total GHGs Avoided vs. 2032 BAU	3,277,000	39.8%
Total GHGs Reduced vs. 2006 Baseline	5,664,000	51%

EXEMPLARY PROJECTS

DC GREEN BANK

A CLEAN ENERGY FINANCE SOLUTION

PROPOSED

This legislation would make the District of Columbia the first city in the United States to establish a Green Bank.

The DC Green Bank would utilize an initial investment of public funds and significantly leverage private capital to:

- Create jobs and spur economic growth;
- Meet the city's sustainability goals; and
- Position DC as a national leader in meeting the commitments of the Paris Agreement.

@DOEE_DC

DC GREEN BANK

A CLEAN ENERGY FINANCE SOLUTION

PROPOSED

The goal of a Green Bank is to accelerate the deployment of clean energy technology by removing upfront costs, leveraging private investment, and increasing the efficiency of public dollars.

The DC Green Bank would offer flexible funding options that lower the cost of capital for energy efficiency and clean energy projects.

CREDIT ENHANCEMENTS

Provide low interest capital for whole-building retrofits.

LOANS AND INVESTMENTS

Rooftop solar with battery storage to guarantee power for building occupants.

INFRASTRUCTURE

District scale infrastructure such as anaerobic digesters, micro-grid infrastructure, or fuel cells.

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SOLAR FOR ALL

Solar for All is intended to expand solar capacity in the District and to provide the benefits of locally-generated solar energy to small businesses, nonprofits, seniors, and low-income households.

Short-term actions to help achieve Solar for All goals include grants, strategic partnerships, zoning and building code improvements, real estate mapping, public engagement and education, enrollment in community solar projects, and establishment of a District Green Bank.

EQUITY ADVISORY GROUP

The EAG will guide the development of community-driven climate-resilience strategies that combine adaptation with express consideration of equity and social cohesion.

The District will establish an Equity Advisory Group (EAG) of racially representative community residents from the Watts Branch neighborhood to guide planning and implementation of two of the District's priority climate initiatives: the Climate Ready DC adaptation plan and Clean Energy DC mitigation plan.

CONTACT INFO

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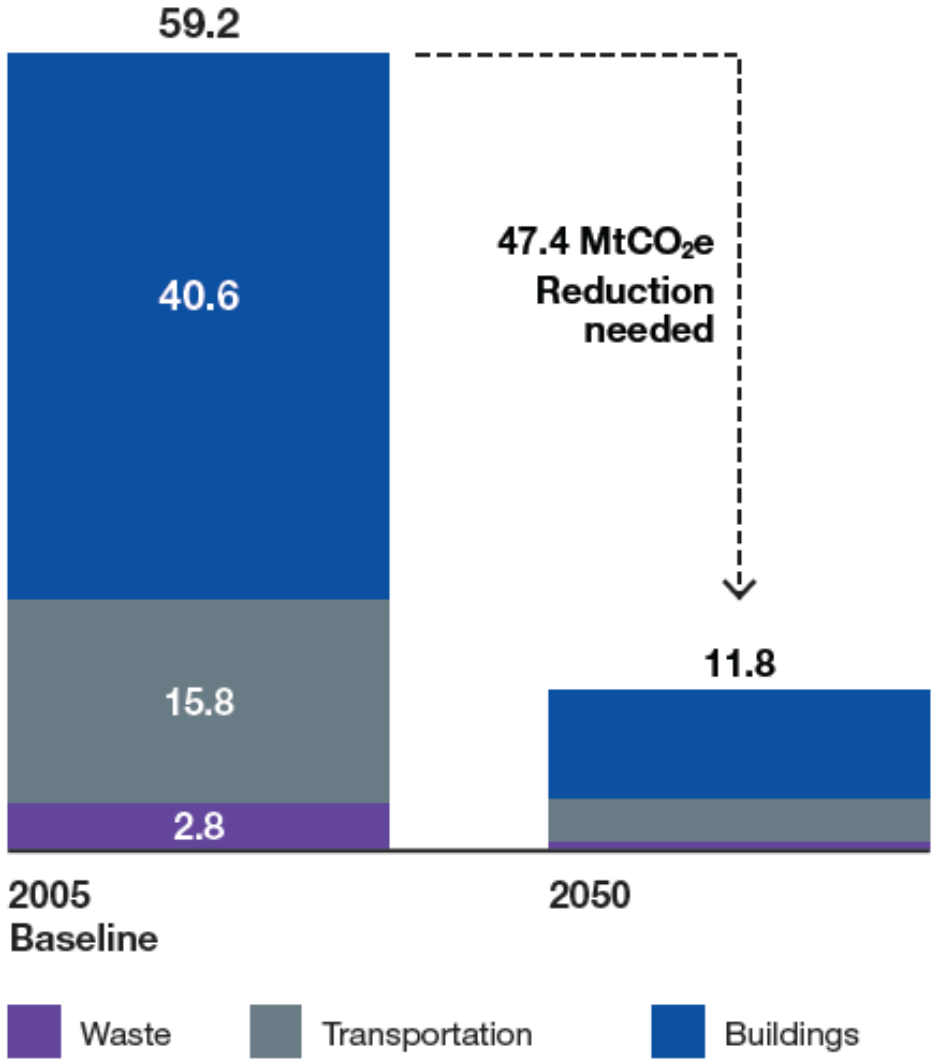
U.S. DEPARTMENT OF ENERGY

One City: Built to Last

Transforming New York City's Buildings for a Low-Carbon Future

The City of New York
Mayor Bill de Blasio

New York City's 80 x 50 Commitment



New York City has committed to reduce greenhouse gas emissions by

80% by 2050

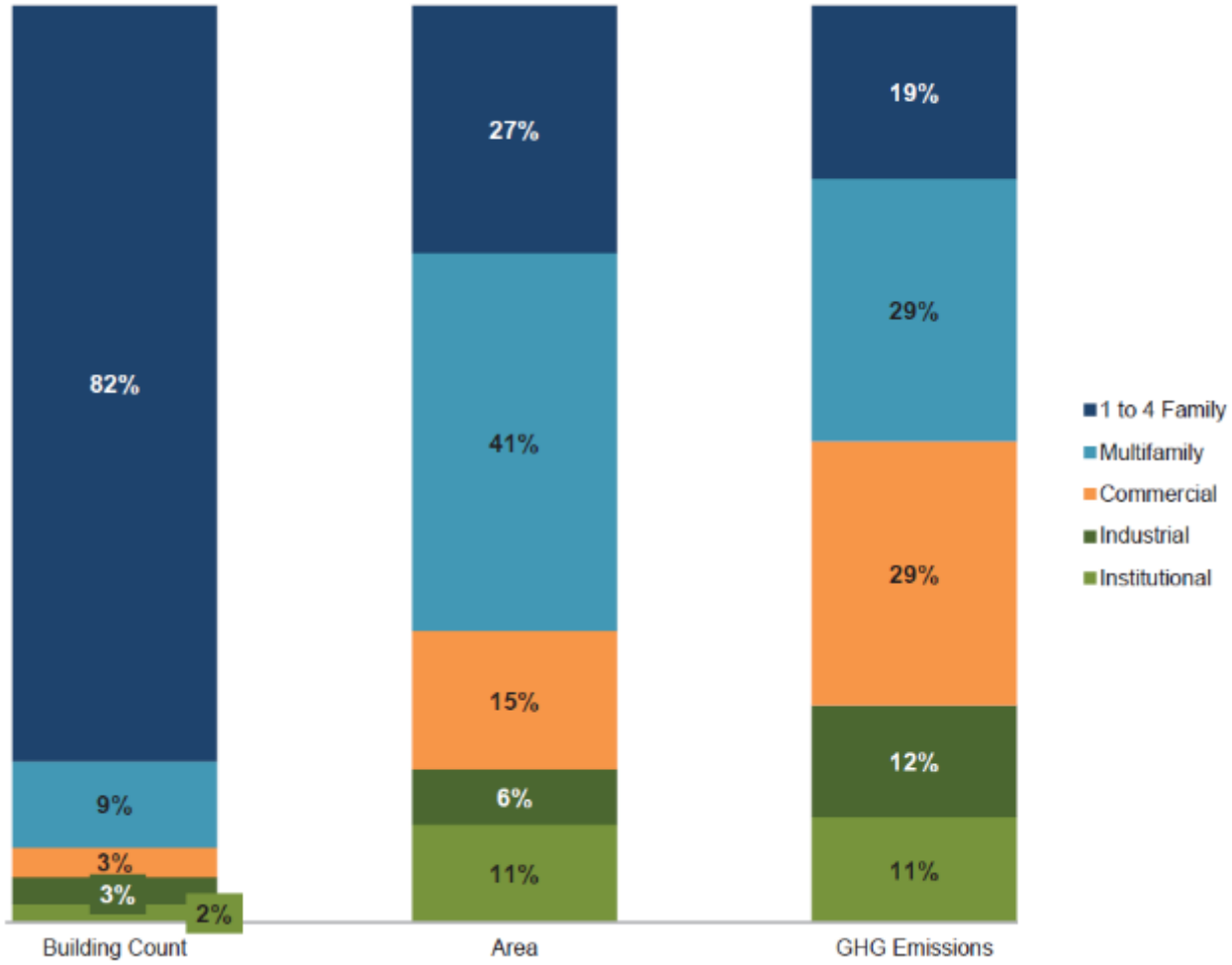
(80 x 50)

NYC Building Characteristics

- **Greatest absolute number of buildings:** 1-4 family homes

- **Greatest share of GHG emissions:** Commercial and multifamily buildings

Building Uses by Building Count, Floor Area, and GHG Emissions

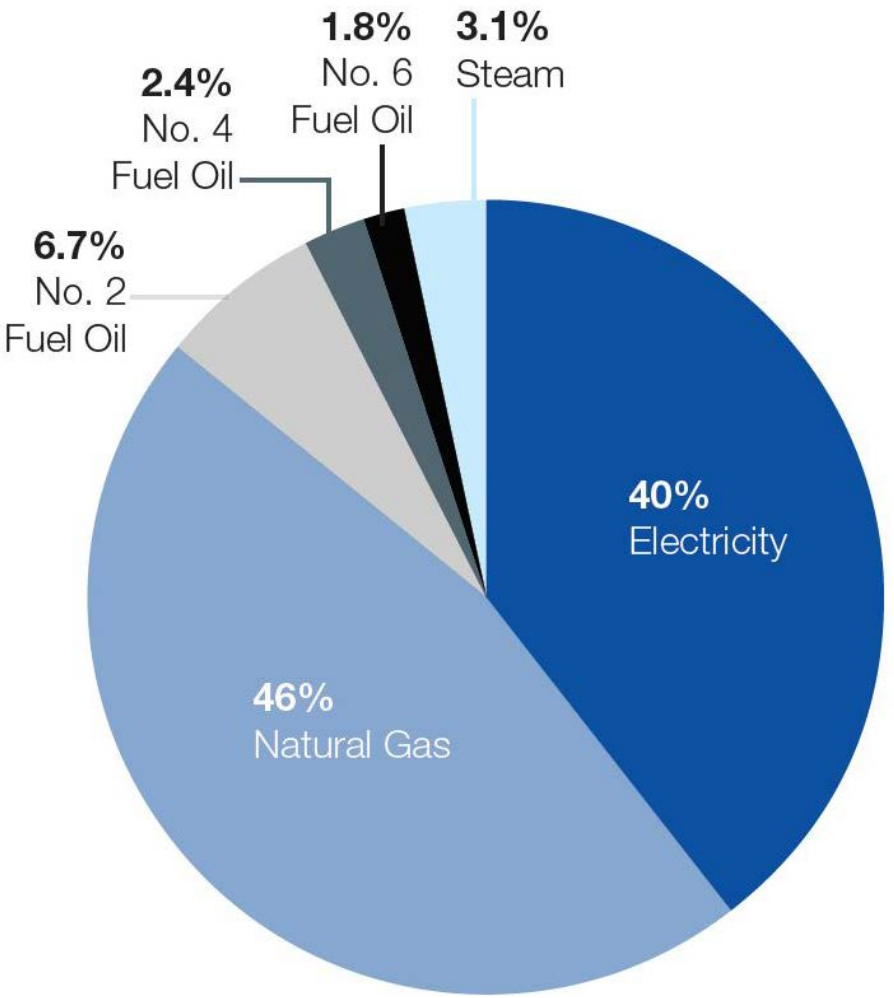


Source: PLUTO and 2015 GHG Inventory

Building Energy Use by Fuel Type

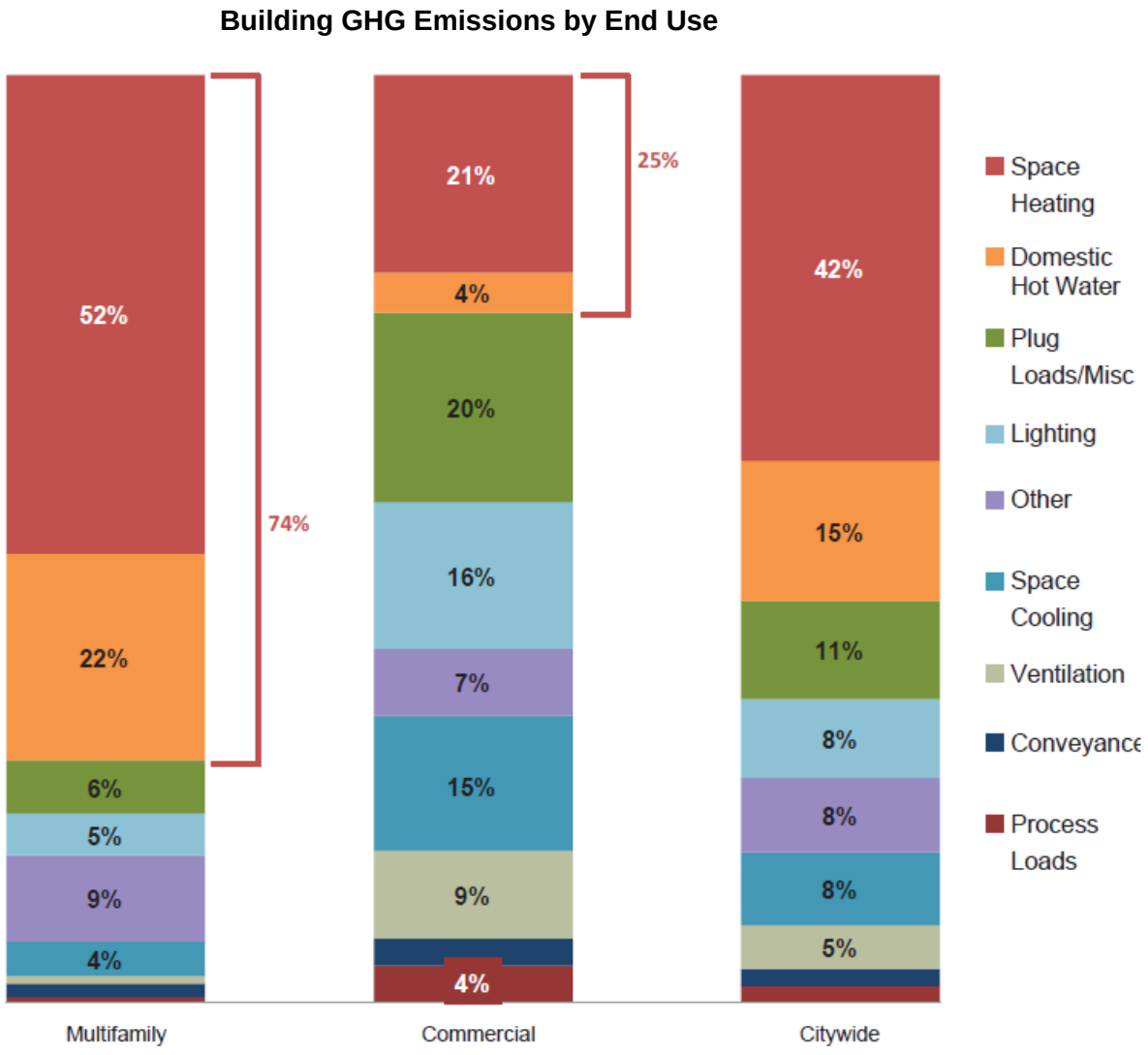
- **Fossil fuels dominate** energy use and GHG emissions from New York City's buildings.

Sources of NYC Building-based Emissions by Fuel Type



Energy End Use in NYC Buildings

- The energy used for **space heating and DHW production** accounts for the majority of building-based GHG emissions.



Source: 2013 and 2014 Local Law 87 Submissions

Deep Energy Retrofit Paths

Models of deep energy retrofit paths show that **40-60 percent energy reductions are possible using existing technologies and strategies.**

Eight Key Building Typologies

Commercial, Pre-war, ≤ 7 Stories

Citywide Building Area: **2.7%** | Citywide Building-based GHG: **5.4%**

Commercial, Pre-war, > 7 Stories

Citywide Building Area: **2.7%** | Citywide Building-based GHG: **5.5%**

Commercial, Post-war, > 7 Stories

Citywide Building Area: **0.7%** | Citywide Building-based GHG: **1.3%**

Commercial, Very Large

Citywide Building Area: **5.9%** | Citywide Building-based GHG: **11.7%**

1-4 Family Home

Citywide Building Area: **25.7%** | Citywide Building-based GHG: **18.9%**

Multifamily, Pre-war, ≤ 7 Stories

Citywide Building Area: **15.8%** | Citywide Building-based GHG: **11.5%**

Multifamily, Post-war, > 7 Stories

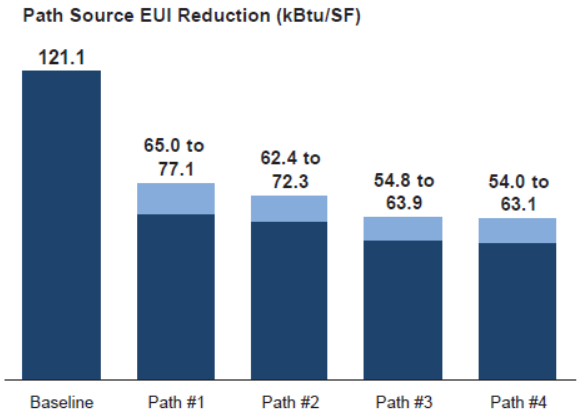
Citywide Building Area: **5.9%** | Citywide Building-based GHG: **4.3%**

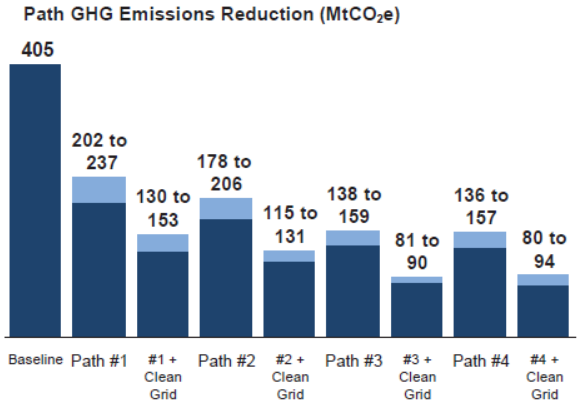
Multifamily, Post-1980, > 7 Stories

Citywide Building Area: **3.3%** | Citywide Building-based GHG: **2.4%**

Sample Deep Retrofit Path Results

Multifamily, Post-War, > Seven Stories

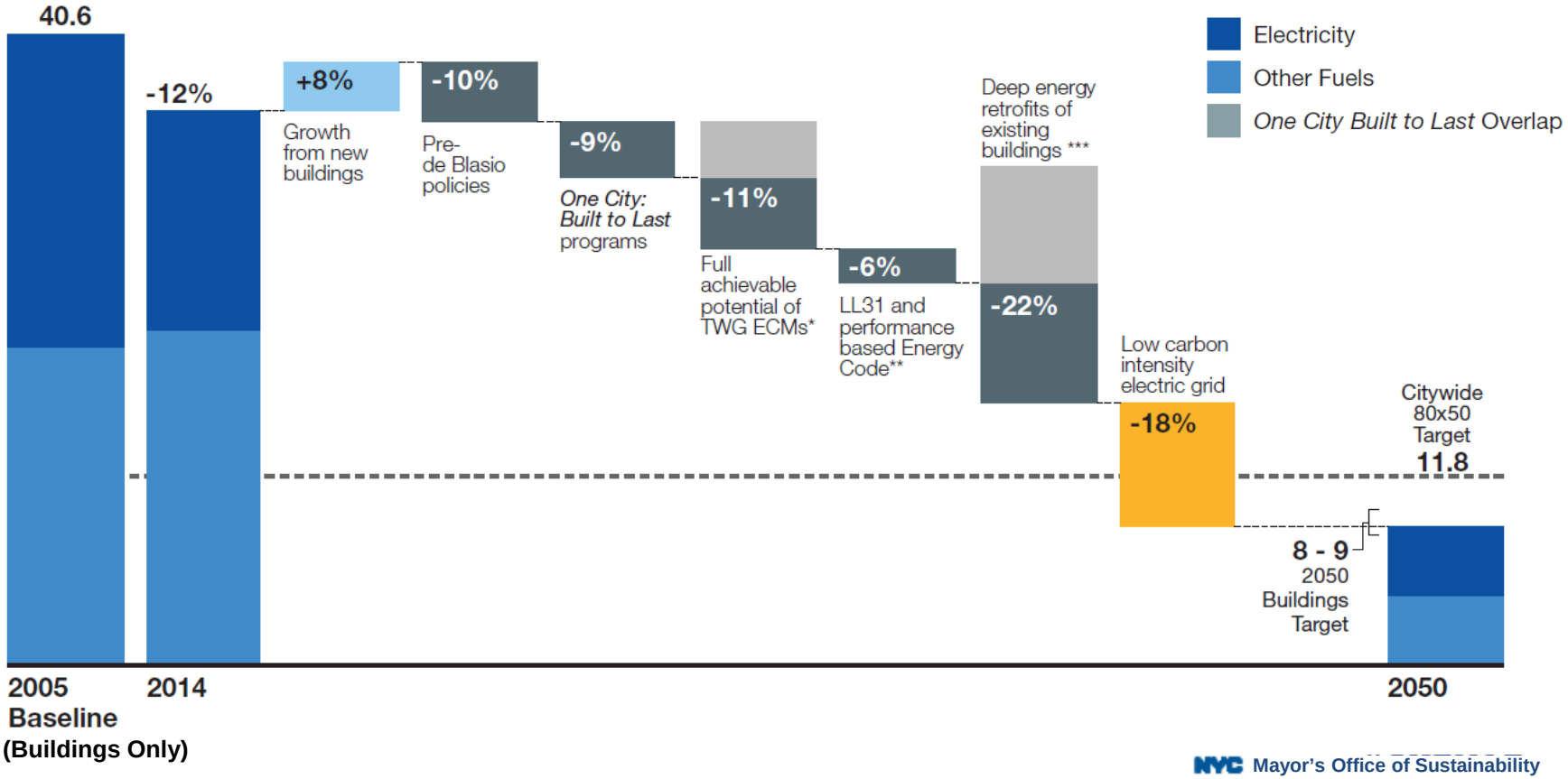




Buildings Pathway to 80 x 50

- NYC must implement **deep energy retrofits in nearly every building** that achieve a 40-60% reduction in energy use
- **50-60% of buildings must also install renewable or high efficiency electric heating systems** and move away from fossil fuel-based heating systems.

A Buildings Pathway to 80 x 50



NYC Retrofit ACCELERATOR

Free, personalized advisory services to streamline the process of making energy efficiency improvements

- Increase demand for efficiency upgrades
- Trusted advisor to buildings
- Unique insights into building needs
- Complement existing market resources

Thermal Decarbonization of 1-4 Family Homes

Step 1: Market Segmentation

Building characteristics can include:

- Year built
- Fuel type
- Last heating system renovation

Market characteristics can include:

- Home ownership
- Income level
- Age demographic

Step 2: Identify Barriers

Barriers could include:

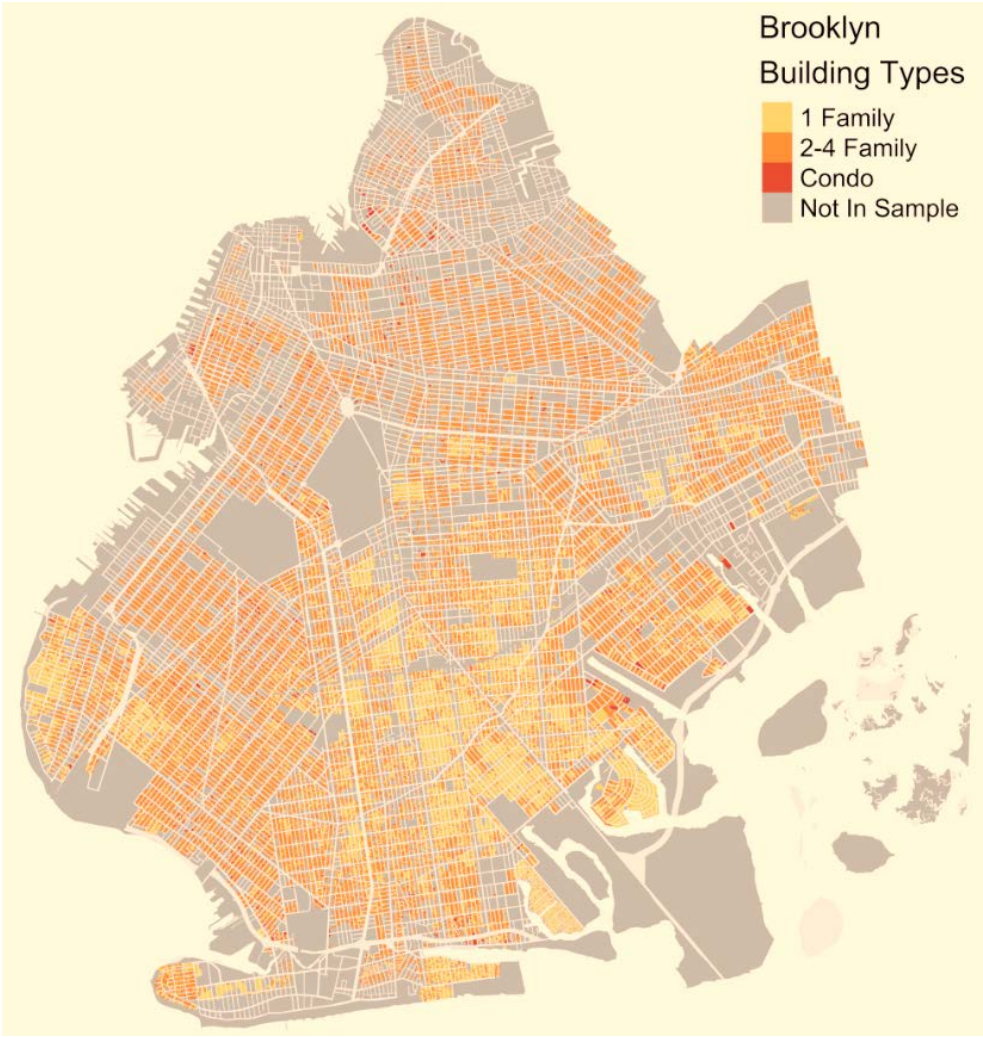
- Lack of qualified contractors
- High cost of installation/no payback
- Lack of customer demand

Step 3: Develop Potential Solutions

Solutions could include:

- Contractor qualification and training
- Financing and incentives
- Outreach and assistance programming
- Public marketing

1-4 Family Homes in Brooklyn



Thank You

Jenna Tatum

NYC Mayor's Office of Sustainability

jtatum@cityhall.nyc.gov

www.nyc.gov/80x50

Thank You

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