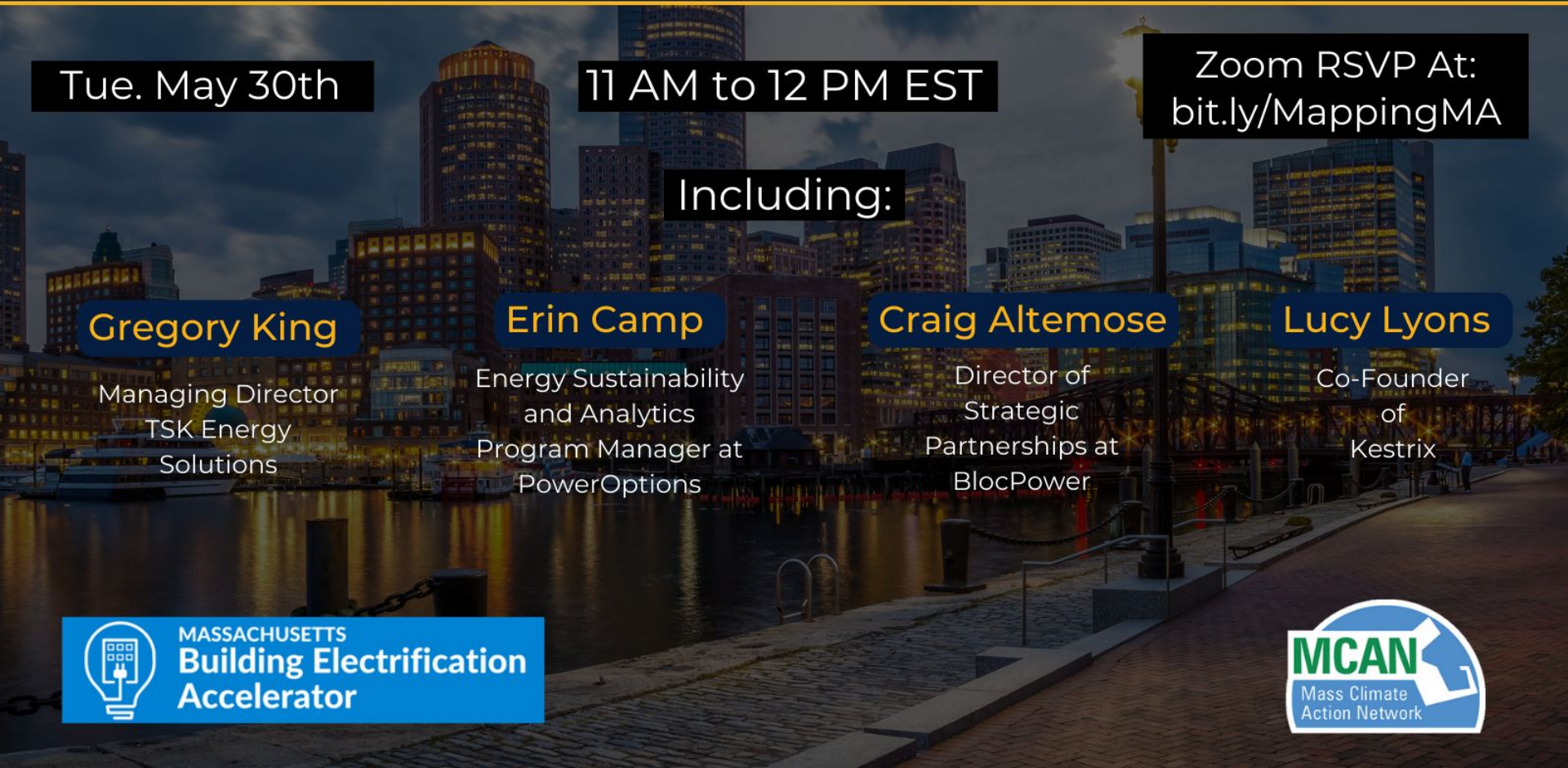
Innovative Approaches to Building Mapping



Tue. May 30th

11 AM to 12 PM EST

Zoom RSVP At:
bit.ly/MappingMA

Including:

Gregory King
Managing Director
TSK Energy Solutions

Erin Camp
Energy Sustainability and Analytics Program Manager at PowerOptions

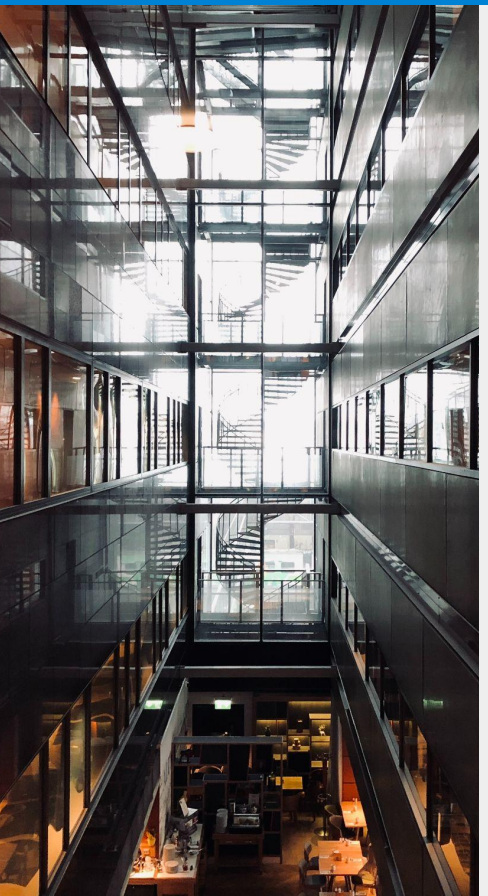
Craig Altemose
Director of Strategic Partnerships at BlocPower

Lucy Lyons
Co-Founder of Kestrix

MASSACHUSETTS
Building Electrification Accelerator

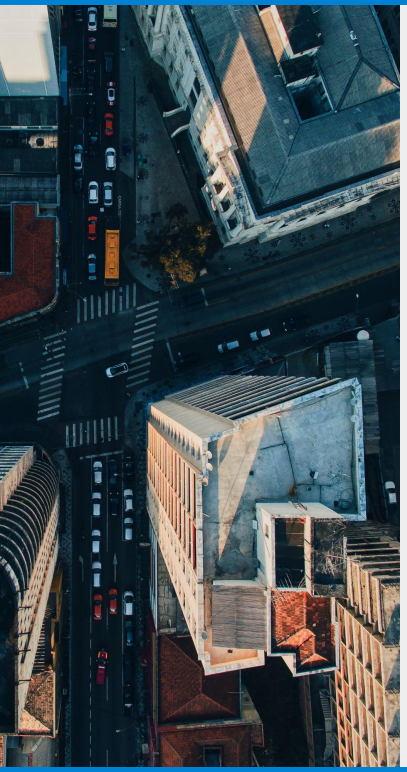
MCAN
Mass Climate Action Network

Welcome!



- We are recording this webinar
- Please add questions to the chat for the Q&A
- We will email links to the recording and slides after the event

Today’s Agenda



- Welcome
- Gregory King, TSK Energy Solutions
- Erin Camp, PowerOptions
- Craig Altemose, BlocPower
- Lucy Lyons, Kestrix
- Closing and Q&A

Introducing Gregory King

Gregory King
Managing Director
TSK Energy Solutions

GREATER GROVE HALL MAIN STREET GREEN ZONE PROJECT FEASIBILITY STUDY

Massachusetts Building Electrification Accelerator

May 30th , 2022

Gregory King, Managing Director

Energy Innovations

TSK Energy Solutions LLC

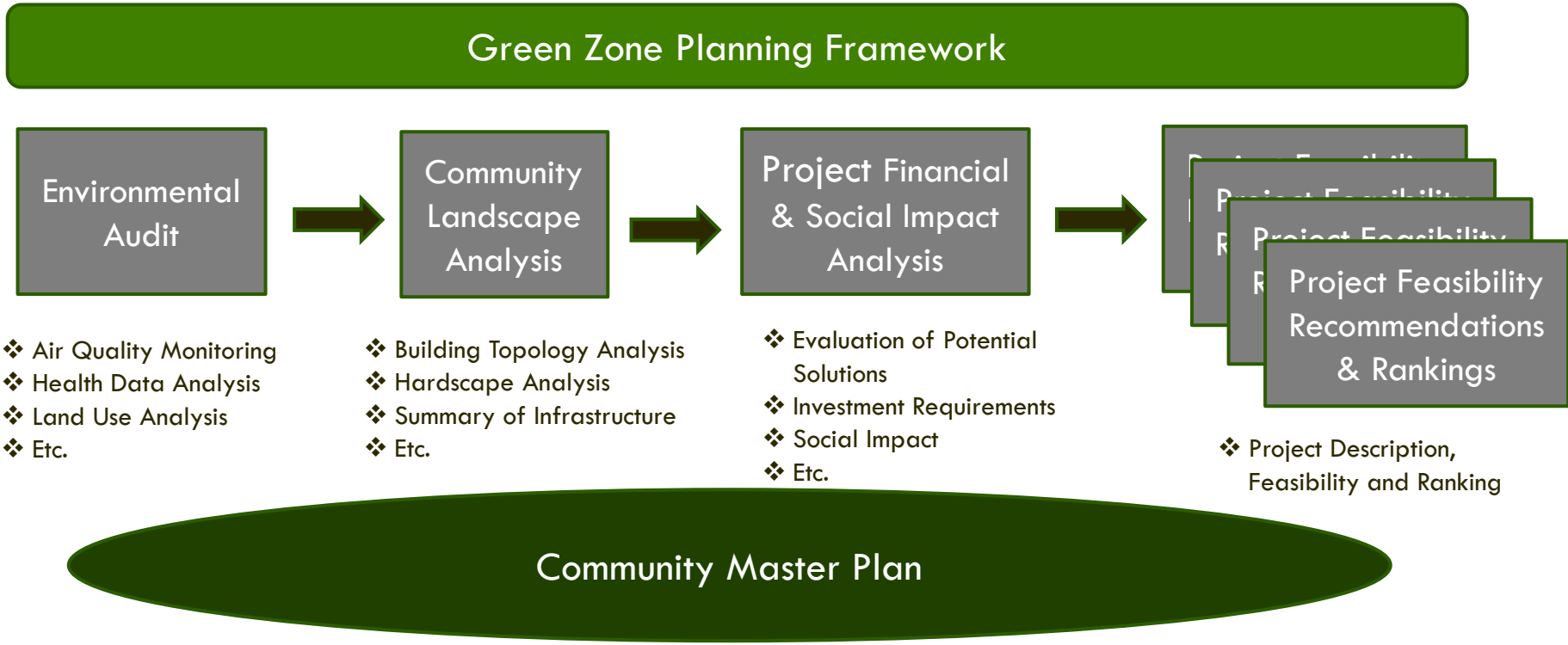
What is a Green Zone?

Green Zone –The use of the term "Green Zone" represents a justice-oriented approach to new investments, planning decisions, infrastructure development and community participation.

Implementing a Green Zone planning process is a pathway to green business practices, a healthier environment and a stronger economic future.

GREEN ZONE

Green Zone Planning Framework



What is Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys:

The same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

History of the Environmental Justice Movement

In the 1980's the environmental justice movement became a national social and racial protest that galvanized communities across the country seeking social justice and environmental protection.

The initial environmental justice spark sprang from a Warren County, North Carolina, protest. In 1982, a small, predominately African-American community was designated to host a hazardous waste landfill. This landfill would accept PCB-contaminated soil that resulted from illegal dumping of toxic waste along roadways. After removing the contaminated soil, the state of North Carolina considered a number of potential sites to host the landfill, but ultimately settled on this small African-American community.

The Status Quo for Communities of Color

The American Council for an Energy Efficient Economy (ACEEE) recommends that equitable clean energy plans, policies, and programs should address several main challenges facing marginalized communities:

» ***History of exclusion from clean energy initiatives:*** Marginalized communities have not been considered or included in past clean energy planning and policymaking. Consequently, many of the same people who would benefit most from such initiatives are overlooked when policies are developed, implemented and evaluated.

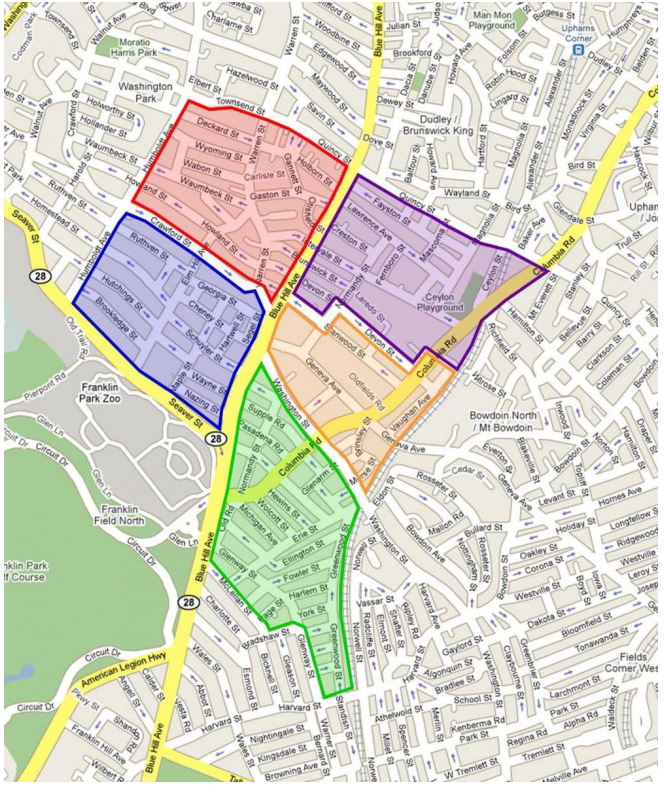
» ***High energy burdens:*** Low-income households, communities of color, older adults, and renters all face disproportionately high energy burdens, meaning they spend more of their income on energy bills compared to their counterparts.

» ***Underrepresentation in the workforce:*** Women and black Americans make up a disproportionately small share of both the energy efficiency and renewable energy workforces

According to ACEEE, "Historically, many marginalized groups have been underserved, overlooked, and underrepresented in local clean energy planning and policymaking. These groups can vary from place to place but often include people of color, low-income residents, older adults, indigenous peoples, immigrants, people with disabilities, and people experiencing homelessness."

The Greater Grove Hall Green Zone Feasibility Project

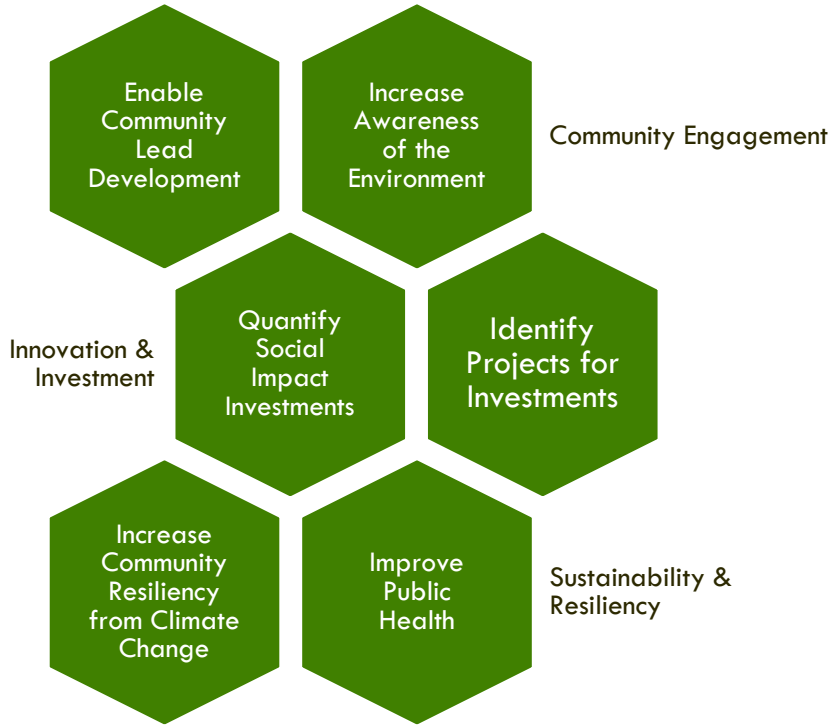
- The nature of this project is the exploration of the creation of a Green Zone in an urban section(s) of Boston's neighborhoods of color.
- The purpose of the "Green Zone" one is to foster green design interventions, including green businesses, practices, and technologies.
- Zones and zoning have been used to achieve a range of desired objectives e.g. Opportunity Zones
- The goal is for the Greater Grove Hall Green Zone would become an important contributor to the self-sufficiency and resiliency of both the neighborhood and region, by providing a place to pilot ideas and devising a methodology that could be replicated elsewhere.



GGHMS Suffers from Environmental Injustice

- The area suffers from poor air quality, causing increased asthma cases
- The area has a high number of vacant and distressed plots with lead contamination in the soil
- The area is exposed to a disproportionate amount of environmental hazards, making it socially vulnerable.

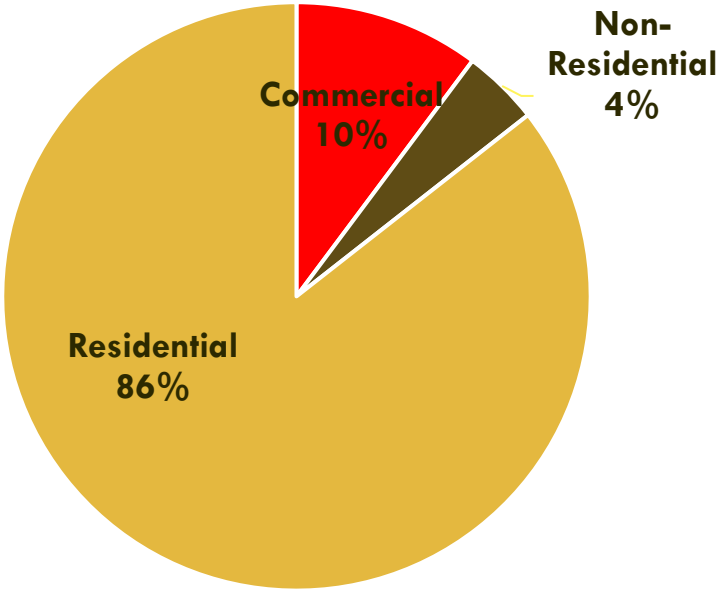
GGHMS Green Zone Project Objectives

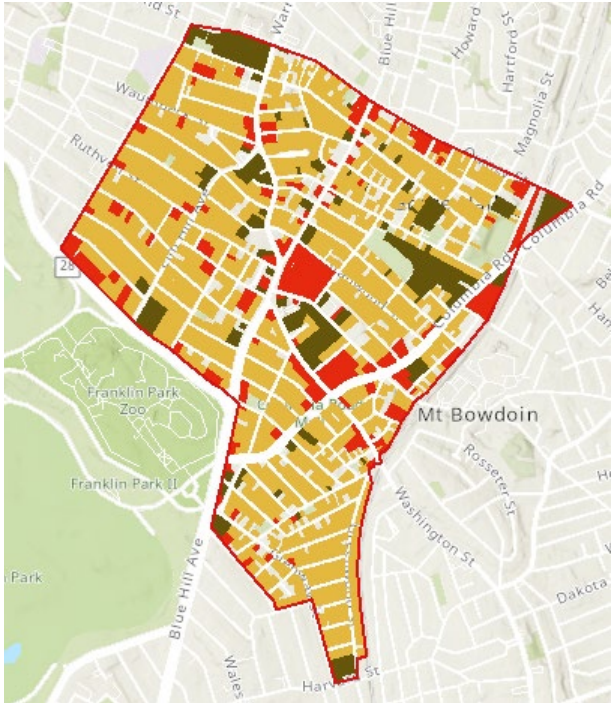


Grove Hall Parcels

Of **2066** parcels in the Grove Hall area,

- 1768 are Residential,
- 211 are Commercial
- 87 are Non - Residential.





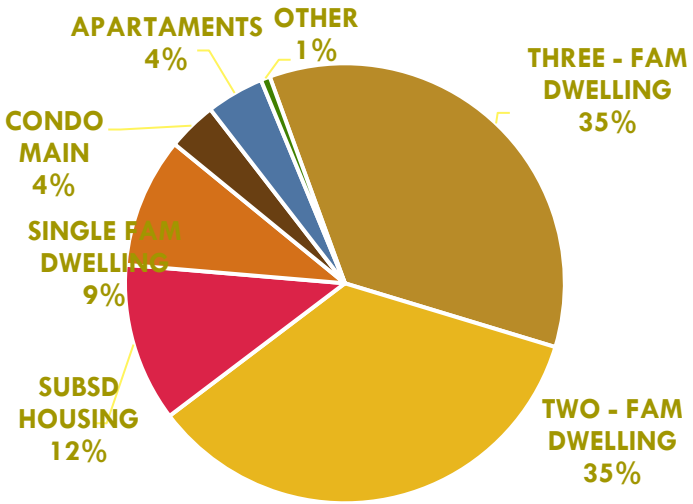
Residential Parcels

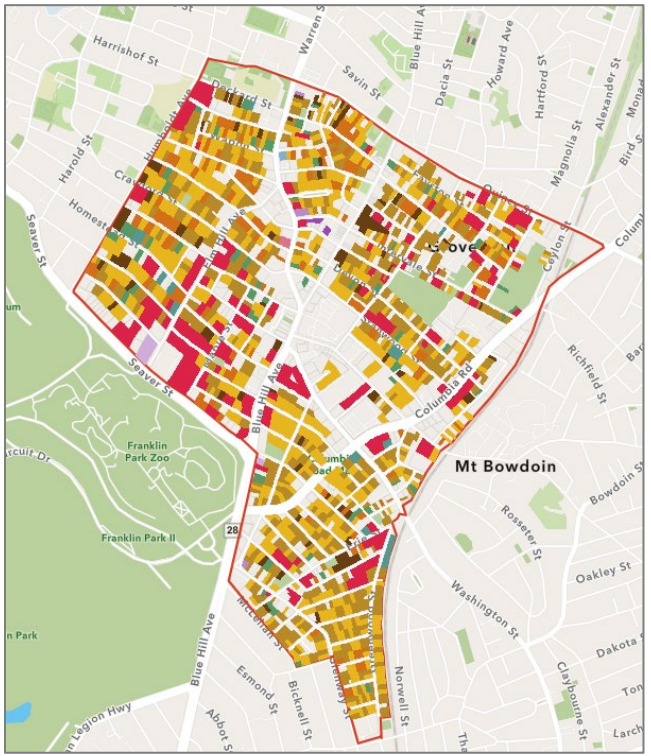
Residential parcels account for **86%** of Grove Hall parcel inventory.

Grove Hall Parcels

Use

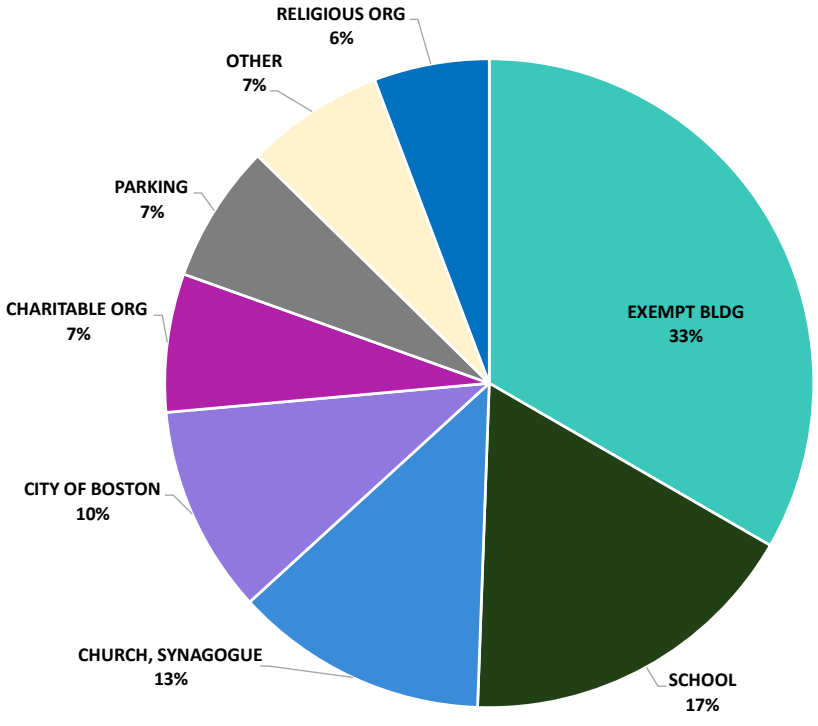
- THREE-FAM DWELLING 623
- TWO-FAM DWELLING 619
- SINGLE FAM DWELLING 169
- SUBSD HOUSING S- 8 204
- SUBSD HOUSING S-202 2
- CONDO MAIN 64
- APT 4-6 UNITS 63
- APT 7-30 UNITS 12
- 121-A PROPERTY 6
- ROOMING HOUSE 3
- BOSTON HOUSING AUTH 2
- ELDERLY HOME 1

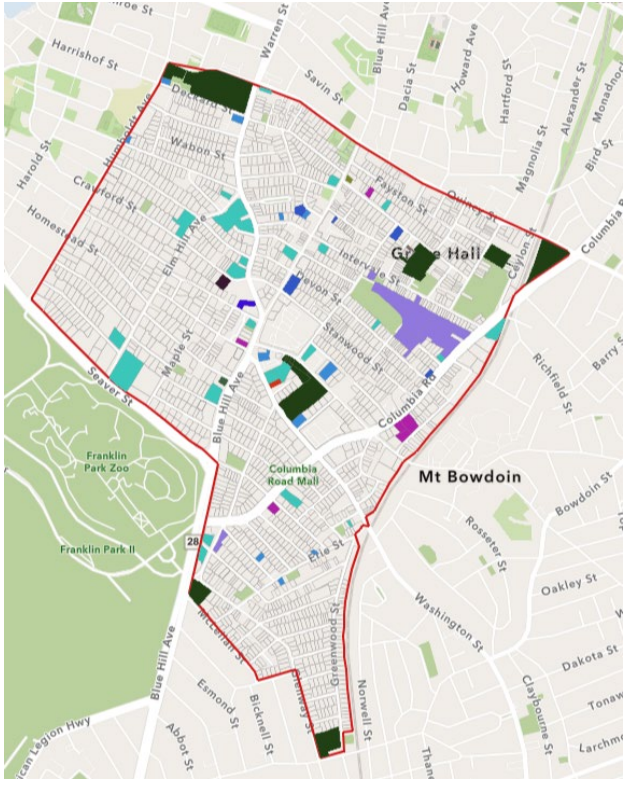




Non – Residential Parcels

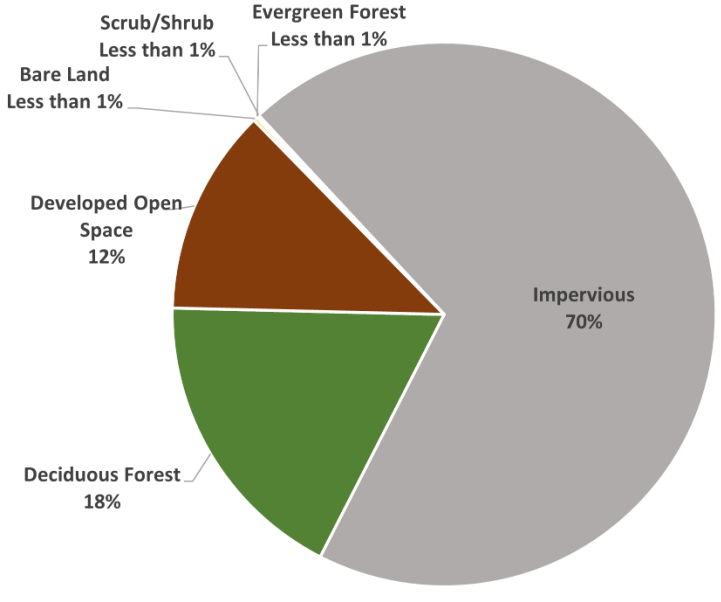
Non -Residential parcels account for **4%** of all parcels in the Grove Hall area. Of **87** parcels, **29** contain **exempt buildings**, **15** contain **schools**, and **11** contain **churches**, including synagogues.





Impervious Surface

The impervious surface includes artificial structures such as cement, pavement, asphalt, etc. In the Grove Hall area, **impervious surface** represents approximately **70%** of all land cover.



Questions

For additional information contact:

Gregory King
TSK Energy Solutions LLC
617.610.9616
gking@tskenergysolutions.com

Grove Hall Community Landscape Analysis:
https://storymaps.arcgis.com/stories/a391ab26379641babc66f7e76c61bff9

Grove Hall Green Zone Legislation
HD.4161 An Act of improving environmental justice in Black communities.

SD.2493 An Act to improve environmental justice in the Commonwealth

Introducing Erin Camp

Erin Camp
Energy Sustainability and Analytics Program Manager
PowerOptions

PowerOptions

Powering Nonprofits since 1998

Building Decarbonization Roadmapping

PowerOptions

We give our members "peace of mind"

A Trusted Advisor Since 1998

Originally created by the Commonwealth of Massachusetts to serve state agencies, PowerOptions has been serving nonprofits and public entities for 25 years.

A Mission-Driven Nonprofit

PowerOptions' mission is to empower nonprofits and public entities with solutions to reduce the cost, carbon, and complexity of energy.

Consortium Leverage

PowerOptions members benefit from the collective buying strength of over 490 members including some of the largest nonprofits in Massachusetts, Connecticut, and Rhode Island.

Flexible Programs

PowerOptions' programs are intentionally and thoughtfully designed to serve members of any size and circumstance

Your Energy Team

PowerOptions' on-call energy team provides guidance throughout the contracting process, so you feel supported and resourced to make smart and proactive energy decisions.

Electricity & Gas Supply | Solar & Renewables | Vehicle Electrification| Energy Efficiency | Analytics & Sustainability Planning

Certified WBE Women's Business Enterprise

490+ members

85+ MWs SOLAR

25 years serving nonprofits

1B kWh ELECTRICITY

$120m ANNUAL ENERGY SUPPLY SALES

7M Dth NATURAL GAS

Energy Sustainability and Analytics Program

Energy Advisory
Tailored expertise and support for our members' unique energy needs

Fleet Electrification
How to get to a fully electrified fleet, from planning through implementation

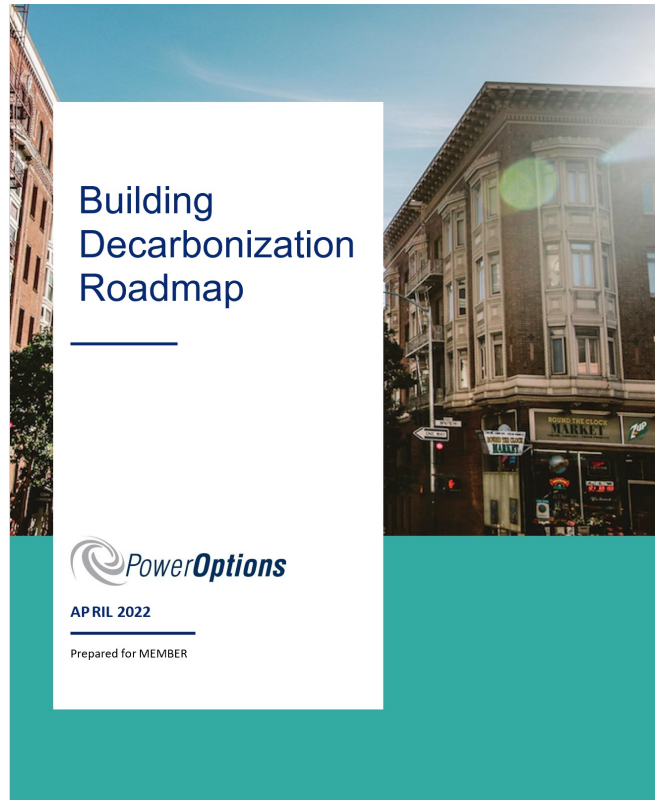
Energy Data Analytics
Utility bill data management and ongoing energy reporting

Building Decarbonization
How to get to "net zero" buildings, from planning through implementation

PowerOptions

PowerOptions' Building Decarbonization Roadmap

- High-level decarbonization potential study to help our members develop a timeline and gauge costs
- Decarbonization analysis includes:
  - Virtual energy efficiency audit
  - Virtual solar assessment
  - Electrification of all fossil-fuel based end uses (HVAC, cooking, water heating)
  - REC purchases (as needed)
- Key outputs: Capital costs, savings, incentives, financing options, avoided BERDO penalties, and GHG reduction potential for each building.
- Required inputs: square footage, existing equipment types and age, and 1 year of all utility bills
- Pricing: $500 per building (we have funding support from MassCEC)



PowerOptions

PowerOptions' Building Decarbonization Roadmap

Energy Efficiency

Energy efficiency (EE) refers to any upgrade to a building that reduces energy usage and, in many cases, costs. Because energy efficiency projects are cost-effective today, our roadmap recommends prioritizing it early in the roadmap to capitalize on energy savings for the remainder of the roadmap.

Based on one year of utility bills, we recommended at least the following **efficiency projects in the near-term**:

- Increase air conditioning setpoints and decrease heating setpoints
- Implement a Building Automation System and reduce HVAC equipment schedules
- Reduce lighting and plug loads
- Upgrade windows
- Convert to a heat pump water heater

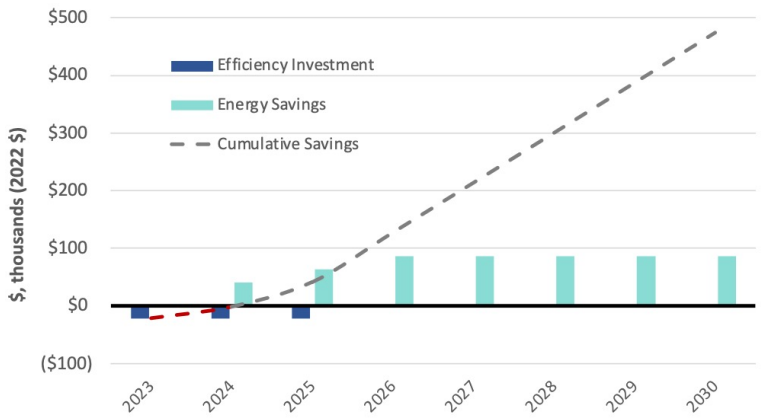
Energy Efficiency Impacts

***Investment**: $330k | **Incentives**: $260k*
***Net cost:** $65k*

***Year 1 Savings:** $20k*
***Annual Savings after Completion**: $70k*
***Payback:** 2 years*

Massachusetts offers strong incentives for commercial customers to implement certain energy efficiency projects. As a result, the up-front cost of efficiency projects is reduced by over 80 percent and the **payback period is about 2 years**. Relative to operating "business as usual," [redacted] will **save about $70,000 annually on energy costs** by implementing efficiency projects (Figure 2).

Figure 2. Net savings from implementing energy efficiency projects, 2023-2050.



Solar and RECs

PowerOptions evaluated the [redacted] options for on-site and off-site (remote) solar PV. Due to the location of the building, and size and age of the roof, we recommend installing a 24 kW on-site solar system as soon as 2024. The upfront cost of the project is about $70,000, and the net cost after incentives would be about $50,000. The system will produce almost 32,000 kWh of electricity annually, saving [redacted] **over $130,000 in electricity costs and 130 metric tons of CO_2e through 2050**.

Solar Impacts

***Investment**: $70k | **Incentives**: $20k*
***Net cost:** $50k*

***On-site Solar Payback:** 8 years*
***CO_2e reduced**: 130 metric tons by 2050*

Figure 3. Location of on-site solar system at [redacted] developed through HelioScope.

Electrification

Electrification Impacts

***Investment**: $290k – $400k*
***Incentives**: $140k*
***Net cost:** $146k – $260k*
***Efficiency + Electrification Payback:** 5 years*

***CO_2e reduced**: 2,000 metric tons by 2050*

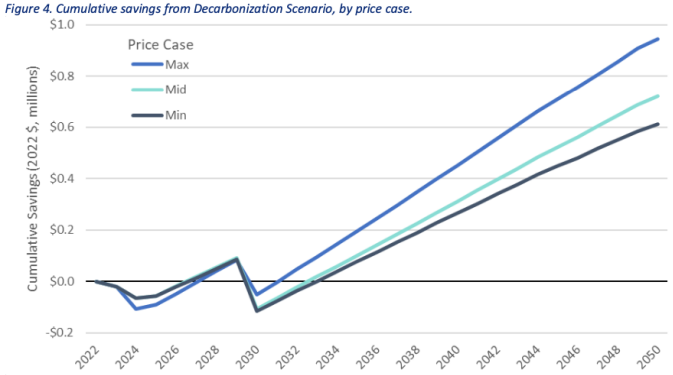
Heat pumps are an efficient all-electric solution for a building's space heating and cooling needs. Heat pumps work similarly to an air conditioner, but they are more efficient and provide heating in the winter by operating in reverse. In contrast to fossil fuel heating equipment that has an efficiency of 80-95%, heat pumps have an efficiency ranging from 250% to 400%, meaning they produce more energy than is put into them. There are many different types of air source heat pumps that vary in cost and efficiency, including variable refrigerant flow (VRF) heat pumps and packaged heat pumps. For most existing heating systems, there is an economical heat pump replacement option within the next decade.

Given that the [redacted]uilding is heated with district steam, our recommendation is to replace the existing steam distribution system with VRF heat pumps because they are a great option for the [redacted]limate control needs. VRF heat pumps are unique in that they can

Financial Impact

After incentives, the total investment required to execute this roadmap is $360,000. Of the possible ways to decarbonize the [redacted]uilding, we believe this is the most cost-effective way. Depending on future energy prices, **they are expected to save between $0.6 and $1 million by 2050** (Figure 4).

Figure 4. Cumulative savings from Decarbonization Scenario, by price case.



Building Decarbonization Implementation

- All PowerOptions Members get free implementation support through our pre-existing programs (energy efficiency, solar + storage, clean electricity procurement)

- PowerOptions plans to have a program for our Members to be able to install heat pumps cost-effectively, ideally using our unique procurement abilities to provide our Members with novel financing for heat pumps (electrification as a service).

Roadmap Timeline

The overarching roadmap timeline is shown below for the [redacted] building. Note that the years below are calendar years (to align with the City of Boston's BERDO measurement cycle), not fiscal years.

2023

- Energy efficiency audit
- Reduce heating setpoints, increase AC setpoints, reduce plug loads, reduce lighting load
- Get quotes for onsite solar

2024

- Onsite solar installation

2029

- Get quotes for building automation system, heat pumps, and window upgrade

2030

- Installation of heat pumps and building automation system
- Upgrade windows

2040-2050

- Purchase renewable energy certifications (RECs) to offset electricity emissions and avoid BERDO penalties

Contact Information

Have more questions, or want a demo of the roadmap?

Reach out to me at ecamp@poweroptions.org!

Thank you!

PowerOptions

Introducing Craig Altemose

Craig Altemose
Director of Strategic Partnerships
BlocPower

BlocMaps

From Goals to Action: Software & Building Data for Energy Leaders

BLOC POWER

Innovative Building Mapping, May 2023

BlocPower is a Black-owned climate technology company focused on making buildings smarter at scale to reduce emissions — while improving indoor air quality and creating new jobs.

This is the decarbonization ecosystem.

Today's Focus

TECHNOLOGY AND DATA

PROGRAM MANAGEMENT FOR CITY OR UTILITY

Building Electrification Program & Project Completion

INCLUSIVE FINANCING

PROJECT MANAGEMENT FOR BUILDING OWNERS

BLOC POWER

Data-driven programs at any phase

Phase One: **Discover**

We are curious about building electrification, but we don't know what's possible for our community.

Phase Two: **Design**

We have a climate goal for our buildings, but we don't know where to start to make a program happen.

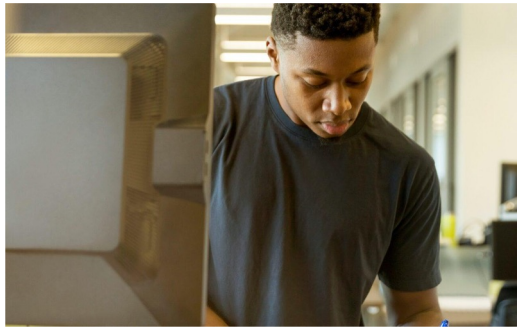
Phase Three: **Deploy**

We have a program, but we don't know which buildings to prioritize or how to best engage them.

BLOC POWER

Leveraging BlocMaps beyond program development

Use this tool to drive more than just energy efficiency, but governmental efficiency, too



Stretch Program Dollars Further

- Spend less on analysis and more on implementation
- Prioritize buildings that meet your goals

Build a Data-Driven Case for Funding

- Develop a data-backed, accessible plan
- Simulate impact for climate & environmental justice goals
- Accelerate buy-in for larger partnership

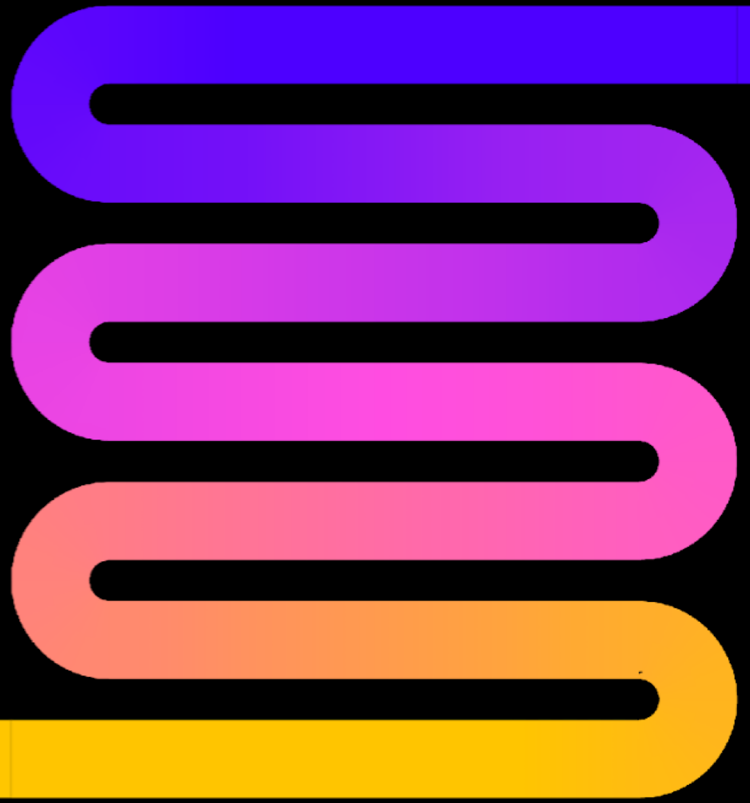
Drive Impact at Scale — Faster

- BlocMaps powers faster approval & resourcing
- Focus on low-hanging fruit to get tangible wins faster
- Machine learning models scale learning and impact

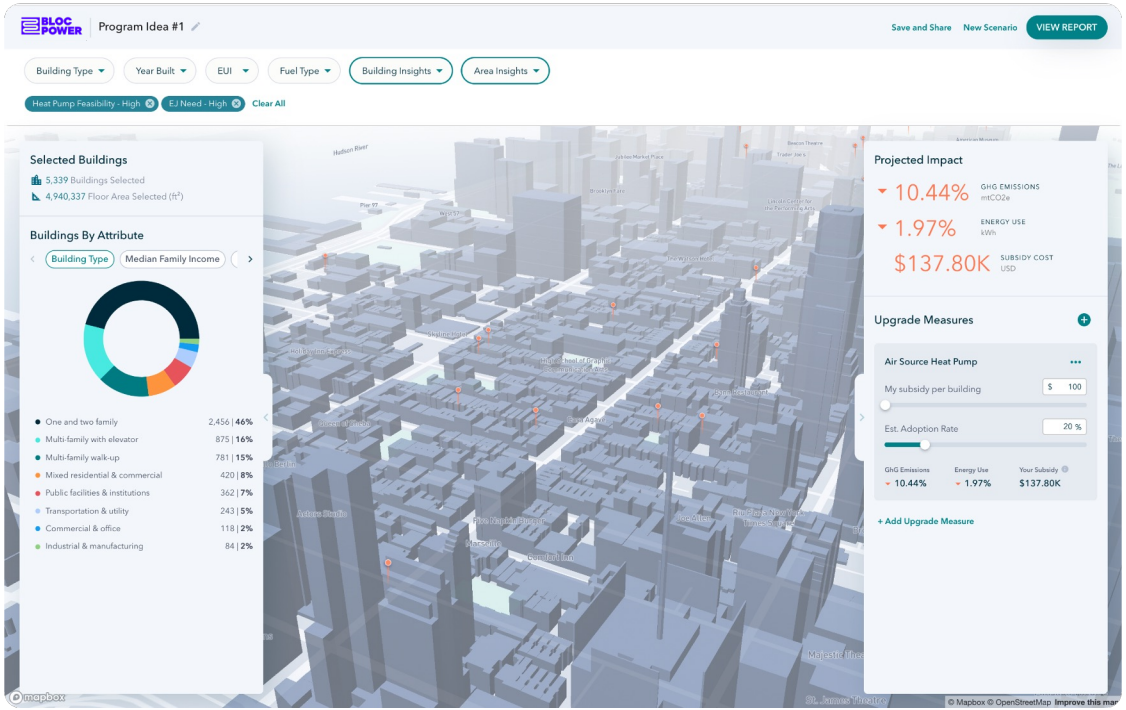
BLOC POWER

Software Demo

How our software and data toolkit is helping cities electrify their buildings



Software demonstration



BLOC POWER

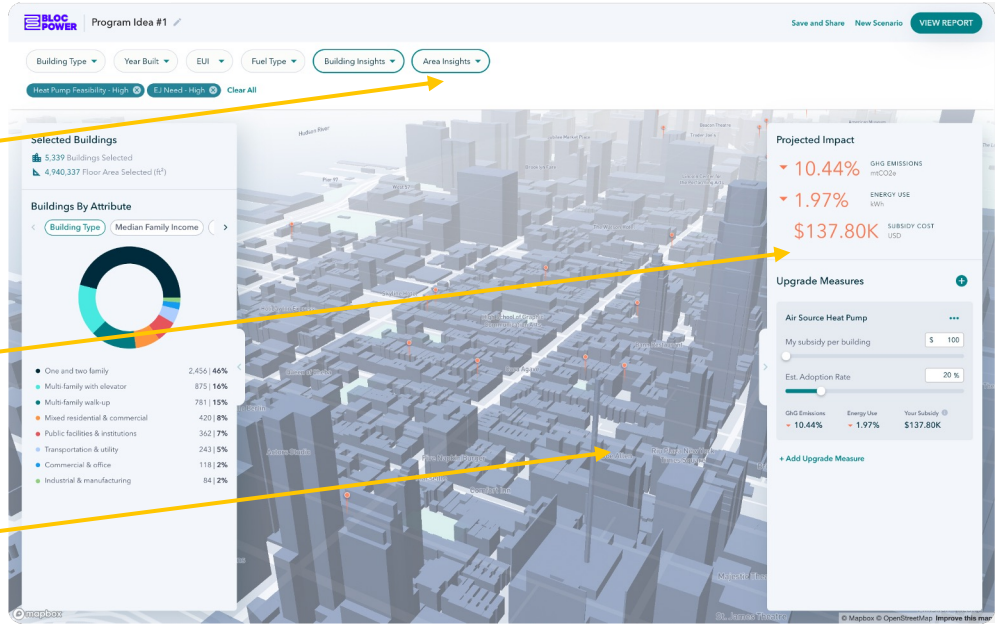
BlocMaps is a proprietary software product of BlocPower

BlocMaps using building data to analyze, visualize and design electrification programs at scale

Apply BlocPower's proprietary data & insights to your buildings data to design a program that meets your goals for climate and environmental justice

Model program impact in terms of greenhouse gas emission reductions, cost and energy usage/intensity

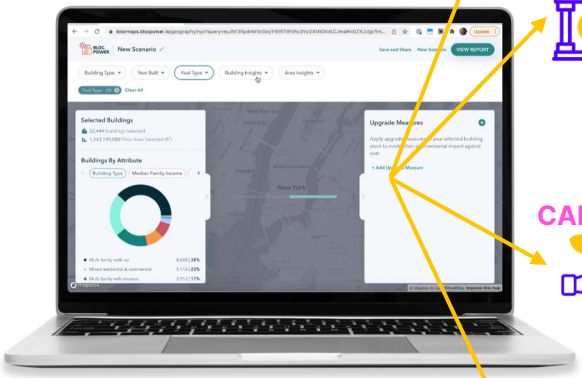
Publish maps to illustrate data to develop support and drive engagement with stakeholders during program approval process



BlocMaps Features

The flexibility and functionality you need

- **Flexible data modeling**
  - We compile, clean and fill in the gaps of your data sources.
- **Data-driven building targeting**
  - Numerous filters and targeting layers include to design a program to meet your goals.
- **Simulate program impact and cost**
  - Assess impact of upgrade and incentives with segmentation
- **Materials for stakeholder engagement**
  - Visualize program with map of target buildings and impact metrics.
- **Customization**
  - Custom add-ons available by consultation (e.g. custom map layers, impact metrics, etc.)



SCALE

- # buildings retrofitted
- # households impacted
- % pollution decrease

ECONOMICS

- Energy bill savings for tenants
- Energy bill savings for owners

CARBON

- Avoided GHG emissions
- $ of carbon credits

WORKFORCE

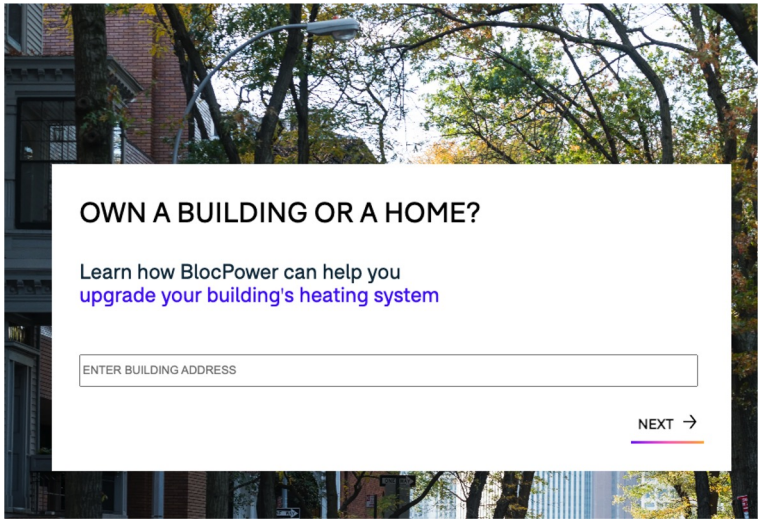
- # jobs created
- Ave. salary indexed to living wage
- # contractors

BLOC POWER

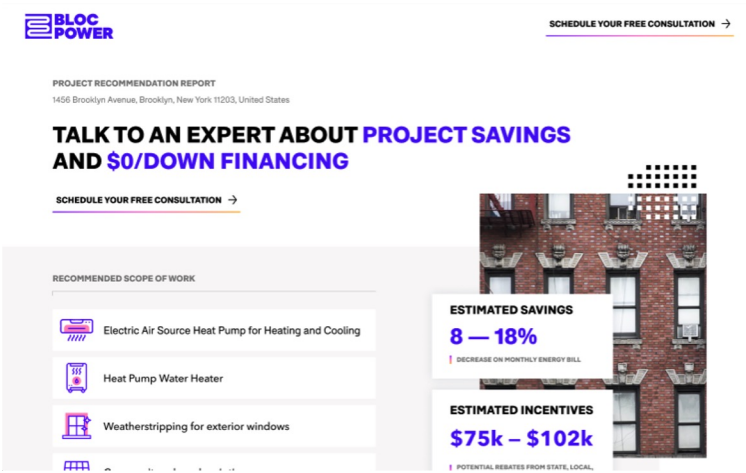
With a program developed, time to get home & building owners on board

The Instant Building Report is a critical early touchpoint for home and building owners

Straightforward Questions for Qualification



Instant, Custom Report, Quote and SOW



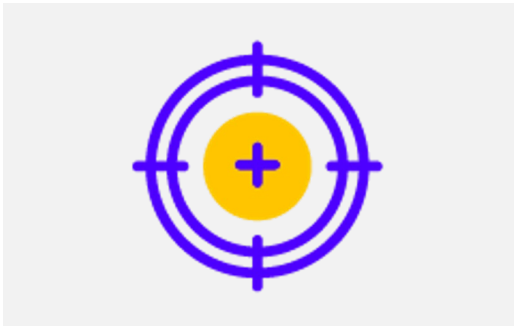
BLOC POWER

Instant Building Report: A tool and resource for home & building owners

A simple and intuitive starting point to learn about the benefits and costs of electrification and energy efficiency upgrades

ACCESSIBLE

Digital destination with responsiveness for all device types meets home and building owners where they are.



FRICTIONLESS

Streamlined path for project qualification and estimated cost and savings, plus ability to speak with BlocPower to move forward with their project.

EDUCATIONAL

Friendly and intuitive materials help home and building owners understand electrification and the benefits for themselves, their families and their tenants.

BLOC POWER

Thank you!

For more information or a longer demo, please email
craig@blocpower.io

BLOC POWER

Introducing Lucy Lyons

Lucy Lyons
Co-Founder
Kestrix

Thermal imaging and AI to scale building retrofit

May 30th 2023

Is your house **cold?**

Are your energy bills **skyrocketing?**

KESTRIX™

30%

of energy used in buildings is wasted

80%

of 2050's buildings are already built

KESTRIX™

The world needs to retrofit for energy efficiency

– at **speed and scale.**

KESTRIX™

To reach net zero by 2050

*we must retrofit **90M** homes per year*

We’re doing just **25%** of that

Why?

"Existing energy efficiency data of buildings does not help us plan or validate retrofits – we need to do manual surveys, which are slow, and cost tons."

Director of Sustainability, UK Top 5 Housing Association

KESTRIX™

Property Road

Up To 2.5m EPCs Are 'Likely To Be Inaccurate'

An investigation performed by Spec has revealed that as many as 2.5 million Energy Performance Certificates (EPCs) are likely to be inaccurate.

13 Feb 2019

LandlordZONE

Staggering inaccuracies in EPCs undermine net zero efforts – LandlordZONE

The Government puts its faith in EPC ratings to measure property energy usage in order to drive up energy efficiency in properties towards...

1 month ago

The Times

It's time to reform EPCs so they are accurate and useful

Baby, it's cold outside (and in). Most of us have been drawing the curtains, pulling the draught excluder across the door and putting on an...

22 Jan 2023

Climate Change Committee

The UK's independent adviser on tackling climate change

Lee Rowley MP
Parliamentary Under Secretary of State
Department for Levelling Up, Housing & Communities
2 Marsham Street
London, SW1P 4DF
Sent by email

Climate Change Committee
1 Victoria Street,
Westminster, London,
SW1H 0ET
w theccc.org.uk

Date 2 February 2023
Ref 230202-LD-LR

Reform of domestic EPC rating metrics to support delivery of Net Zero

Dear Lee,

Climate Change Committee

The UK's independent adviser on tackling climate change

Lee Rowley MP
Parliamentary Under Secretary of State
Department for Levelling Up, Housing & Communities
2 Marsham Street
London, SW1P 4DF
Sent by email

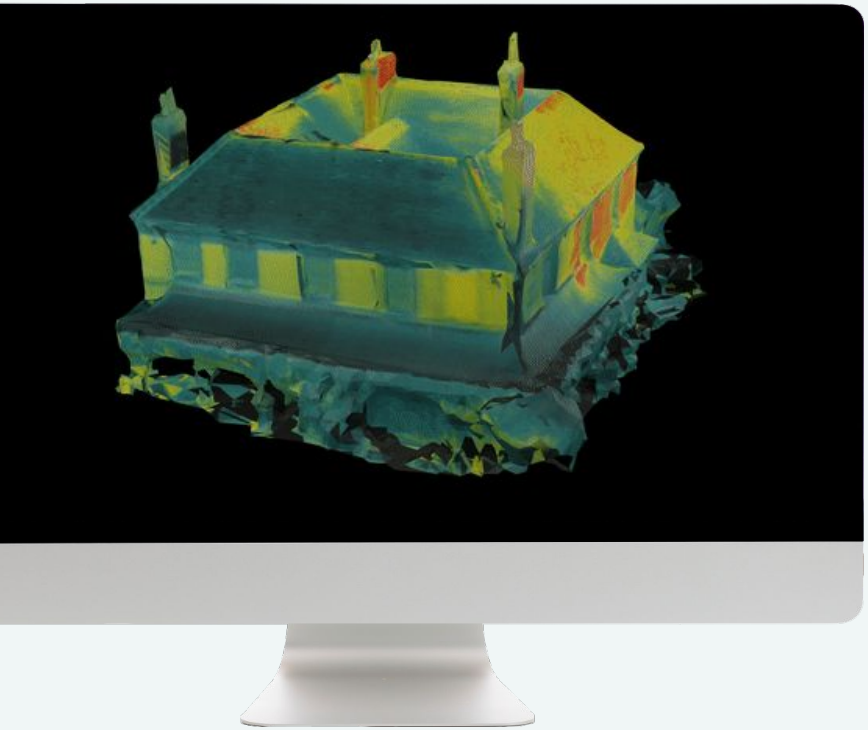
Climate Change Committee
1 Victoria Street,
Westminster, London,
SW1H 0ET
w theccc.org.uk

Date 2 February 2023
Ref 230202-LD-LR

Reform of domestic EPC rating metrics to support delivery of Net Zero

Dear Lee,

How can retrofit's data problem be solved?



Kestrix uses **mass-thermal image capture** and **AI** to show exactly how heat leaks from buildings – so that building retrofit can be planned and validated at scale.

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#1

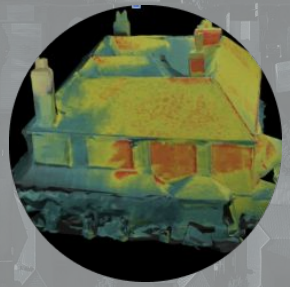
VANTAGE UAV

HEROTECH8 OPEN AIR

Nationwide Drones

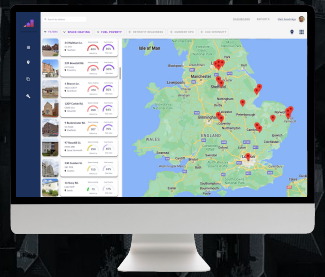
Drone & car network scans for heat loss data at scale

#2



Kestrix's AI extracts building energy performance insights

#3



SaaS dashboard streamlines retrofit planning and verification

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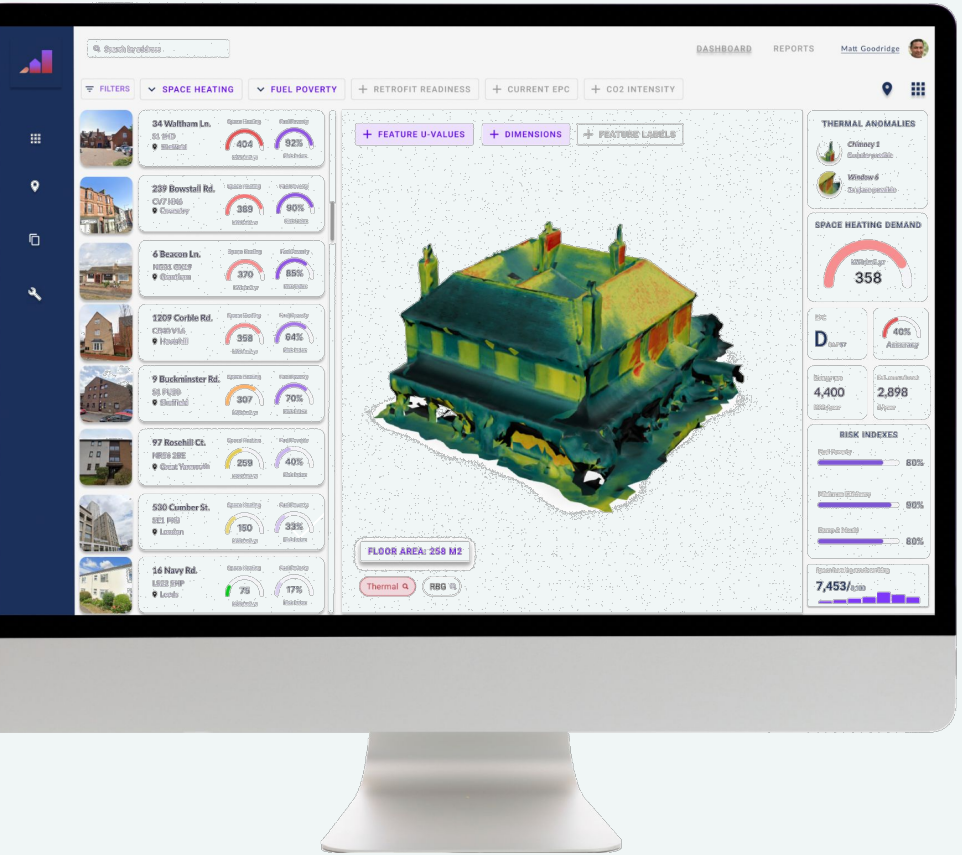
How it works



Local governments and asset owners can understand…

- **Which** assets leak most?
- Where **are the leaks exactly?**
- What can be done to improve assets?
- How much it will cost?

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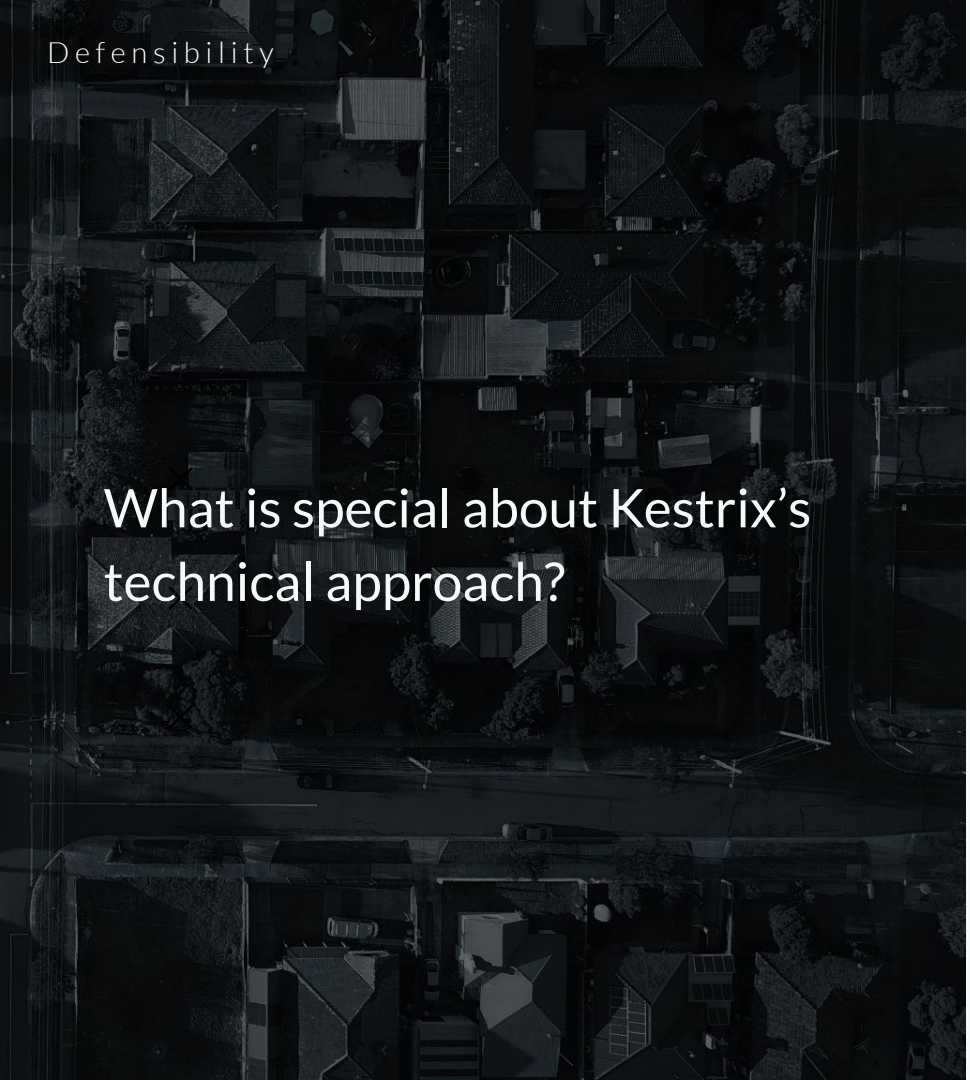

What is special about Kestrix's technical approach?

Kestrix is the first to apply machine learning to both thermal and visible spectrum images to:

- **Extract property surface temperature** via surface emissivity determination
- **Detect and categorise thermal bridging** and failed insulation.
- **Predict building component U-values** through exterior measurements.

Together, this enables est. **space heating demand intensity (kWh/m^2.yr),** without interior temperature.

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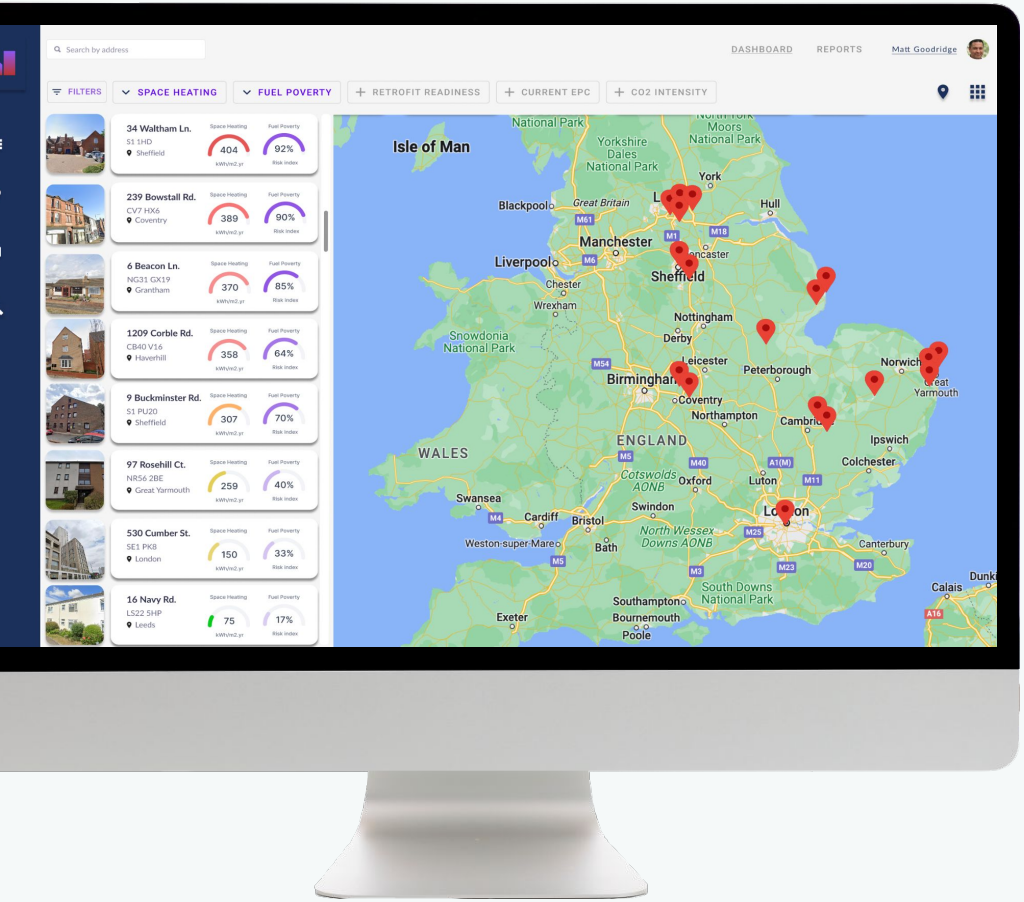

CLARION HOUSING

UK's largest social housing provider with 140,000 dwellings

How is Kestrix helping its first customer?

- ✓ 20 buildings scanned
- ✓ 2D images → 3D models
- ✓ Thermal anomalies identified/grouped
- ✓ Retrofit priority ranking established

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How it works

Prioritize where insulation is most needed

Undertake **heat pump feasibility** assessments

Track a municipalities' **net zero progress**

Validate insulation has been installed right

Price a retrofit project per asset or scheme

Visually engage stakeholders on the journey

Make a case for **external (e.g. grant) financing**

Claim **CO2e reductions**

Image: MIT (Long Phan & Sanjay Sharma)

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What other sorts of traction is Kestrix seeing?

$300k grant won in consortium with SHP and contractor

$150k equity financing from top climate accelerator

Letter of support signed from 140B+ revenues big-6 utility


#GetRetroFIT with KESTRIX™
KESTRIX™

Thank you

Contact

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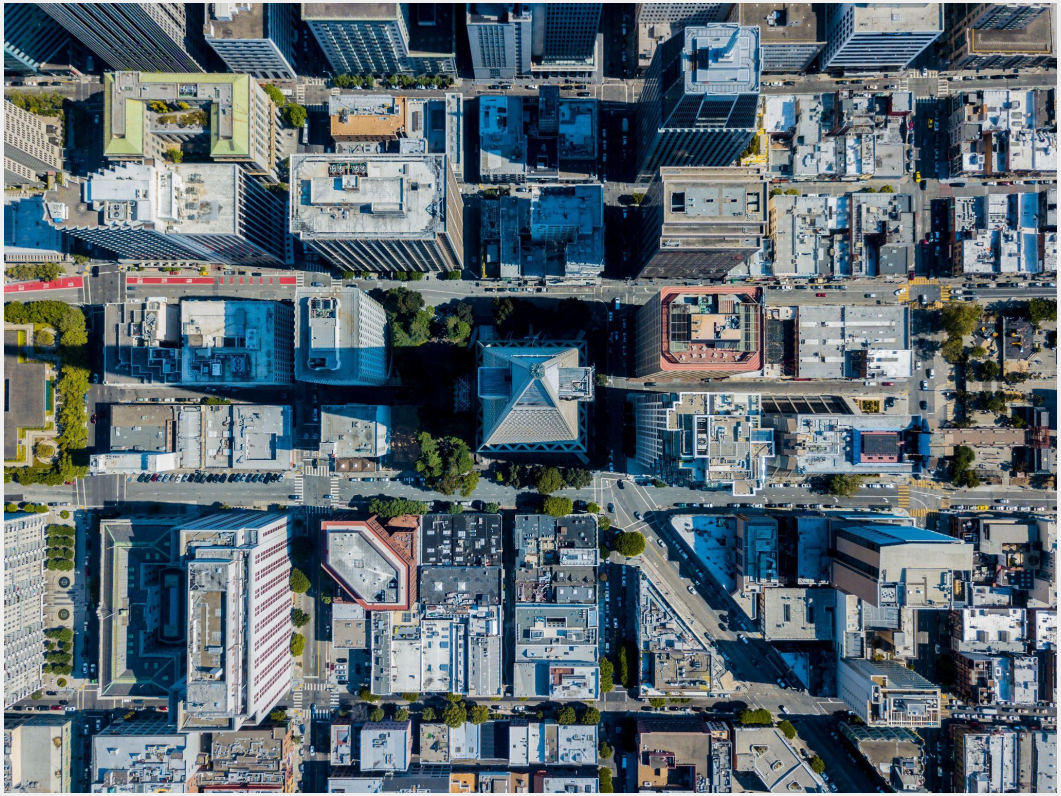
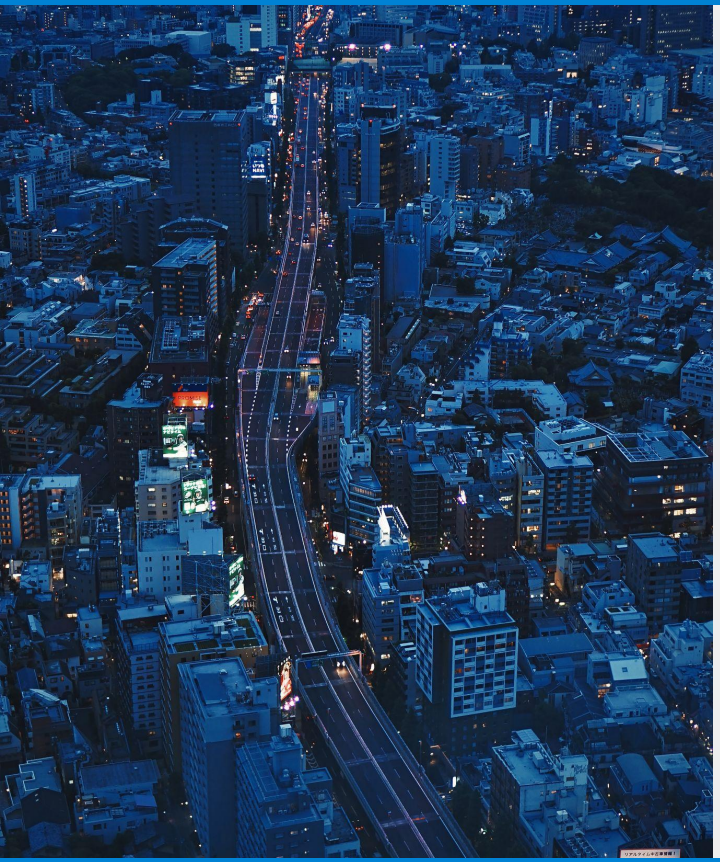
Thank you!



Q&A



Appendix

What BlocMaps needs from city, state or utility partners

We have a flexible and iterative data collection and analysis approach

City or State Requests

Utility Requests

HOMES AND BUILDINGS DATA

Common Sources: Municipal Department of Buildings, Tax Assessor

LOCAL COST AND INCENTIVES DATA

Common Sources: Energy Efficiency Studies, Benchmarking Reports, Audit Reports

ENERGY CONSUMPTION DATA

Common Sources: Electric, Gas, Oil Utilities

HOW BLOCPOWER APPLIES DATA

- Fills in gaps through modeling or procurement
- Runs predictive models to estimate impacts and effectiveness
- Continually refines and validates models

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Sample Requested Data from Municipal & State Partners

Data Points	Example (Sample Data)
Address	1216 Ella St, San Luis Obispo, CA 93401
Zip Code	93401
Building Class	Multifamily Family
Landmark Status	No
Total Building Floor Area (sq.ft)	6,500
Number Of Floors	4
Residential Units	8
Total Units	8
Year Built	1965
Heating System Type	Steam
Space Heating Fuel Type	Fuel Oil #2
Energy.Yr/Mmbtu (kBtu/sq.ft)	42
Median Rent	$2,500
Building Code Violations	3 / By number of records for each category (building maintenance, HVAC, DHW system)
Energy Performance Benchmarking Dataset or Previous Energy Efficiency Reports	Dataset or Report (Could come from utility or 3rd party)
Zoning	R-10
Owner Occupied	Yes or No
Any known lead, asbestos, mold presence	Lead and Asbestos
Year Altered 1	1985
Roof Type	Flat

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Sample Requested Data from Utility Partners

Data Points	Example (Sample Data)
Address	1216 Ella St, San Luis Obispo, CA 93401
Electricity Consumption (Kwh) per year	18,000
Peak Demand (Kw)	32
Elec Costs/ Yr ($)	$4,800
Gas Consumption (Therms/CCF) per year	3,200
Gas Costs/ Yr ($)	$3,000
Oil Consumption (Gallons) per year	2,000
Oil Costs/ Yr ($)	10,000

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