DEPARTMENT OF ENERGY & ENVIRONMENT

Opportunities for Energy Sector Disruption in the District of Columbia

Department of Energy and Environment
Government of the District of Columbia

Government-University-Industry
Research Roundtable
National Academy of Sciences
October 21, 2015

QUESTION:

How does a major city retrofit itself to become a more equitable, diverse, world-class hub of commerce and innovation…

while also becoming extremely energy efficient & powering itself with 100% clean energy?




★ ★ ★
SUSTAIN
ABLE
DC





In just one generation—20 years—the District of Columbia will be the healthiest, greenest, and most livable city in the United States.

Sustainable DC 2032 Energy Goals

Goal 1: Improve the efficiency of energy use to reduce overall consumption.

Target: Cut citywide energy use by 50%

Goal 2: Increase the proportion of energy sourced from clean and renewable supplies

Target: Increase the use of renewable energy to make up 50% of the District's energy supply

Goal 3: Modernize energy infrastructure for improved efficiency and reliability

Target: Reduce annual power outages to fewer than 2 events of less than 100 minutes annually

Goal 4: Minimize the generation of greenhouse gas emissions from all sources

Target: Reduce greenhouse gas emissions by 50%

Pathway to True Sustainability

DC's Development Future: Living Communities

"Future-proofing" Buildings

- Carbon
- Stormwater
- Energy

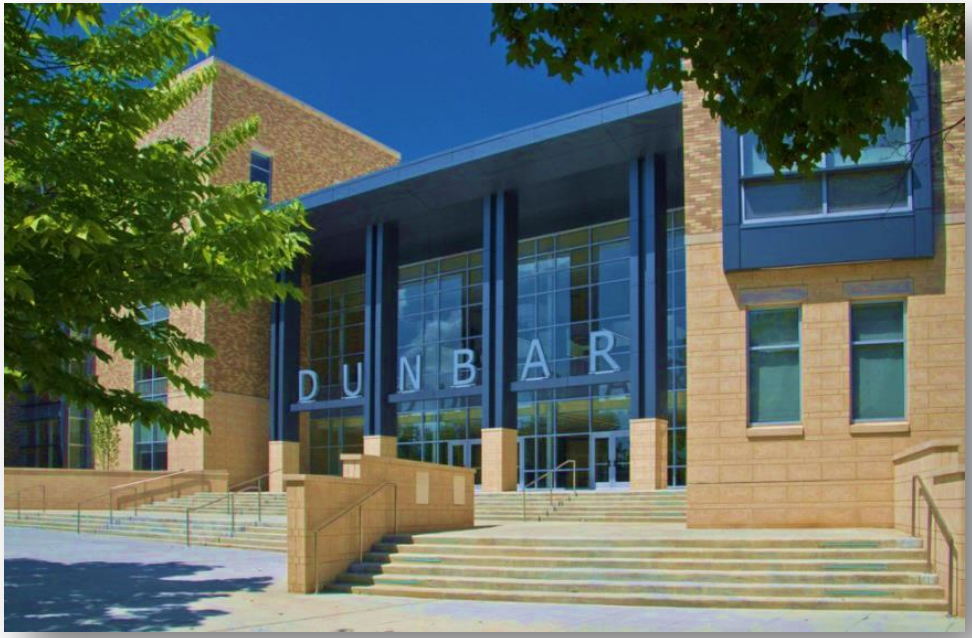
Designing for Resilience

- District Energy/Microgrids
- Onsite Renewables/CHP
- Flood Mitigation
- Living Buildings & Communities

DC's Existing Green Policies

Green Building & Energy

- ✓ Green Building Act (2006)
- ✓ Energy Benchmarking (2008)
- ✓ Energy Efficiency Financing Act (2010)
- ✓ Distributed Generation Amendment Act (2011)
- ✓ Community Renewables Act (2013)
- ✓ Green Construction Codes (2014)



Green Infrastructure

- ✓ Stormwater Regulations (2013)
- ✓ Green Area Ratio (2013)

PLANNING: INCORPORATING DISRUPTIVE TECHNOLOGIES INTO THE BUILT ENVIRONMENT

- Living Building Challenge
- Renewable Energy Policy Drivers
- Onsite Solar
- Data and Mapping
- Solar + Storage + Green Roofs
- Microgrids/Grid 2.0

DEPARTMENT OF ENERGY & ENVIRONMENT

DC SUSTAINABLE ENERGY UTILITY

DCWATER.COM

DEPARTMENT OF CONSUMER & REGULATORY AFFAIRS

DGS THE DEPARTMENT OF GENERAL SERVICES

DISTRICT OF COLUMBIA HOUSING AUTHORITY
Commitment to Excellence

THE METAPHOR OF THE FLOWER

ROOTED IN PLACE AND YET:

Harvests all energy + water

Is adapted to climate and site

Operates pollution free

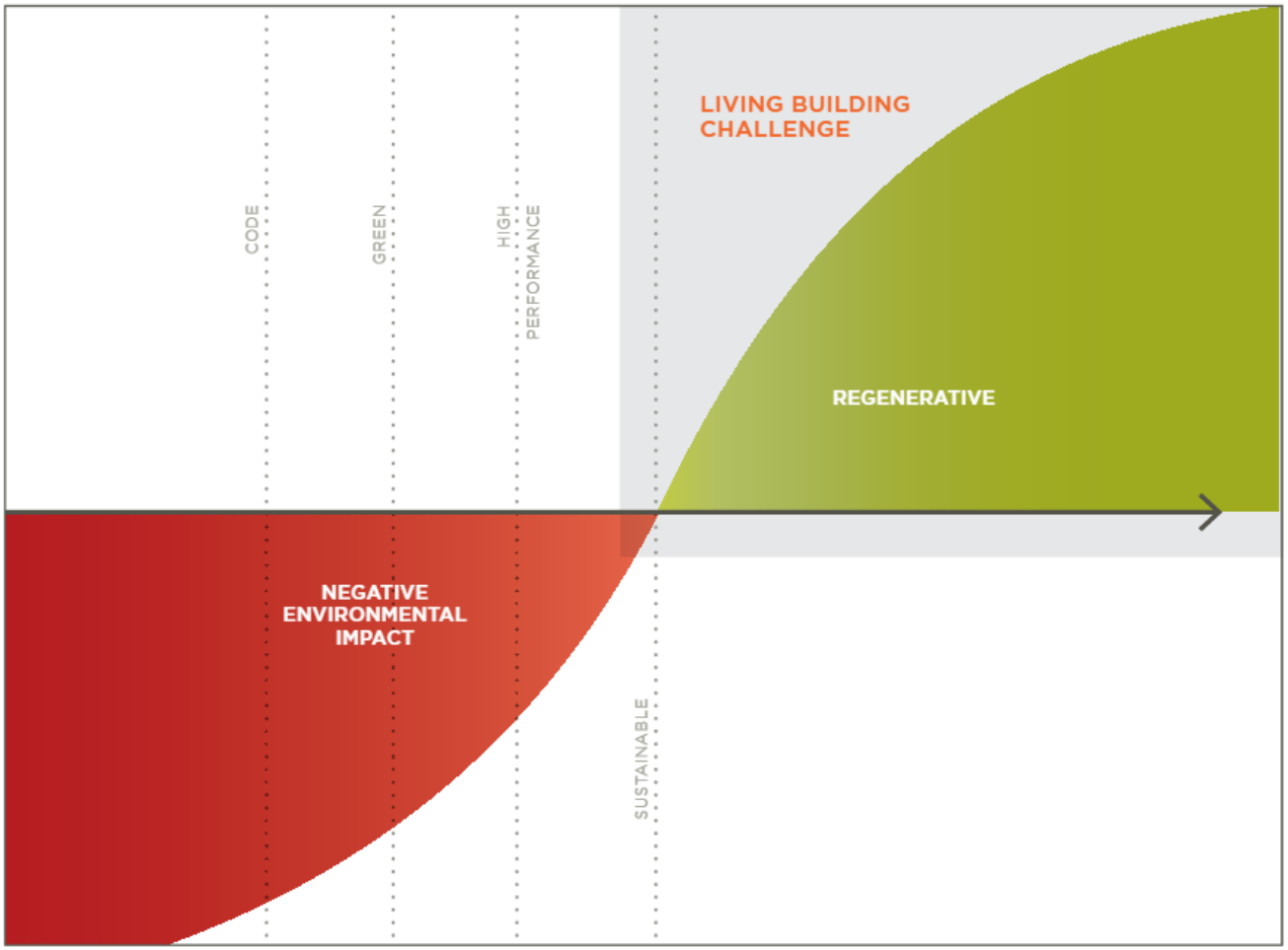
Is comprised of integrated systems

Is beautiful

LIVING BUILDING CHALLENGE™

Living Building Challenge

THE LIVING BUILDING CHALLENGE IS A PHILOSOPHY, CERTIFICATION AND ADVOCACY TOOL FOR PROJECTS TO MOVE BEYOND MERELY BEING LESS BAD AND TO BECOME TRULY REGENERATIVE.



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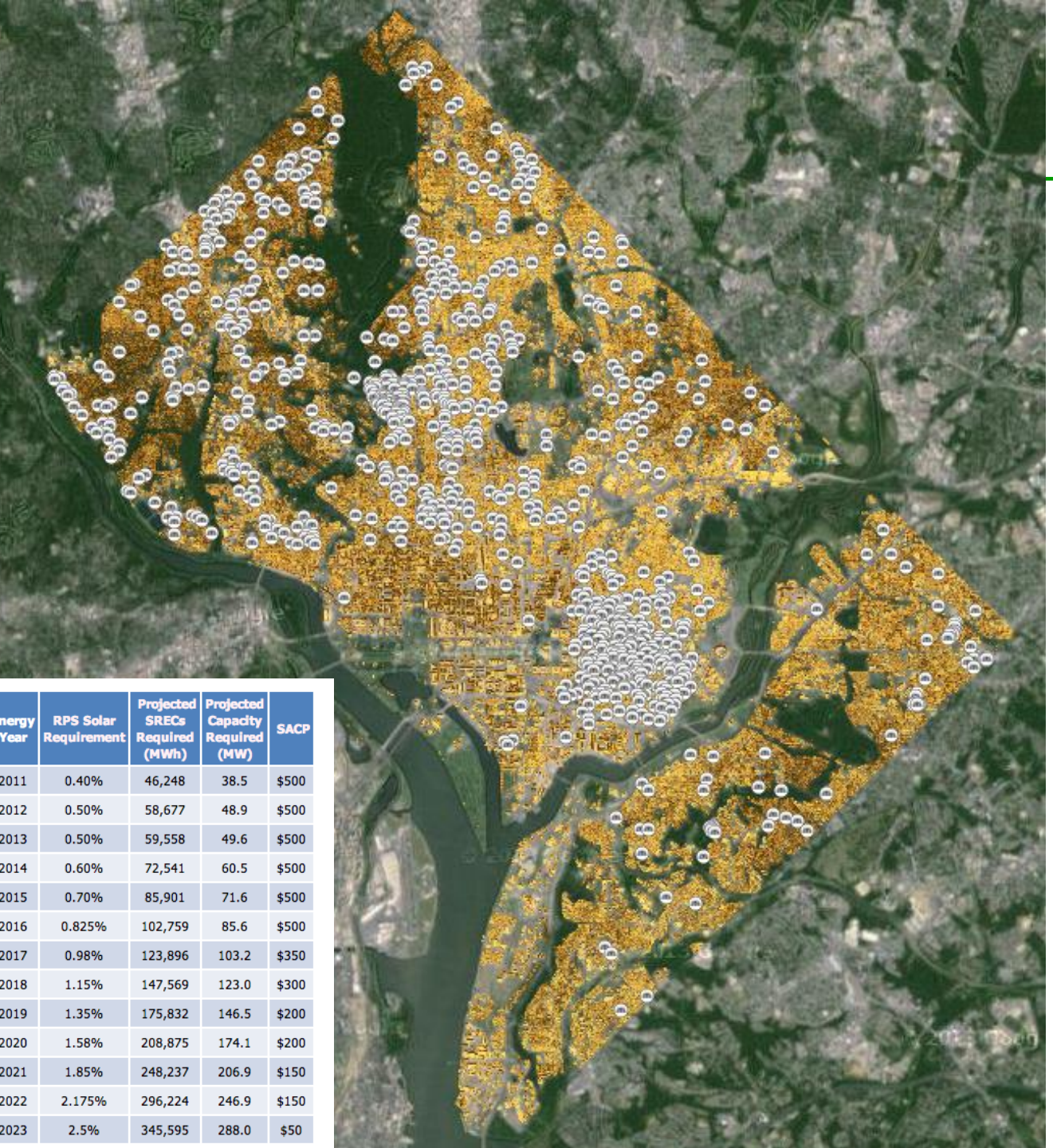
Primary Clean Energy Policy Drivers

- **Renewable Portfolio Standard (2005)**
  - Two tiers of allowable renewable energy
  - By 2023, 20% energy must be renewables, 2.5% from solar
- **Community Renewables Energy Act (2013)**
  - Allows community renewable energy facilities of up to 5 MW
  - Allows two or more "subscribers" to share a single system
  - Provides Consumer Protections prioritizing those persons most sensitive to market barriers; and
  - Encourages developers to promote participation by renters and low- to moderate-income retail electric customers



nergy Year	RPS Solar Requirement	Projected SRECs Required (MWh)	Projected Capacity Required (MW)	SACP
2011	0.40%	46,248	38.5	$500
2012	0.50%	58,677	48.9	$500
2013	0.50%	59,558	49.6	$500
2014	0.60%	72,541	60.5	$500
2015	0.70%	85,901	71.6	$500
2016	0.825%	102,759	85.6	$500
2017	0.98%	123,896	103.2	$350
2018	1.15%	147,569	123.0	$300
2019	1.35%	175,832	146.5	$200
2020	1.58%	208,875	174.1	$200
2021	1.85%	248,237	206.9	$150
2022	2.175%	296,224	246.9	$150
2023	2.5%	345,595	288.0	$50

DC Solar Capacity & Requirements

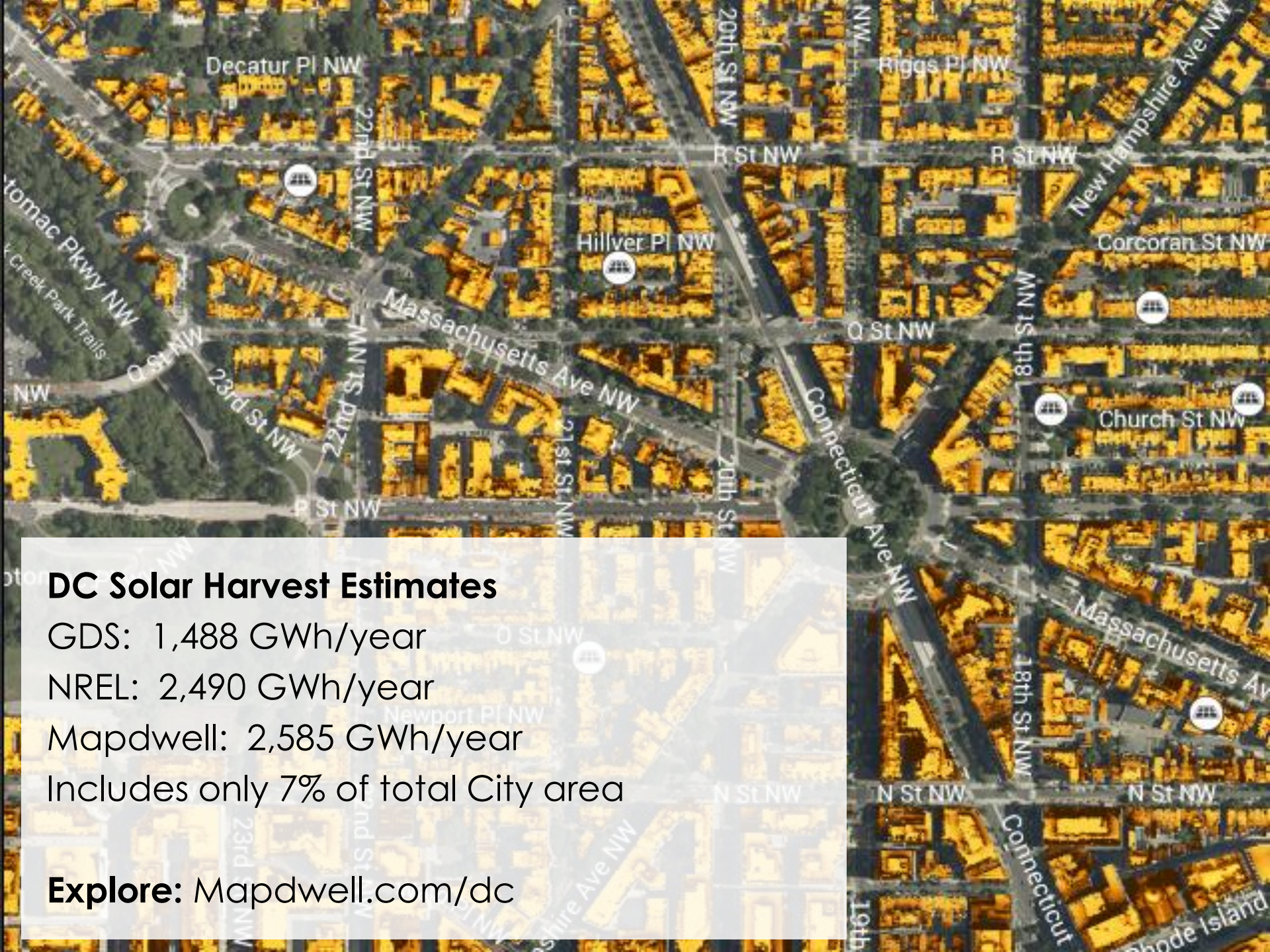
Requirement (2023)
~280 MW: Current RPS solar carve out (PV + thermal)

Current Capacity (2015)
17 MW: Installed in DC (PV + thermal)

37 MW: Total installed DC + PJM)

Technical Potential
~70 MW: PV capacity on standalone homes

~2,700 MW: All building types



DC Solar Harvest Estimates

GDS: 1,488 GWh/year

NREL: 2,490 GWh/year

Mapdwell: 2,585 GWh/year

Includes only 7% of total City area

Explore: Mapdwell.com/dc


EcoDistricts

EcoDistricts

URBAN INGENUITY

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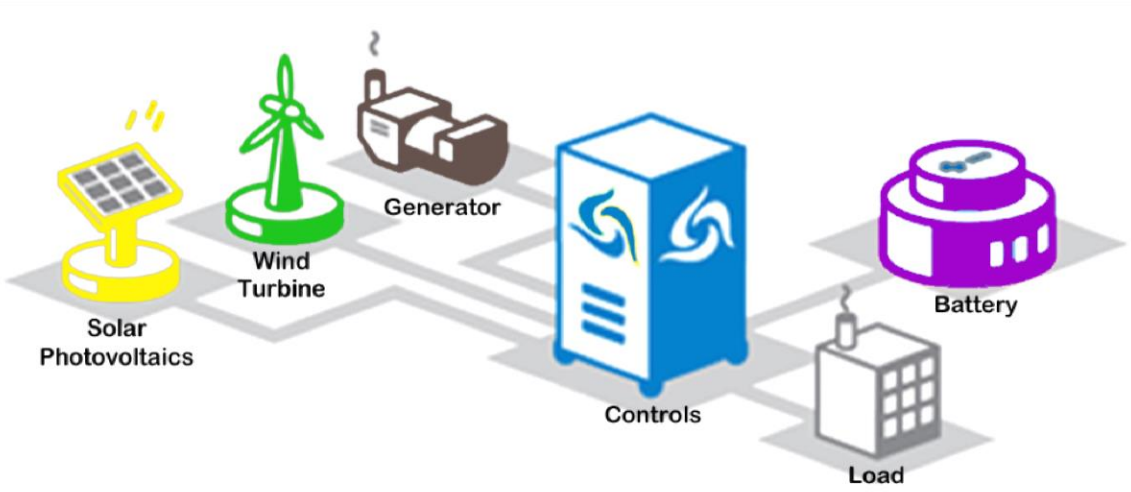
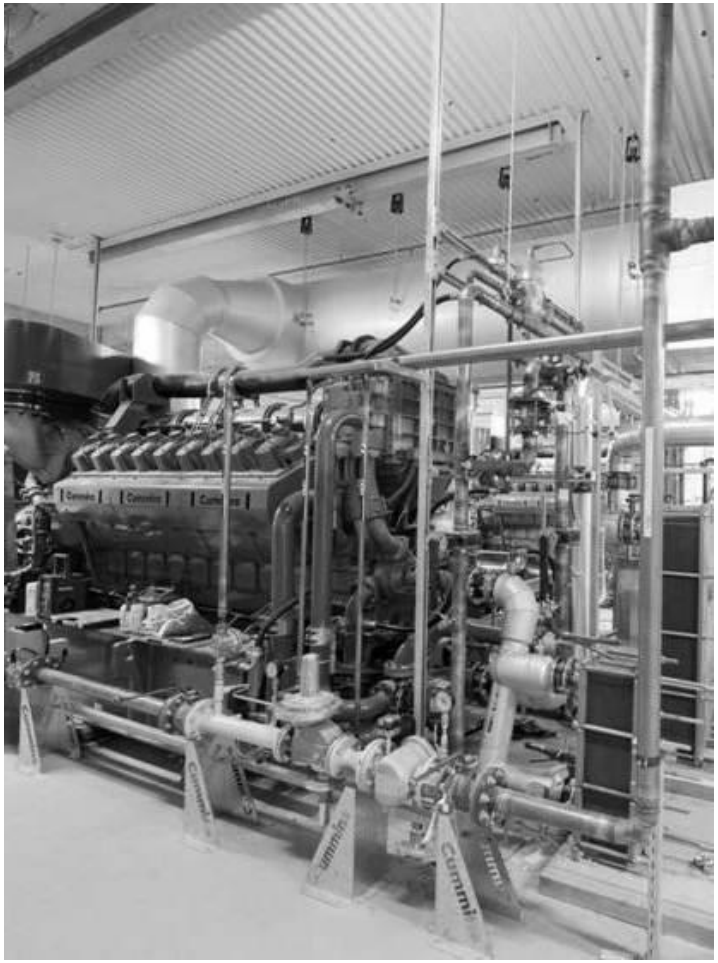
DISTRICT ENERGY: Deploying Clean Energy Microgrids in the Nation's Capital

September 2015



Next Steps:

- Narrow and prioritize list and refine scoring worksheet
- Develop financing model demonstration & integrate with green banks and incentives study.
- Further research and analyze regulatory barriers and options & provide guidance to DOEE and PSC
- Develop stakeholder tools and a "Go To Market" package



DEPLOYING ADVANCED ENERGY SOLUTIONS

- **Residential/Commercial PV**
- **Municipal PV**
- **Sewage to Energy**
- **Electric Cycling**
- **Electric Vehicle Grand Prix**

District Solar Initiatives

Deployment, Education & Outreach

- DDOE/Energy Office *Renewable Energy Demonstration Program* ("REDP") 2005-2008
  - Competitive grants to deploy innovative solar technologies
  - $800k, 68 PV, thermal and small wind systems + storage

Deployment

Residential, Small Commercial, Institutional

- DOEE Renewable Energy Incentive Program (REIP) 2009-2013
  - $6.8M, 885 projects (34 low-income), 4.1 MW cumulative capacity
  - Kickstarted District's nascent solar market
- DCSEU Low-Income Solar Program – 2012, ongoing
  - Over 200 single-family installations
- DOEE EnergySmart DC Solar Initiative (EDSI) – 2014, ongoing
  - Comprehensive suite of programs to encourage deployment, innovation, education, outreach, and underlying policies
  - Funded by ACP
  - $6M for FY15/16 to support low-income, community solar, small business

Municipal

- DGS - ~10 MW at 50 sites (PPA, under procurement)
- DC Water - ~10 MW at Blue Plains (PPA, planning)
- DCHA, HUD investigating procurement strategies to solarize District-owned and Federally-owned affordable housing, ~1-3 MW under consideration
- DCRA permit streamlining

Solar on DC Municipal Facilities

Case Study - Dunbar High School PV System

- Commissioned December 2013
- 463 kilowatts (1,940 solar PV panels)
- Generation approximately 543,000 kWh of electricity/year (based on 1st year production)
- System supplies ~20 percent of facility's annual estimated electricity needs
- Constellation Energy financed, owns and operates the system
- Electricity is purchased by the Department of General Services under a 20-year power purchase agreement

Deploy, Innovate, Educate: GRiPV

Challenge: District policy supports the development of resilient distributed solar energy facilities as well as green roofs, yet few examples exist in DC.

Goals:

- Support the development of PV and green roof integrated with PV (GRiPV) systems
- Support the development of rooftop solar as well as Community Renewable Energy Facilities (community solar)
- Systems include performance monitoring of both systems
- Provide public education and outreach, develop and disseminate case-studies

Outcomes:

- Broad deployment of solar PV, some with integrated green roofs resulting in higher performing PV systems
- Research opportunities that provide new insights into the interplay of various components within urban GRiPV systems
- Contribute to meeting RPS solar carve out

COMMUNITY SOLAR GARDENS

32 CAMBI Thermal Hydrolysis Vessels (foreground)
4 Anaerobic Digesters (background)
3 Natural Gas Turbines

DC Water Blue Plains Wastewater Treatment Facility


RIDE

DC Electric Vehicle Grand Prix

- Organized by Global EEE (501(c)(3), the Washington DC Electric Vehicle Grand Prix is a hands-on educational program for high schools in Washington DC, Maryland, and Virginia.
- Singl-seater, electric-motor- driven vehicles with three wheels
- Power - deep cycle lead acid battery packs not exceeding 73 lbs

Teams drive their vehicles as far as possible for one hour on the closed loop course using only energy stored in their batteries.

The winner of the DC EV Grand Prix is the team that covers the longest distance in the allotted hour.

FINANCING ENERGY DISRUPTION

DC PACE: Green Financing Mechanism

PACE COMMERCIAL
an energy finance solution

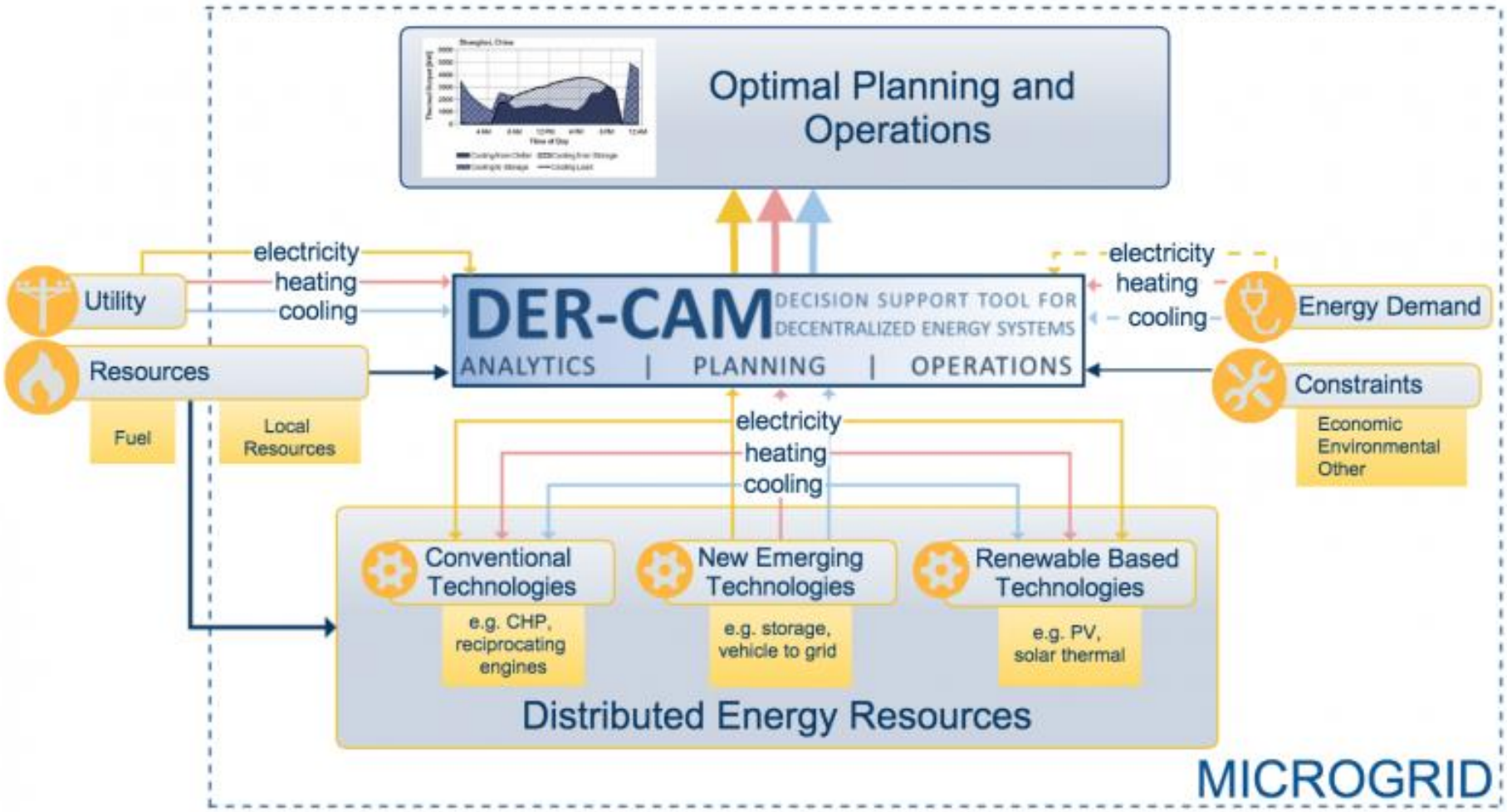
PACE:
Property
Assessed
Clean
Energy

- Green financing loan program established by DC Council as part of the Energy Efficiency Financing Act of 2010 and Sustainable DC Act of 2012, administered by DOEE
- Backed by $250 million in District bonding authority available to all commercial, institutional, and multi-family real estate within the District of Columbia
- Provides 100% upfront private capital investment, repaid through a property tax
- Same financing mechanism used to fund infrastructure projects (like PILOT or TIF)
- Current pipeline of $50 Million in energy efficiency and renewable projects

DC Electric Vehicle Incentives

- **Reduced Registration Fee** - New registrations on vehicles rated 40 mpg or greater average city fuel economy (EPA) receive a 50% registration fee discount ($36). (DC Code 50-1501.03)
- **Excise Tax Exemption** - Qualified Alternative Fuel Vehicles and those rated over 40 mpg are exempt from the 6% Title Tax (original certificate of title). (DC Code 50-2201.03(j)
- **Alternative Fuel Vehicle Tax Credit -** Income tax credit of 50 percent—up to $19,000 per vehicle—available for the incremental or conversion cost for qualified vehicles. A tax credit is also available for 50 percent of the equipment costs for the purchase and installation of alternative fuel infrastructure. The maximum credit is $1,000 per residential electric vehicle charging station and $10,000 for each public fueling station.
- **Fleet Incentives** - Certified clean fuel fleet vehicles are exempt from time-of-day and time-of- week restrictions and commercial vehicle bans (DC Code 50-702 and 50-714)

DER-CAM Modeling for EcoDistricts



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