



Manufacturer's Roundtable

Cold Climate Heat Pumps

December 4, 2024



WHAT IS CEDA?



The California Energy Design Assistance (CEDA) program is the only statewide utility incentive program for new construction and major renovations.

- Promotes **electrification** and **decarbonization**
- CEDA works in collaboration with project teams to reduce energy demand, consumption, and carbon emissions.
- Serves commercial, public, high-rise multifamily, industrial, and agricultural projects in Pacific Gas & Electric (PG&E), Southern California Edison (SCE), SoCalGas (SCG), and San Diego Gas & Electric (SDG&E) service areas.



WHY PARTICIPATE IN CEDA?



- Receive complimentary **decarbonization** analysis tailored to project goals to identify most effective measures to implement



- Gain analysis of **energy costs and paybacks**
- Receive **financial incentives** to help offset the costs of decarbonization measures



- Demonstrate commitment to high performance building practices and design

\$2,800
+
measure package
incentive

- **\$2800 Design team incentive** per project as a thank you for participation
- Based on the project measure package the design team chooses for implementation



HIGH PERFORMANCE MEASURES

CEDA aims to exceed California's decarbonization standards by identifying high performance measures and providing educational opportunities to explore use cases and best practices.

This not only advances the market, but also qualifies participants for enhanced incentives through our program.

A current list of eligible high-performance measures can be found on our website [here](#).

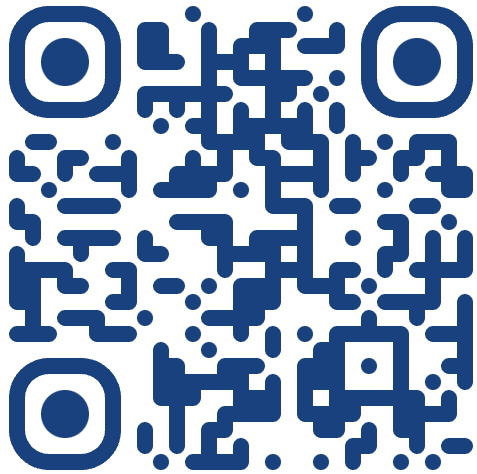


HAVE A PROJECT TO DISCUSS?



For more information, please contact our program outreach specialists, visit our website, or fill out an interest form

Scan me to enroll a project



CaliforniaEDA.com

Sean M. Williams | Outreach Specialist
swilliams@willdan.com

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Why Cold Climate Heat Pumps

In today's roundtable we'll discuss:



What makes heat pumps **succeed** in cold climates



Different **product offerings** and form factors

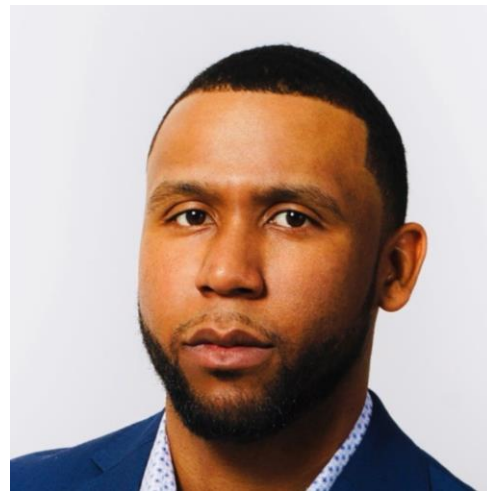


Heat pump **performance** at different temperatures

Today's Panelists



Samuel Beeson
LGE



James Momperousse
Carrier



Sam Lamos
Gradient



Jonathan Moscatello
Daikin

Applying MODERN Heat Pumps



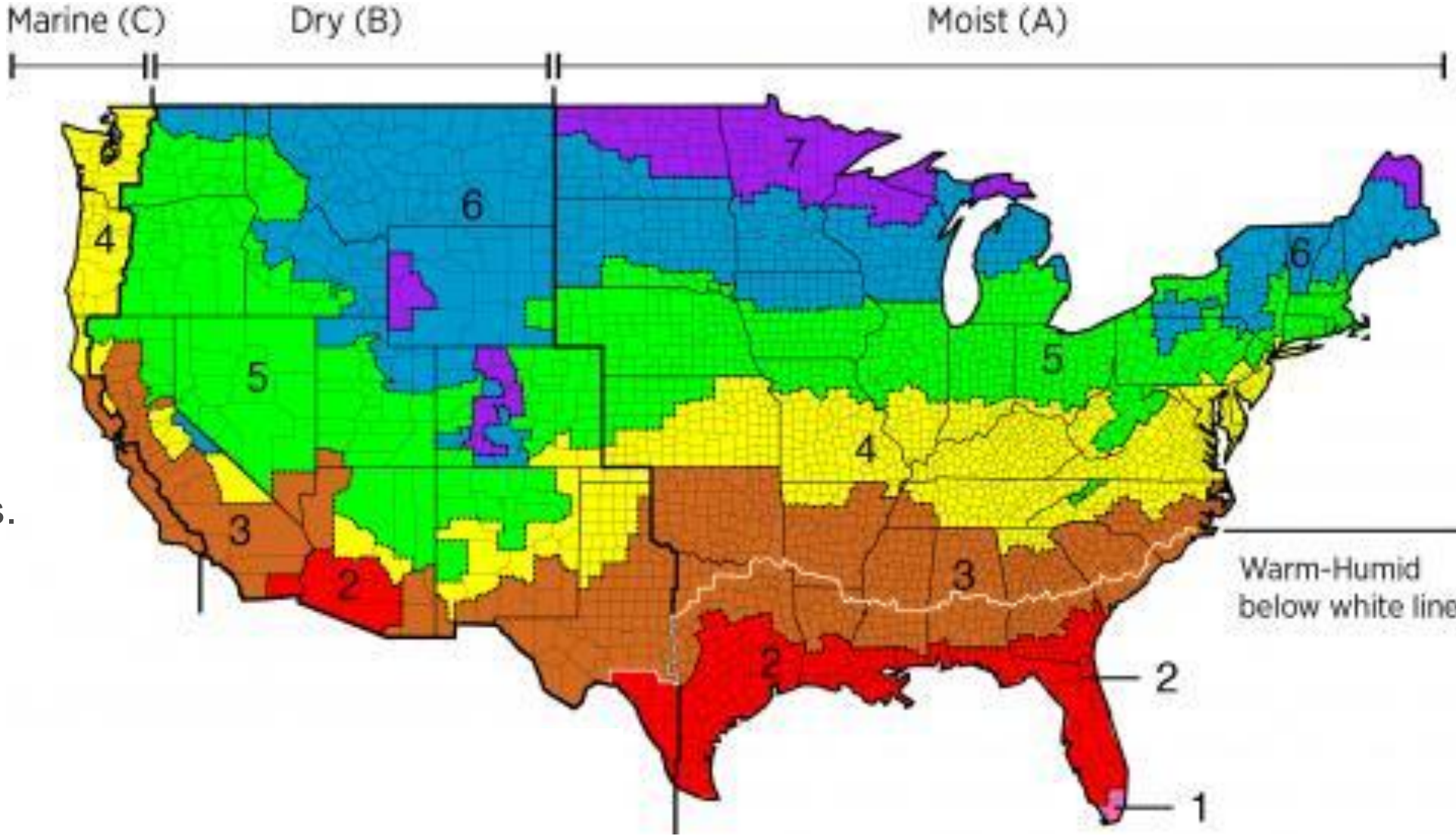
In Cold Climates



What is a COLD CLIMATE?

Conventional thinking is zones 5, 6 and 7.

In reality, zones 3 and 4 also have low temps.

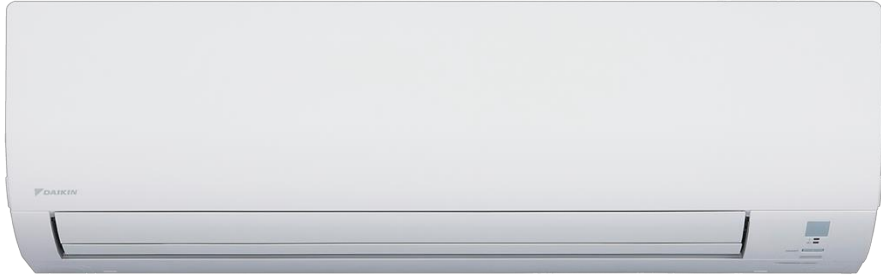


HEAT PUMPS IN COLD CLIMATES? YOU BET!



Heat pumps work great with the right:

1. Sales Strategies
2. Design & Application
3. Installation Practices
4. After-sales Support

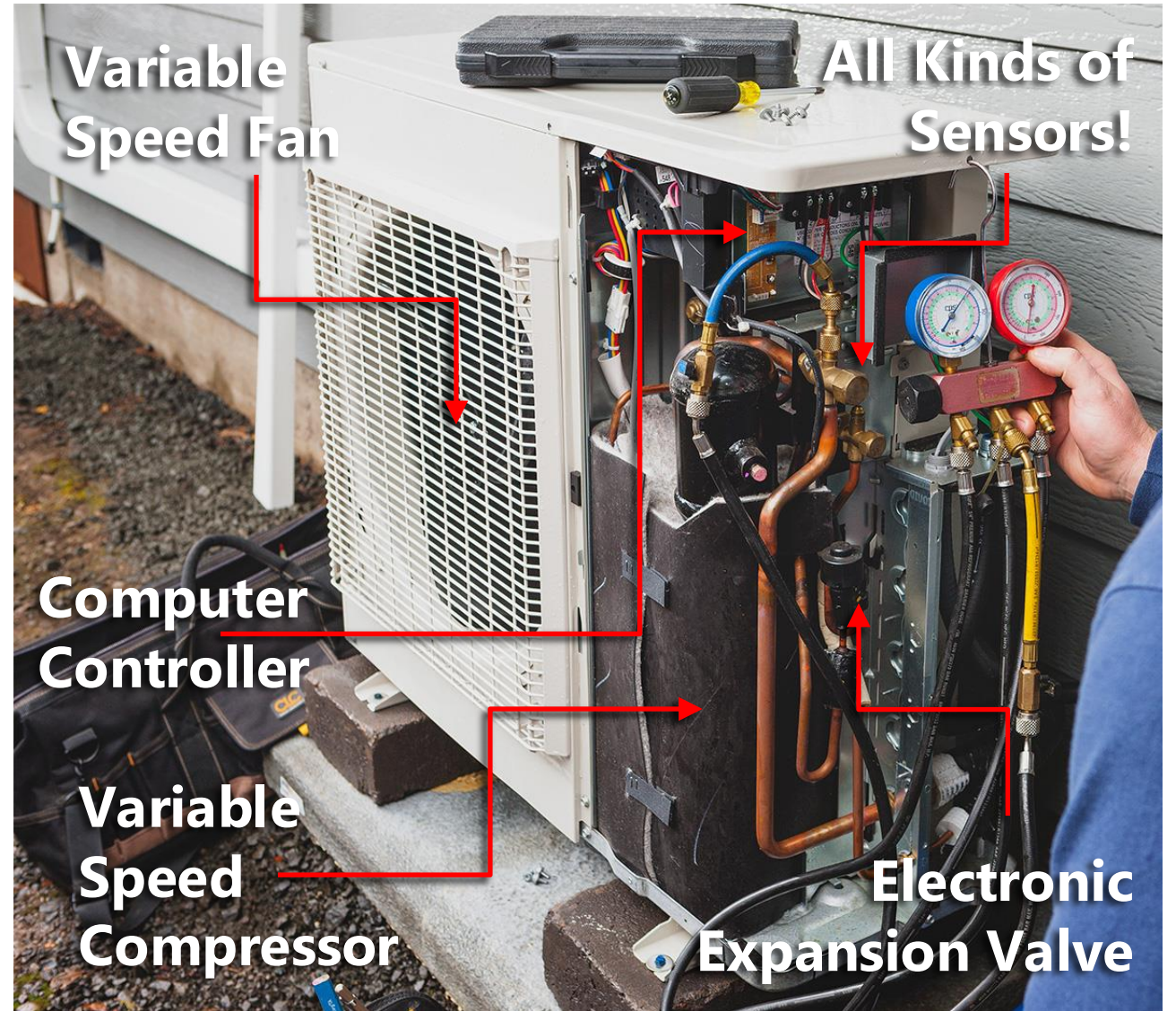


Today, in the USA:

- **Heat pumps are not yet an everyday sale, everywhere.**
- **However, new heat pump technologies are ready to change this.**

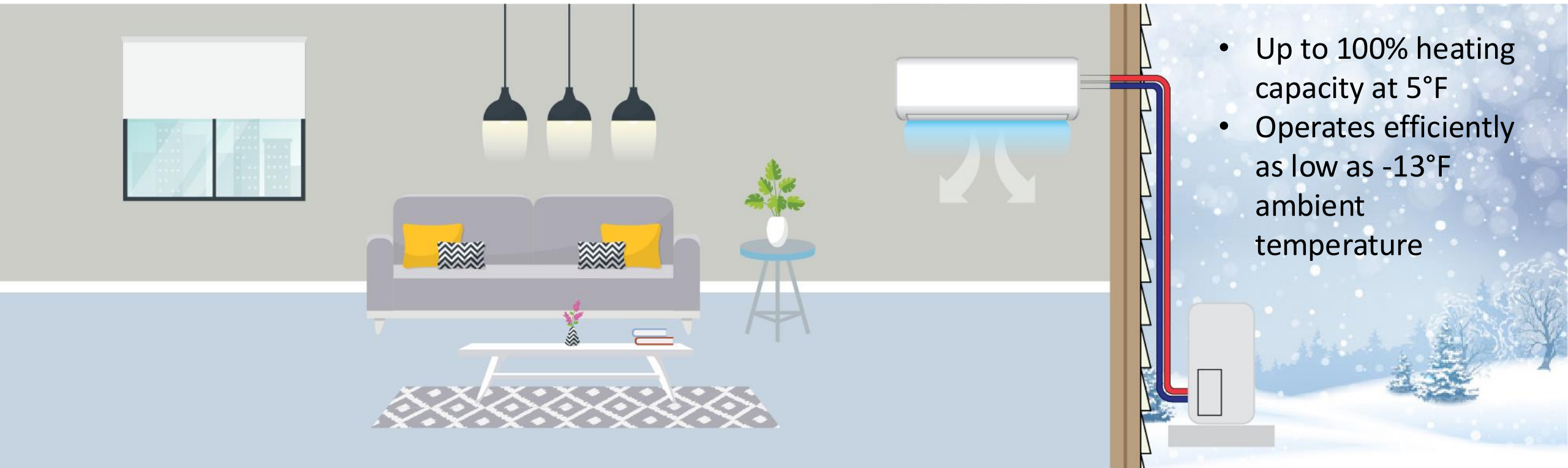
In
C  **OLDER**
Climates

Not Your Father's
HEAT PUMP



Improved Low Ambient Heat Gathering Capabilities

Thanks to advanced computer programming and improved control of the expansion valve, compressor speed and fan speed.

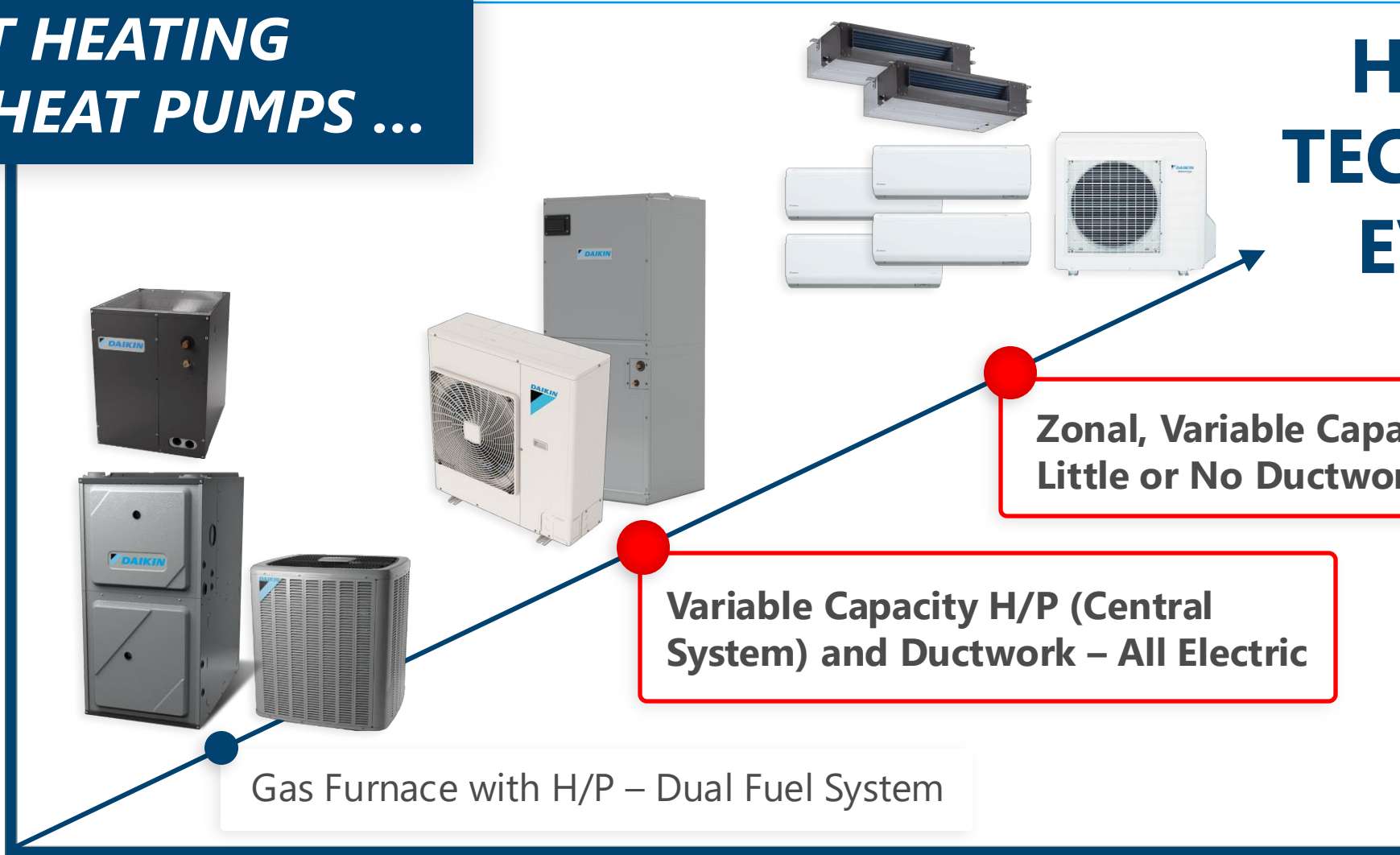


- Up to 100% heating capacity at 5°F
- Operates efficiently as low as -13°F ambient temperature

**AS YOU THINK
ABOUT HEATING
WITH HEAT PUMPS ...**

HEAT PUMP TECHNOLOGY EVOLUTION

COMFORT
ENERGY
SAVINGS
FEATURES



Gas Furnace with H/P – Dual Fuel System

Variable Capacity H/P (Central System) and Ductwork – All Electric

Zonal, Variable Capacity H/P with Little or No Ductwork – All Electric

PRODUCT
SOPHISTICATION

Heat Pump Type Analysis

Dual-Fuel

- Gas furnace for heating during on the coldest days
- Heat pump for heating on the milder days (majority of the time)
- Heat Pump provides 100% of the cooling

Could be the easiest “entry point” for many contractors

Variable Capacity Central System

- Heat pump operates to well below zero degrees F
- If needed, electric resistance provides supplemental heat

The easiest “all electric” option for most homes

Zonal Variable Capacity

- Heat pumps provide 100% of heating and cooling
- Uses multiple indoor units (possibly outdoor units, too)
- Unoccupied rooms/zones are turned off

Uses the least amount of energy while providing the greatest comfort.

SkyAir Single - Zone Systems

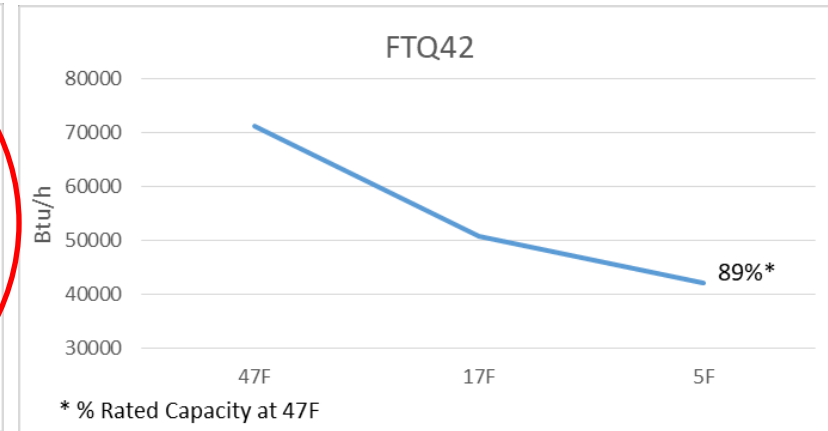
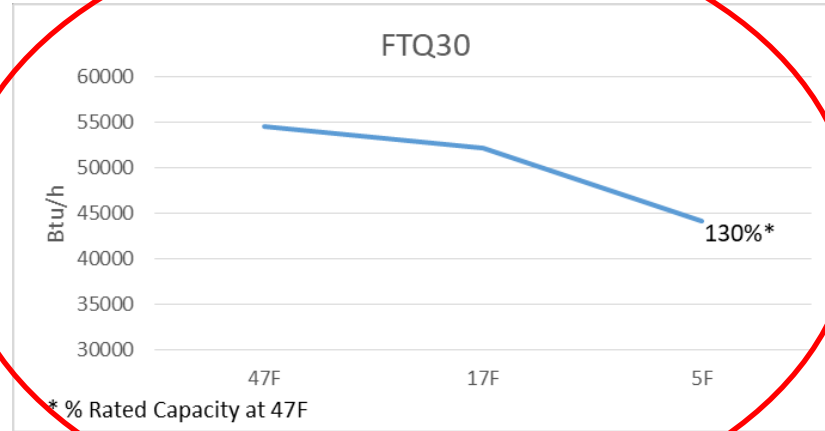
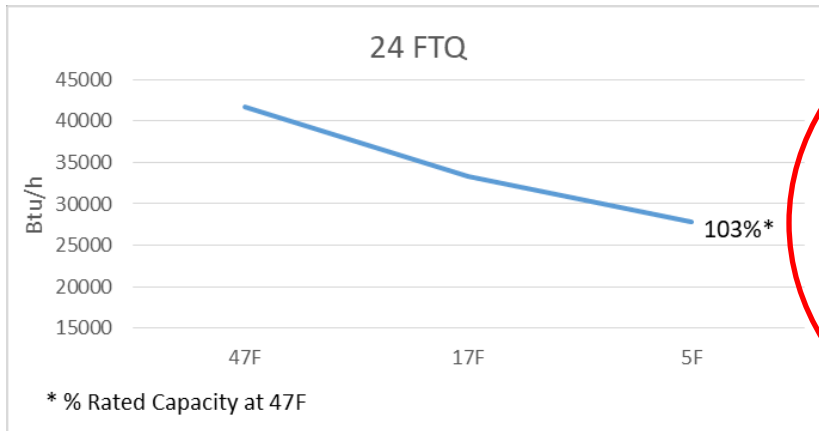


FTQ and FBQ Ducted Indoor Units

- High Heating Capacity with RZQ heat pump
 - 100% rated **heating** capacity down to -4°F (-20°C) for RZQ18/24/30/36
 - 86% rated **heating** capacity down to -4°F (-20°C) for RZQ42
 - 75% rated **heating** capacity down to -4°F (-20°C) for RZQ48
- Newly designed RZQ drain pan
 - More holes to help prevent condensate from freezing
- Variable Refrigerant Temperature Technology
 - Allows the system to dynamically change refrigerant temperatures
 - Designed to save energy and enhance overall occupancy comfort
 - Greatly improves part load efficiency by delivering a more appropriate part load capacity



SkyAir FTQ



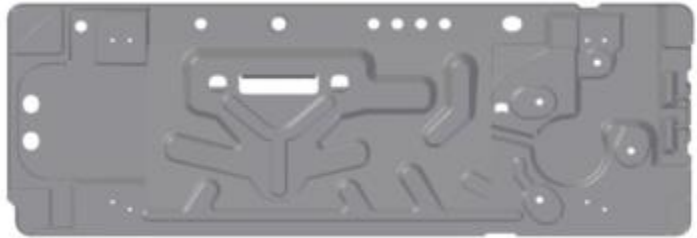
- FTQ 24,30 & 42 provide up to 130% **heating** capacity at 5°F
- FTQ is designed for zero clearance on three sides, and only 24" of clearance on the front for service
- Upflow, downflow, horizontal left & horizontal right installation configurations



Daikin *AURORA* Heat Pump Systems

Designed to provide high performance in extreme conditions

- Up to 100% rated **Heating** Capacity at 5°F (-15°C)
 - Confirmed continuous operation down to -13°F (-25°C)
- Up to 100% rated **Cooling** Capacity at 104°F (40°C)
- Available indoor units: Wall Mount, Floor Mount & FDMQ Ducted Concealed



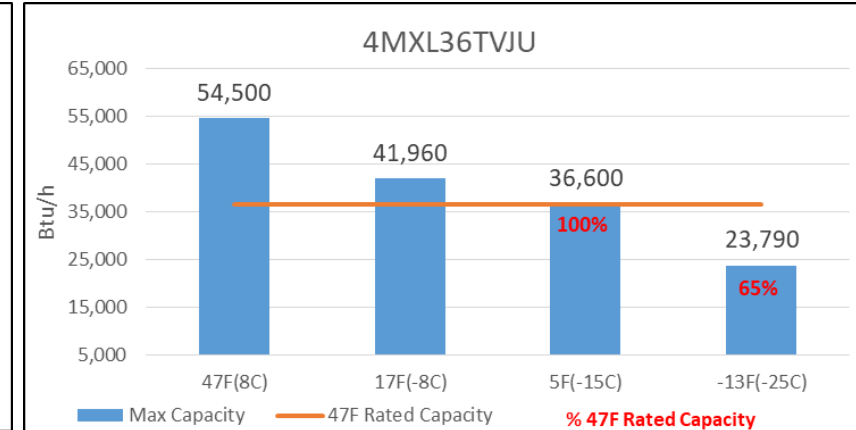
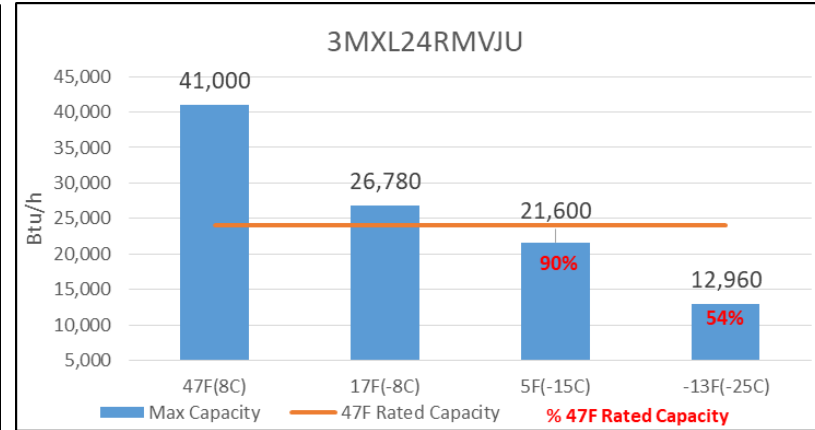
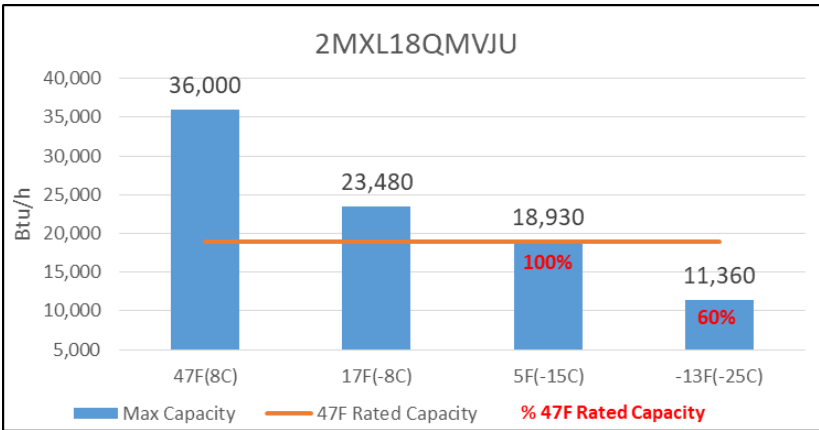
Daikin's Enhanced Drain Pan was designed for optimal drainage in cold climates to reduce ice build-up in extreme conditions.



**NEW Indoor Unit
Type!**

Daikin *AURORA* Multi-Zone Performance

Max Heating Capacity: Non-Ducted Configurations



- Daikin *AURORA* Multi-Zone Systems provide up to 100% rated **Heating** capacity at 5F (-15C)
 - Up to 65% rated **Heating** capacity at -13F (-25C)



4 Steps To Success

1 Sales Strategies

- That get you at the table, proposing cold climate heat pumps
- To overcome objections, which are natural to offering new technologies

2 Design and Application

- A process that will result in homeowner comfort
- Simple system installations that deliver PROFIT and SUCCESS

3 Installation

- 10 tips to ensure H/Ps work well in cold climates

4 After-sales Support

- Must have's that ensure PROFIT
- Must do's to ensure homeowner satisfaction



THANK YOU!

For more great cold climate heat pump content, see:



Got questions?

Jonathan Moscatello

Daikin Comfort Technologies

Jonathan.Moscatello@daikincomfort.com



AIR CONDITIONING TECHNOLOGIES

LGRED^o

New Buildings Institute – Cold Climate Heat Pumps
Sam Beeson, Senior Business Development Manager, Utilities
Dec 4, 2024



The all-electric home



LG is proud to offer the largest portfolio of home electrification products in the US market



LG Air Conditioning Technologies

*According to a 2023 leading consumer testing organization



MULTI-ZONE Lineup

OUTDOOR UNITS			
Btu/h	Multi F	Maximum Indoor Units	Combination Sample
18,000	LMU183HV LGRED* LMU180HHV	2	
24,000	LMU243HV LGRED* LMU240HHV	3	
30,000	LMU303HV LGRED* LMU300HHV	4	
36,000	LMU363HV	4	
Btu/h	Multi F MAX	Maximum Indoor Units	Combination Sample
36,000	LMU361HHV LGRED*	5	
42,000	LMU421HHV LGRED*	6	
48,000	LMU481HV LMU480HHV LGRED*	8	
54,000	LMU541HV	8	
60,000	LMU601HV	8	

MULTI-ZONE Lineup

INDOOR UNITS							
Btu/h	7,000	9,000	12,000	15,000	18,000	24,000	36,000
Wall Mounted	ART COOL™ Gallery		LMAN097HVP	LMAN127HVP			
	ART COOL™ Mirror						
	ART COOL™		LAN090HSV5	LAN120HSV5		LAN181HSV5	
High Efficiency							
		LMN079HVT	LSN090HSV5	LSN120HSV5	LMN159HVT	LSN181HSV5	LMN249HVT
Low Wall Console							
		LQN090HV4	LQN120HV4	LMQN150HV			
Ceiling Cassette	4-Way						
		LMCN078HV	LCN098HV4	LCN128HV4		LCN188HV4	
Ducted	Low Static						
			LDN097HV4	LDN127HV4		LDN187HV4	
	High Static						LHN248HV
Vertical A/HU							
					LVN181HV4	LVN241HV4	LVN361HV4

MULTI-ZONE



AHR | 2025 | INNOVATION AWARDS
WINNER

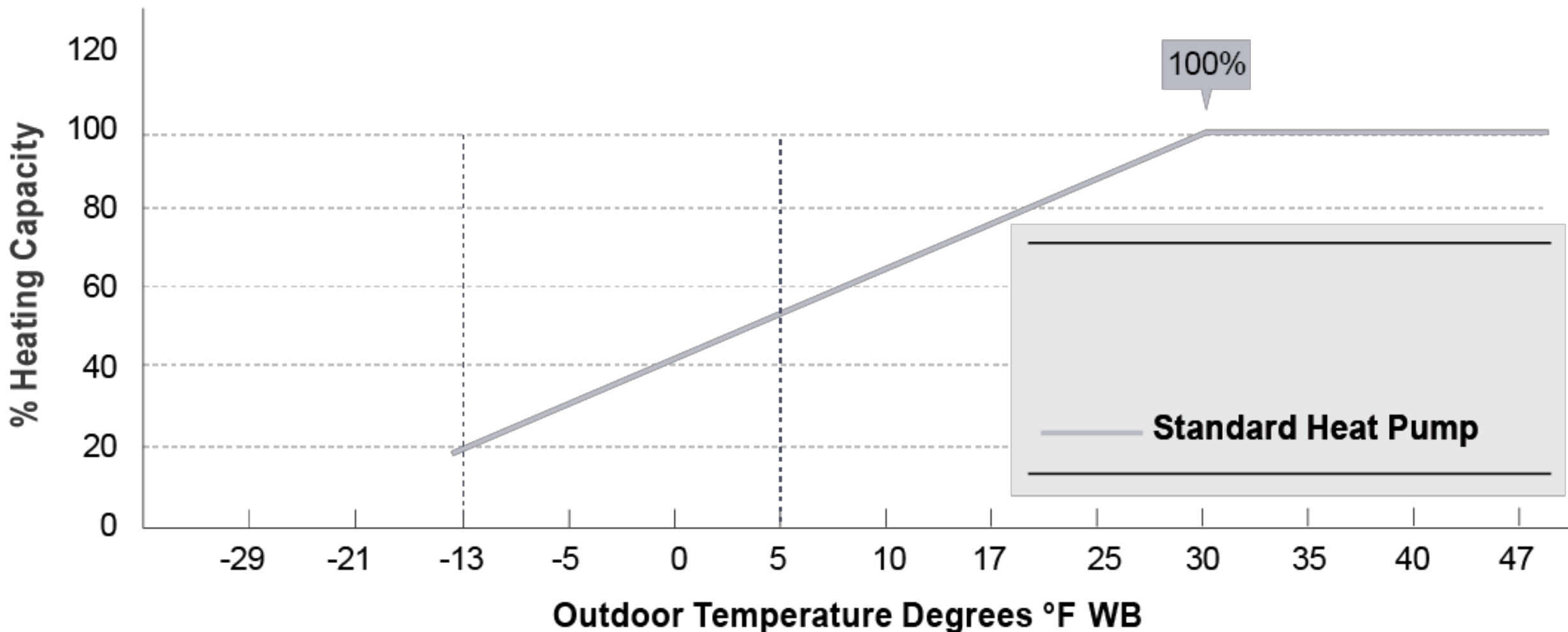
2025 AHR Expo Innovation Awards

WINNER

Sustainable Solutions

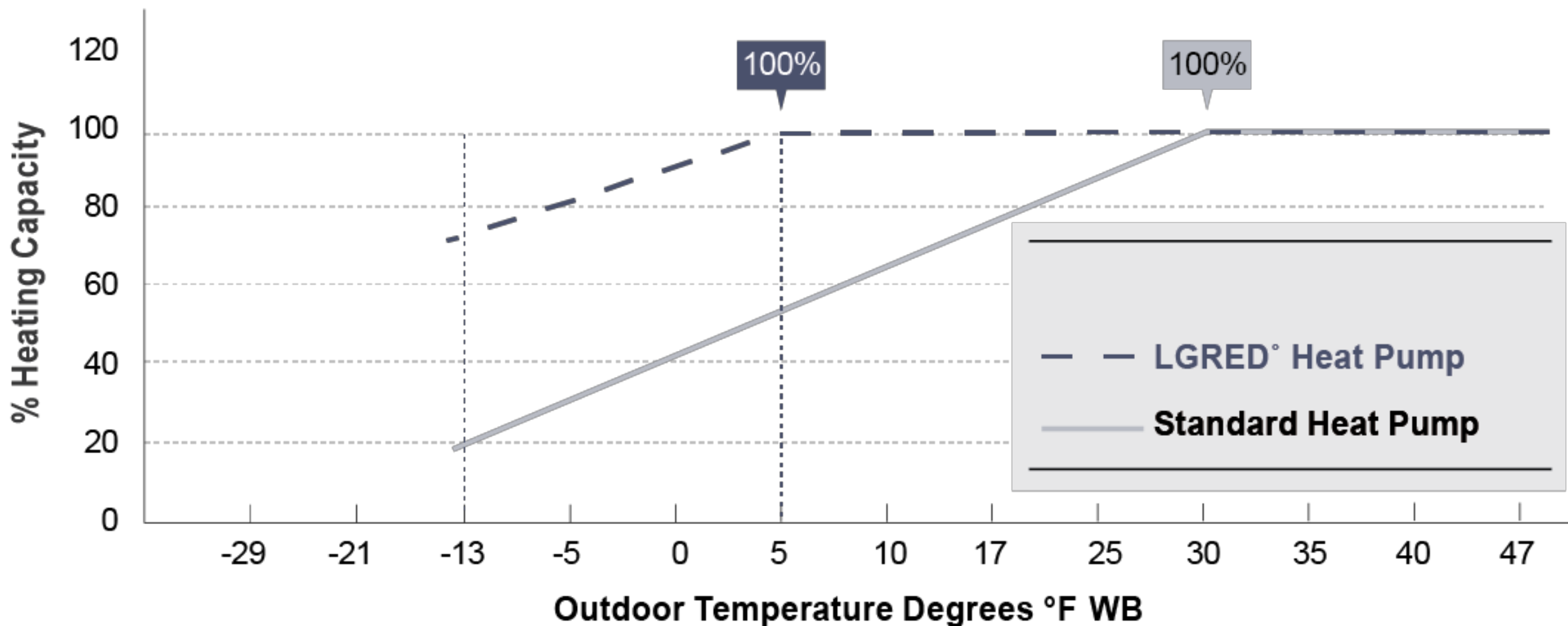
LG Residential Cold Climate Heat Pump

100% Heating Capacity with LG Heat Pumps



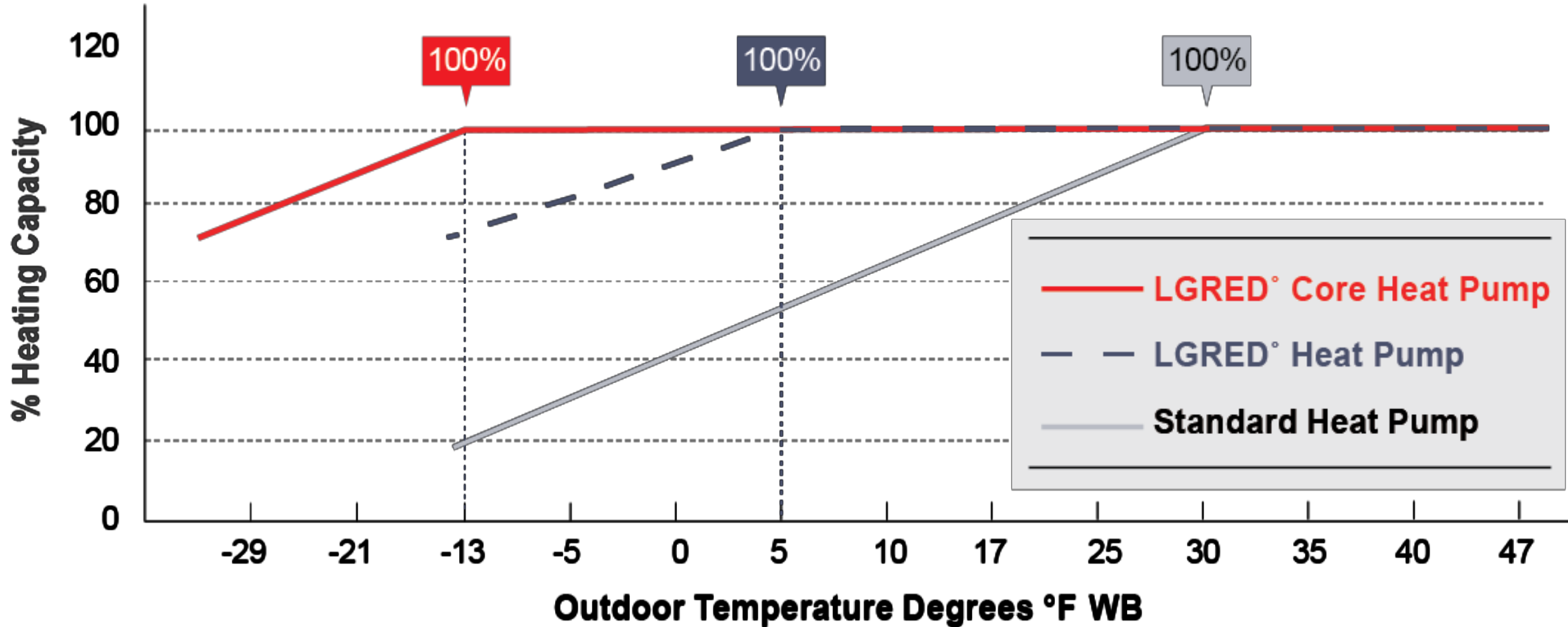
Heating capacity varies by system and is non-linear. This table visually represents overall performance.

100% Heating Capacity with LG Heat Pumps



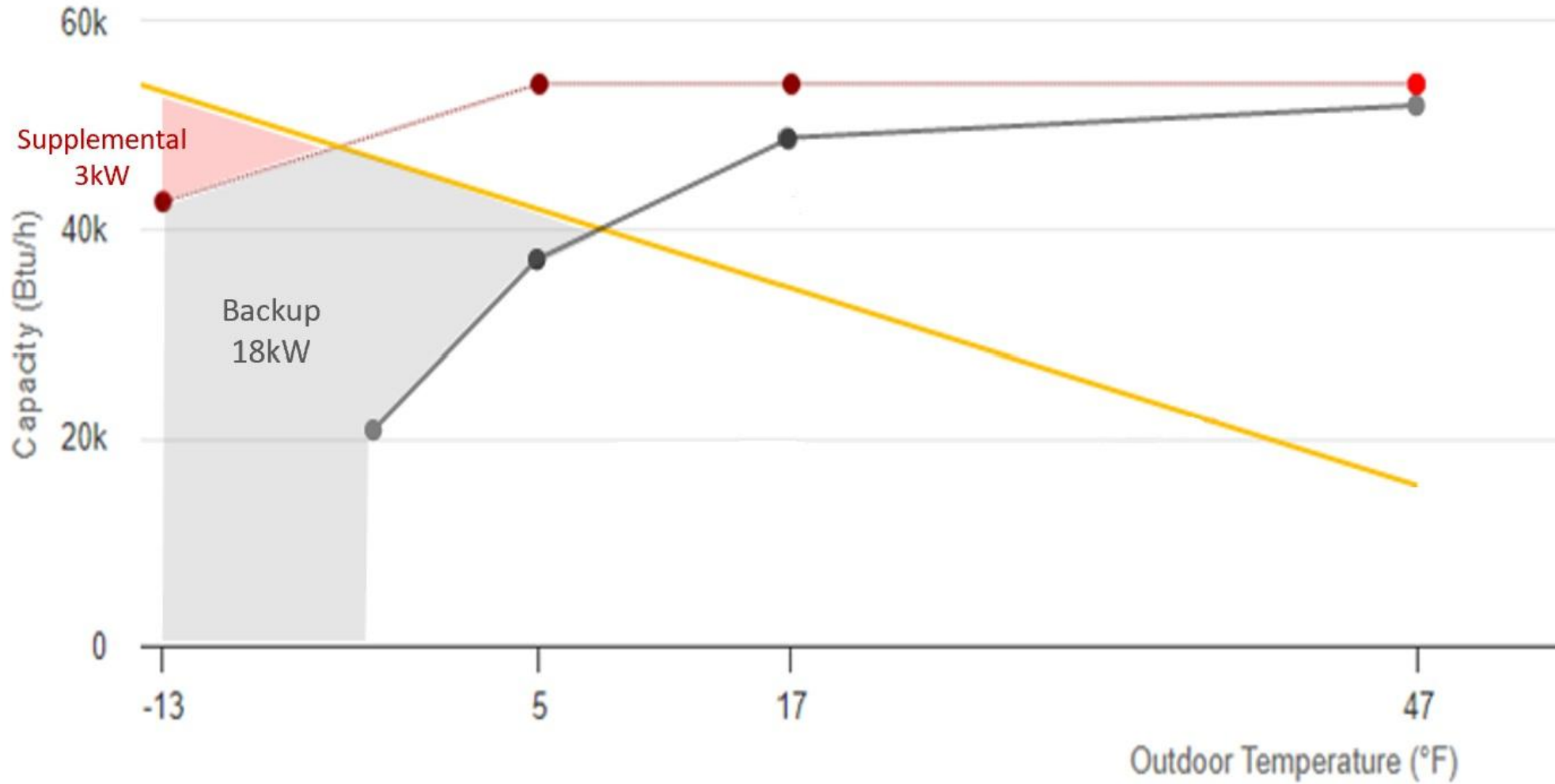
Heating capacity varies by system and is non-linear. This table visually represents overall performance.

100% Heating Capacity with LG Heat Pumps



Heating capacity varies by system and is non-linear. This table visually represents overall performance.

Heating Capacity & Supplemental Heat Example



Formula for Best Outcome

- Building Load Calculation for Proper Sizing
 - Manual J, D & S
- Quality Installation
 - Equipment selection
 - Equipment location
 - Piping
 - Charge verification
 - Start-up / commissioning
 - Homeowner education



Turn to the experts

Puron

ADVANCE™

A new refrigerant for a better future

All New Ductless and Crossover Product Line

James Momperousse

- 
- **Puron Advance**
 - **Design Changes**
 - **Nomenclature**
 - **Product Line up**
 - **Product Concepts**
 - **Controls**
 - **Timeline**



Turn to the experts

Puron Advance - Ductless

NEW LINEUP

Expect initial arrival Fall 2024

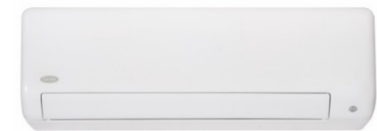
Same platforms and desired features

Select new-platform introductions

NEW HARDWARE ON NEW UNITS

A2L dissipation sensor

Puron
ADVANCE™



Design Changes

Packaging

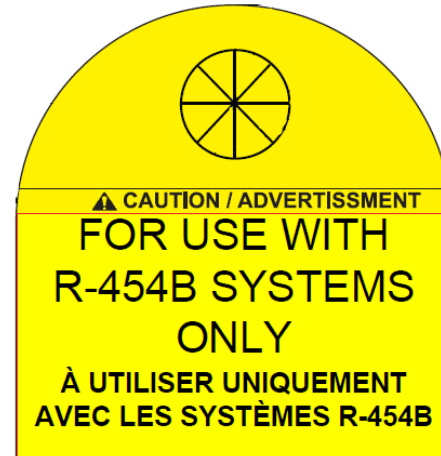
WARNING - RISK OF FIRE DUE TO FLAMMABLE REFRIGERANT USED. FOLLOW HANDLING INSTRUCTIONS CAREFULLY IN COMPLIANCE WITH NATIONAL REGULATIONS.
AVERTISSEMENT-RISQUE D'INCENDIE DÙ AU REFRIGÉRANT INFLAMMABLE UTILISÉ. SUIVRE ATTENTIVEMENT LES INSTRUCTIONS D'OPÉRATION CONFORMÉMENT AUX RÉGLEMENTATIONS NATIONALES.

R-454B **Refrigerant Safety Group A2L** **R-454B**

Model	Capacity (kg/h)	Capacity (ton)	Capacity (hp)
241	1.8	0.5	0.7
242	2.2	0.6	0.9
243	2.7	0.8	1.1
244	3.2	0.9	1.3
245	3.7	1.0	1.4
246	4.2	1.2	1.6
247	4.7	1.3	1.8
248	5.2	1.5	2.0
249	5.7	1.6	2.2
250	6.2	1.8	2.4
251	6.7	1.9	2.6
252	7.2	2.1	2.8
253	7.7	2.2	3.0
254	8.2	2.4	3.2
255	8.7	2.5	3.4
256	9.2	2.7	3.6
257	9.7	2.8	3.8
258	10.2	3.0	4.0
259	10.7	3.1	4.2
260	11.2	3.3	4.4

Carrier 241 R454B **781897** **45MAHAQ12XA1** **0224V10001** **45MAHAQ12XA101--**

Equipment



Refrigerant Valve Hangtag



Service Port Red Cap

Design Changes

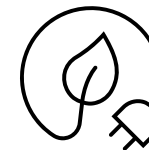
Fan Coil / Evap Coil



Nomenclature Example

	2023 Model	2025 Model
Outdoor	38MAR*	37MAR*
Indoor	40MBA*	45MBA*

Outdoor AC/HP



Compressor upgrades
& system optimization

#Select equipment does not include a leak sensor

Ductless Nomenclature

Outdoor Units

	1	2	3	4	5	6	7	8	9	10	11	12
Title	Product	Refrigerant	Model Type			Major Series	Unit Type	Nominal Capacity		# of Indoor Units	Variation	Electrical
Product # / Letter	3	7	M	A	R	A	Q	36		A	A	3
Descriptions	3 = Horizontal Discharge	7 = Puron Advance		MAR MPR MHR MGH MGR			Q= Heat Pump C=Cooling Only	18/19 = 18,000 24/25 = 24,000 30/31 = 30,000 36/37 = 36,000 42/43 = 42,000 48/49 = 48,000 60/61 = 60,000		X = 0 A = 1 B = 2 C = 3 D = 4 E = 5		1 = 115-1-60 3 = 208/230-1-60

Indoor Units

	1	2	3	4	5	6	7	8	9	10	11	12
Title	Product	Refrigerant	Model Type	Indoor Type		Major Series	Unit Type	Nominal Capacity		# of Indoor Units	Variation	Electrical
Product # / Letter	4	5	M	A	F	A	Q	36		X	X	3
Descriptions	4 = Indoor Unit	5 = Puron Advance	MP MA MH		F=Floor Console H=High Wall C=Cassette A=Air Handler		Q= Heat Pump C=Cooling Only	18/19 = 18,000 24/25 = 24,000 30/31 = 30,000 36/37 = 36,000 42/43 = 42,000 48/49 = 48,000 60/61 = 60,000		X = 0		1 = 115-1-60 3 = 208/230-1-60

PURON ADVANCE LINEUP

Infinity



06 / 09 / 12 / 18

Single Zone



06 / 09 / 12 /
18 / 24 / 33

Light Commercial



36



48 / 58

Multi-zone



18 / 24 / 30 / 36



48 / 55

Crossover (ducted)

Performance



06 / 09 / 12* / 18 / 24 /
30 / 33 / 36



09 / 12 / 18 / 24 /
36 / 48



06 / 09 / 12 / 18



9 / 12 / 16



18 / 24
/ 36 / 48 / 58



06 / 09 / 12 / 18 / 24
/ 36 / 48 / 58

*High Static
Option*



18 / 24 / 30 / 33 / 36 /
36 / 48 / 60



18 / 24 / 30 / 36 / 48 / 60

09 / 12* / 18 /
24 / 30 / 36



Light Commercial



36



48 / 58

18 / 24 / 30 / 36



48 / 55



Comfort

Heat Pump



09* / 12* / 18 / 24 / 30 / 36

Cooling Only



09 / 12* / 18 / 24

Multi-zone Compatible (208/230V Only)

Light Commercial Compatible

*115V Option Available

Value Tier not shown, but still offered



18 / 24 / 30 / 36 / 48 / 60

Single Zone High Walls

NOTE: Images are for illustration purposes only. Actual models may differ slightly.

Infinity



Cooling up to 122°F /
Heating down to -22°F

06 / 09 / 12 / 18



06 / 09 / 12 / 18

Refrigerant detection Sensor
Intelligent, I-clean , Vertical Swing, Humidity Control
(same as Mid Tier Features)
6K system, achieving 35.1 SEER2, 30.0 HSPF2
100% Heating capacity at 0° F (-17° C)

Performance



09* / 12* / 18 / 24 / 30 / 36



09 / 12* / 18 / 24

Cooling up to 122°F /
Heating down to 5°F



09 / 12* / 18 / 24



09* / 12* / 18 / 24 / 30 / 36

No Refrigerant detection Sensor
(**Not** MZ Compatible)
No Humidity Control,
No Intelligent Eye **No** Vertical Swing
Achieving **22.4 SEER2, 9.4 HSPF2 (H/P)**
Achieving **22.2 SEER2 (C/O)**

Comfort



09* / 12* / 18 / 24

Cooling up to 122°F /
Heating down to 5°F



09* / 12* / 18 / 24

Variation available with/without Refrigerant detection Sensor

(with Sensor MZ Compatible)

No Humidity Control, **No** Intelligent Eye **No** Vertical Swing
Achieving **19.0 SEER2, 9.7 HSPF2**

*115V compatible

Value

Single Zone High Walls

Infinity

Performance

Comfort

Value



37MAHA

06 / 09 / 12 / 18 / 24 / 33

Cooling up to 122°F / Heating down to -22°F



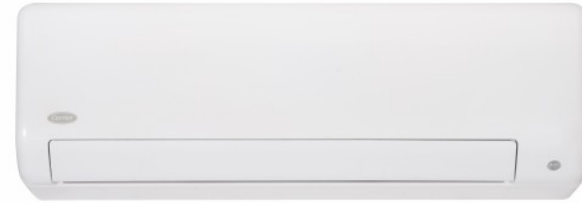
37MARA

09 / 12* / 18 / 24 / 30 / 36

Cooling up to 122°F / Heating down to -13°F

NOTE: Images are for illustration purposes only. Actual models may differ slightly.

45MAHA



06 / 09 / 12* / 18 / 24 / 30 / 33 / 36

Refrigerant detection Sensor

Intelligent, I-clean , Vertical Swing, Humidity Control

Achieving 26.0 SEER2, 13.9 HSPF2 (Performance)

Achieving 27.5 SEER2, 14.8 HSPF2 (Infinity)

*115V compatible

Light Commercial & Multizone Systems

Infinity

Performance

Comfort

Value



Cooling up to 122°F / Heating down to -22°F

37MBHA

Sizes: 36 / 48 / 58



Cooling up to 122°F / Heating down to -13°F

37MBRA

Sizes: 36 / 48 / 58



Safety shut-off valve added

One more connection port added to MZ units

Cooling up to 122°F / Heating down to -22°

37MGHA

Sizes: 18/ 24 / 30/ 36/ 48/ 60



One more connection port added to MZ units

Cooling up to 122°F / Heating down to -13°

37MGRA

Sizes: 18/ 24 /30/ 36/ 48/ 60



37MTRA

One more connection port added to MZ units

Cooling up to 122°F / Heating down to -13°

Sizes: 18/ 27/ 36/ 48

NOTE: Images are for illustration purposes only. Actual models may differ slightly.

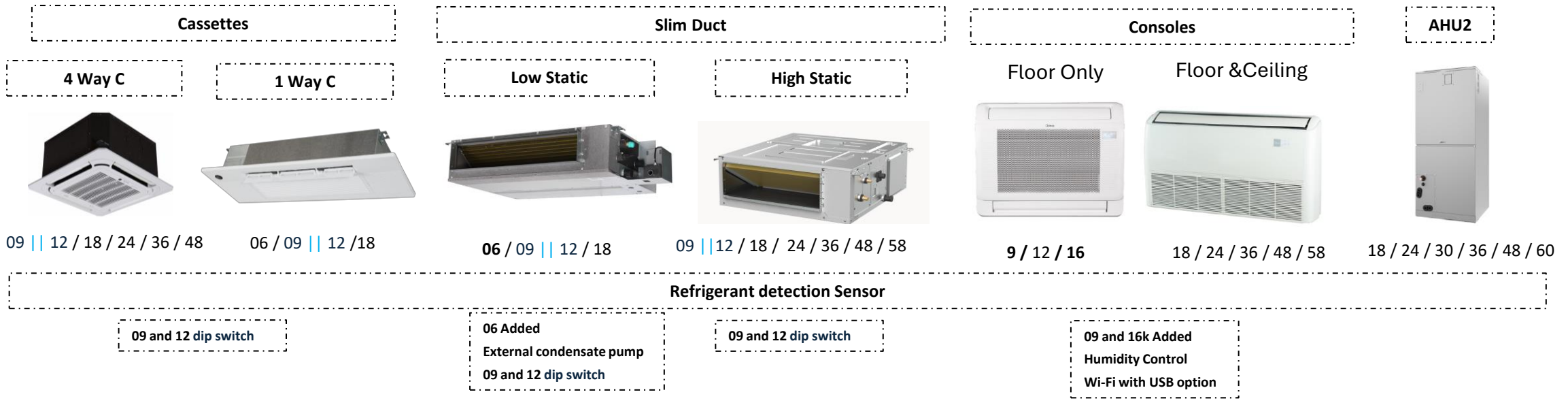
Performance Series Indoor Units

Infinity

Performance

Comfort

Value



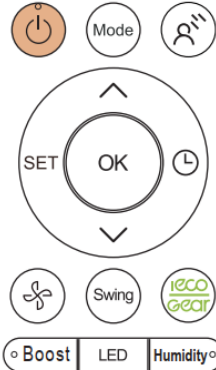
Puron Advance Indoor Controls and Accessories

Wireless



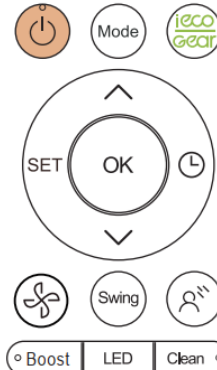
- Intelligent eye
- Humidity control
- 1F /0.5C increment

RG10L5
High Wall (High/Mid)
1- Way Cassette
4 - Way Cassette
Floor Console



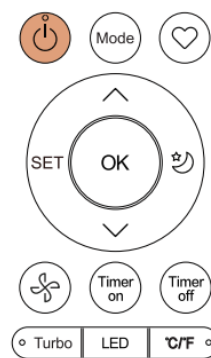
- Humidity control
- 1F /0.5C increment

RG10L4
Celling Console
Ceiling and Floor C



- 1F /0.5C increment

RG10R
High Wall (Entry/Value)
Low Static Ducted
High Static Ducted



RG10F8
Air Handlers

Wired

KSACN1201AAA



- Non-programable
- Works with All Indoors but AHUs

KSACN1401AAA



- Programable
- In-Built Wi-fi
- Works with All Indoors but Value Tier HW

Wi-fi Kit



KSAIF0701AAA

- Plugs in Indoor unit
- OTA feature
- Works with All High Walls, Cassettes and Console

NEXT GENERATION
**Puron Advance
Crossover**



Crossover Solutions



Crossover Heat Pump



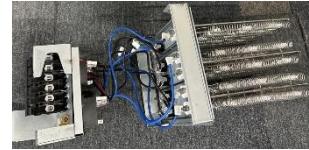
Air Handler



Air Handler



Auxiliary Electric Heat



100% Electric

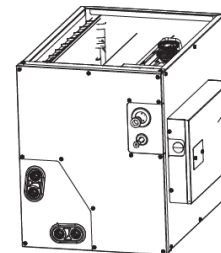
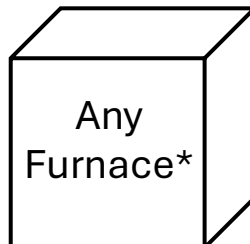
- Variable speed compressor (Inverter)
- Smaller footprint,
- Horizontal discharge
- light weight, quieter

Furnace



Evap Coil

Furnace



Evap Coil + Control Interface

Dual Fuel

- Conventional refg line set, Insulation on suction line only
- Separate powering of Indoor and Outdoor
- Built-in 24V Interface in both IDU/ODU
- Pairs with Fan Coil/Furnace

Crossover Lineup

Infinity

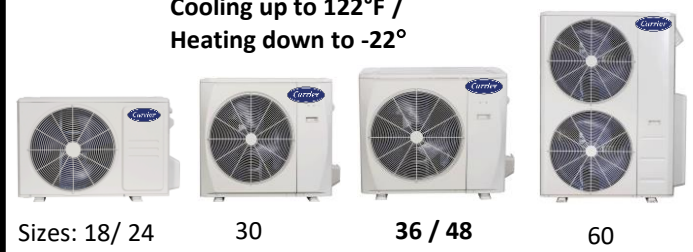
Performance

Comfort

Value

Perf/Rebates	ODU	IDU
Best	37MUHA	45MUHA
Better	37MUHA	45MUAA
Good	37MURA	45MUAA

Cooling up to 122°F / Heating down to -22°



Features Outdoor:
Improved performance across all sizes
Up to 100% 5F Heating Capacity



Features Indoor:
Dip Switch – 3 SKUs 18/24, 30/36, 48/60
Three Filter thickness : 1"/2"/4"
Magnetic filter rack

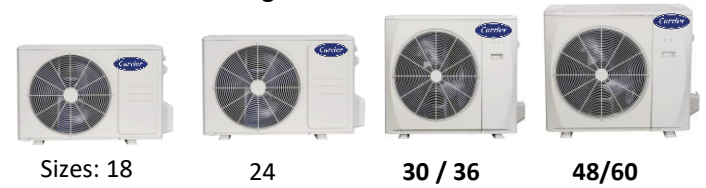
18 || 24 / 30 || 36 / 48 || 60



24 / 30 / 36 / 48 / 60

	Product Family
Mid Tier OD	37MUHA
Mid Tier ID	45MUHA
Mid Tier Coil	45MULA

Cooling up to 122°F / Heating down to -13°



Features Outdoor:
Improved performance across all sizes
Up to 75% Heating capacity at 5° F



18 / 24 / 30 / 36 / 48 / 60

	Product Family
Entry Tier OD	37MURA
Entry Tier ID	45MURA

|| - Dip Switch (Higher Capacity by Default)

NOTE: Images are for illustration purposes only. Actual models may differ slightly.

Performance Crossover ODU (37MUHA)



Up-to: **19 SEER2 / 12.5 EER2 / 10.8 HSPF2**

Up-to 100% Capacity at 5F

RS-485 and 24V Communication

Wi-fi option for the system is through Wired Controller

Conventional Line Set size (3/8th liquid, 3/4th suction)

Compatible with 45MUAA, 45MUHA, 45MULA and all residential Fan coils/Furnace offered by Carrier.

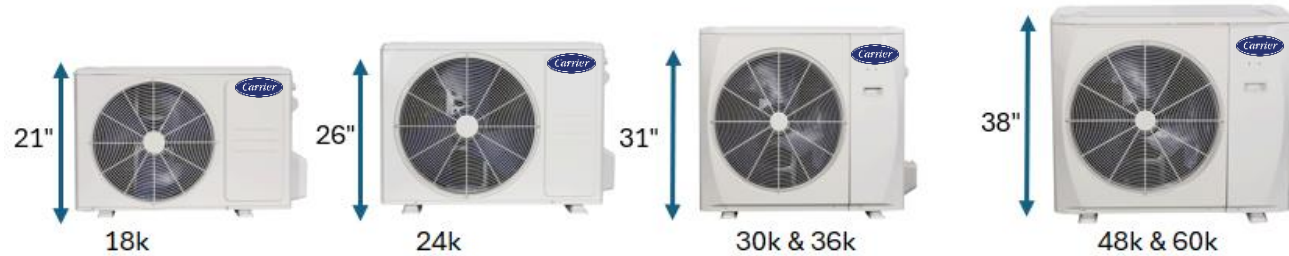
Heating operating range -22° ~ 75° F / Cooling operating range -22° ~ 122°F

Reverse Fan Operation

Crankcase Heater & Basepan Heater

System	Performance (Up-to)
Best	19 SEER2, 12.5 EER2, 10.8 HSPF2
Better	19 SEER2, 12.5 EER2, 10.3 HSPF2

Comfort Crossover ODU (37MURA)



Up-to: **18.8 SEER2 / 11 EER2 / 9.7 HSPF2**
Up to 70% Capacity at 5F

RS-485 and 24V Communication

Wi-fi option for the system is through Wired Controller

Conventional Line Set size (3/8th liquid, 3/4th suction)

Compatible with 45MUAA, and all residential Fan coils/Furnace offered by Carrier.

Heating operating range **-13° ~ 75° F** / Cooling operating range **-13° ~ 122°F**

Reverse Fan Operation

Crankcase Heater & Basepan Heater

System	Performance
Good	18.8 SEER2 / 11 EER2 / 9.7 HSPF2

Performance Crossover Air Handler (45MUHA)



Modular design Screwless connection

Rotate two modules to avoid coil reconfig

Even Airflow for higher efficiency

30% less pressure loss with M-Coil

Automatically identifying the required voltage (115/208/230V)

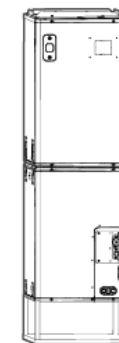
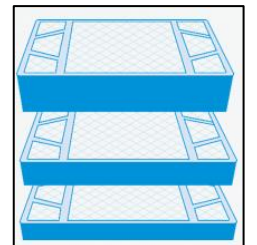
Selective filter sizing (1/2/4inch)

Mode(Auto-Cool-Dry-Heat-Fan),

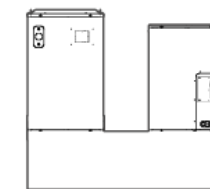
Sleep, Timer, Follow me, child lock

Wi-fi (using wired wall controller)

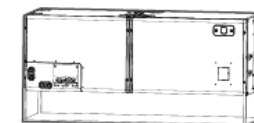
5K -25K Auxiliary Electric Heat



Vertical up



Low boy



Horizontal

At least
5in(127mm)

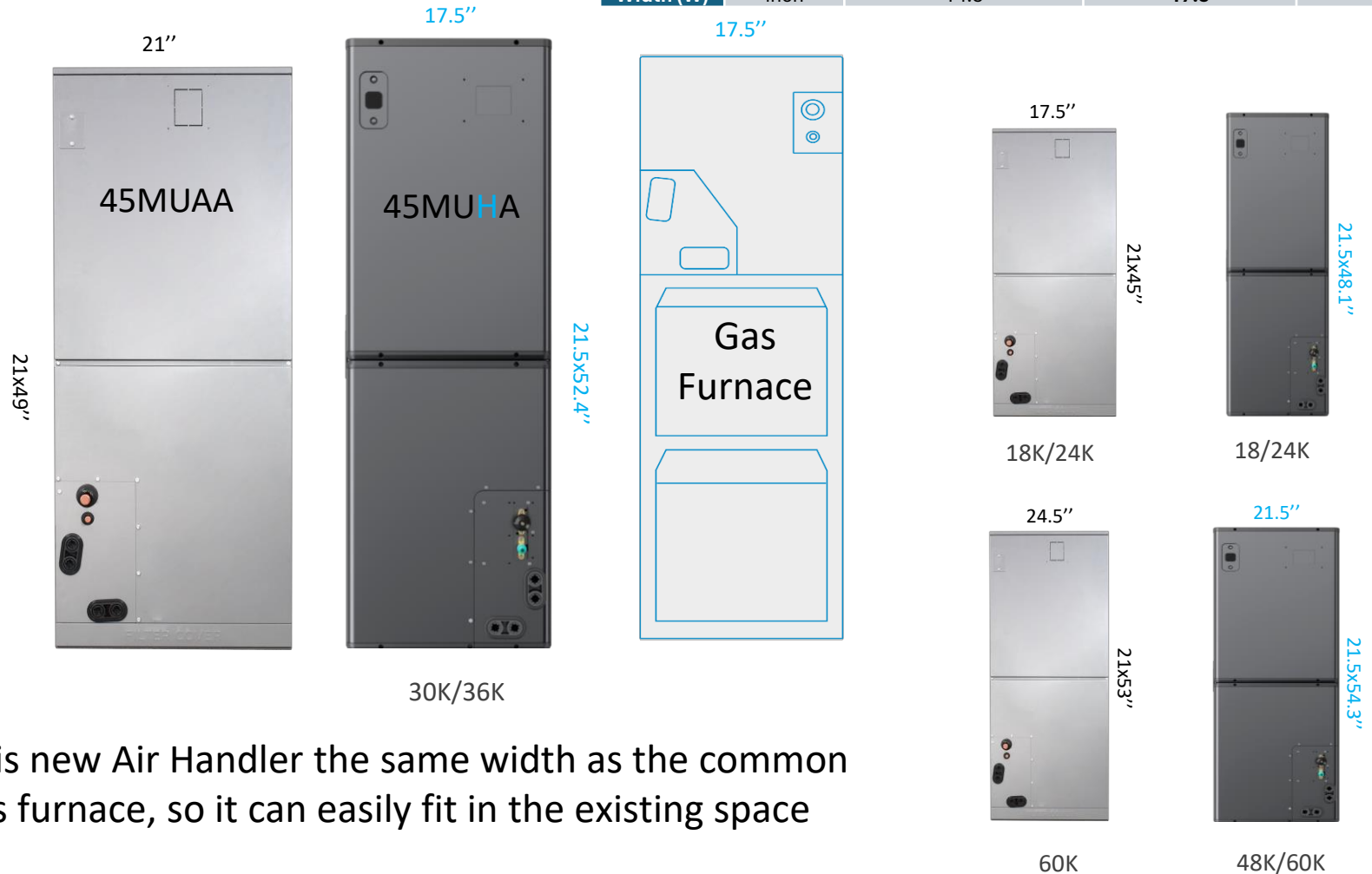
Performance Crossover Air Handler (45MUHA)



18 || 24 / 30 || 36 / 48 || 60

|| - Dip Switch (Higher Capacity by Default)

System Size		45MUHAQ24XX3	45MUHAQ36XX3	45MUHAQ60XX3
		24K (or 12k) (115/208/230 V)	36K (or 30k) (115/208/230 V)	60K (or 480k) (115/208/230 V)
Height (H)	inch	48.11	52.36	54.33
Depth (D)	Inch	21.5	21.5	21.5
Width (W)	inch	14.5	17.5	21.5



This new Air Handler the same width as the common gas furnace, so it can easily fit in the existing space

Comfort Crossover Air Handler



18/ 24 / 30 / 36 / 48/ 60

Refrigerant Detection Sensor

3 Cabinet sizes

Multi-poise: 4 different setups

Mode(Auto-Cool-Dry-Heat-Fan)

Sleep, Timer, Follow me, child lock

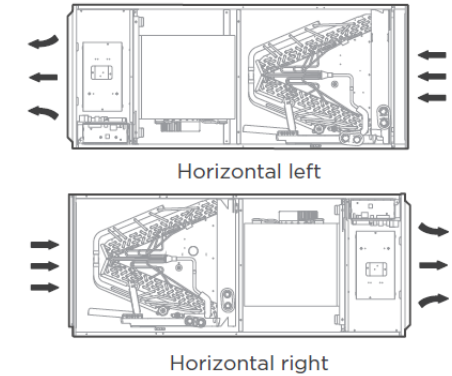
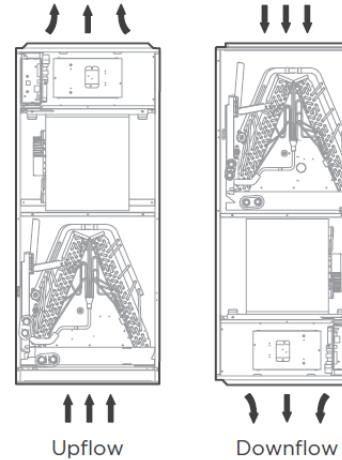
Compatible with 3rd party 24V Thermostat

EEV Metering

115V/208/230V

5kW -25kW Auxiliary Electric Heat

Wi-fi (using wired wall controller)



	Height	Width	Depth
	in (mm)	in (mm)	in (mm)
45MUAAQ18XX3	45.00(1143)	21(534)	17.52(445)
45MUAAQ24XX3	45.00(1143)	21 (534)	17.52(445)
45MUAAQ30XX3	49.02(1245)	21 (534)	21.02(534)
45MUAAQ36XX3	49.02(1245)	21(534)	21.02(534)
45MUAAQ48XX3	53(1346)	21(534)	24.49(622)
45MUAAQ60XX3	53(1346)	21(534)	24.49(622)

Crossover System Match:

Fan Coils	Product Family	Cool Stage	Motor
Infinity (High)	FE5B	VS	VS ECM
Performance (Mid)	FT5	2	VS ECM
Comfort (Entry)	FJ5	1	MS ECM
	F55	2	MS ECM
Multi-Family	FMA5X	1	MS ECM
	FMU(C)5Z	1	MS ECM
	FMU(C)5X	1	PSC
	FMA5L	1	PSC
Builder	FG5	2	VS ECM



Evap COIL	Product Family	ORIENT
V-COILS	CVAVA	Vert
	CVAMA	MP
A-COILS	CAAMP	MP
SLAB-COILS	CSAHP	SLAB HORZ



Gas Furnace	Product Family	Stage	AFUE
Infinity (High)	59MN7C	VS	99%
	59TN6C	2	97%
	58TN0B	2	80%
	59CU5B	1	95%
Performance (Mid)	58CU0B	1	80%
	59TP6C	2	97%
	58TP0B	2	80%
	59SP6B	1	97%
Comfort (Entry)	58SP0B	1	80%
	59SC6A	1	97%
	59SC2E	1	92%
	58SC0B	1	80%
	58SB0B	1	80%
	59SU5	1	95%
	58SU0B	1	80%



Oil Furnace	Product Family	Stage	AFUE
Performance (Mid)	OVL	1	87%
	OVM	1	87%
Comfort (Entry)	OBL	1	87%
	OBM	1	86%



Ductless Puron Advance Phase-in Schedule



Spring 2024

Detailed product
launch plan/ schedule
available on HVAC
Partners

Summer 2024

Release of Last Call Order Date
for Puron Products (R-410A)

Fall 2024

Product Available
at Warehouse



Turn to the experts

Puron

ADVANCE™

A new refrigerant for a better future

• GRADIENT

Revolutionary Window Heat Pumps

2024



Gradient at a Glance

Mission: Remove barriers to installation of high efficiency air conditioners and heat pumps

Product deployment: Pioneered inverted-U heat pumps in 2022, with Gen1 units operating in 36 states

Key partnerships: DOE, CEC, NYSERDA, NYCHA

Key awards:

- CEE Integrated Home Competition Grand Prize 2024
 - Time's Best Inventions 2022
 - Fast Company World Changing Ideas 2022
 - Accelerate at VERGE 22 Finalist, 2022
 - House Beautiful Live Better Awards 2022
 - Nominee, Earthshot Prize 2024
-

Location: San Francisco, CA

Why Window Heat Pumps?

Professionally installed systems suffer from high labor costs and refrigerant management issues, while conventional window ACs are inefficient and obtrusive.



*GRADIENT



WINDOW AC



MINI-SPLIT



CENTRAL/DUCTED
HEAT PUMP

	*GRADIENT	WINDOW AC	MINI-SPLIT	CENTRAL/DUCTED HEAT PUMP
Installation	No Refrigerant Handling	✓	✗	✗
	Plug-in Installation	✓	✗	✗
	Avoid Building Modifications	✓	✗	✗
Operation	Cold Climate Heating	✗	✓	✓
	Zonal Control	✓	✓	✗

All-Weather 120V Specifications*



Dimensions

Indoor portion	Outdoor portion
Height: 24 in	Height: 24 in
Width: 25.5 in	Width: 25.5 in
Depth: 8.75 in	Depth: 14 in



Weight

140 lbs



Noise

High/Medium/Low
47/44/38 dB(A)



Volts & Power Cord

120V AC and 15 A circuit	Power cord length: 6 feet
-----------------------------	---------------------------------



Features

- Mobile app control
- Scheduling
- BACnet compatible



Modes

- Cooling
- Fan-only
- Heating



Heating & Cooling

Cooling power	Heating power
9300 BTU/hr	9000 BTU/hr

100% capacity down to 17°F



Energy Efficiency

47°F (8.3°C): 4.04 COP
17°F (-8.3°C): 2.37 COP

Cooling Efficiency

Combined Energy Efficiency Ratio (CEER) is the Seasonal Cooling Efficiency for Window ACs

CEER	SEER2	EER2
16.8	19-23	13.6

-○ The CEER and the SEER2 tests involve different test conditions and calculation procedures, so it's not possible to create a precise crosswalk between the two.
-○ Our SEER2 range of estimates is based on mini-splits of similar capacities with similar EER2s.
-○ Both SEER2 and CEER are weighted averages, with the SEER2 being weighted toward more moderate outdoor temperatures. That approach makes SEER2 higher than CEER for a given system design.



Heating Efficiency

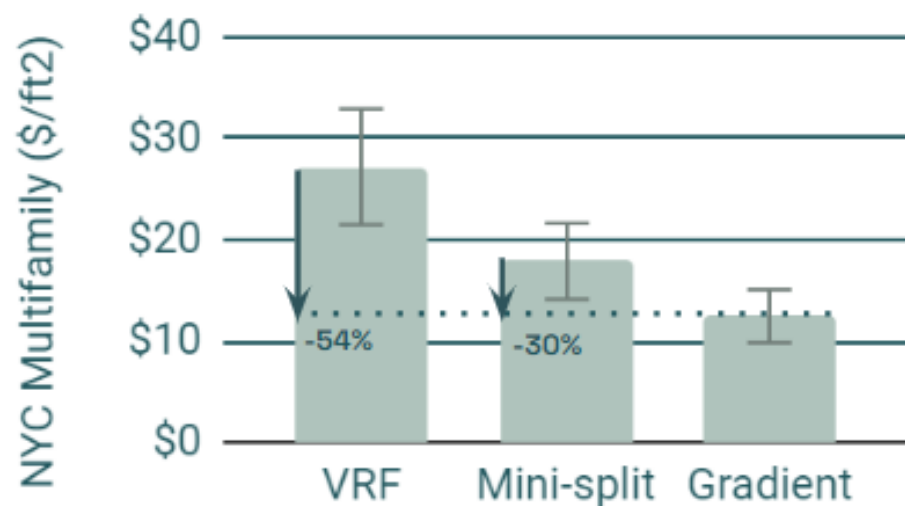
Heating Energy Efficiency Ratio (HEER) is the Seasonal Heating Efficiency for Window Heat Pumps

HEER	HSPF2	Capacity Ratio @ 5 degrees	COP @ 5 degrees
9.4	9.3	80%	2.06

- ENERGY STAR has published their **HEER** testing methodology for reverse cycle room air conditioners (window heat pumps)
- The HEER and the HSPF2 tests involve the same test conditions but different calculation procedures, so we can use our HEER test data to calculate exactly what the equivalent HSPF2 would be.

Market Opportunities for Window Heat Pumps

Lower Upfront Cost than Any Other Heat Pump through Simpler Installation



Source: Gradient analysis of Urban Green Going Electric report (2020), inflation adjusted

Lower Operating Cost than Average Incumbent HVAC via High Efficiency

	Annual Utility HVAC Delta			
	Resist. Electric	Delivered Fuels	Natural Gas Steam	Natural Gas Furnace
Northeast	-58%	-39%	-43%	-18%
Midwest	-60%	-48%	-48%	-30%
West	-62%	-47%	-41%	-33%
South	-58%	-59%	-58%	-48%

Source: Gradient analysis of DOE RECS 2020 microdata with 2023 utility costs

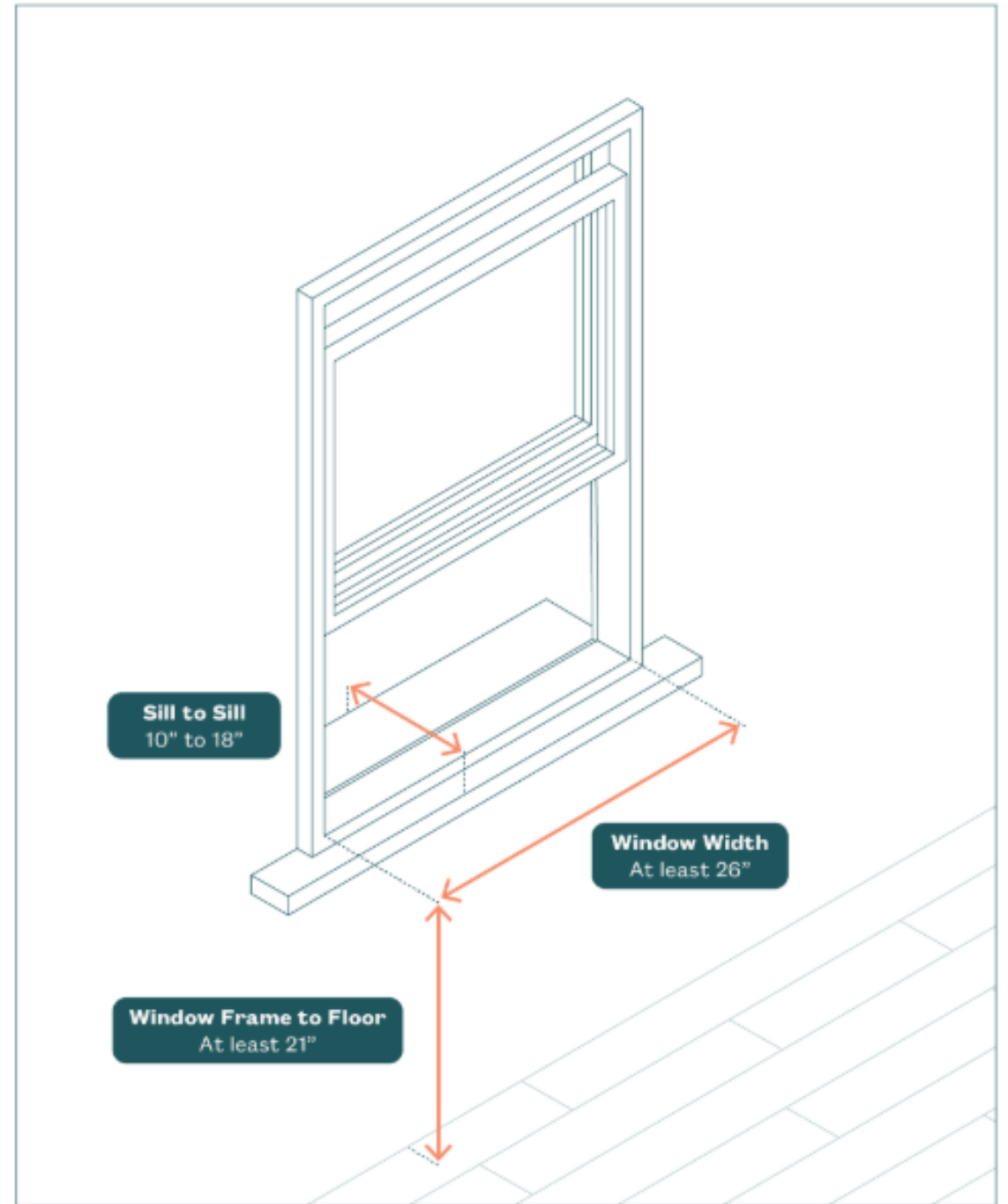
Gradient Window Heat Pumps fit ~50% of US residential windows.

Your window is single or double hung (can slide up and down) and can open at least 16" in height

Clearance below window on both sides of the wall inside and outside is at least 21"

Width of the window is at least 26"

Depth of the window, sill to sill, is between 10" and 18"



The Gradient All-Weather 120V Window Heat Pump



•GRADIENT



NYCHA Clean Heat for All Challenge

CH4A

- 2022 program between NYPA, NYCHA, and NYSERDA with goal of cost effectively meeting LL97 targets
 - Inspired by 1996 program for refrigerators
 - Followed by 2024 program for battery stoves
- Key specs
 - Window install, cord connected, factory charged (no EPA 608 license required)
 - 8,300-9,000 BTU/hr with 1.85-2.35 COP at 17°F
 - Meltwater and condensate management
 - Strict targets for air leak and heat leak
 - No auxiliary resistance heat
- Gradient was awarded a contract for 10,000 heat pumps
 - Initial 36 deployed in December 2023

Specifications For Clean Heat for All Challenge Cold Climate Packaged Heat Pump Solution



Rev. 2.0
2/22/2022



NYCHA Performance

Efficient Power Consumption

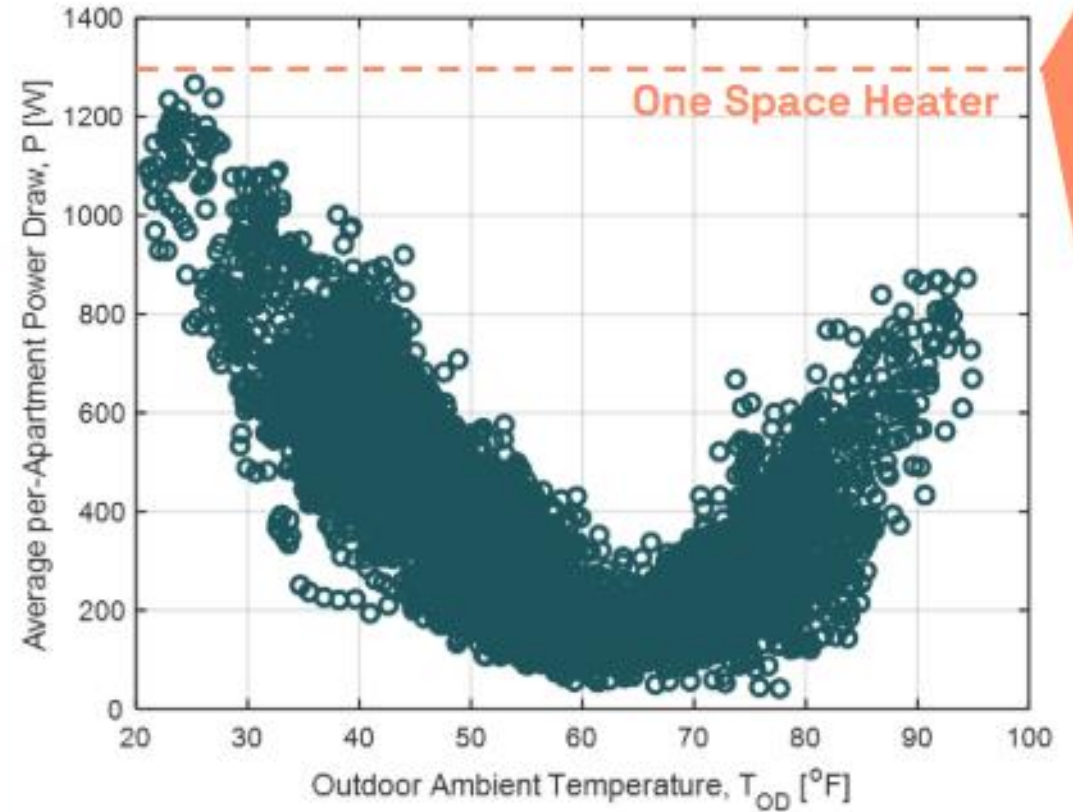
- Uses less power than a single space heater to heat a 700 sq. ft., 2BR apartment even during Winter of '23-'24's coldest hour

Data-Driven Performance Monitoring

- Real-time data collected via on-board sensors, accessible through Gradient's cloud-based backend (available for customer use)

Condensate Performance

- RFP Requirement: No dripping or freezing on lower units or building façade
- Solution: Atomizers



10X

**Reduction in
Installation Time
Compared to
Ductless Mini Splits**

*GRADIENT

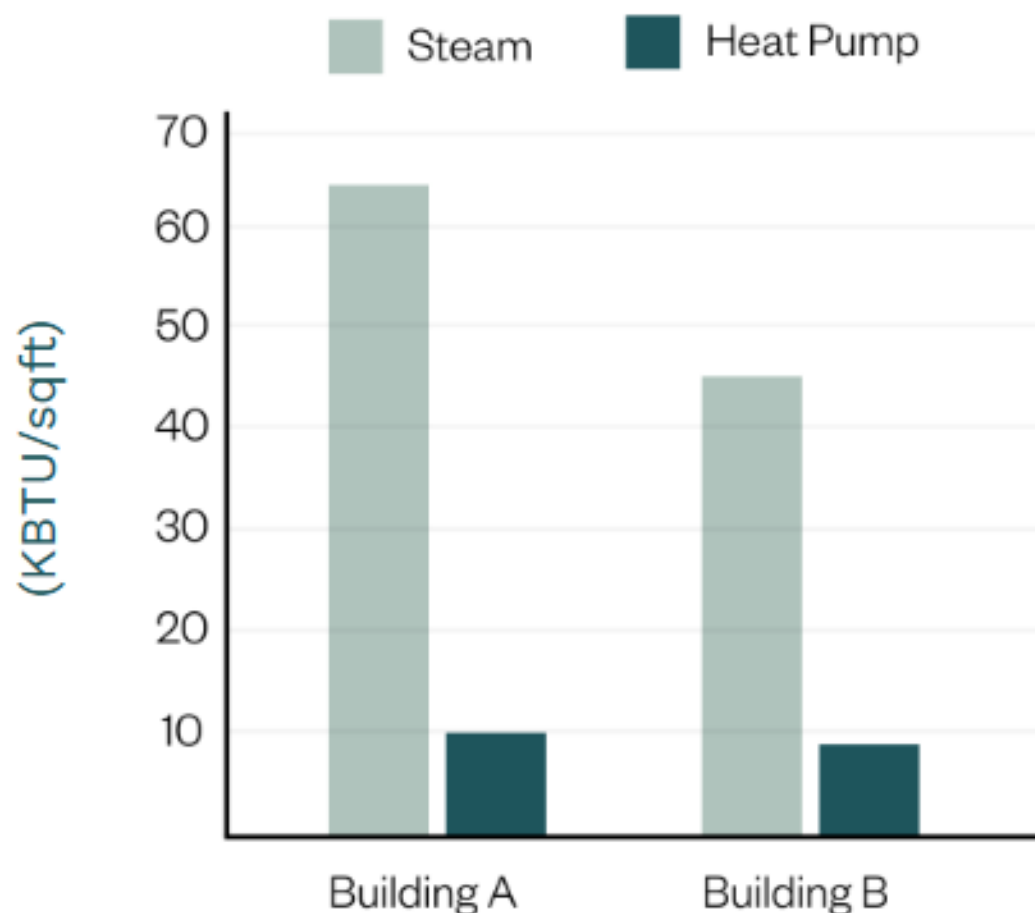


NYSERDA Preliminary M&V Results¹

Energy Efficiency, Cost Savings, & Environmental Benefits

- Energy & Cost Savings: 85-88% reduction in heating energy; 49-60% cost savings.
- GHG Reduction: 76-81% reduction in emissions.
- Uniform Temperature: Consistent control, even in unheated spaces.
- Minimal Impact to Electrical Load: Only 30% of building load from heat pumps at peak

Heating Energy Per Square Foot



NYSERDA Preliminary M&V Results¹

How satisfied are you with the new heating units?

- Satisfied
- Neutral
- Dissatisfied



How well did the new units keep you warm this winter?

- Too cold
- Just right
- Too warm



Were the units easy to use?

- Yes
- No



How was the sound from the units?

- Very quiet
- Okay
- Too noisy



Thank You!

Questions?

samantha@gradientcomfort.com

