Community Preservation Corporation

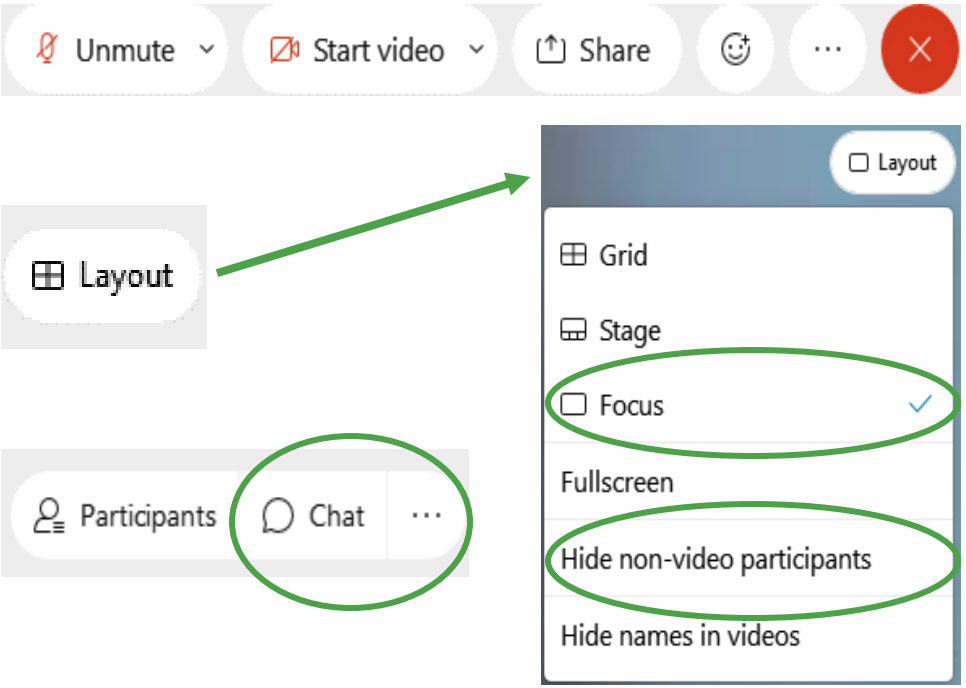
# Heat Pumps in Your Home:

## *Installation Dos and Don'ts to Improve Performance*

**July 10th, 2024**

# AUDIENCE BEST PRACTICES

- Please ensure your microphone is **muted**.
- **For best viewing results**: View should be set to Focus or Stage View for shared content with non-video attendees hidden. The Layout options will appear at the top right of your screen.
- **Questions** should be submitted through the Q&A box OR the chat function **to the event Hosts**. The chat icon is located at the bottom right corner of your screen.
- Presentation slides and contact information will be shared with all attendees following the event.



# TODAY'S AGENDA

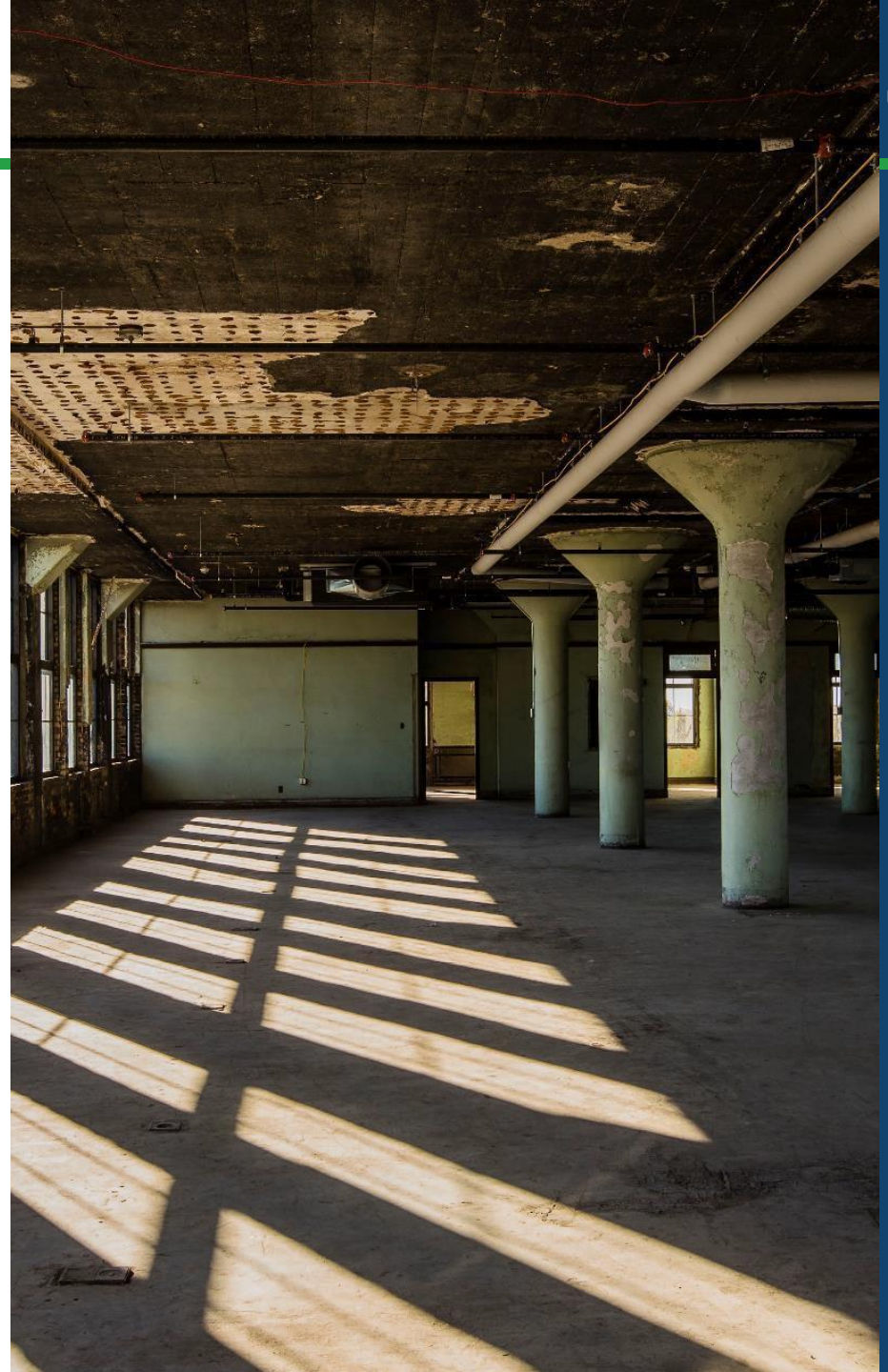
| | |
|---|---|
| **Welcome and Introduction** | **Danielle Donnelly and Izzy Nesci**, Assistant Vice President of Sustainability Programs and Sustainability Associate, Community Preservation Corporation |
| **Introduction to ASHPs, Market Transformation, Installation Challenges & Best Practices** | **Michele Connor**, Area Sales Manager, Mitsubishi Electric<br>**Grace Boueri,** Sales Development Associate, Mitsubishi Electric<br>**Mike Yarolin,** Owner, Thermodynamix |
| **Open Q&A** | |

# MISSION-DRIVEN SINCE 1974

**CPC believes** housing is central to transforming underserved neighborhoods into thriving and vibrant communities.

**CPC is a** nonprofit affordable housing and community revitalization finance company providing flexible capital solutions, fresh thinking and a collaborative approach to the complex issues facing communities.

**Our goal** is to be more than just a lender. At CPC, we work as a partner to provide technical expertise and hands-on support to help meet the capital needs and broader community revitalization goals of our customers, local stakeholders and the communities we serve.



**Adaptive Reuse**
500 Seneca Street
Buffalo, NY

# INVESTING IN OUR MISSION

**CPC believes** housing is central to transforming underserved neighborhoods into thriving communities. Today, CPC uses its unique expertise in housing finance and public policy to:

**Expand housing access** and seek new ways to lower the cost of producing affordable housing

**Invest in closing the racial wealth gap**, and increase diversity and equity in the development industry

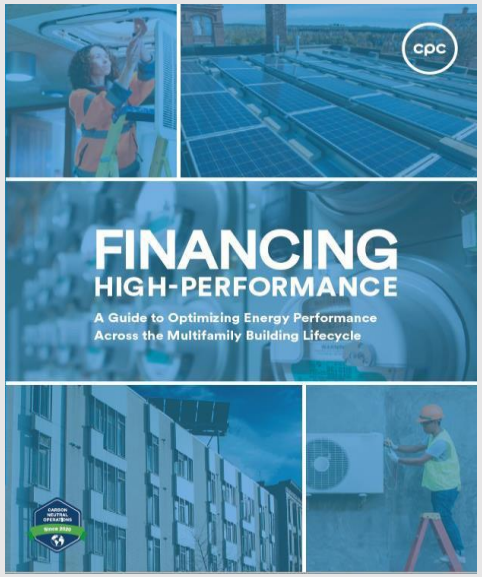
**Commit to and expand investment in the green economy** and lessen the impact of climate change

# CPC SUSTAINABILITY

## EDUCATION

Through its sustainability initiative, CPC has engaged partners, clients, and peers to provide important information about local and state policy, underwriting strategies, and financing opportunities for buildings incorporating energy efficiency.

CPC has conducted trainings and webinars to bring “underwriting savings” to a broader lending audience, published a white paper on Passive House performance, and convened a summit to address New York’s shift to a carbon neutral economy.




**Financing High-Performance Guide,** 2020

1

## CREATING CAPITAL SOLUTIONS

CPC pioneered the “underwriting savings” approach and cemented the methodology with the release of Underwriting Efficiency guide.

Following the creation of its sustainability initiative, CPC has continued to explore creative ways to finance energy efficiency and high-performance building measures and bring these practices to the forefront of affordable housing development.

**Capital Solutions for High-Performance Construction,** Troy, NY

2

## DATA & TRACKING

The backbone of CPC’s sustainability initiative is the impressive portfolio of loans that employ one or more Sustainability Criteria.

Tracking these loans, tagging the completed criteria, and benchmarking performance allow us to analyze long term performance and improve our lending practices.

Information from CPC’s sustainability portfolio has helped our private and public partners to innovate and inform policy decisions and state funded programs.

**Electric Metering from Financing High-Performance,** 2020

3

CARBON NEUTRAL OPERATIONS
Since 2020

# BUILDING PERFORMANCE WEBINAR SERIES

- Through our building performance webinar series, CPC provides important information about local and statepolicy, underwriting strategies, and financing opportunities for buildings incorporating energy efficiency


WEBINAR

**Electrifying Transit: Accessible EV Charging for Multifamily Renters and Owners**


WEBINAR

**Local Law 97 Compliance: Guidance for Regulated Buildings and Low-Lift Big Impact Measures to Reduce GHG Emissions**


WEBINAR

**Optimizing Energy Efficiency in Large Multifamily Buildings**


WEBINAR

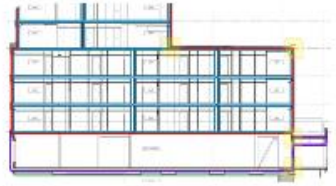
**Finding Opportunity in a High Interest Rate Environment**

WEBINAR

**Climate Friendly Homes Fund Info Session**


WEBINAR

**Sustainable Affordable Housing**



WEBINAR

**Webinar: Optimizing Building Envelopes and Ventilation**

WEBINAR

**Practical Solutions for Multifamily Building Decarbonization**

# MARKET TRANSFORMATION AND FINANCING OPPORTUNITIES

- The Inflation Reduction Act is one of the largest investments in the American economy, energy security, and climate in U.S history
- Encompassed within the IRA is the Greenhouse Gas Reduction Fund, a **first-of-its-kind $27 billion investment to mobilize financing and private capital to confront the climate crisis**
  - National Clean Investment Fund (NCIF)
  - Clean Communities Investment Accelerator (CCIA)
  - Solar for All
- The IRA also includes **clean energy tax credits** to incentivize investments in communities across the country
  - Home Electrification and Appliances Rebate Program (HEAR)
  - Electrification Rebates (formerly known as the High-Efficiency Electric Home Rebate Program (HEEHR))
  - 179D, 45L, 25D/25C

# SPECIAL INITIATIVES - CPC'S ROLE IN FINANCING DECARBONIZATION

- **Climate United's Greenhouse Gas Reduction Fund (GGRF) Award**
  - Climate United is a coalition formed by CPC, Calvert Impact, and Self-Help, to manage an award from the $14 billion National Clean Investment Fund. On April 4th, 2024, Climate United was awarded nearly $7B from the EPA.
  - Climate United's strategy focuses on demonstrating the benefits of the clean energy transition through investments in the program's three priority areas: **distributed power generation and storage, building decarbonization, and electric transportation.**
  - CPC has established CPC Climate Capital to lead the coalition's multifamily market strategy through the deployment of low-cost subordinate debt financing
- **Climate Friendly Homes Fund (CFHF)**
  - The CFHF, administered by CPC following a competitive Notice of Funding Availability (NOFA), provides financing for existing, 5-50 unit buildings in New York State (NYS) with a focus on replacing older and less energy-efficient systems with **all-electric, high-performance heating, cooling, and hot water heating systems**.
  - With **$250 million** in funding, CPC and NYS Homes and Community Renewal (HCR) aim to finance electrification retrofits in at least **10,000 units of multifamily housing that serve economically disadvantaged communities**.
  - Funds must be committed by **March 2027.**

# TODAY'S WEBINAR - ELECTRIFICATION & PROPER INSTALLATION

- **High-efficiency electric systems** have the potential to provide greater heating and cooling efficiency, cost savings, and GHG emissions reduction
- Heating during the winter and cooling during the summer
- Greater control and comfort to tenants of multifamily buildings
- Optimized performance through careful installation, commissioning, and M+V

Featured Speaker

# Michele Connor
# Mitsubishi Electric Trane US

Michele Connor | Area Sales Manager, Residential-NY Metro

Mitsubishi Electric Trane US (METUS)

July 10, 2024

MITSUBISHI ELECTRIC TRANE HVAC US

Featured Speaker

# Grace Boueri
# Mitsubishi Electric Trane US

Grace Boeri | Sales Development Associate

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MITSUBISHI ELECTRIC TRANE HVAC US

Featured Speaker

# Mike Yarolin
# Thermodynamix, LLC

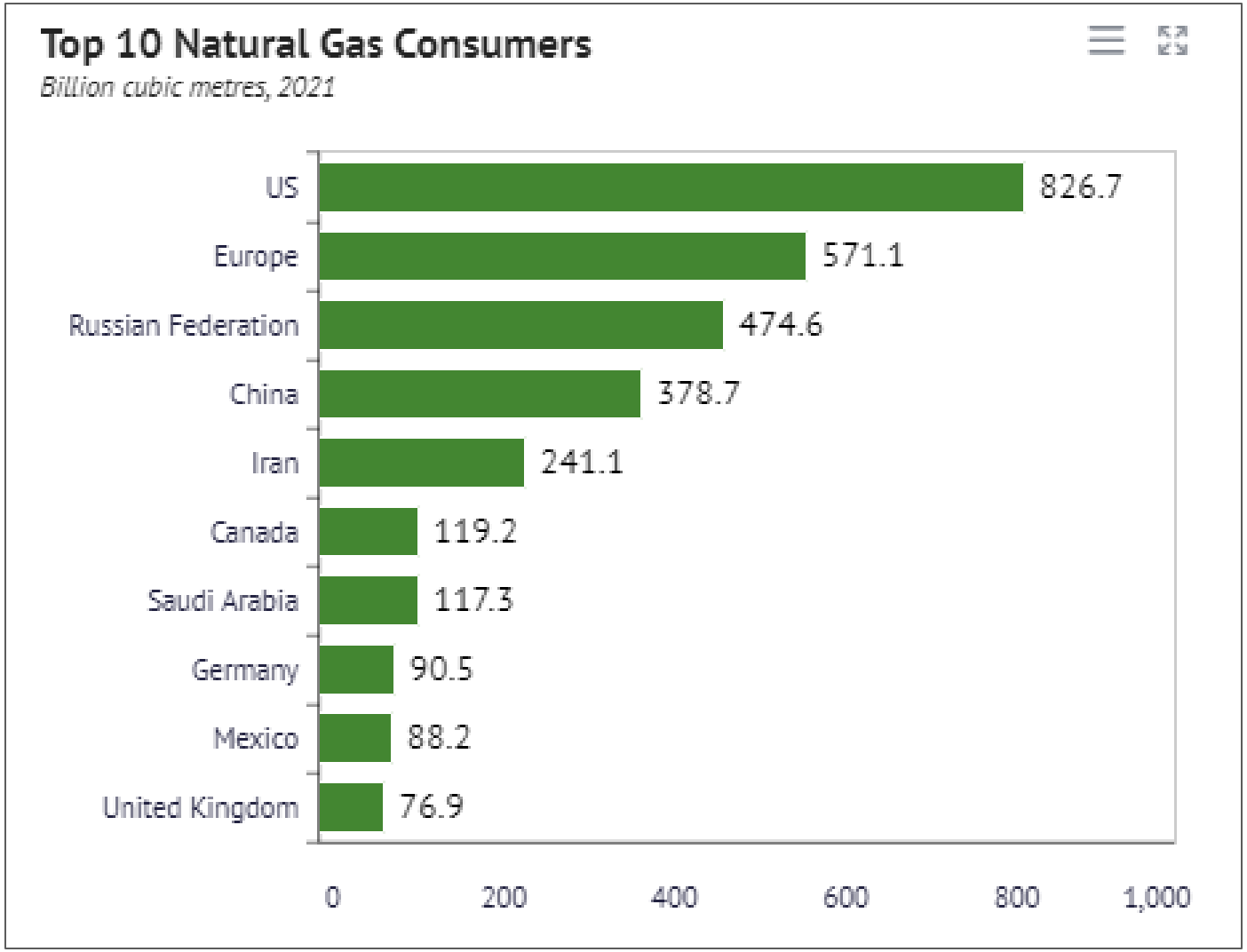
Michael Yarolin | Owner

Thermodynamix, LLC, Ossining, NY

# Market Transformation

# US Natural Gas Consumption

More than 50% of American Homes Rely on Fossil Fuels as their Primary Heating Source

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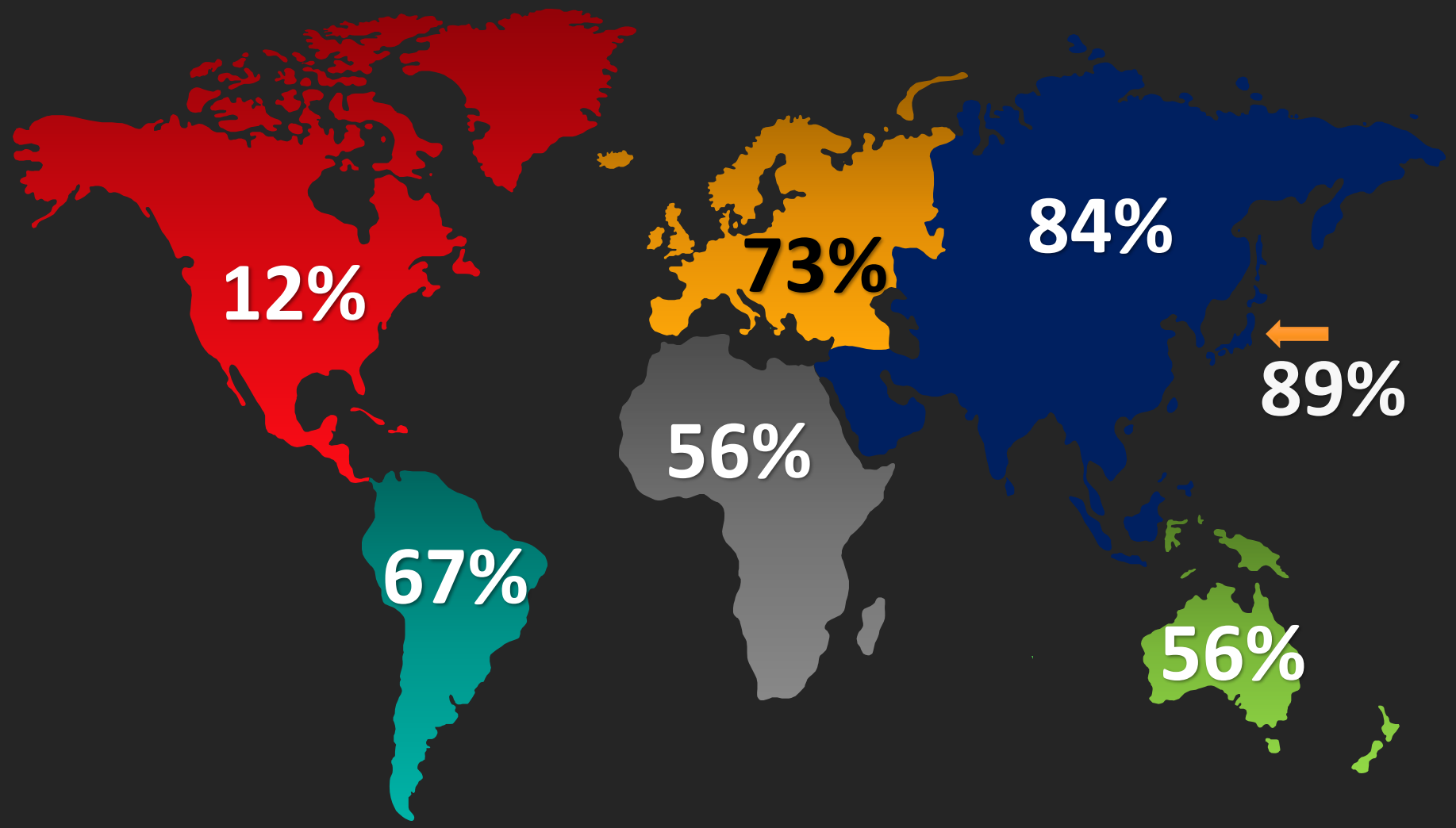
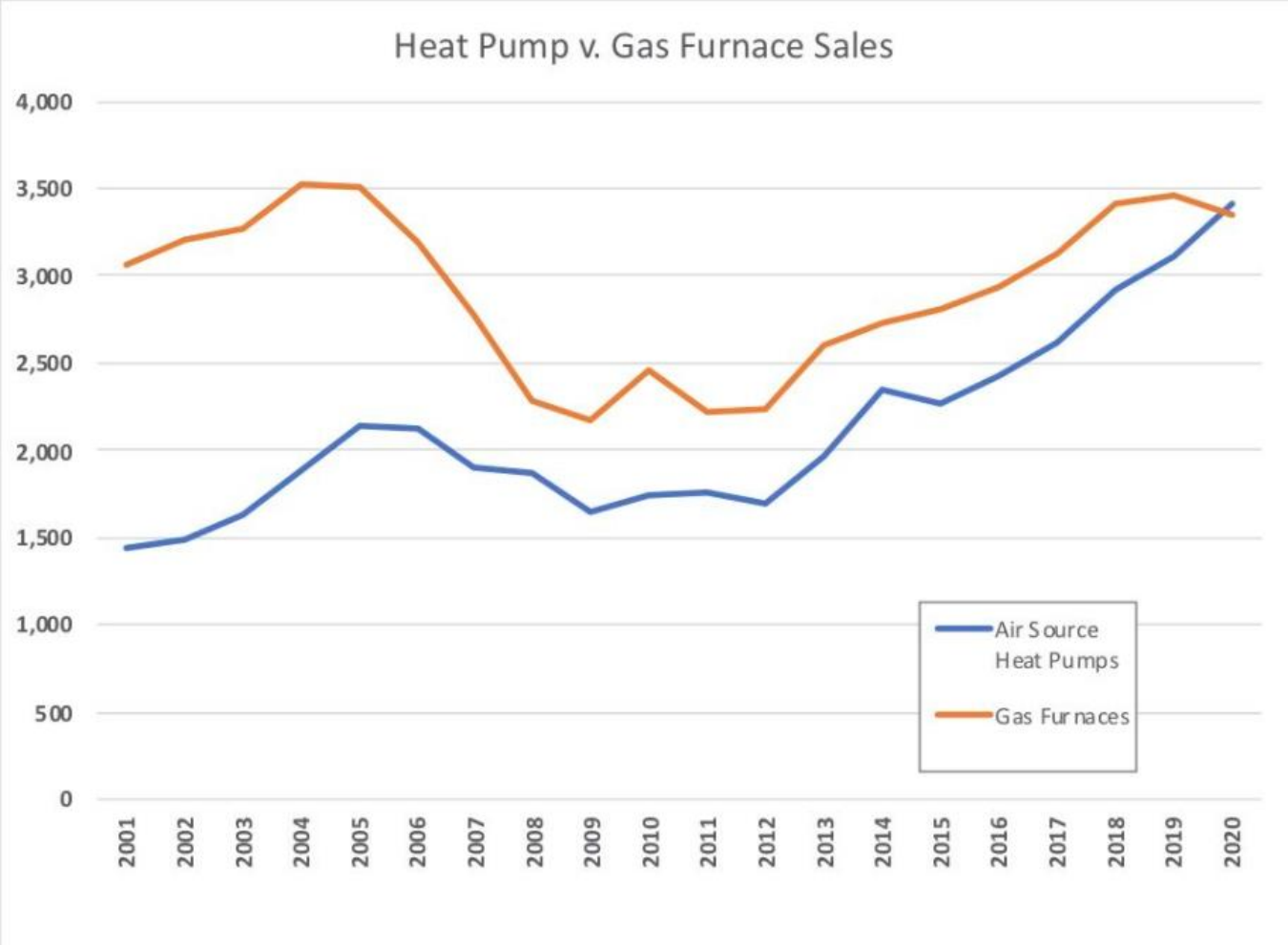
HEATING & AIR CONDITIONING

# Variable Speed Heat Pump Adoption-2017



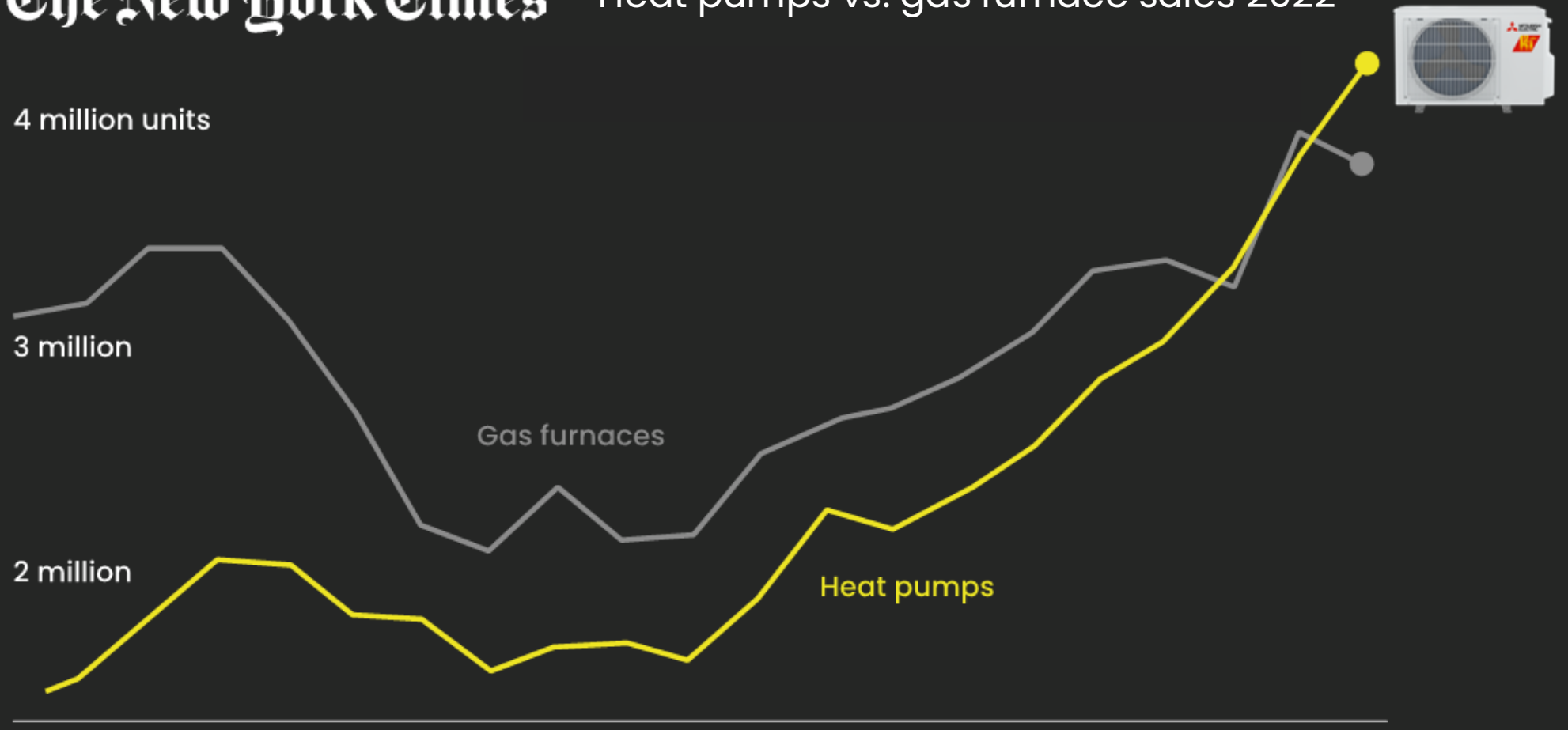
# 2020 Heat Pump v. Gas Furnace Sales



# HEAT PUMPS HAVE HIT THE MAINSTREAM

The New York Times

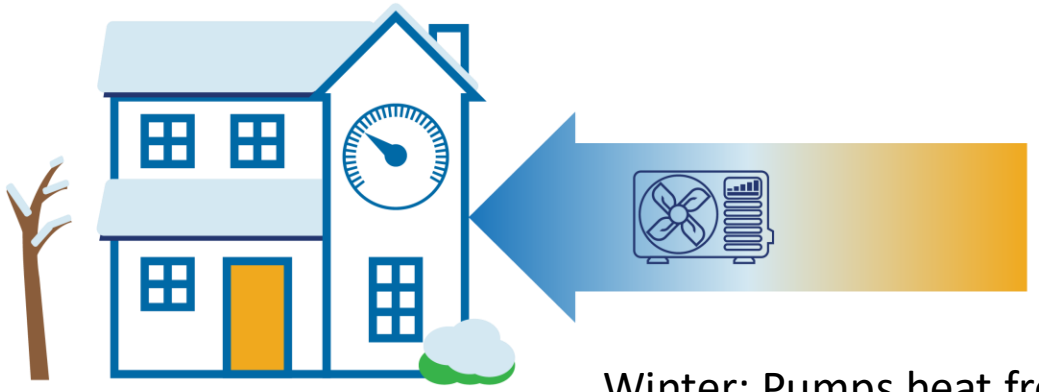
Heat pumps vs. gas furnace sales 2022




https://www.nytimes.com/interactive/2023/02/22/climate/heat-pumps-extreme-cold.html

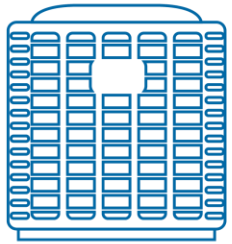
# What is a heat pump?

Summer: Pumps heat from the inside to the outside

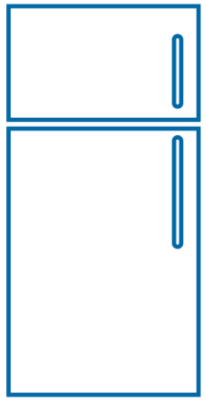


Winter: Pumps heat from the outside to the inside

Same technology as:



Air-conditioner



Refrigerator

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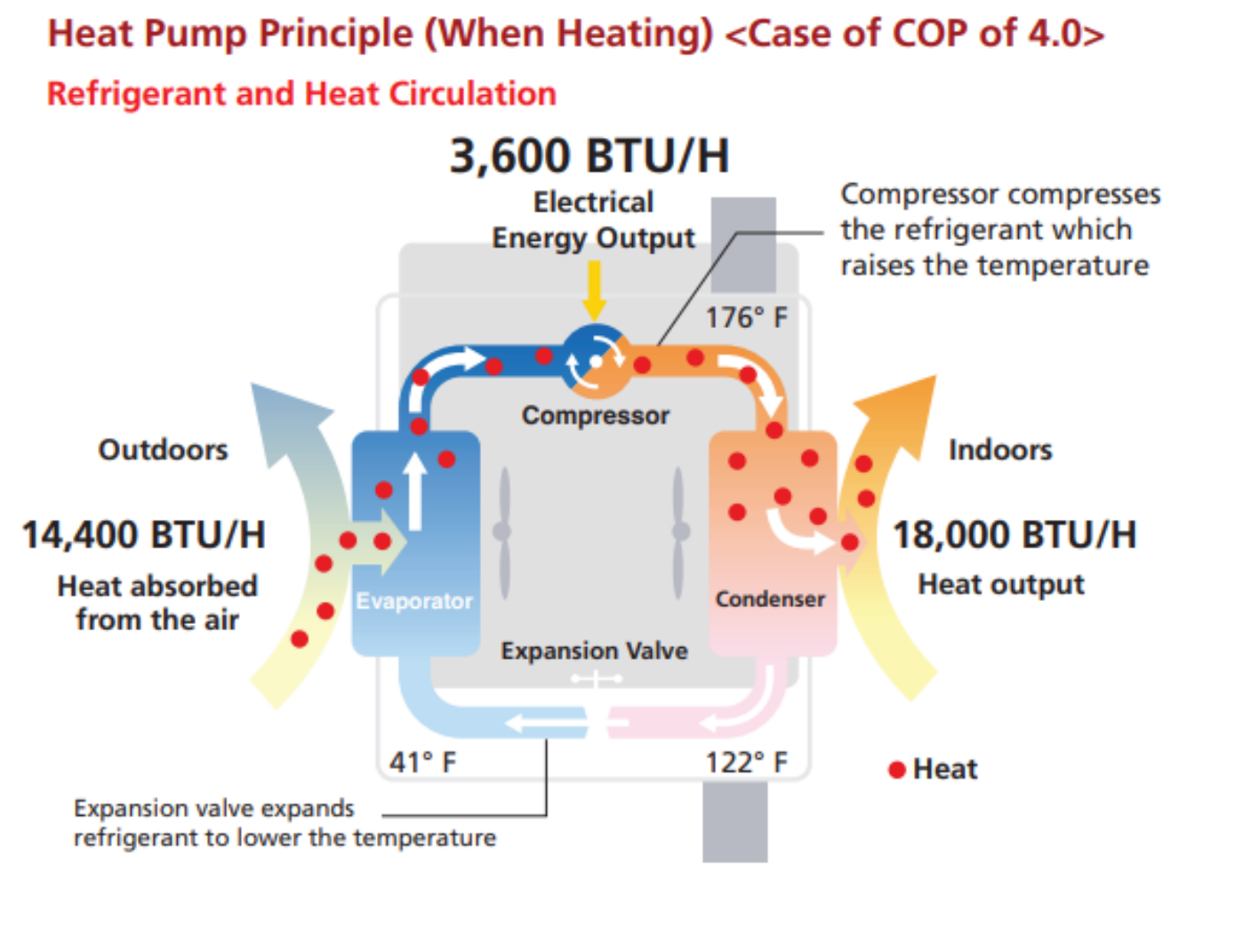
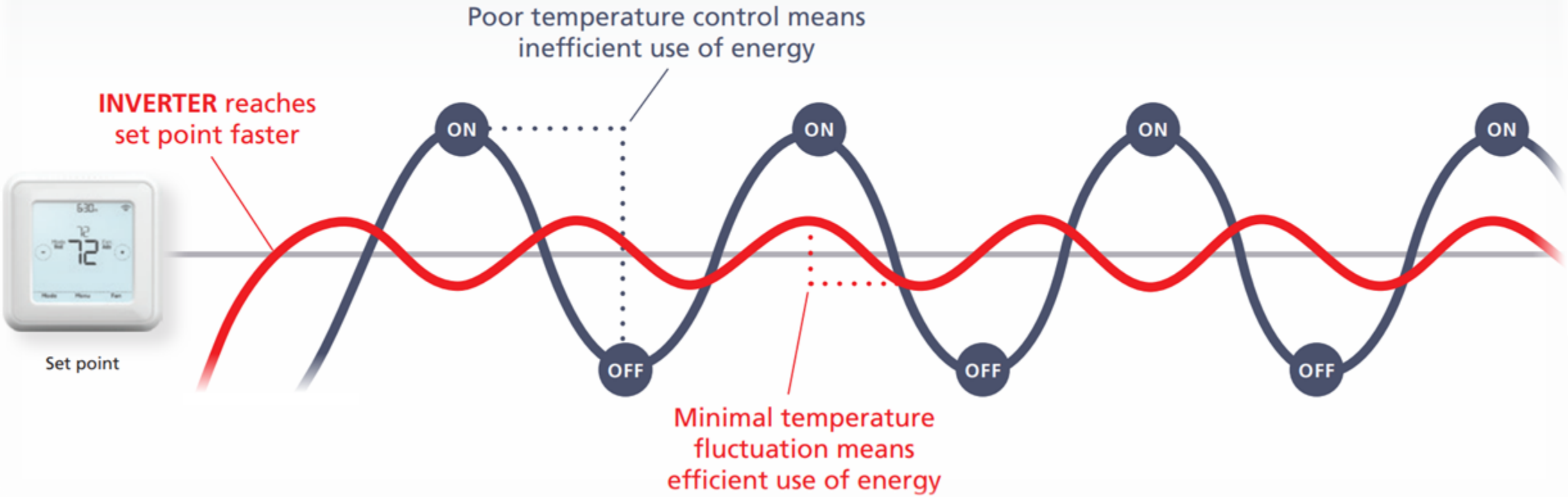
# Coefficient of Performance (COP)



# INVERTER vs. Conventional System Operation



# *Residential Products*

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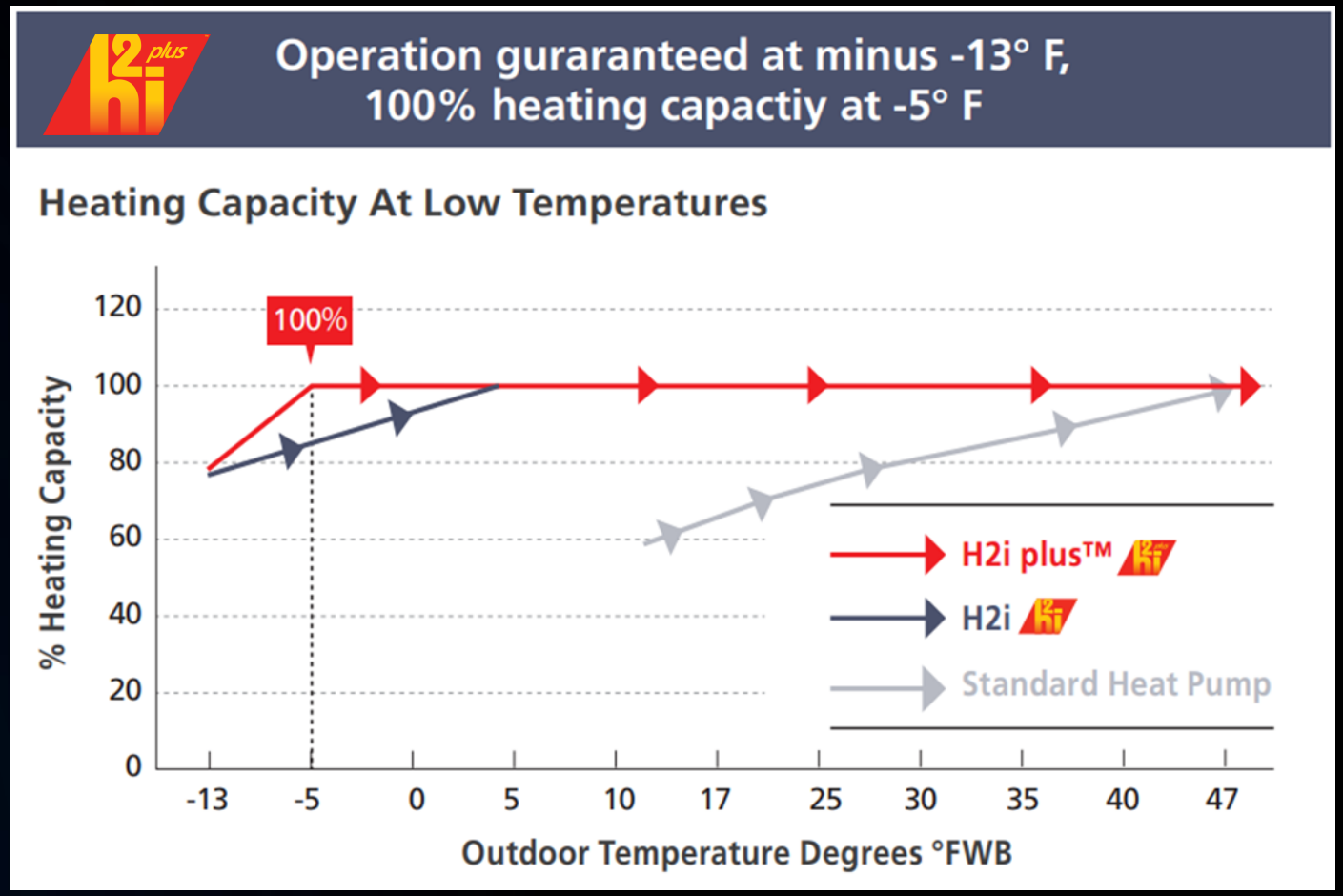
HEATING & AIR CONDITIONING

# Heat...and lots of it

- Our Hyper-Heating INVERTER® systems feature the most advanced heat pump technology for delivering exceptional heating performance
- Single-zone and multi-zone systems give you year-round comfort and control of one room to every room of the home.



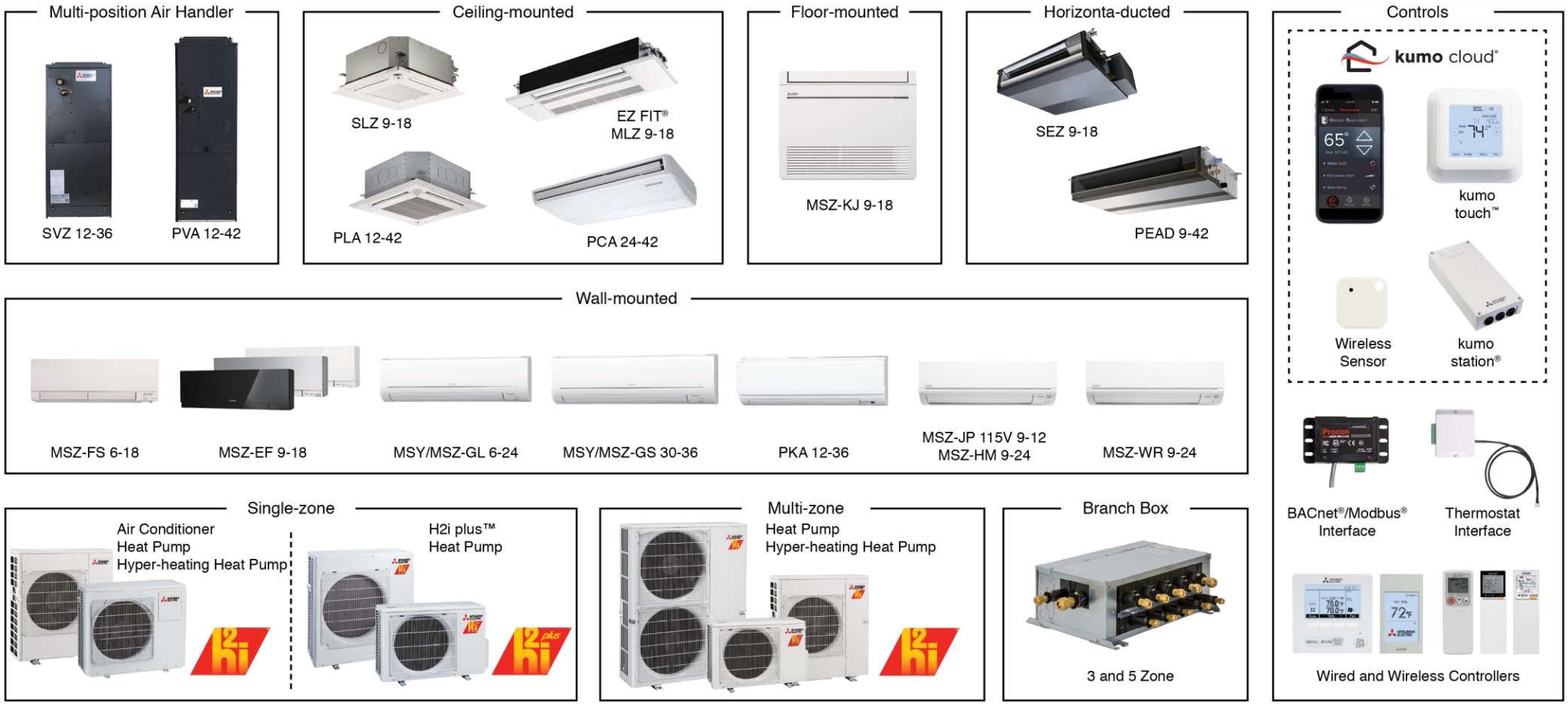
## Single Zone Applications

- ✓ Sunrooms
- ✓ Single Room Additions
- ✓ Bonus Rooms
- ✓ Garages
- ✓ Sheds
- ✓ Barns
- ✓ Problem Rooms
- ✓ Displace fossil fuel heating systems
- ✓ Supplemental Cooling
- ✓ Computer Rooms
- ✓ Retail Establishments

## Multi Zone Applications

- ✓ Whole House Solutions
- ✓ Multi-family applications
- ✓ Multi Room Additions
- ✓ Multiple Office Areas
- ✓ Full Heating System Replacement
- ✓ New Construction/Gut Rehab
- ✓ Individualized Comfort

# Residential Product Overview



# Residential system costs per household examples

- ✓ $4,000 to $9,000 system install
- ✓ NY Clean Heat Rebate aprx. $8,000
- ✓ 25C tax credit of $2,000


**Single-zone system**

- ✓ $10,000 to $30,000 system install
- ✓ NY Clean Heat Rebate aprx. $8,000
- ✓ NY Local/utility rebate up to $8,000 with decommissioning of boiler/furnace
- ✓ 25C tax credit of $2,000

**Whole-home**

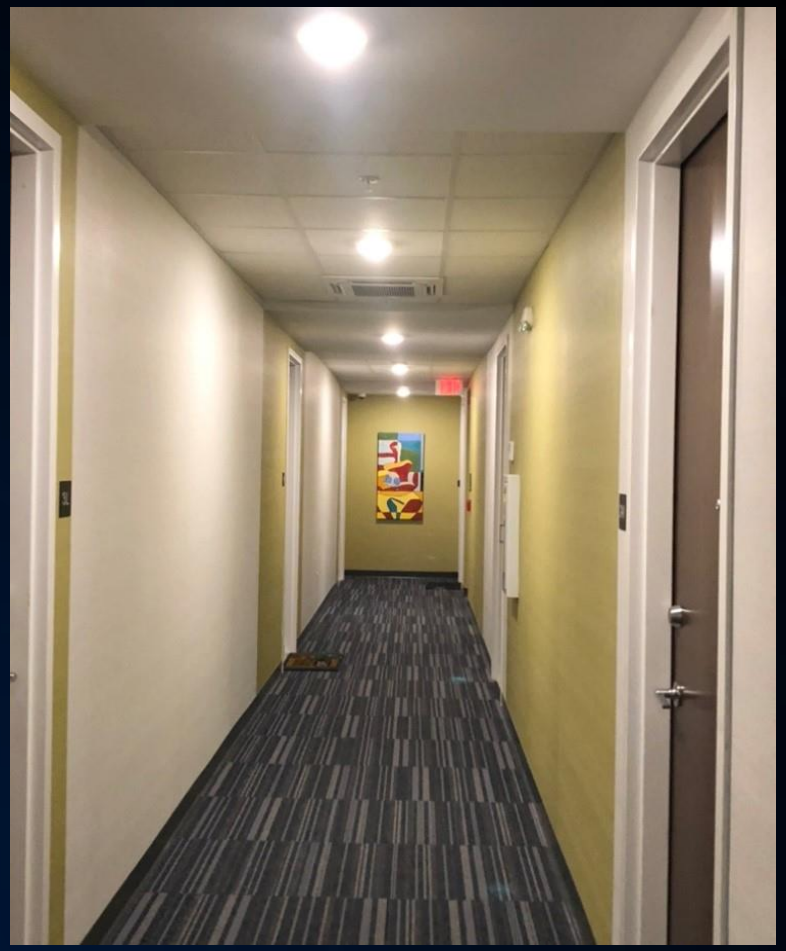

70° F
70° F
72° F
69° F
OFF
68° F

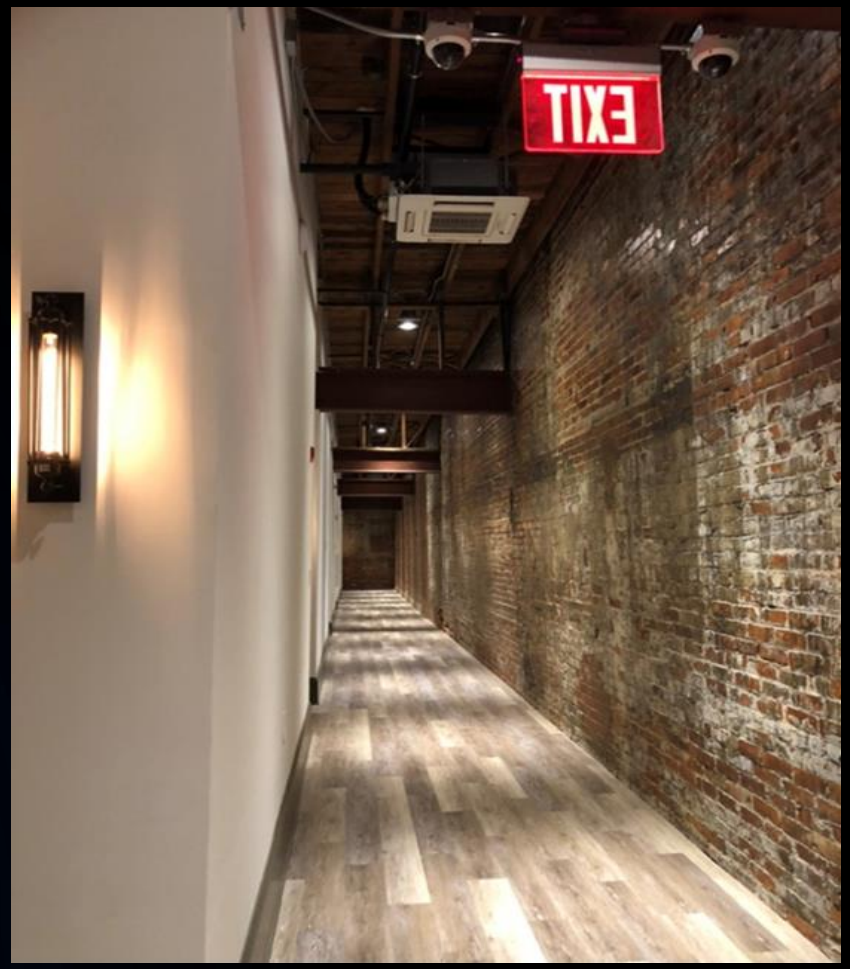
# Wall Mounted Indoor Unit Examples

# Indoor Unit Examples  MLZ One Way Ceiling Cassette

# Indoor Unit Examples  MLZ One Way Ceiling Cassette

# Example Pictures – Indoor Unit
# SLZ (2’ x 2’) 4-Way Ceiling Cassette





# Indoor Unit Examples  SVZ Ducted Air Handler

# Outdoor Unit Examples

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SOLARone

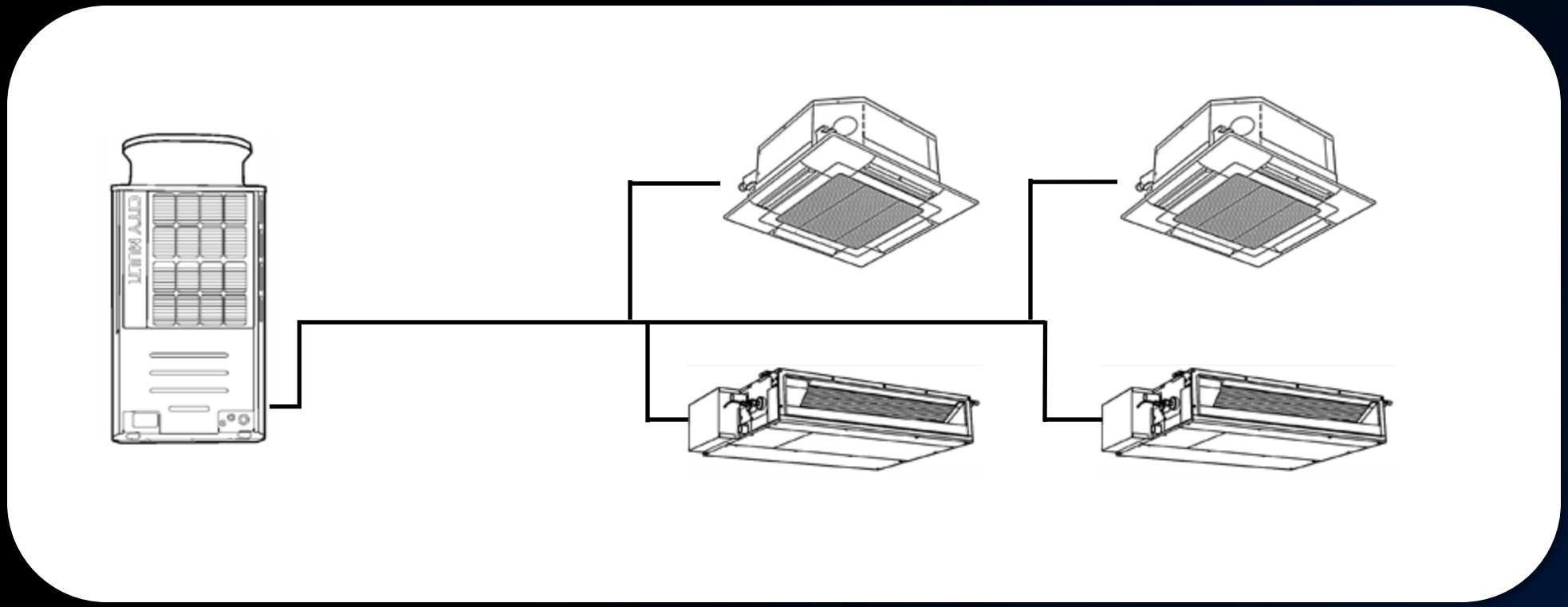
# Heat pump retrofit projects Challenges & Best Practices

Residential mini-splits systems (M&P series)

Central VRF systems (Citymulti)

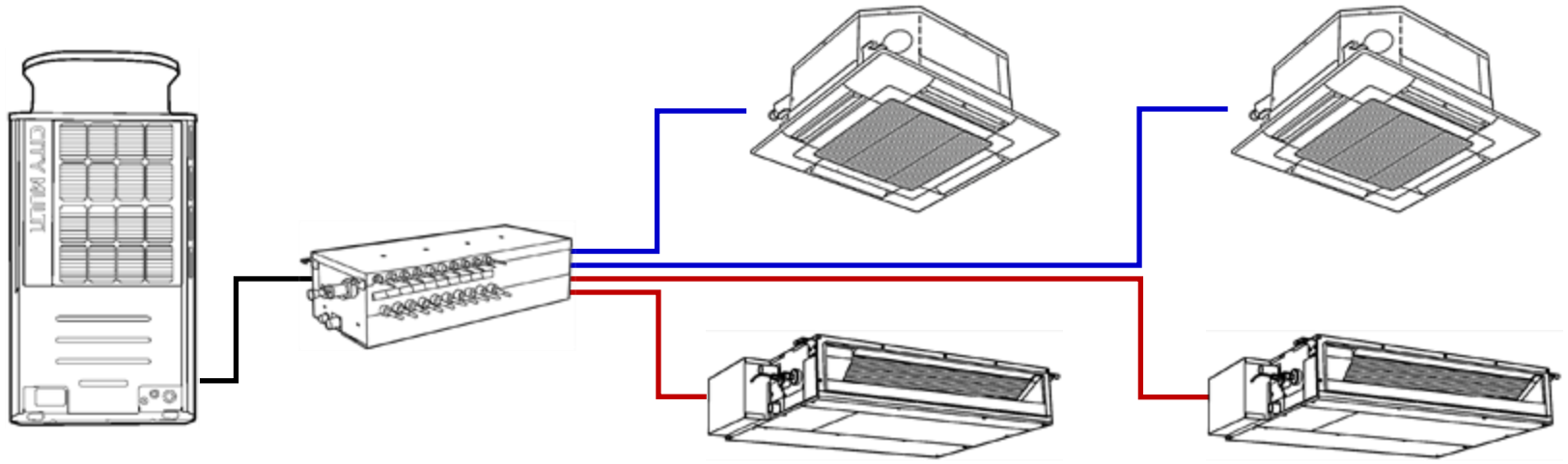
# Heat Pump vs Heat Recovery

## Heat Pump



# Heat Pump vs Heat Recovery

## Heat Recovery



# Residential mini-split systems (M&P series) or Central Variant Refrigerant Flow (VRF) systems (Citymulti)

- Electric capacity
- Refrigerant lines
- Outdoor unit space availability
- Tenant disruption
- Utility charge apportionment
- Cost & planning
- Proper sizing, design  and selection

# Electric capacity-challenges & best practices

**For both Residential mini-split systems & Central VRF system**

- Power and wiring upgrades
- Independent electrical lines
- Buildings with electric resistant heat may not require electrical upgrades
- Assess electrical capacity (amps available per apartment)

# Refrigerant Lines

## Residential mini-split systems

- Independent refrigerant lines
- Require less refrigerant than central VRF systems
- Leak detection sensors

## Central VRF system

- Require more refrigerant than mini-split systems
- Code compliance
- More connection points than mini-split systems
- 5-10 x more pipe length capability in centralized VRF
- Leak detection sensors

# Outdoor unit space availability

## Residential mini-split systems

- Roof
- Ground
- Exterior wall mount
- Balcony
- Requires a stand or wall bracket
- ODU’s need to be close to unit they serve

## Central VRF system

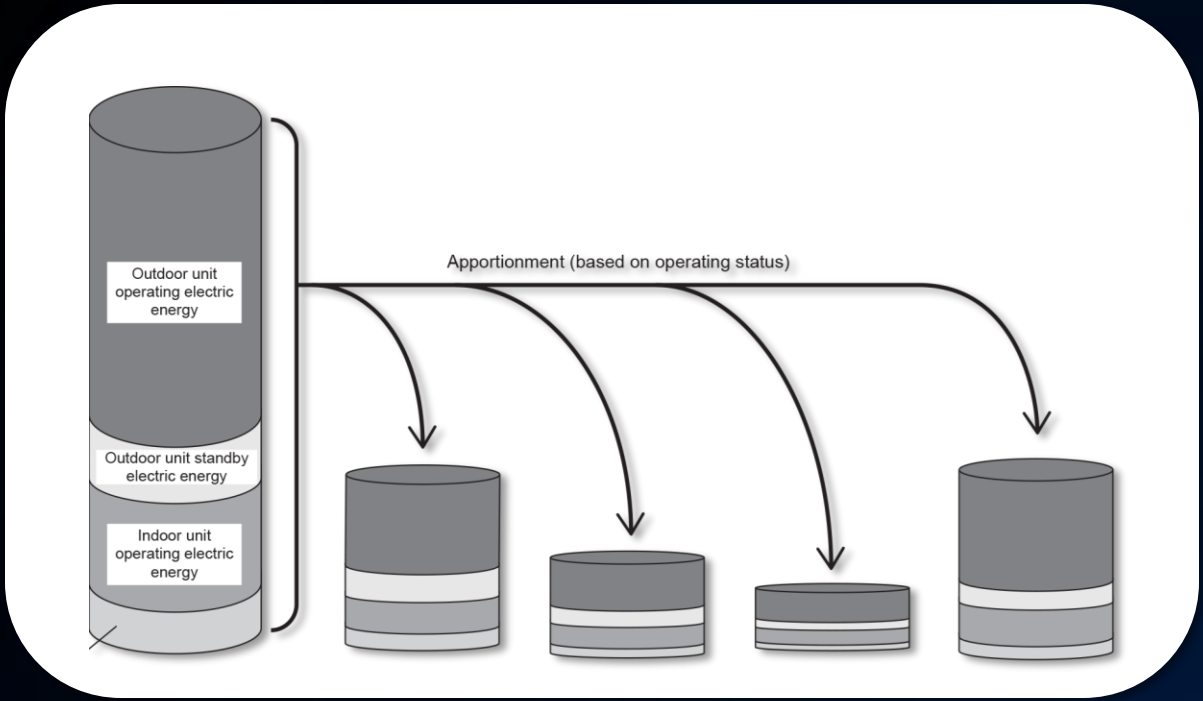
- Roof, Ground, Indoors
- Larger outdoor units
- May require structural analysis
- May require a crane
- Fewer outdoor units required than mini-split systems
- Roof location may limit space for other uses such as solar panels

# Utility charge and apportionment

## Residential mini-split systems

- Ability to measure heating with an electric meter
- Submetering of electric heat may requires public service commission approval

## Central VRF system



# Tenant/homeowner disruption

**Residential mini-split systems  & Central VRF systems**

- Most of the install work needs to be done in or near the unit
- Less invasive than individual systems

- Educate the occupants on the benefits of heat pumps to get their buy in
- Improved temperature and comfort control
- Improved indoor air quality

# Cost & Planning

## Residential mini-split systems & Central VRF

- Estimated high upfront cost
- Typically, less expensive than central VRF
- Electricity is more expensive than natural gas*
- Engineers to assess electrical capacity

## Planning

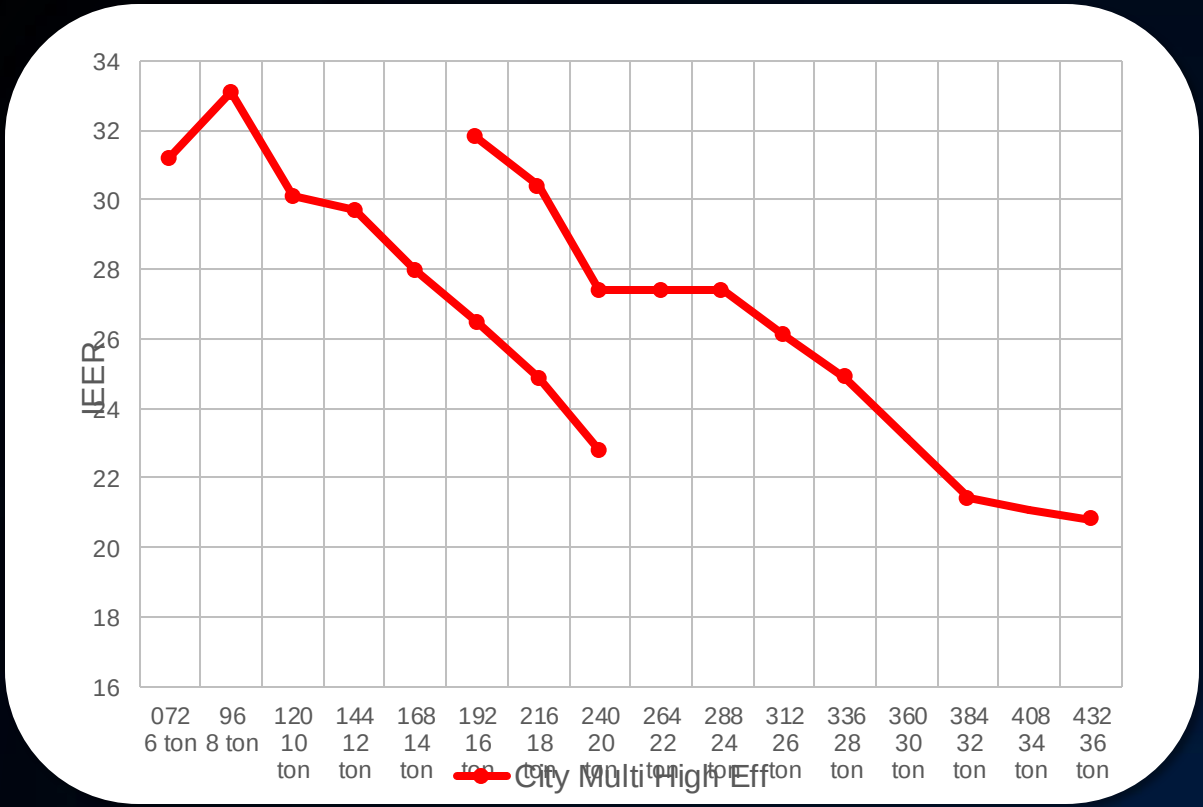
- Spread the retrofit work out over time
- Retrofit one part of the building at a time
- Phase work to get building “heat pump ready”
- Engineer or Architect to audit existing hvac systems to suggest improvements

# Proper sizing, design and equipment selection

## Residential mini-split systems

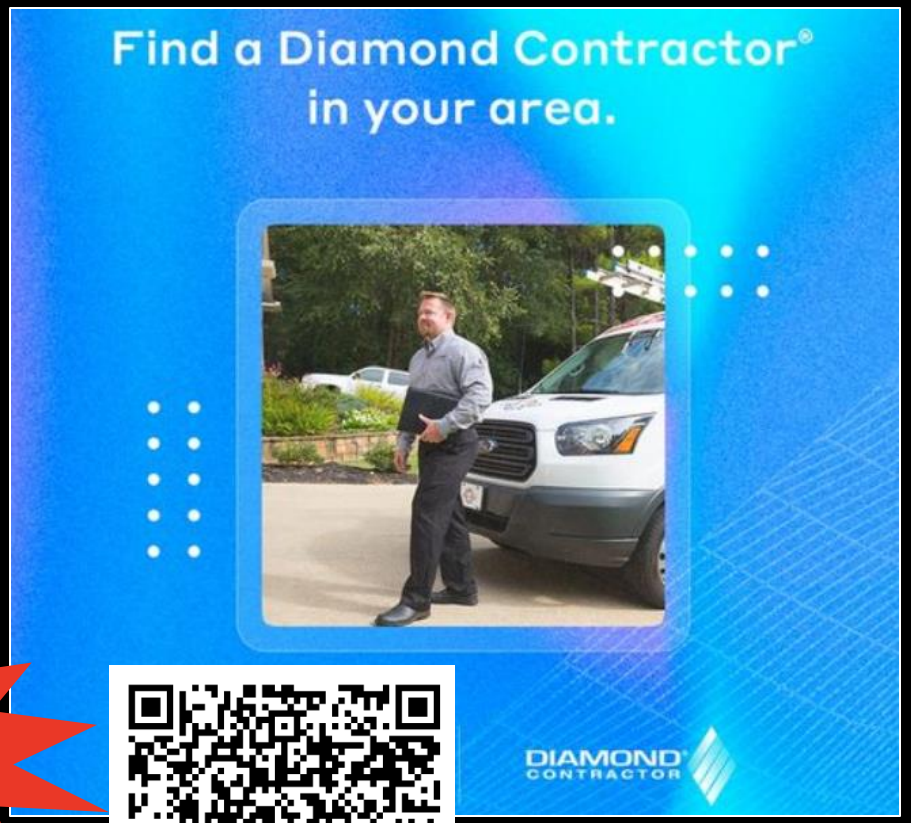
- Manual J heat load calculation
- Manual D duct design
- Manual S proper system selection
- Diamond System Builder
- System heating capacity at 5 degrees by location
- System cooling capacity not to exceed 115% of minimum cooling capacity

## Central VRF system




Sourced from AHRI directory on 5/20/2021

# A Diamond Contractor network of over five thousand trained HVAC professionals




What's Diamond Contractor?

Find a Diamond Contractor

# Thank you!
# Questions?

# THANK YOU FOR TUNING IN

## Contact Today's Speakers

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**Grace Boueri,** Mitsubishi Electric – gboueri@hvac.mea.com

**Mike Yarolin,** Thermodynamix – mike@thermodynamixllc.com

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