Air Source Heat Pump Webinar

Mitsubishi

Today's Speaker

Kevin DeMaster
Mitsubishi Electric Trane HVAC US
Sr. Mgr. Utilities & Electrification

MITSUBISHI ELECTRIC TRANE HVAC US

The FUTURE of Comfort is here TODAY!

Kevin DeMaster- Sr. Mgr. Utilities & Electrification

Apr 28th – 2022

About Mitsubishi Electric

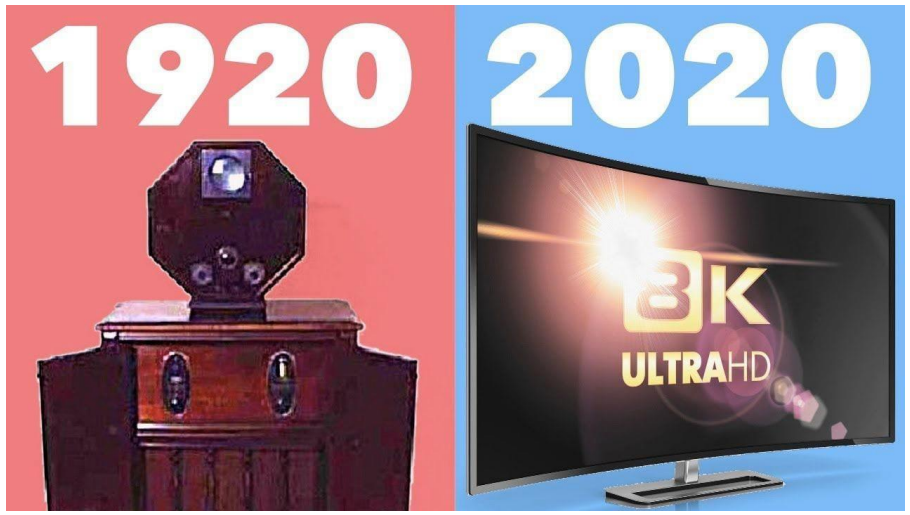
Mitsubishi Electric est. in USA in 1980

Joint Venture Established May 2018

Mitsubishi Electric Trane HVAC US (ie METUS)

Joint company, no single owner

Technology Improvements Are Occurring in All Categories

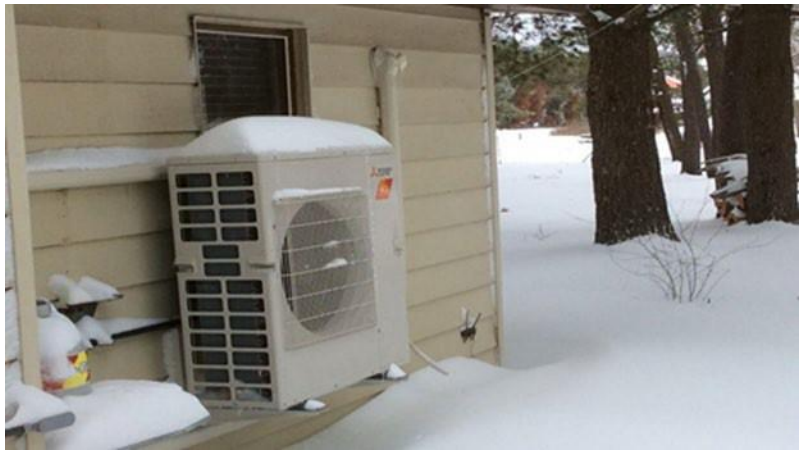


60 Watts

14 Watts

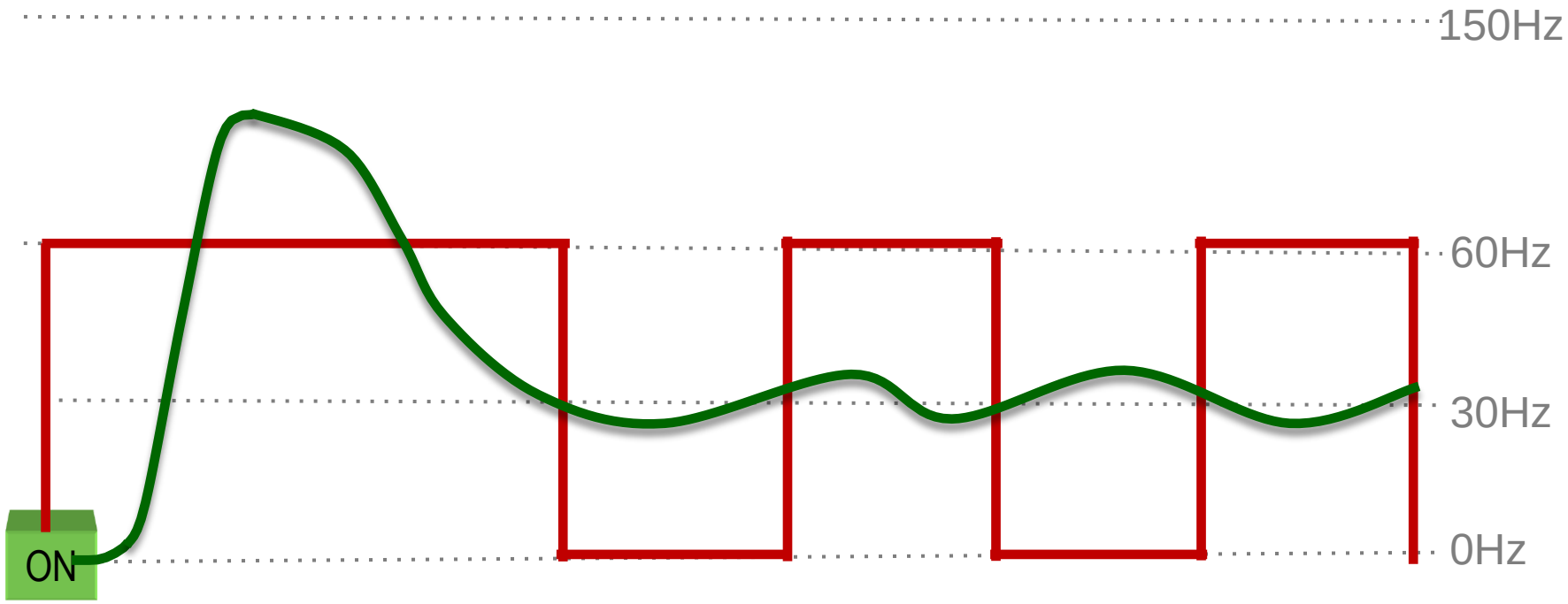
8 Watts

10 SEER
Backup Heat @32F



Up to 33 SEER
100% Heating @ -5F

Heat Pumps Not Created Equal:
INVERTER Compressor Benefit



Personal Comfort

ZONED COMFORT SOLUTIONS

Sunroom (1:1)

Basement (multizone)

ZCS (whole home)

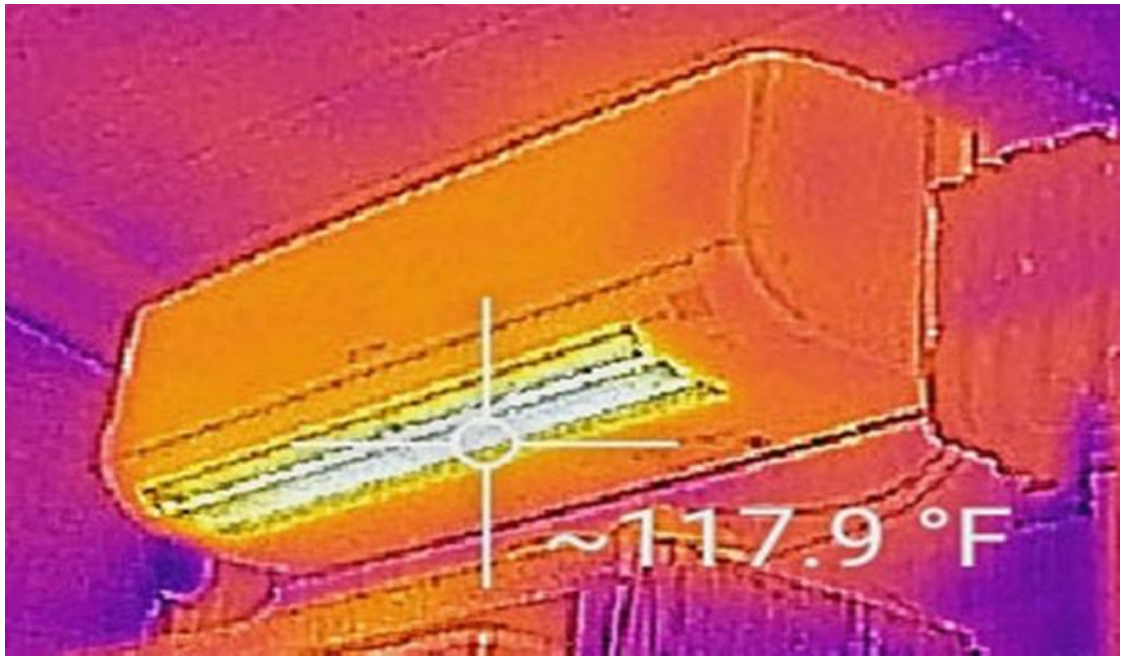
Migration from single zone hot/cold spots to whole home solutions

Single Zone (Mini-Split) & Multi-Zone (Multi-Split) Systems

Challenge YOUR Thinking! - COMFORT

What option provides comfort and efficiency?

Cold Climate Air Source Heat pumps – It's not about the SEER rating



HOT START TECHNOLOGY

100%	70-93%
5F	-13F

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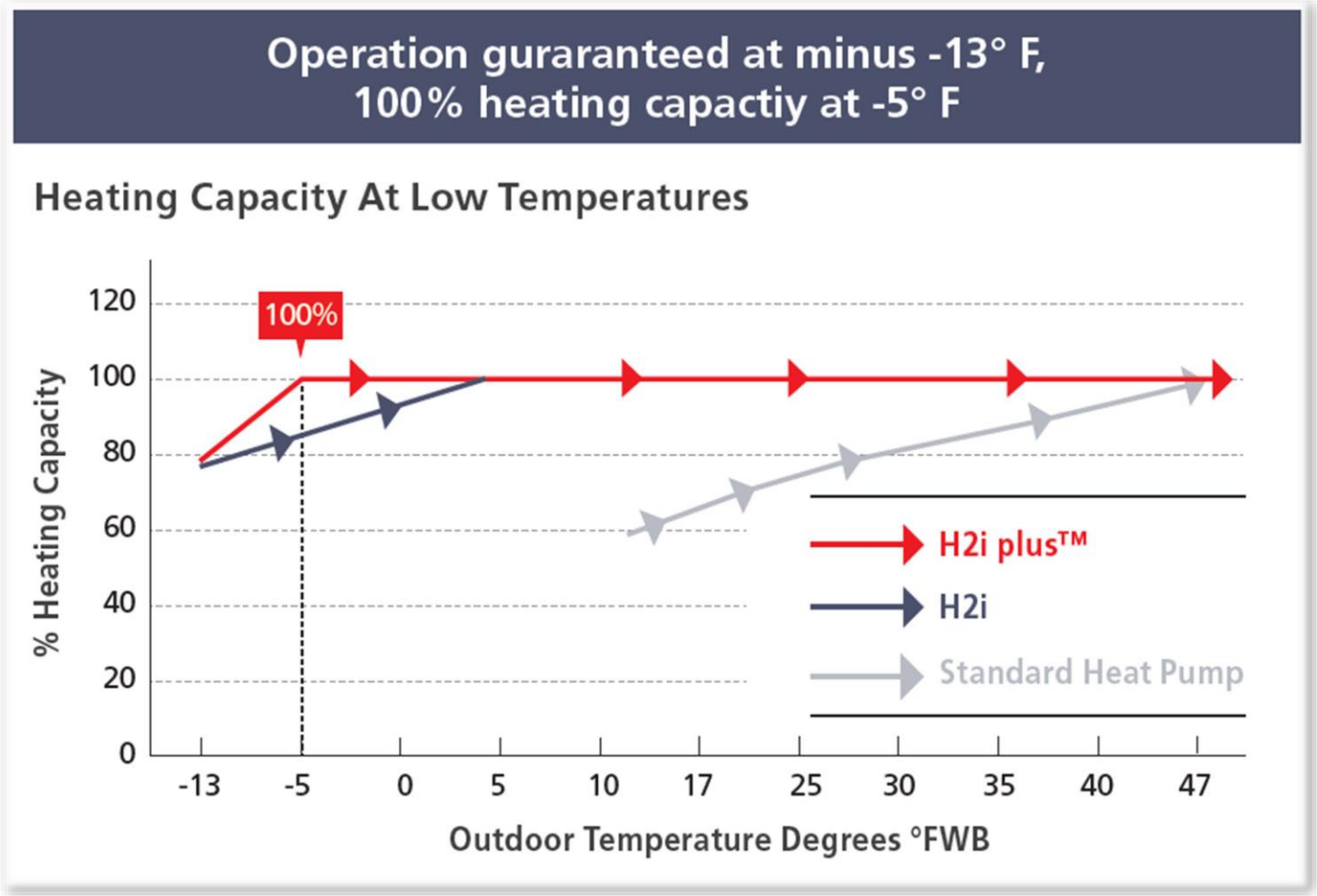
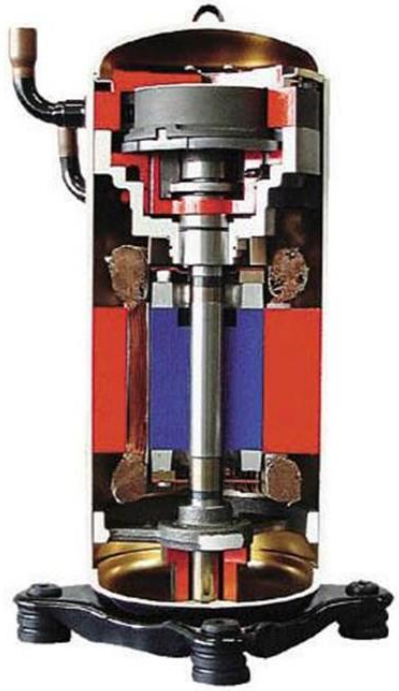
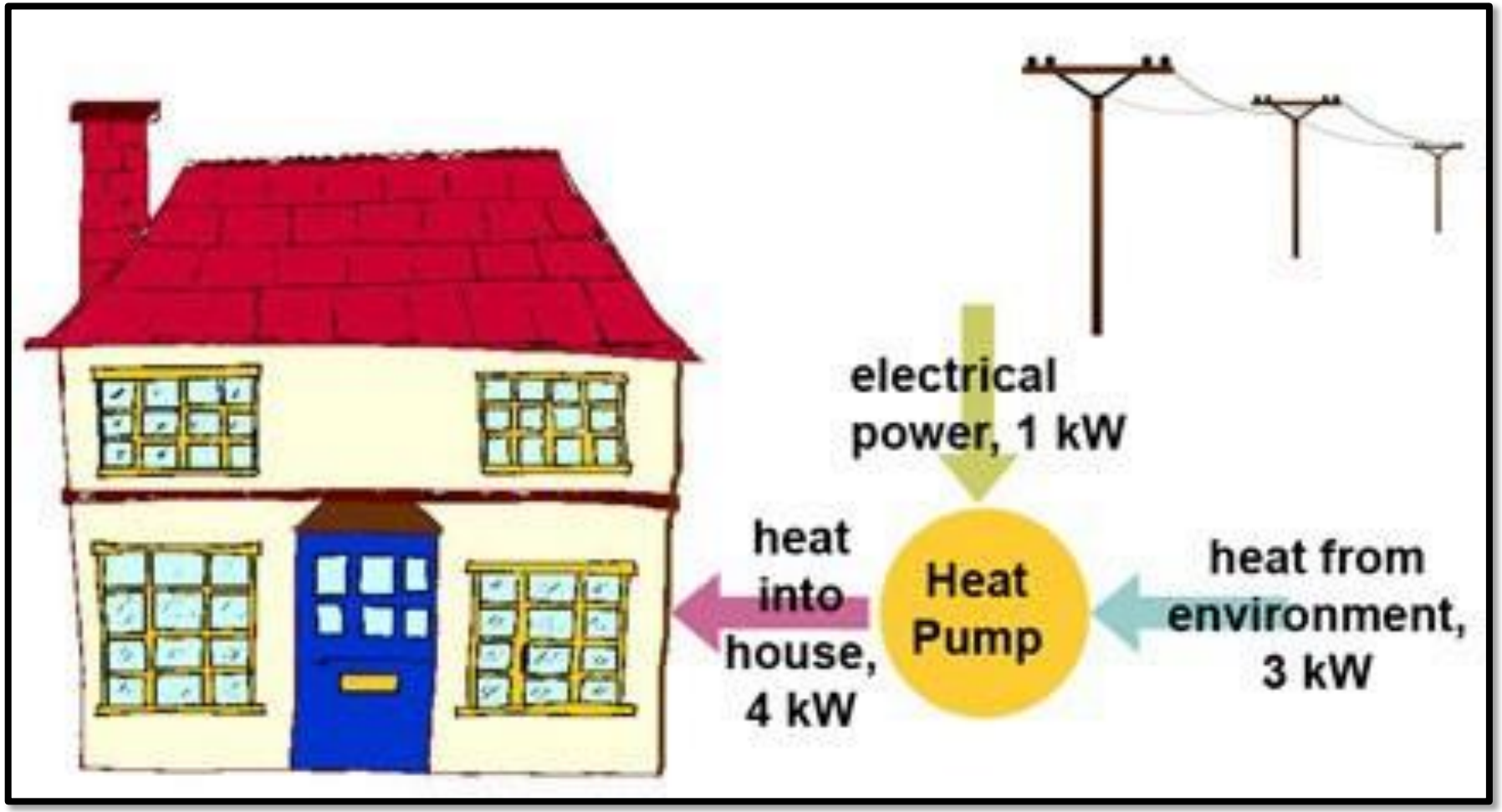
Heat Pumps Not Equal - Cold Climate Heat Pump (ccHP) Technology





FLASH INJECTION

Cold Climate Heat Pumps….Why Utilities and Policies are Advocating



https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/60c9295c0d6f5b30e2a66948/1623796080027/Alliance+Building+Decarbonization+Roadmap.pdf

DOE Cold Climate Heat Pump Challenge

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Residential Cold-Climate Heat Pump Technology Challenge

Why are cold-climate heat pumps important?

Space conditioning and water heating consume over 40% of the nation's primary energy and are a major source of greenhouse gas (GHG) emissions. Electric heat pumps (HPs), which extract heat from the air and ground, are an efficient alternative to fuel-fired space conditioning and water heating equipment. However, the performance of conventional HPs declines in colder climates, which have high space heating demands. In recent years, HVAC manufacturers have developed specialized cold-climate heat pumps (CCHPs) which incorporate advanced designs to operate with greater capacity and efficiency at low outdoor temperatures (below 32°F).

Why is a technology challenge needed?

CCHPs are gaining acceptance in some regions, with support from government, industry, and utility initiatives, but additional efforts are needed to address common technical and market barriers to wider adoption by consumers, which include performance at temperatures of 5°F and below, installation challenges, and electricity grid impacts during peak demand periods.

To advance the adoption of CCHP technologies, the US Department of Energy (DOE) is launching the Cold- Climate Heat Pump Technology Challenge as part of the Initiative for Better Energy, Emissions, and Equity (E3 Initiative).

In partnership with the U.S. Environmental Protection Agency (EPA), Natural Resources Canada (NRCan) and heat pump manufacturers, DOE aims to accelerate the development and commercialization of next-generation CCHPs that meets consumer comfort and efficiency needs in cold climate regions of North America. CCHP products that meet the Challenge specification would offer high efficiency and heating capacity both seasonally and at very cold temperatures (5°F and below). The Challenge builds upon the recent ENERGY STAR specification (v6.0).

Cold-climate heat pumps (CCHPs) provide both space heating and cooling for homes, and incorporate advanced features that allow for improved heating capacity and efficiency at cold weather conditions compared with traditional heat pumps.

Photo credit stock.adobe.com.

Which products are in scope?

The CCHP Technology Challenge is focused on residential, centrally ducted, electric-only HPs. The Challenge has two segments: one for a CCHP optimized for 5°F (-15°C) operation and the other for a CCHP optimized for -15°F (-26°C) operation. Manufacturers can choose to participate in one or both segments of the challenge. Challenge submissions are limited to models that meet the following criteria:

- Have a nominal cooling capacity (or nominal heating capacity for a heating-only HP) greater than or equal to 24,000 Btu/h and less than or equal to 65,000 Btu/h.
- Meet all of the challenge specification requirements
- Comply with all applicable federal and state standards, regulations and laws governing these types of HPs, including compliance with all safety and environmental standards.

Advantages of Heat Pumps

Fossil fuels burned in space and water heating are some of the largest contributors to U.S. GHG emissions today. Heat pumps, when combined with low carbon electricity resources, can provide substantial GHG emissions savings for the buildings sector. A variety of heat pump solutions are available to fit individual building needs including ducted, ductless, air-to-water and other solutions. Other advantages include:

- Provides both heating and cooling
- High efficiency and performance throughout the year
- Better comfort with multi-speed operation
- Grid connectivity enables grid optimization and renewable integration
- Some products enable temperature control in different areas of the home
- Potential for improved air quality

Outdoor coil absorbs heat from the air, then the compressor concentrates the heat, and finally the indoor coil releases heat into the air.

Photo credit ORNL

What are the challenge specifications?

Performance Requirements

Seasonal Heating

- 8.5 HSPF2 (ASHRAE Region V)
- Heating at 5°F [-15°C]
- Minimum COP of 2.1-2.4 at 5°F
- Capacity ratio of 100% for 5°F capacity to 47°F capacity
- Minimum turndown ratio at 47°F
- Compressor cut-in and cut-out temperatures

Heating at -15°F [-26°C] (optional)

- HP operation at -15°F as measured by compressor cut-in and cut-out temperatures

Auxiliary heat

- Staged auxiliary heating

Low GWP Requirement

- Employ refrigerant with a global warming potential (GWP) value of no more than 750 (AR4,100 year)

Connected Product Criteria

- Offer the connected product capabilities within the latest ENERGY STAR specification (v6.0).

Ver 6.1

ENERGY STAR

nep

Click here to access NEEP'S COLD CLIMATE AIR SOURCE Heat Pump List

Heat Pumps						
Product Type	Product Subtype	SEER	EER	HSPF		
HP Split System	Multi-Capacity	**>16**	>12.0	>9.0		
Cold Climate Heat Pumps						
Product Type	Product Subtype	SEER	EER	HSPF	COP@5F	% Heat Capacity
HP Split System	non-ducted	16	X	10	1.75	60%
HP Split System	ducted	15	X	9	1.75	60%

Superior COP Performance @5F

Heating Capacity

	FS06	FS09	FS12	FS15	FS18
Maximum Heating Capacity at 5°F (-15°C)	10,500BTU/H	11,590BTU/H	14,690BTU/H	19,360BTU/H	23,000BTU/H
COP at 5°F (-15°C)	2.46	2.41	2.42	2.17	2.15
Maximum Heating Capacity at -5°F (-20.5°C)	8,700BTU/H	9,600BTU/H	12,300BTU/H	16,000BTU/H	19,000BTU/H
COP at -5°F (-20.5°C)	2.26	2.20	2.24	2.01	2.00

5F

-5F

Wall Mount Systems Only

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Transparency of Operating Characteristics - Heat Capacity 100%

Heating Capacity (M-Series)

Outdoor Temperature Degrees		50° F	41° F	32° F	23° F	14° F	5° F	-4° F	-13° F
MSZ-FS06NA-U1 / MUZ-FS06NA-U1	Heating Capacity (BTU/H)	14,445	13,703	12,962	12,149	11,037	9,924	8,700	7,721
	Percentage of Rated Capacity	100%	100%	100%	100%	100%	100%	100%	89%
MSZ-FS06NA-U1 / MUZ-FS06NAH-U1	Heating Capacity (BTU/H)	14,445	13,703	12,962	12,149	11,037	9,924	8,700	7,721
	Percentage of Rated Capacity	100%	100%	100%	100%	100%	100%	100%	89%
MSZ-FS09NA-U1 / MUZ-FS09NA-U1	Heating Capacity (BTU/H)	18,554	17,631	16,707	15,068	13,304	11,540	9,600	8,048
	Percentage of Rated Capacity	100%	100%	100%	100%	100%	100%	100%	84%
MSZ-FS09NA-U1 / MUZ-FS09NAH-U1	Heating Capacity (BTU/H)	18,554	17,631	16,707	15,068	13,304	11,540	9,600	8,048
	Percentage of Rated Capacity	100%	100%	100%	100%	100%	100%	100%	84%
MSZ-FS12NA-U1 / MUZ-FS12NA-U1	Heating Capacity (BTU/H)	21,714	20,524	19,333	18,143	16,464	14,482	12,301	10,556
	Percentage of Rated Capacity	100%	100%	100%	100%	100%	100%	100%	86%

40 Systems – 100% Capacity @5F
Mitsubishi Meeting DOE Cold Climate Challenge Performances for Years

The Hyper Heat Evolution Continues…

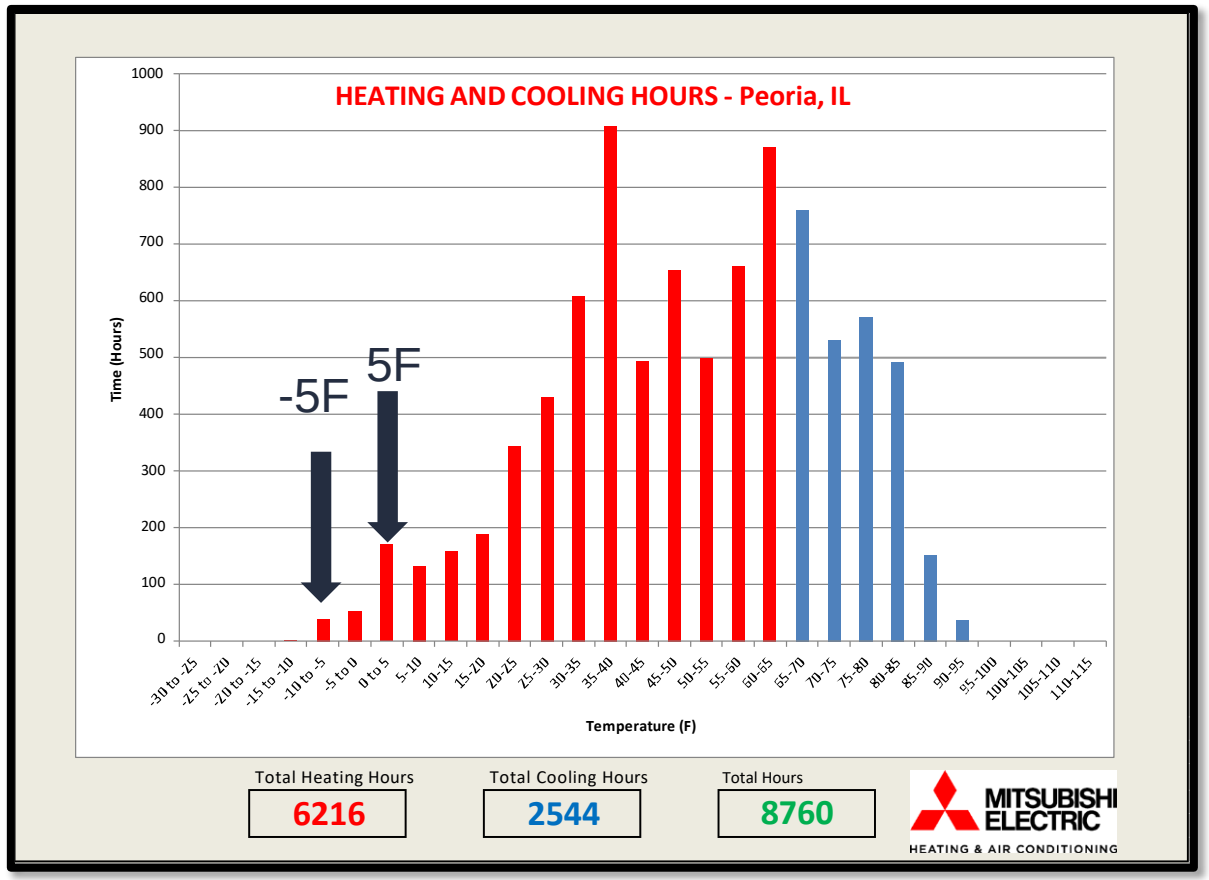
- 60+ hyper heat combinations added for various capacities and indoor unit types between 2020 and 2022

◆ New additions in 2020-22

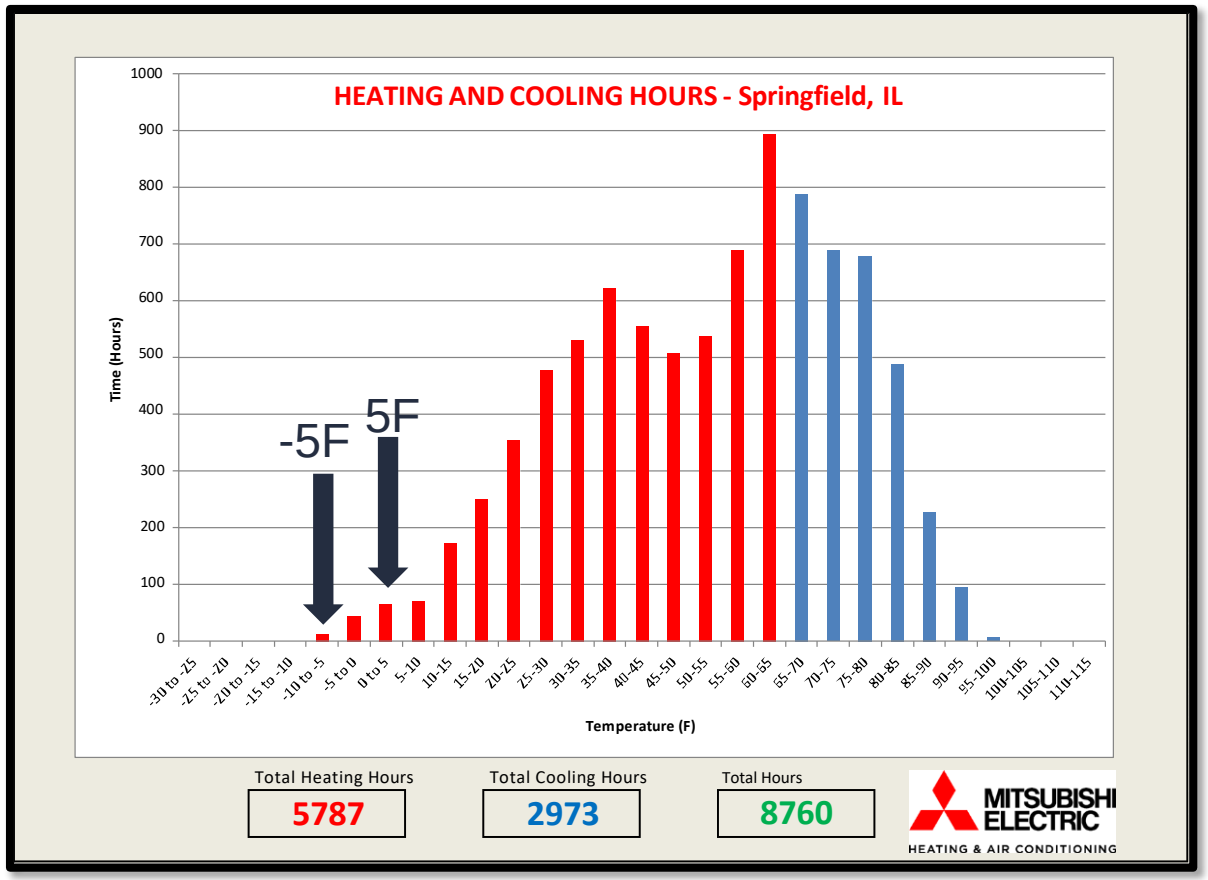
◆ Existing

	6	9	12	15	18	24	30	36	42	48	60
Wall Mounted (High-Tier FS, PKA)	◆	◆	◆	◆	◆	◆	◇	◇			
Wall Mounted (Mid-Tier GS)		◆	◆	◆	◆	◆					
Floor Mounted (MFZ)		◇	◇	◇	◇						
EZ FIT Cassette (MLZ)		◆	◆		◆						
2x2 Ceiling Cassette (SLZ)		◆	◆	◆	◆						
Low-static ducted (SEZ)		◆	◆	◆	◆						
Mid-static ducted (PEAD)		◆	◆	◆	◆	◆	◆	◆	◆		
intelli-AIR (High-tier PVA)						◆	◇	◇	◇	2023	2023
intelli-AIR (Mid-tier SVZ)			◆		◆	◆	◆	◆		2023	2023
intelli-HEAT (PAA, A-coil)			◆		◆	◆	◆	◆	◆	2023	2023
Ceiling Suspended (PCA)						◆	◇	◇	◇	◆	
3x3 Ceiling Cassette (PLA)						◆	◇	◇	◇	◆	
Multi-zone ODU (MXZ)					◆	◆	◆	◆	◆	◆	2024

Weather Profile – Peoria & Springfield IL:



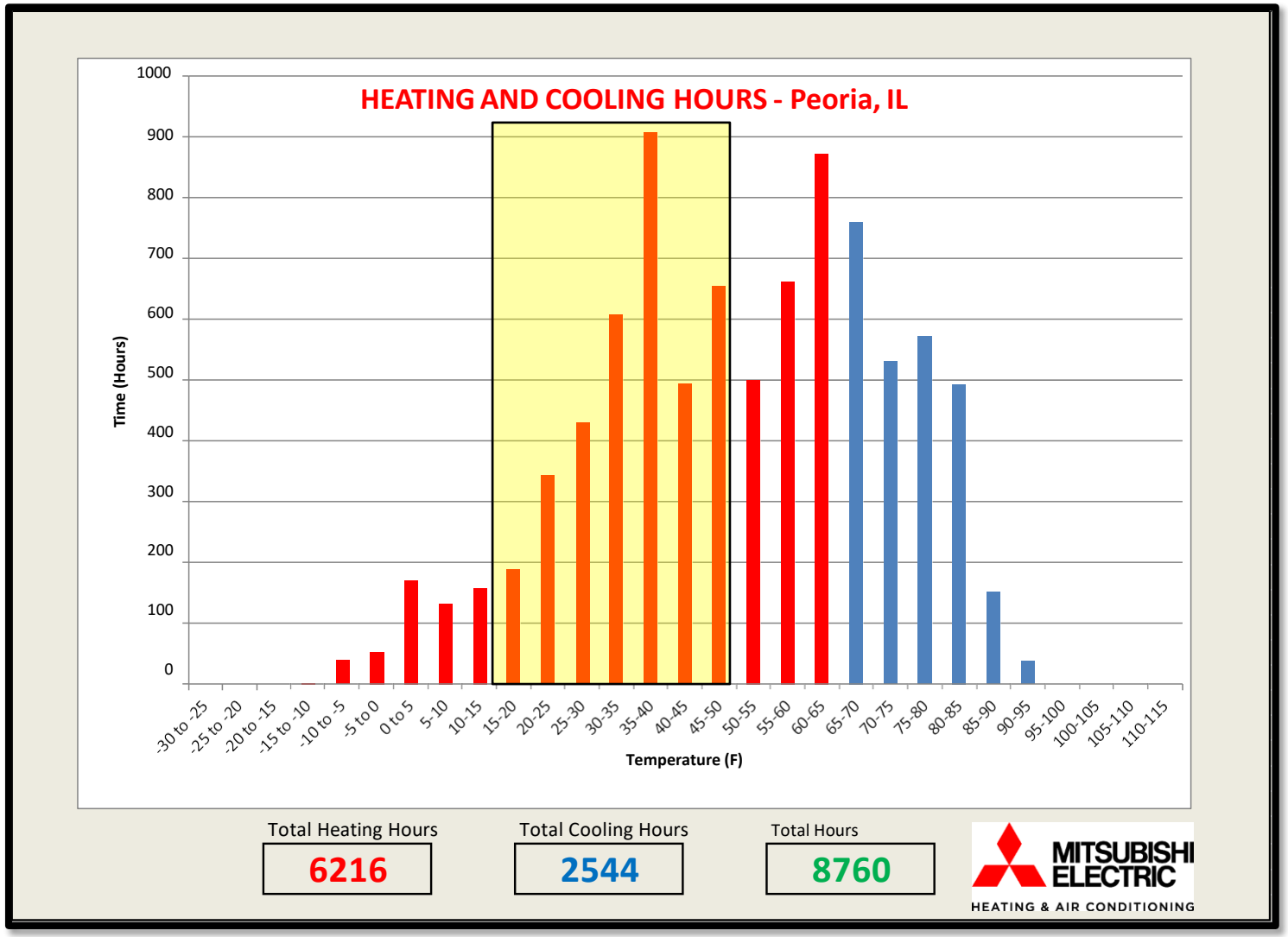
- Hours below 5F ~264
- 96% Heating Hours above 5F
- Hyperheat Plus to -5F only 40 Hours (0.6%) Below



- Hours below 5F ~122
- 98% Heating Hours above 5F
- Hyperheat Plus to -5F only 13 Hours (0.2%) Below

Weather Profile – Peoria, IL

- AHRI Testing 17/47F
- Bulk of Heating Hours
- Average COP Across ALL 406 Models
- 47F C.O.P. – 3.95
- 17F C.O.P. – 2.75
    - Average COP in band 17/47 > 3++ COP

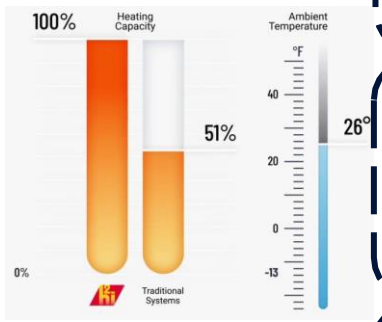


Heat Pumps Not Created Equal!!

Single or 2-speed Heat Pump

VS.

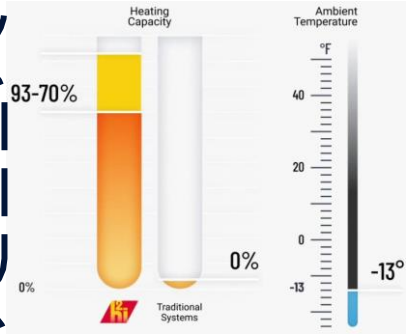
Variable Capacity Heat Pump



AHRI Products		AHRI Products
(69%)	❑ SEER 15-15.9	(98%)
(30%)	❑ SEER 16-17.9	(96%)
(4%)	❑ SEER 18+	(70%)

Cooling

COP ~1 below 20 — **Heating** — COP ~1.75 @-13F – No Electric "Toaster"



Blender = 80db — **Noise** — Electric toothbrush = 50db

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Rewiring America Heating Analysis Winter 2020/21 to Winter 2021/22

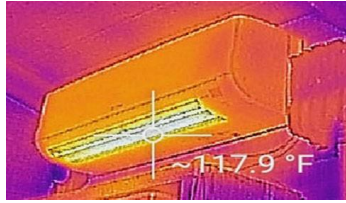
Figure 1: Regional breakdown of expected winter season heating bill increases from 2020 to 2021.

https://surveys.signforgood.com/ra-energy-bill-security?code=jtk27-ot-fl

Rewiring America - December 2021

Energy bill security for American households through electrification

E. N. CENTRAL	
Fuel oil	+$524
Propane	+$677
Natural gas	+$257
Resistance	+$75
Heat pump	+$30



Summary – Cost of Illinois Heating BTU's

All Home Energy 129MMBtu – Illinois
Space Heating – 51%

AFUE 85%

AFUE 90%

COP 1.0

COP 2.75

Propane –
$2.26/gal

Natural Gas –
$1.31/ therm

Electric Resistance Heat –
$0.091 / kWh

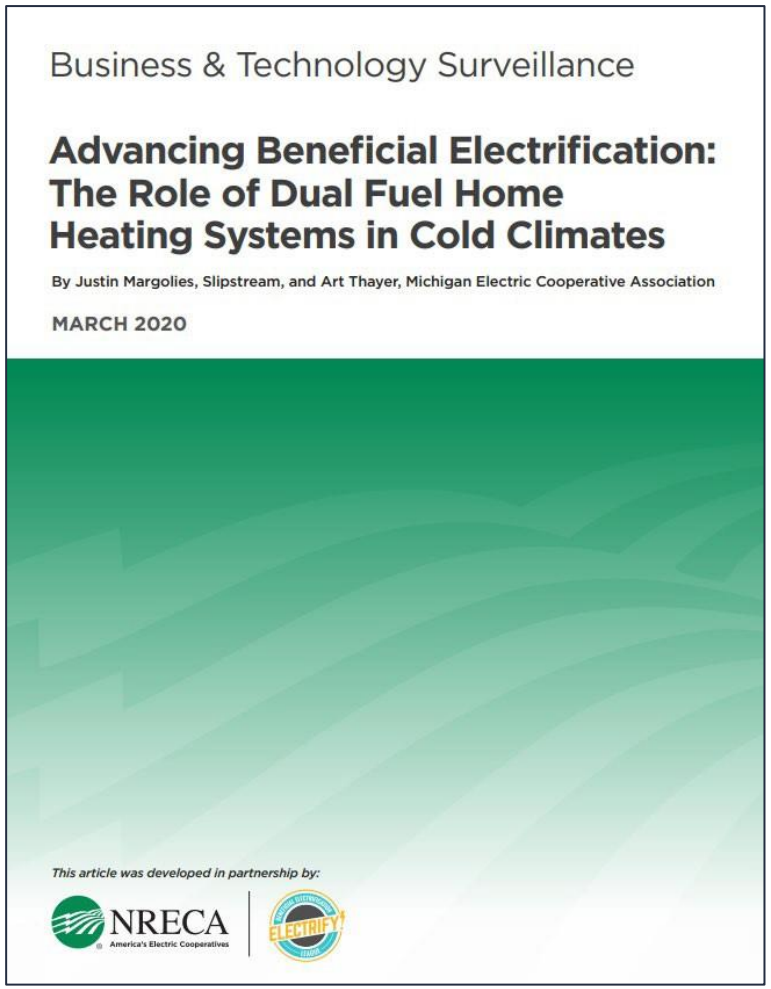
Cold Climate Heat Pump –
$0.091 / kWh

Cost Per Million BTU's
$29.19
$14.56
$26.66
17-47 degrees $9.70

Source EIA Illinois – April 2022

https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/IL.pdf

Dual Fuel Heat Pump Research



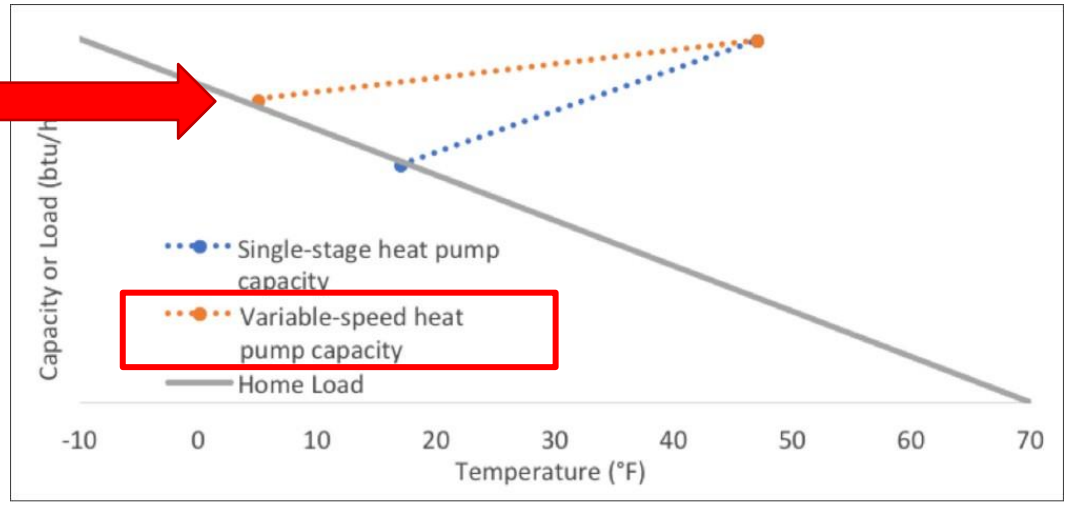


FIGURE 2: Home Heating Load Increases as Heat Pump Capacity Decreases[2]

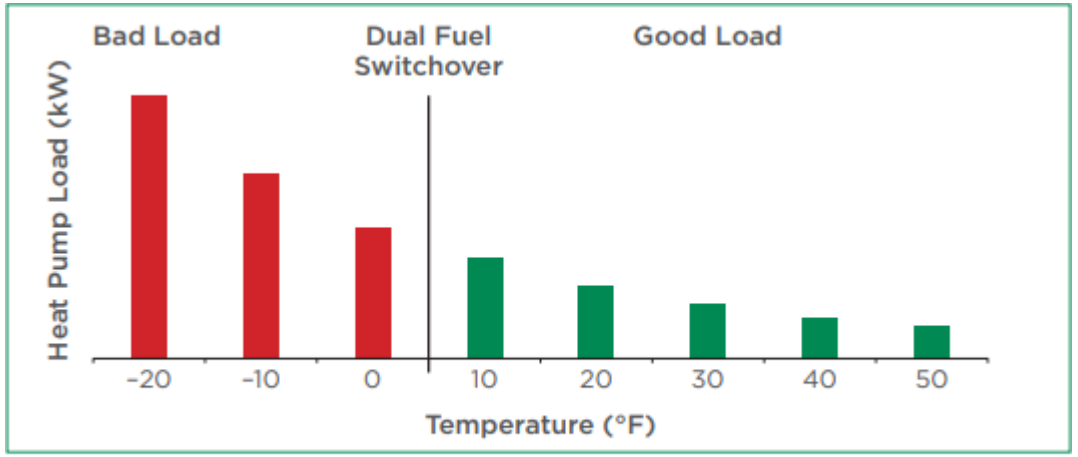


FIGURE 1: Dual Fuel Heat Pumps Generally Add Good Load in Future State of High Penetration of Electric Space Heating

Follow the Market Opportunity Horizon & Trends

Watch for

Heat Pumps Surpass Furnaces

ILLINOIS - Investor-Owned Utility

- Must be 16 SEER or greater as confirmed by AHRI
- Must be 9.0 HSPF or greater as confirmed by AHRI
- Limit 2 per residential account

- MIDSTREAM PROGRAM – MUST BE ENROLLED AS DISTRIBUTOR
- DIRECT DISCOUNT TO CONTRACTOR
- USE ASHP REBATE FOR FULLY DUCTED (SVZ, PVA, MXZ w/SVZ)

Central Business Unit Spring Promo 2022– Homeowner Flyer

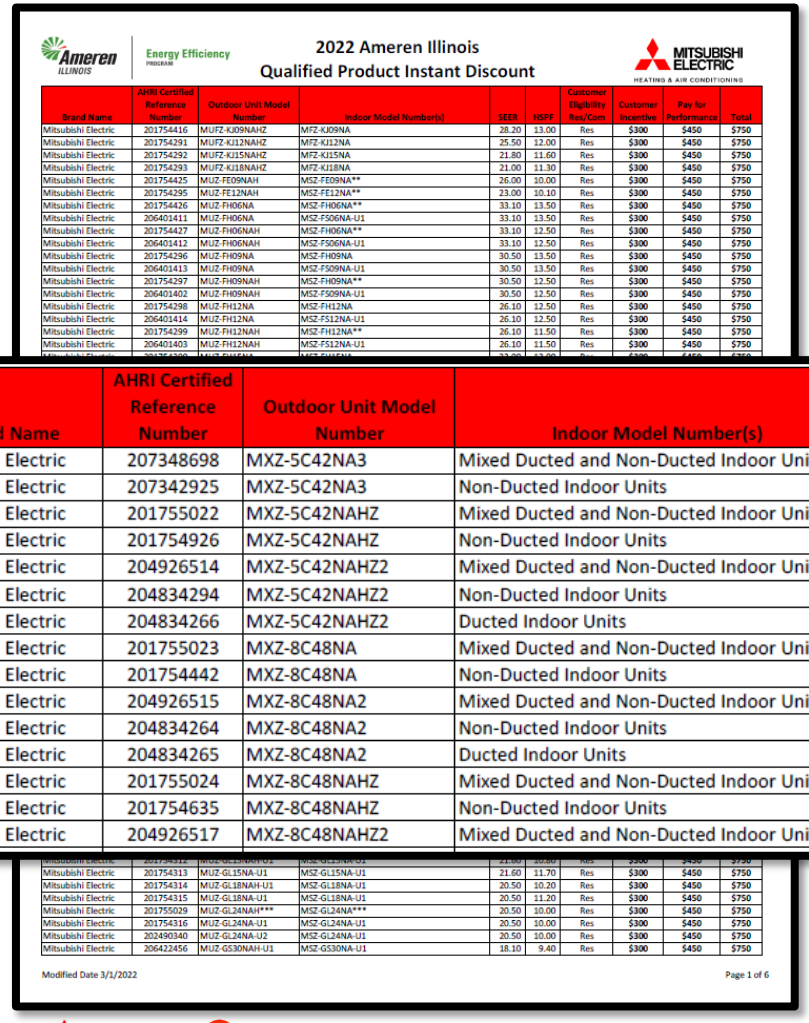
Diamond Contractor Benefit

Mitsubishi Multi-Zone Promotion

- $500 – Customer Rebate
- $100 – Contractor Incentive
- $250 – Air Handler Contractor Bonus
- **Up To $850 Mitsubishi Incentives**

Stacked with Ameren Incentives Could Be Significant

How To Promote Eligible Utility Equipment?


Ameren ILLINOIS Energy Efficiency PROGRAM

2022 Ameren Illinois
Qualified Product Instant Discount

MITSUBISHI ELECTRIC HEATING & AIR CONDITIONING

Brand Name	AHRI Certified Reference Number	Outdoor Unit Model Number	Indoor Model Number(s)	SEER	HSPF	Customer Eligibility Res/Com	Customer Incentive	Pay for Performance	Total
Mitsubishi Electric	201754416	MUFZ-KJ09NAHZ	MFZ-KJ09NA	28.20	13.00	Res	$300	$450	$750
Mitsubishi Electric	201754291	MUFZ-KJ12NAHZ	MFZ-KJ12NA	25.50	12.00	Res	$300	$450	$750
Mitsubishi Electric	201754292	MUFZ-KJ15NAHZ	MFZ-KJ15NA	21.80	11.60	Res	$300	$450	$750
Mitsubishi Electric	201754293	MUFZ-KJ18NAHZ	MFZ-KJ18NA	21.00	11.30	Res	$300	$450	$750
Mitsubishi Electric	201754425	MUZ-FE09NAH	MSZ-FE09NA**	26.00	10.00	Res	$300	$450	$750
Mitsubishi Electric	201754295	MUZ-FE12NAH	MSZ-FE12NA**	23.00	10.10	Res	$300	$450	$750
Mitsubishi Electric	201754426	MUZ-FH06NA	MSZ-FH06NA**	33.10	13.50	Res	$300	$450	$750
Mitsubishi Electric	206401411	MUZ-FH06NA	MSZ-FS06NA-U1	33.10	13.50	Res	$300	$450	$750
Mitsubishi Electric	201754427	MUZ-FH06NAH	MSZ-FH06NA**	33.10	12.50	Res	$300	$450	$750
Mitsubishi Electric	206401412	MUZ-FH06NAH	MSZ-FS06NA-U1	33.10	12.50	Res	$300	$450	$750
Mitsubishi Electric	201754296	MUZ-FH09NA	MSZ-FH09NA	30.50	13.50	Res	$300	$450	$750
Mitsubishi Electric	206401413	MUZ-FH09NA	MSZ-FS09NA-U1	30.50	13.50	Res	$300	$450	$750
Mitsubishi Electric	201754297	MUZ-FH09NAH	MSZ-FH09NA**	30.50	12.50	Res	$300	$450	$750
Mitsubishi Electric	206401402	MUZ-FH09NAH	MSZ-FS09NA-U1	30.50	12.50	Res	$300	$450	$750
Mitsubishi Electric	201754298	MUZ-FH12NA	MSZ-FH12NA	26.10	12.50	Res	$300	$450	$750
Mitsubishi Electric	206401414	MUZ-FH12NA	MSZ-FS12NA-U1	26.10	12.50	Res	$300	$450	$750
Mitsubishi Electric	201754299	MUZ-FH12NAH	MSZ-FH12NA**	26.10	11.50	Res	$300	$450	$750
Mitsubishi Electric	206401403	MUZ-FH12NAH	MSZ-FS12NA-U1	26.10	11.50	Res	$300	$450	$750
Mitsubishi Electric	201754313	MUZ-GL15NA-U1	MSZ-GL15NA-U1	21.60	11.70	Res	$300	$450	$750
Mitsubishi Electric	201754314	MUZ-GL18NAH-U1	MSZ-GL18NA-U1	20.50	10.20	Res	$300	$450	$750
Mitsubishi Electric	201754315	MUZ-GL18NA-U1	MSZ-GL18NA-U1	20.50	11.20	Res	$300	$450	$750
Mitsubishi Electric	201755029	MUZ-GL24NAH***	MSZ-GL24NA***	20.50	10.00	Res	$300	$450	$750
Mitsubishi Electric	201754316	MUZ-GL24NA-U1	MSZ-GL24NA-U1	20.50	10.00	Res	$300	$450	$750
Mitsubishi Electric	202490340	MUZ-GL24NA-U2	MSZ-GL24NA-U1	20.50	10.00	Res	$300	$450	$750
Mitsubishi Electric	206422456	MUZ-GS30NAH-U1	MSZ-GS30NA-U1	18.10	9.40	Res	$300	$450	$750

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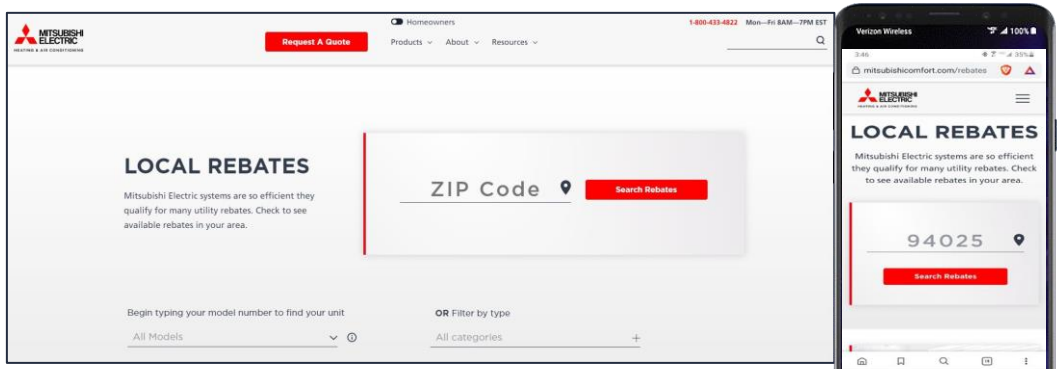
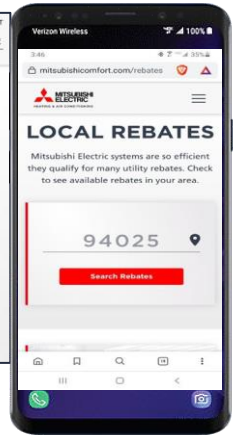
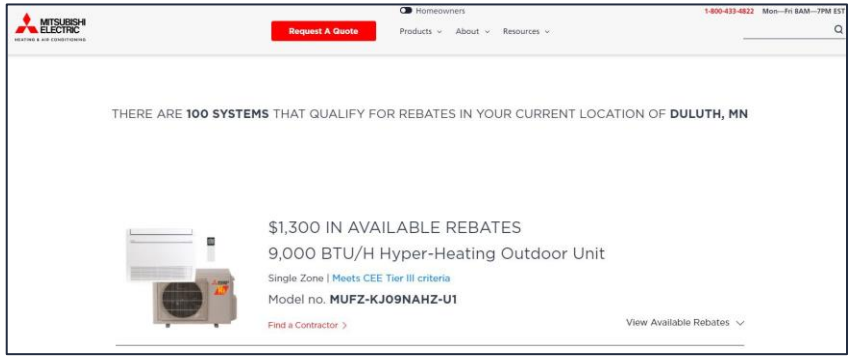
Brand Name	AHRI Certified Reference Number	Outdoor Unit Model Number	Indoor Model Number(s)	SEER	HSPF	Customer Eligibility Res/Com	Customer Incentive
Mitsubishi Electric	207348698	MXZ-5C42NA3	Mixed Ducted and Non-Ducted Indoor Units	17.45	9.50	Res	$300
Mitsubishi Electric	207342925	MXZ-5C42NA3	Non-Ducted Indoor Units	19.70	10.00	Res	$300
Mitsubishi Electric	201755022	MXZ-5C42NAHZ	Mixed Ducted and Non-Ducted Indoor Units	17.00	10.55	Res	$300
Mitsubishi Electric	201754926	MXZ-5C42NAHZ	Non-Ducted Indoor Units	19.00	11.00	Res	$300
Mitsubishi Electric	204926514	MXZ-5C42NAHZ2	Mixed Ducted and Non-Ducted Indoor Units	18.50	10.80	Res	$300
Mitsubishi Electric	204834294	MXZ-5C42NAHZ2	Non-Ducted Indoor Units	20.00	11.00	Res	$300
Mitsubishi Electric	204834266	MXZ-5C42NAHZ2	Ducted Indoor Units	17.00	10.60	Res	$300
Mitsubishi Electric	201755023	MXZ-8C48NA	Mixed Ducted and Non-Ducted Indoor Units	16.80	10.75	Res	$300
Mitsubishi Electric	201754442	MXZ-8C48NA	Non-Ducted Indoor Units	18.90	11.40	Res	$300
Mitsubishi Electric	204926515	MXZ-8C48NA2	Mixed Ducted and Non-Ducted Indoor Units	18.00	10.80	Res	$300
Mitsubishi Electric	204834264	MXZ-8C48NA2	Non-Ducted Indoor Units	20.00	11.50	Res	$300
Mitsubishi Electric	204834265	MXZ-8C48NA2	Ducted Indoor Units	16.00	10.10	Res	$300
Mitsubishi Electric	201755024	MXZ-8C48NAHZ	Mixed Ducted and Non-Ducted Indoor Units	16.80	10.50	Res	$300
Mitsubishi Electric	201754635	MXZ-8C48NAHZ	Non-Ducted Indoor Units	18.90	11.00	Res	$300
Mitsubishi Electric	204926517	MXZ-8C48NAHZ2	Mixed Ducted and Non-Ducted Indoor Units	18.00	10.80	Res	$300







https://www.mitsubishicomfort.com/rebates

MITSUBISHI ELECTRIC TRANE HVAC US

Recent & New Products Advancing the Market

Recent & New Product Highlights Advancing the Market

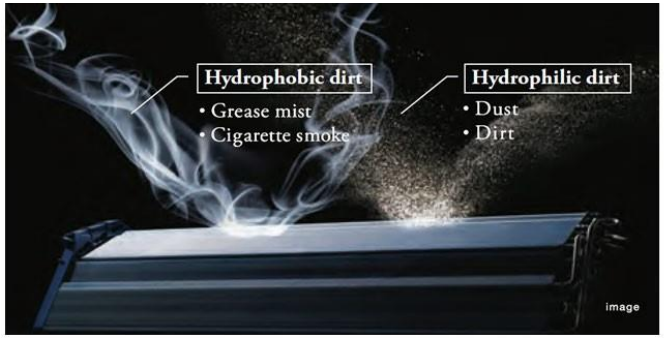
MLZ EZ FIT

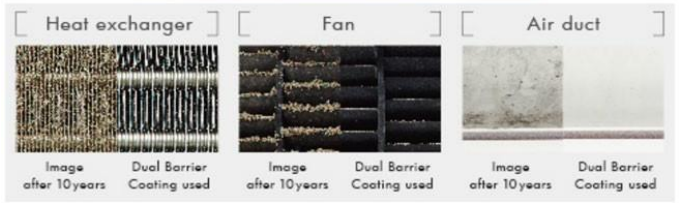
- Smaller width fits between I-joists
- New 6K Btu/h

- Expanding Hyperheat Ducted to 4 & 5 ton

- P-Series Cooling only Product
- 100% cooling capacity down to -40° F
- Wind Baffles

DUAL BARRIER COATING





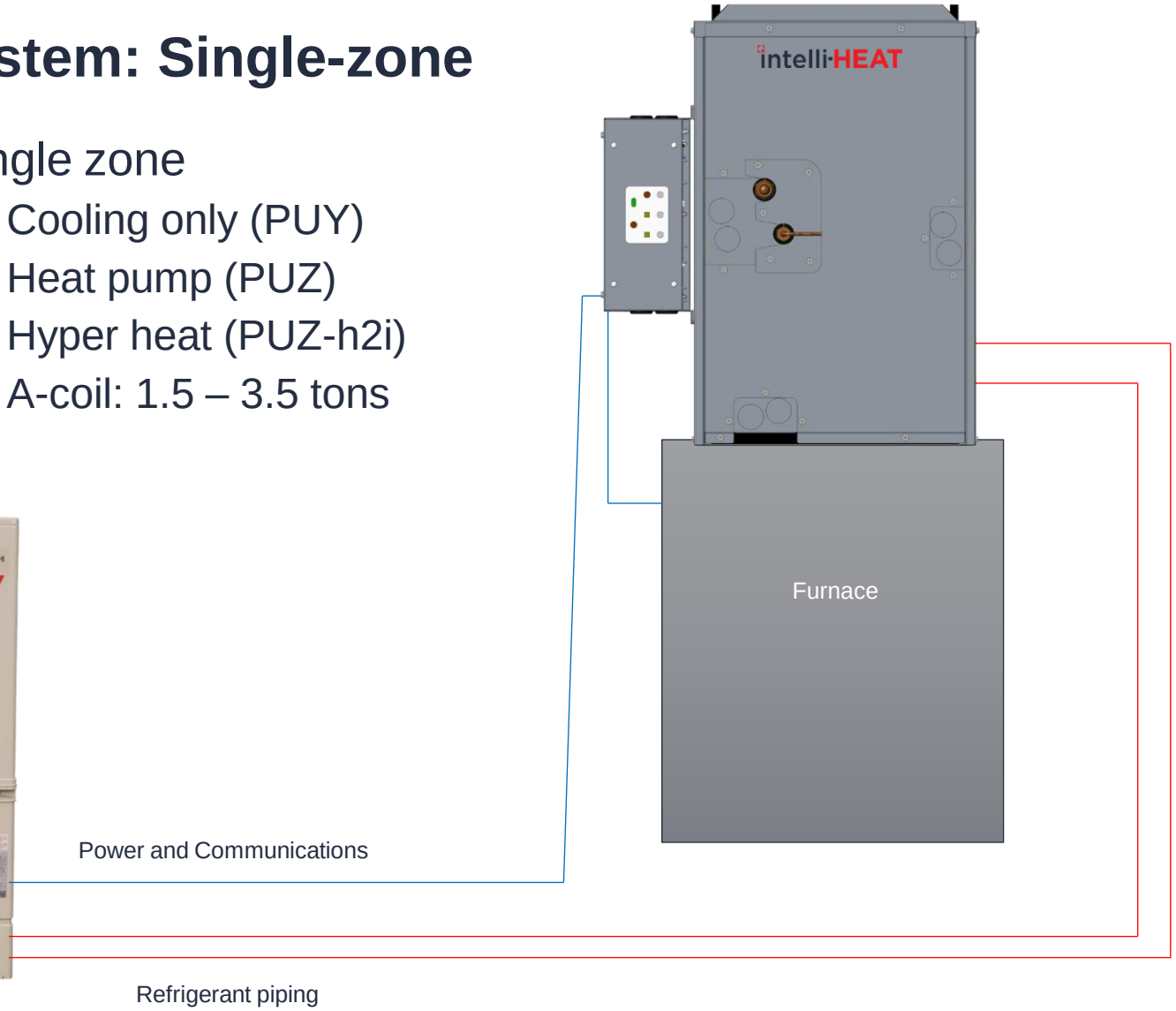
	Air volume worsening (vs the New)	The affect on electric consumption
With DBC	86.9%	104.0%
Without DBC	55.3%	122.0%

2022 Featured Release intelli-HEAT and Control Box

intelli-HEAT

Intelli-Heat system: Single-zone

- Single zone
  - Cooling only (PUY)
  - Heat pump (PUZ)
  - Hyper heat (PUZ-h2i)
  - A-coil: 1.5 – 3.5 tons

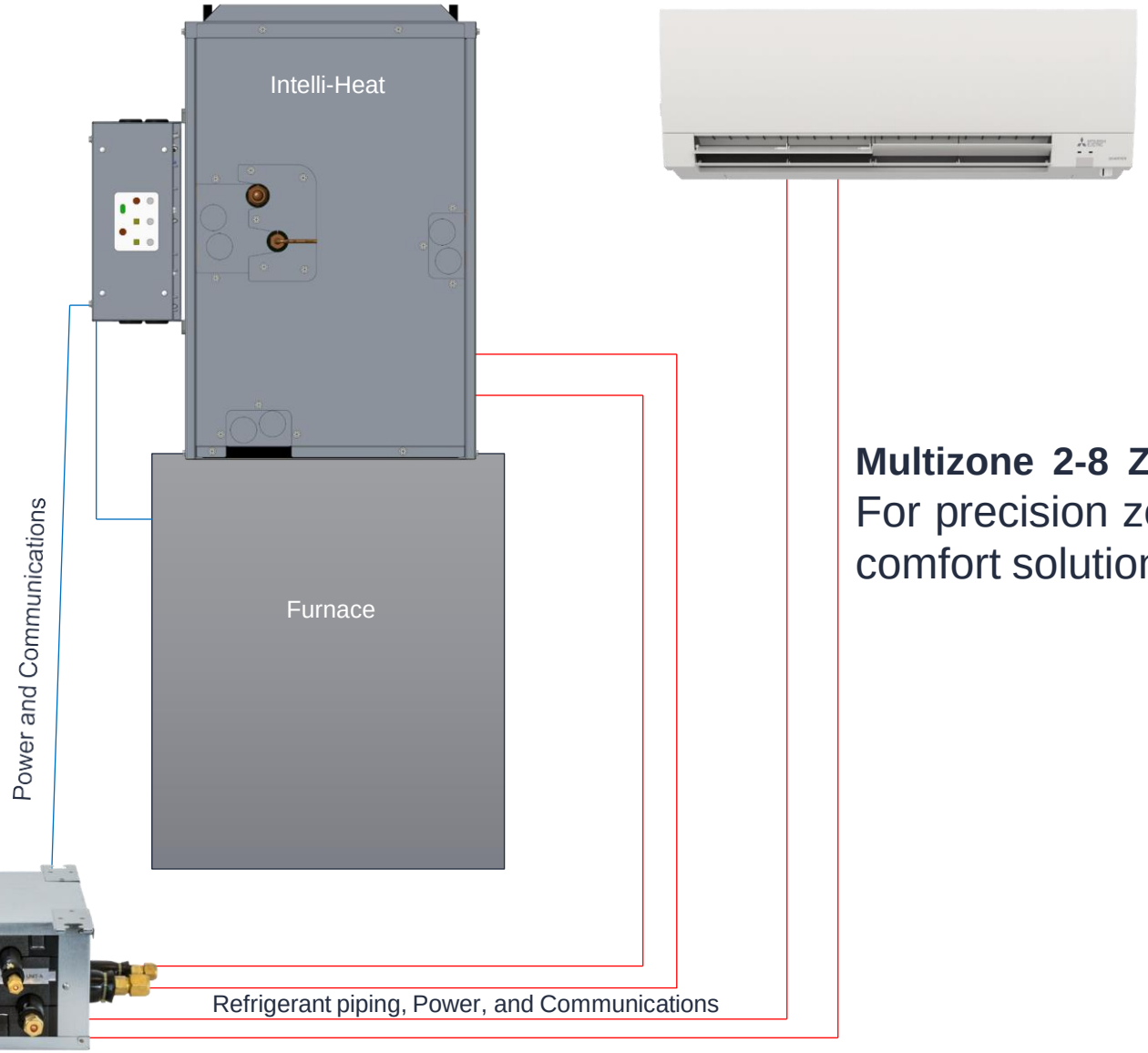


Any furnace connection

Optimum Switchover
Economic balance point and capacity balance point

Intelli-Heat system: Multi-zone

- Multi-zone
  - Heat pump (MXZ)
  - 2 – 5 tons
  - Hyper heat (MXZ-h2i)
  - 2 – 4 tons
  - A-coil: 1.5-3 tons



Multizone 2-8 Zones
For precision zoned comfort solutions

Why Mitsubishi Electric?

America's #1 Selling Ductless Brand

National Market Share ~40%

Midwest Market Share >40%

#1 in Breath of Product Offering

No other brand has more system combinations to choose from.

Industry leading 100% capacity to -5F

Most Energy Star Rated products

More systems than any other manufacturer that qualify for utility company rebates

#1 in Product Reliability

Warranty failure rate less than ½ of 1%/year or "less than .05% per year"

#1 in Units Installed

Over 2,000,000 Systems Installed Nationwide

National Advertising Campaign

First Manufacturer to Maintain a National Advertising Campaign

Qualified Leads Delivered Directly to Your Inbox

35+ Years in the USA

Introduced to the US Market in 1983

Local Mitsubishi Support

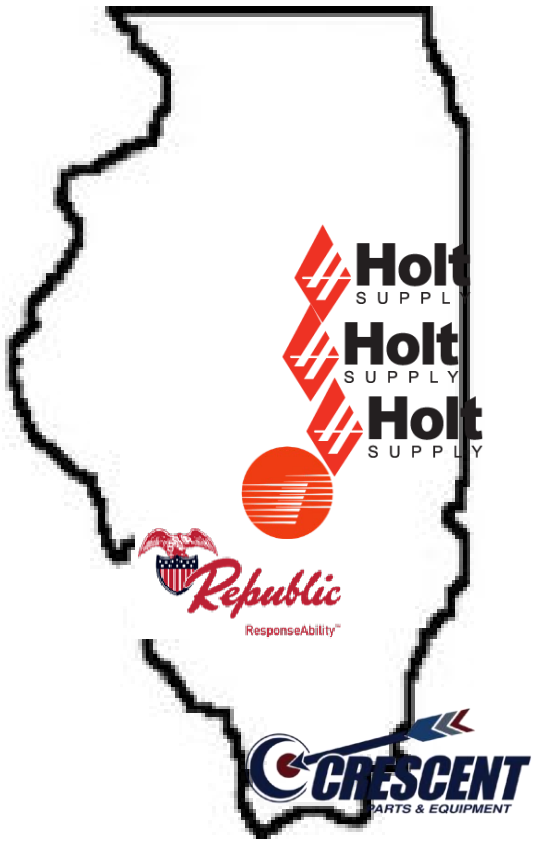
Local Mitsubishi Factory Support Living in Your Area Ready to Support You

Guaranteed performance

First Manufacturer to Guarantee Operation down to -13F

Support for Mitsubishi in Ameren Illinois

Distributors



Brands

MITSUBISHI ELECTRIC
HEATING & AIR CONDITIONING

American Standard
HEATING & AIR CONDITIONING

MITSUBISHI ELECTRIC

TRANE

MITSUBISHI ELECTRIC

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