Climate Mobilization Act Series: All-Electric NYC Buildings

Join us for a discussion of New York City’s latest advancements towards decarbonization, mandating all-electric new construction buildings, how these changes fold into state-level initiatives and building compliance pathways, and the implications of this leap in the city’s decarbonization efforts for environmental justice, indoor air quality, and public health.

Opening Remarks
Emily Dean, Director of Housing Decarbonization, NYSERDA

Moderator
Sara Neff, Head of ESG, Lendlease

Speakers
Jared Della Valle, Chief Executive Officer, Founder, Alloy Development
Amie Gross, President, Amie Gross Architects
Benjamin Rodney, Vice President of Construction, Hines

April 5, 2022 | 12 to 1:30 pm | 1.5 AIA LU|HSW
Building Energy Exchange | be-exchange.org
Alloy

100 FLATBUSH
Alloy

- Mixed Income Rental+Condo: 580,000 GSF
- Market Rate Rental: 250,000 GSF
- Commercial & Retail: 150,000 GSF
- School: 150,000 GSF
- Commercial & Retail: 70,000 GSF
Alloy

1275-foot evacuation zone of 350 psi, 30-inch Metropolitan Natural Gas Reliability pipeline

- Greenpoint Depot
- "Metropolitan Natural Gas Reliability Project" pipeline, Bushwick, Brooklyn, NY

Census data
Population per census block within evacuation zone:
- 0 - 190
- 191 - 250
- 251 - 500
- 501 - 1000
- > 1000

Within evacuation zone:
- Population: ~179,000
- Daycare facilities: 81
- K-12 public schools: 55
- Health care centers: 9
- Private schools: 8
- Home health service: 1
- Medical centers: 1
- Nursing homes: 3
Alloy
100 Flatbush is 100% all-electric with no gas connection.
Decarbonization
Using Density to Reduce CO2

Image courtesy Thorton Thomasetti
To keep to 1.5°C

CO2 emissions would have to decline by **45%** before **2030**

Renewable energy will need to supply **70-80%** of power by **2050**.
Alloy

100% Renewable Energy Source Capable

No Gas Utilities; No Gas Leaks
Combustion-Free Homes

No Parking

High-Efficiency Electric Boiler
Building-Wide Energy Recovery

Induction Cooktops
Heat Pump Dryers

NYC LL.97 2024 & 2030 Compliant
NYS 2040 CPA Compliant
Today gas is 37% less CO2 intensive than grid electricity*

100 Flatbush is already 20% cleaner per btu of heat delivered to a space

By 2030, NYC and NY States grids will be interconnected and electric will be 200% cleaner than gas

Image courtesy Thorton Thomasetti
Alloy

Alloy is investing an additional $7MM to achieve carbon neutrality.
## Costs To Pursue Carbon Neutral Performance

### HARD COSTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Electrical Vault</td>
<td>$500,000</td>
</tr>
<tr>
<td>Increased Switchgear Capacity</td>
<td>$300,000</td>
</tr>
<tr>
<td>Electric Boiler Premium</td>
<td>$300,000</td>
</tr>
<tr>
<td>Facades Premium</td>
<td>$2,200,000</td>
</tr>
<tr>
<td>ERV Premium</td>
<td>$800,000</td>
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<td>Lighting Control Premium</td>
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<tr>
<td>Induction Cooktop Premium</td>
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Total HARD COSTS: $4,700,000

### SOFT COSTS

<table>
<thead>
<tr>
<th>Description</th>
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<tr>
<td>Architectural</td>
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<tr>
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<tr>
<td>Commissioning</td>
<td>$50,000</td>
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Total SOFT COSTS: $1,050,000
## Unique Operating Costs to Pursue Carbon Neutral Performance

<table>
<thead>
<tr>
<th>Year</th>
<th>Hybrid Gas &amp; Electric Utility Expenses</th>
<th>All-Electric Utility Expenses</th>
<th>All-Electric Premium</th>
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<tbody>
<tr>
<td>2024</td>
<td>$389,000</td>
<td>$502,000</td>
<td>$114,000</td>
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<td>2025</td>
<td>418,000</td>
<td>540,000</td>
<td>122,000</td>
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<tr>
<td>2026</td>
<td>449,000</td>
<td>550,000</td>
<td>131,000</td>
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<td>2027</td>
<td>483,000</td>
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<tr>
<td>2028</td>
<td>519,000</td>
<td>670,000</td>
<td>151,000</td>
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<tr>
<td>2029</td>
<td>558,000</td>
<td>721,000</td>
<td>163,000</td>
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<tr>
<td>2030</td>
<td>600,000</td>
<td>776,000</td>
<td>175,000</td>
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<tr>
<td>2031</td>
<td>645,000</td>
<td>833,000</td>
<td>188,000</td>
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<tr>
<td>2032</td>
<td>693,000</td>
<td>896,000</td>
<td>202,000</td>
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<tr>
<td>2033</td>
<td>745,000</td>
<td>962,000</td>
<td>217,000</td>
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<tr>
<td>2034</td>
<td>801,000</td>
<td>1,034,000</td>
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<td>2035</td>
<td>861,000</td>
<td>1,112,000</td>
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**10 Year NPV: $4,759,000 $5,146,000 $1,387,000**
Investing $5.8MM up front to lose $1.4MM per year makes no sense.
## Costs To Pursue Carbon Neutral Performance

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Increased Electrical Vault</td>
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<td>Increased Steam/air Capacity</td>
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<td>Electric Boiler Premium</td>
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<td>Paradox Premium</td>
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<td>ARV Premium</td>
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<td>Lighting Control Premium</td>
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<td>Induction Cooking Premium</td>
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<tr>
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<tr>
<td>Energy Modeling</td>
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<tr>
<td></td>
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</table>

**True Up Front Cost of Carbon Neutral Performance**

$1,600,000
### Unique Operating Costs to Pursue Carbon Neutral Performance

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<thead>
<tr>
<th>Year</th>
<th>Hybrid Gas &amp; Electric Utility Expenses</th>
<th>All-Electric Utility Expenses</th>
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<td>$620,000</td>
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<td>2008</td>
<td>$519,000</td>
<td>$720,000</td>
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<td>2009</td>
<td>$558,000</td>
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<td>2015</td>
<td>$851,000</td>
<td>$1,110,000</td>
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10 Year NPV: $4,750,000

### Operating Costs inclusive of LL97 Incentives*

<table>
<thead>
<tr>
<th>Year</th>
<th>All-Electric Utility Expenses</th>
<th>LL97 Incentive Credit (Inclusive of Incentive)</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>2004</td>
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<tr>
<td>2012</td>
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<tr>
<td>2014</td>
<td>$874,000</td>
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<tr>
<td></td>
<td>$5,910,000</td>
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$943,000

*Key Assumptions*

Utility rates escalate 2X faster for gas than electric.

2030 LL97 Greenhouse Gas Coefficient (the 'Source to Site' factor) reflects a 15% carbon efficiency improvement in the grid per year.
Investing $1.6MM up front to save $900M per year makes sense.
Alloy

“Sustainable, inclusive residences are the future of New York City, and we are proud to invest in the Alloy Block’s all-electric, mixed-income, mixed-use tower that will become the new model for environmentally-conscious urban living.”

- Alfred Trivilino, Managing Director, Related Fund Management

“This project underscores Ares’ commitment to corporate sustainability by investing in public-private partnership opportunities that generate positive environmental and social impact. We are excited to be part of this great project as we work to realize the important benefits for all stakeholders involved.”

- Andrew Holm, Partner in the Ares Real Estate Group
ROOF PHOTOVOLTAIC PLAN

VRF HEAT PUMPS

ERV

DOMESTIC HOT WATER HEAT PUMPS

ERV

VRF HEAT PUMPS

EM GENERATOR

ERV

ERV

DOMESTIC HOT WATER STORAGE TANKS
EAST-WEST BUILDING SECTION

PROPERTY LINE

LOCUST HILL AVE (WEST)

LINE OF APPROXIMATE EXISTING GRADE

177'-11"
61'-3"
28'-0" (+/-)
90'-0" (+/-)
72'-0" (+/-)

NEW YORK STATE OF OPPORTUNITY. NYSERDA

WESTHAB
SECTION DETAILS

EXTERIOR WALL SECTION

OSB SHEATHING (FRT)
R-23 MINERAL WOOL BATT INSULATION
R-17ci MINERAL WOOL BOARD INSULATION
2X6 WOOD STUDS (FRT AT EXTERIOR WALL)
PLYWOOD SUBFLOORS (FRT AT EXTERIOR WALL)
PRE-ENGINEERED WOOD TRUSS

STEEL BRACKET TO OFFSET RELIEVING ANGLE
L4X4 CLIP ANGLE

THERMAL VENEER TIE / INSULATION FASTENER
OFFSET RELIEVING ANGLES
CONTINUOUS EXTERIOR INSULATION

NEW YORK STATE OF OPPORTUNITY
NYSERDA

WESTHAB
April 5, 2022

Hudson Square
Sustainable Development

Climate Mobilization Act Series: All Electric NYC Buildings

Building Energy Exchange
How do we marry a new development up to an existing 1930’s building?

555 Greenwich New Development

345 Features

345 Hudson | 900k SF | 17 Floors | 1930’s Vintage

All Electric

Floor Level Packaged Units

Steam Heating

Natural Gas Boilers
THE CLIMATE PROBLEM STATEMENT

Follow the science and bend the curve, the science is ever increasing in certainty

Global CO₂ Pathways

Sources: Data from Climate Action Tracker, data as of April 2021
Real estate has one of the highest global footprints alongside transportation, oil and gas.

- **73%** of Global GHG is from Energy
- **38%** of total Energy is from Real Estate
- Real Estate is responsible for as much as **66%+** of total GHG in Center Business Districts (NYC Data)

Sources: Our World in Data, World Green Building Council, Global Status Report 2017, NYC 2017 GHG Emissions Inventory
WASTED ENERGY

Indicative of other parts of the world, US Energy waste is as high as 67%.

Estimated U.S. Energy Consumption in 2019: 100.2 Quads

67% Wasted

33% Utilized

Sources: Lawrence Livermore National Laboratory and the Department of Energy

Circular System

Reduce Need
Maximize Energy
Reduce Waste
Increase grid availability

Potentially reduce or delay new infrastructure required
GLOBAL COLLABORATION

Without global collaboration we will fall short of our goals by 40 years. Hines has taken a position to collaborate with sustainability leaders in the industry to pave the path forward for real estate.

GLOBAL ENERGY-RELATED CO$_2$ EMISSIONS

Sources: IEA, Net Zero by 2050, July 2021
- Iterative approach
- Started with developing a new building. Connection to 345 Hudson came later
- Existing constraints helped drive solutions and open doors to different ideas
SECTOR COLLABORATION

We must also collaborate across sectors in a triple helix model

Partner to create a decarbonization playbook of existing buildings

Leverage Center for the Built Environment to implement low carbon building solutions

Perform transition risk analysis and underwriting for green vs brown assets
HSP DECARBONIZATION PLAN

Process for decarbonization of new and existing assets

- Decarb Research: Global Decarbonization Research
- Playbook: Existing Building Decarbonization
- Strategic Partners: Micro-Occupancy Control
- Progressive Tech: Best in class Technology Research
- EBC Implementation: Climate Neutrality 2032

- 45%+ \( \downarrow \) CO₂ 2030
- 40% \( \downarrow \) Code
- Tenant Electrical Usage
- Cutting Edge: 71% \( \downarrow \) 2010 EUI
- LMI Offsets
555 GREENWICH STREET, NYC

A low carbon approach can deliver strong financial returns

Existing constraints helped drive the ultimate solutions

ELECTRIFICATION

GEOTHERMAL PILES

DOAS VENTILATION SYSTEM

THERMALLY ACTIVE BUILDING

Up to 6x more efficient

25% reduction in electrical consumption

25% to 40% of heating + cooling

Better indoor air quality

No fossil fuels burning / air pollution at site

16% greater thermal comfort

16% carbon reduction from NYC 2030 targets

1.2% additional hard cost

$3m reduced OPEX (15 years)

IRR on additional investment: 15.4%

*Past performance does not guarantee future results. There is no guarantee future projects will achieve the same sustainability results.*
A circular systems approach, keep the waste energy within the building

- **Heat Pump**
- **Dry Cooler**
- **Geothermal Long-Term Storage**
- **Air-Air Energy Recovery**
- **Radiant Short-Term Storage**

**Energy Source**
- Hot Water
- Chilled Water
- Same

**Energy Transport**
- Maximize energy recycling
345 HUDSON CIRCULAR SYSTEM APPROACH

Electrify heating, eliminate economizer and move to hydronic based systems

Energy Arbitrage Loop

Remove fossil fuels and steam distribution and use the natural diversity and thermal storage within a building
Eliminating fossil fuels immediately reduces demand, by moving towards hydronic based systems we can reduce heating and cooling energy by 60% – 80%.

HEATING ENERGY REDUCTION
- Existing Building: 71%
- Heat Pump + AHU (All Air): 84%

COOLING ENERGY REDUCTION
- Existing Building: 30%
- Heat Pump + DOAS (Hydronic Based): 65%

COOLING LOAD REDUCTION
- Existing Building: 14%
- Heat Pump + DOAS (Hydronic Based): 69%

SYSTEM EFFICIENCY
- Existing Building: 300-400%
- Heat Pump + DOAS (Hydronic Based): 500-600%

345 HUDSON SYSTEM BOUNDARIES

Electrify heating, eliminate economizer and move to hydronic based systems.
345 Deployment Plan

NOT EVERYTHING MUST BE DONE AT ONCE. COMPLETE IN NATURAL PROGRESSION OF TENANT TURNOVER

THE DEPLOYMENT PLAN
SYSTEM BOUNDARIES
CURRENT BUILDING ENERGY INFRASTRUCTURE

In order to devise our solution, we have divided the energy system of the building into three distinct ‘system boundaries’ (SB), based on how an investment is generally deployed, and how it is operated and maintained.

This approach also supports calculations of emissions for each stakeholder and allows each stakeholder to understand their impact transparently. Our system boundary approach makes our solution comprehensible for rapid replication and scaling.

System Boundary 1 (SB1):
This includes the energy distribution to the space which is fully under tenant control. The landlord will incentivize this initiative through initial investments designed to meet tenants' needs. Examples of typical equipment in this boundary include radiators, radiant panels, Variable Air Volume (VAV) boxes, Fan Coil Units (FCUs), chilled beams, etc.

System Boundary 2 (SB2):
This includes the equipment which supplies energy to the tenant space (SB1). It is comprised of equipment on each floor and is supported by the building infrastructure. SB2 is commonly supplied & installed by the landlord. Examples of typical equipment in this boundary include Packaged Terminal Air Conditioner (PTAC), Air Handling Units (AHUs), Dedicated Outdoor Air System (DOAS), Hot water boiler, etc.

System Boundary 3 (SB3):
This is the building infrastructure, which is the backbone of the entire energy supply. This is included in core & shell developments and fully under the landlord’s control. Examples of typical equipment in this boundary include water cooled chillers, cooling towers, boiler plants, electrical substations, primary AHU, etc.
POTENTIAL TENANT OPTIONS IN PORTFOLIO

**SB1 TENANT MENU 1**
- **Ventilation**
  - 100% fresh air, up to 40% increase than standard.

**SB1 TENANT MENU 2**
- **Variable Airflow Ventilation**
  - VAV supplied via DOAS with high heat recovery efficiency to balance the loads and act as a booster to the radiant floor.

**SB1 TENANT MENU 3**
- **Ventilation**
  - 100% fresh air, up to 40% increase than standard.

**Activated Beams**
- Active beams that work with high temperature cooling.

**Activated Thermal Slab**
- Self-regulating radiant floor slab that is set at single temperature, uses the thermal mass and inertia to provide heating and cooling with minimal energy input.

**Likely Outcome for 345**
NYC Scientific Pathway Analysis

CLCPA Met
(Existing stranded 2042 on 1.5 degree. Electrification net zero 2050)

CLCPA 70%
(Existing stranded 2028 on 1.5 degree. Electrification stranded 2042)
Key Takeaways

- Maximizing each unit of energy before exporting to atmosphere will reduce the overall energy required.
- Entire building must be thought of as the ‘system’ (Thermally active structures).
- Repeatable, scalable, flexible and cost-effective solutions (especially for existing buildings) are critical.
- No one right answer to meet scientific targets.
- Carbon reduction and implementation roadmaps for existing buildings are critical. Implementation can take place over several years or decades but must be generally thought out at the start.
discuss.

Submit questions via Zoom Q+A

Moderator
Sara Neff, Head of ESG, Lendlease

Speakers
Jared Della Valle, Chief Executive Officer, Founder, Alloy Development
Amie Gross, President, Amie Gross Architects
Benjamin Rodney, Vice President of Construction, Hines
thank you.