NYSERDA

Sizing and Design Tools and Considerations

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Training Topics

- Oversizing
- Over-zoning
- Existing Duct Management
- NEEP Sizing and Design Selection Tool – Live Demonstration

Sizing Considerations

Oversizing, Over-Zoning, Existing Ducts, Supplemental Heating

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Oversizing

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The Basics

- Always specify Air conditioning, Heating & Refrigeration Institute (AHRI) indoor/outdoor matched pairs
- Pull extended performance data from NEEP database or manufacturer’s data
- Size for heating first, cooling second

What Really Matters When Sizing For Heating

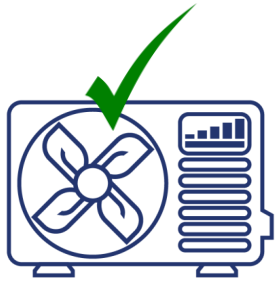
- Meeting home heating load on the coldest day
- Not providing too much heat on mild days
- Ensuring heat in every room by choosing the right product.

The Goldilocks Principle

Too Small

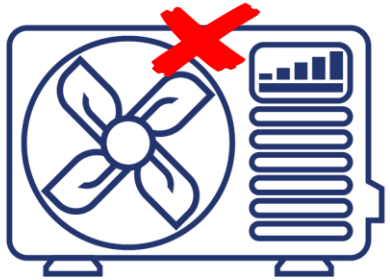
System will not keep the house warm on the coldest days

- Poor comfort (cold and may need backup heat)
- Slow catch up if using thermostat setbacks



Just Right

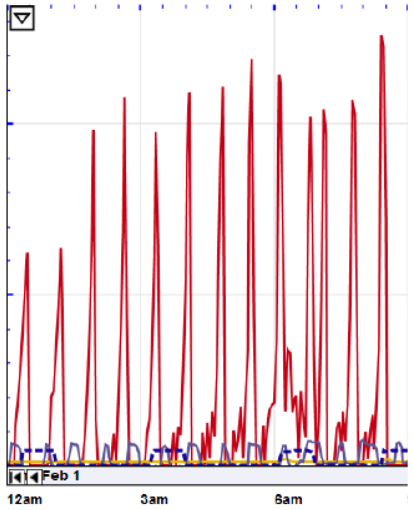
- Comfortable
- Efficient
- Durable



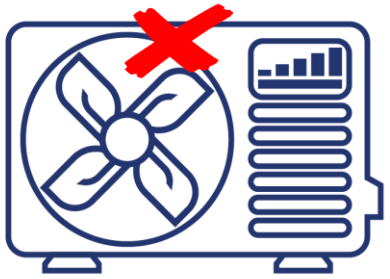
Too Big

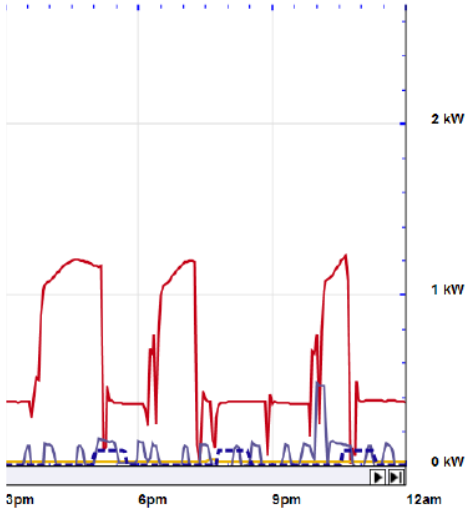
- System will cycle on and off
- Poor comfort (humid and too warm)
- Poor energy efficiency
- Poor durability
- More expensive

Too Much Heat Leads to Short Cycling



Short cycling: turns on and off repeatedly





Right-sized: runs for 20 min. to 2 hour blocks steadily

The Effects of Oversizing

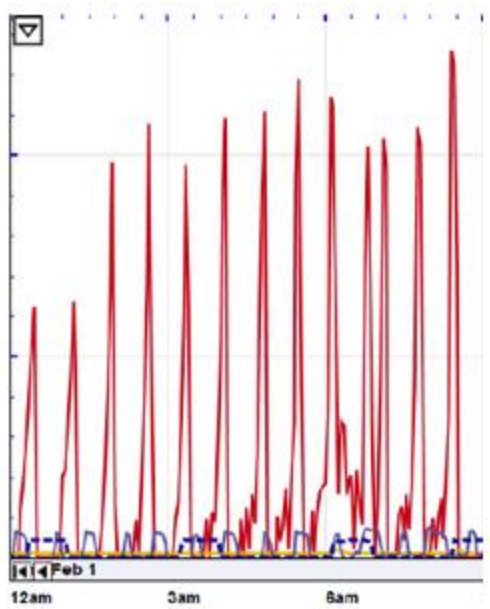
- How Oversized *is* Oversized?

- Operational Issues
  - Low-Load Compressor Cycling
  - Lack of Dehumidification
  - Purge Cycling
  - Poor Comfort

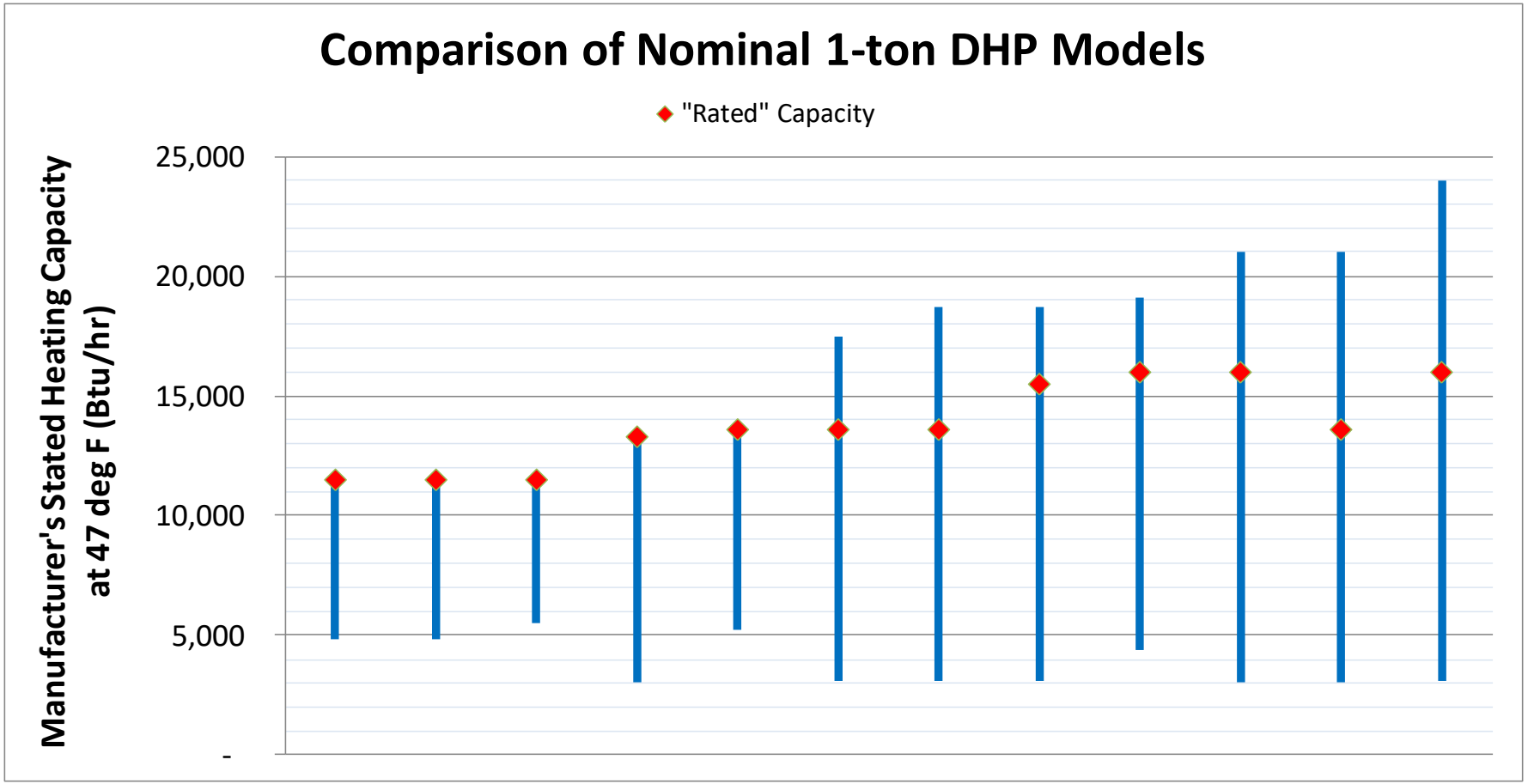
- Cost Issues
  - Upfront Cost
  - Energy Usage, Inefficiency, and High Bills
  - Shorter Equipment Lifespan

Importance of Avoiding Short Cycling

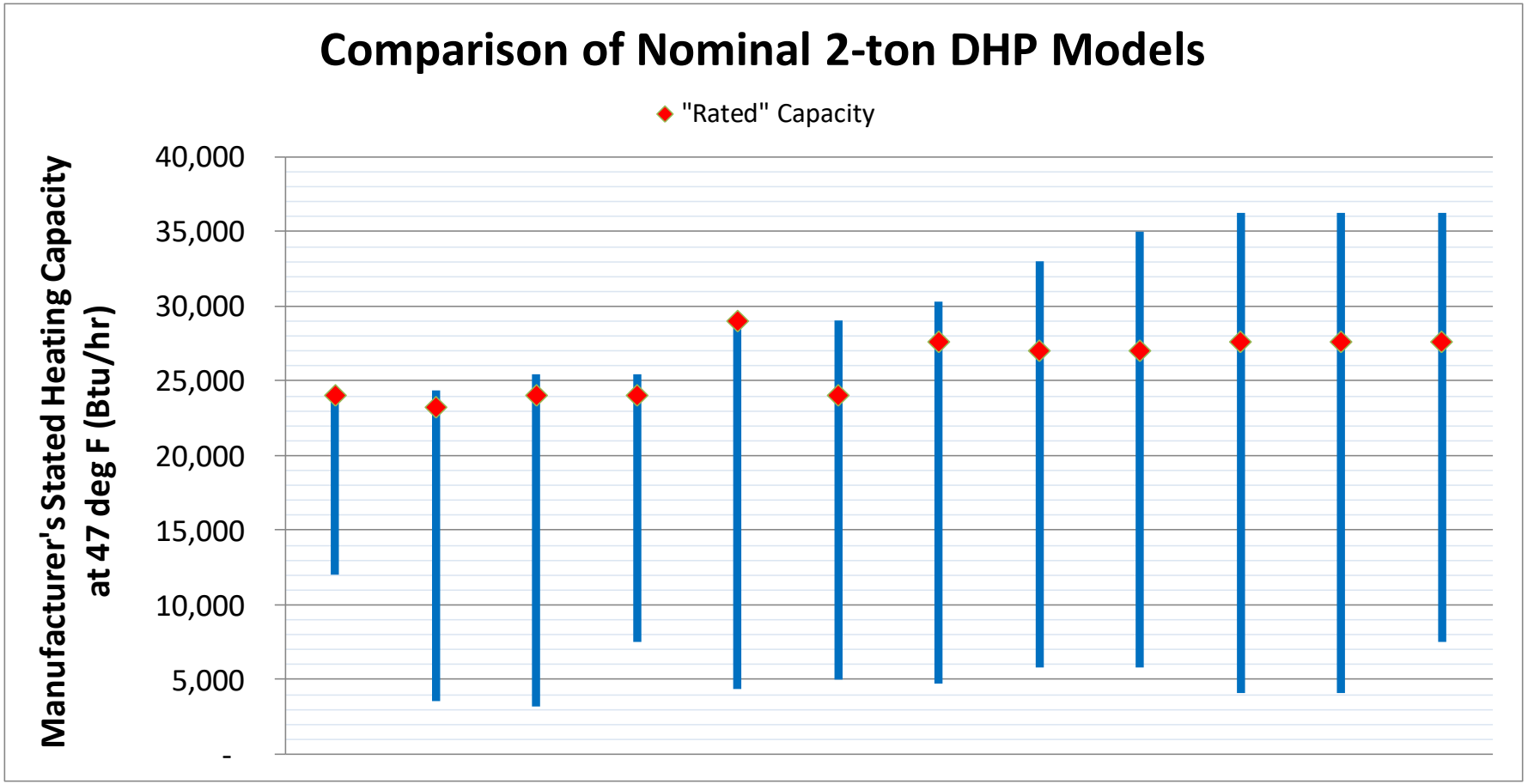
- Short Cycling Can:
  - Reduce operating COP by 15% – 40% when short cycling
    - e.g., a COP of 5.0 acts like a 4.0
- Not as critical as failing to meet design load, ***but the impact should not be neglected***,
  - For partial load displacement - it is the **more critical** sizing factor



Maximum-Minimum Capacity Ranges



Maximum-Minimum Capacity Ranges

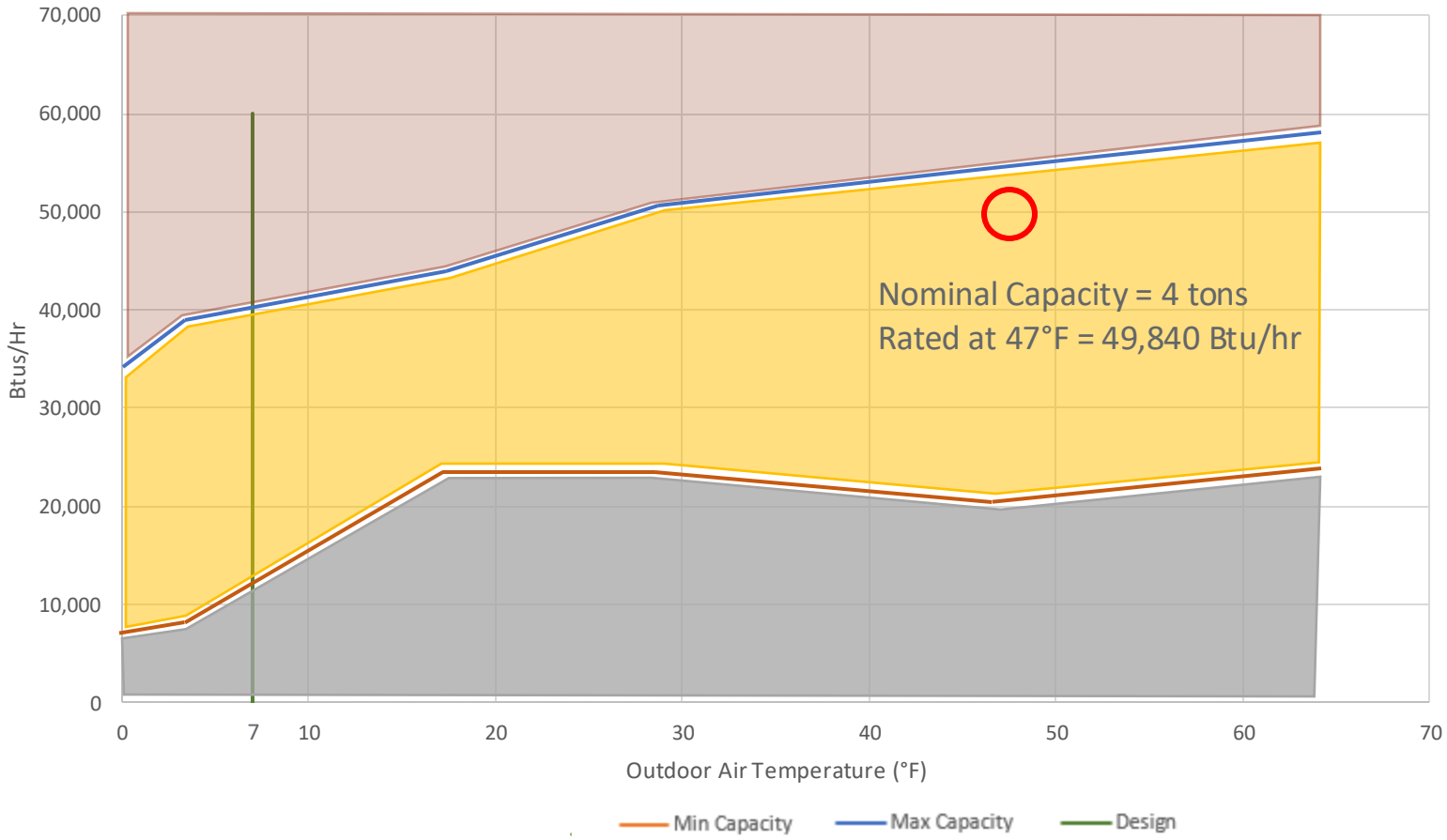


VCHP Modulating Zone

Insufficient Capacity, Backup Needed

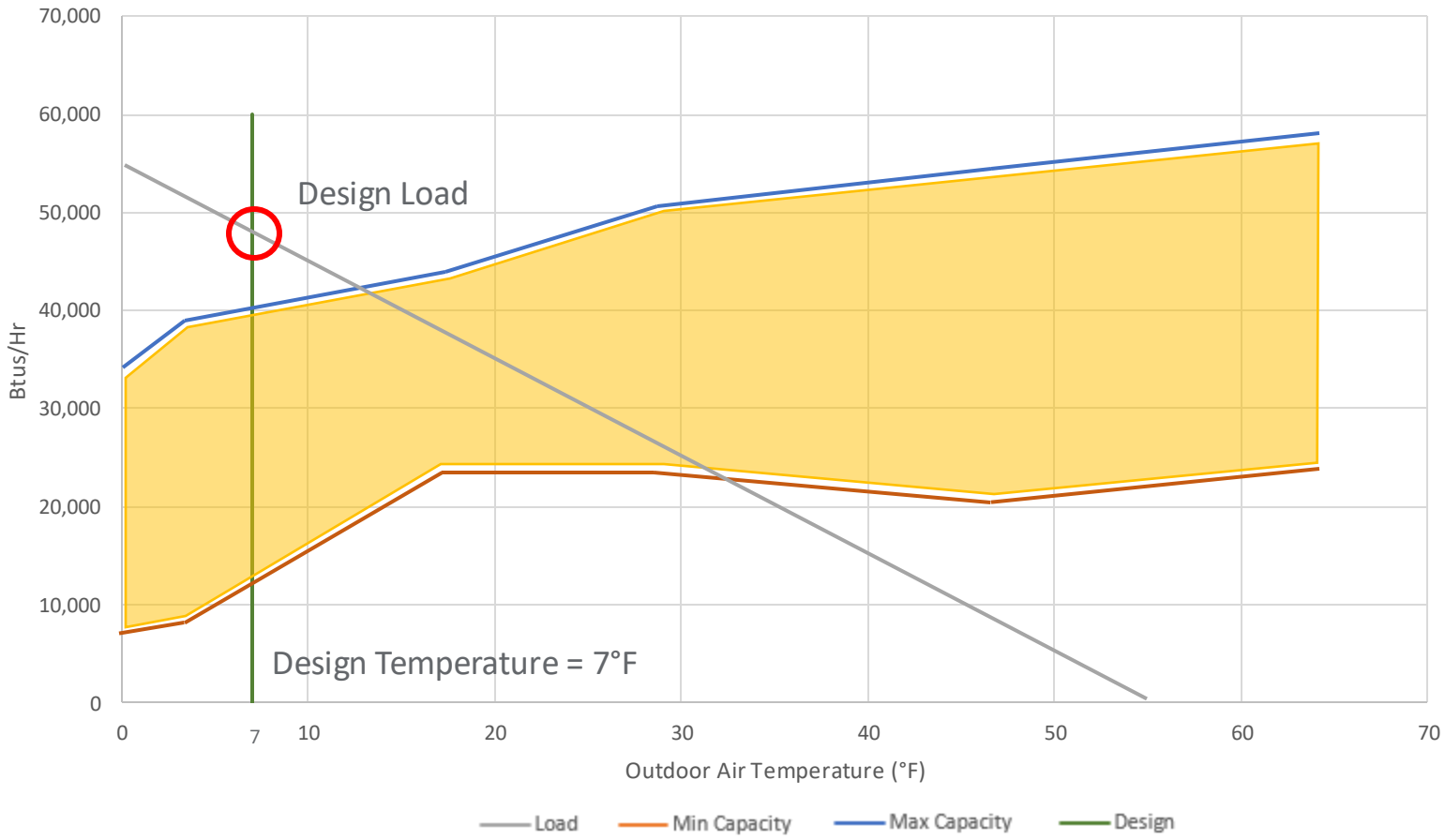
Modulating Heat Pump

Short Cycling, Inefficient Operation



Home Load Line

Modulating
Heat Pump

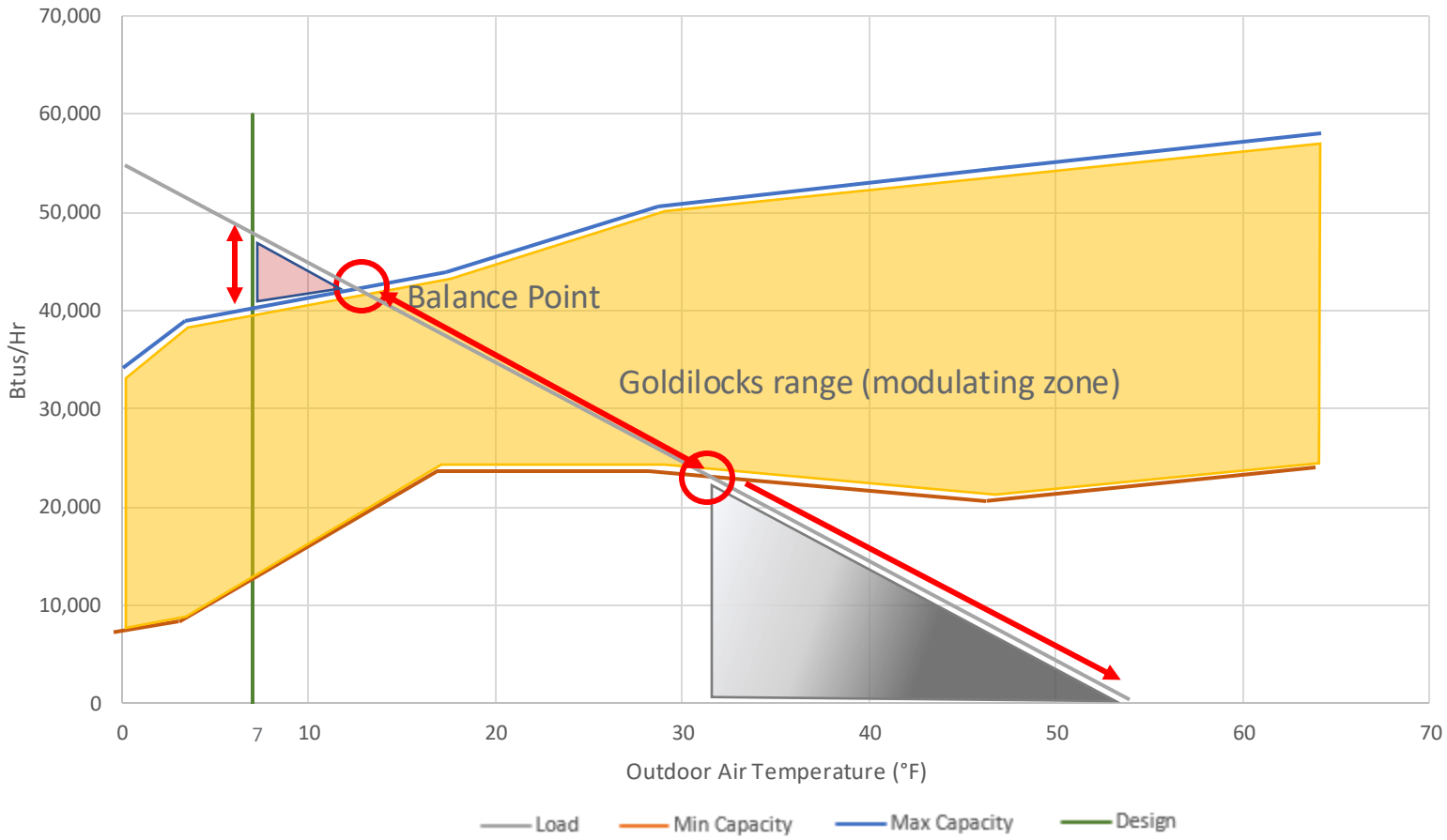


Goldilocks Sizing – Let it Modulate

Backup Heat

Modulating Heat Pump

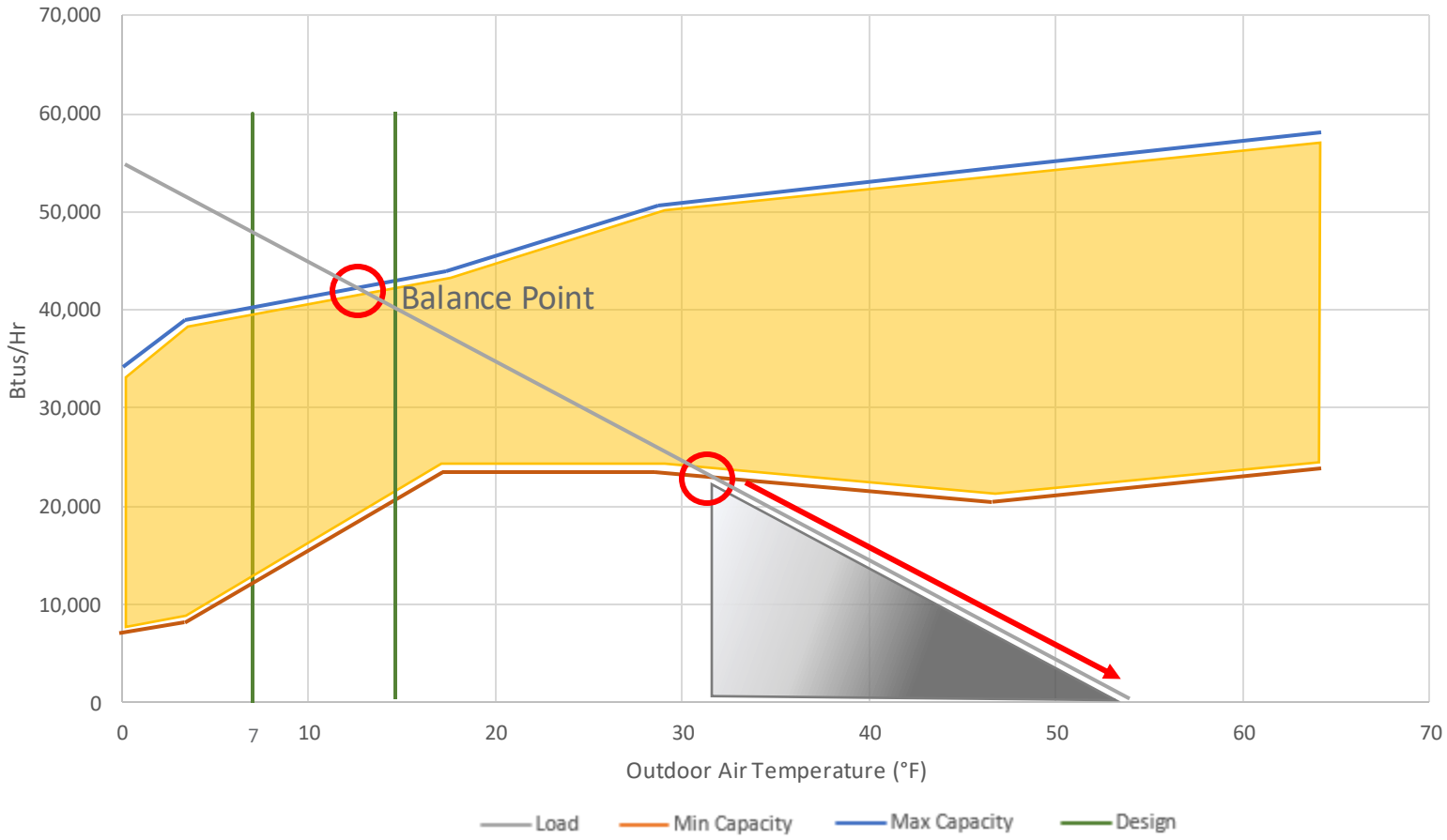
Short Cycling, Inefficient Operation



Different Design Temperature?

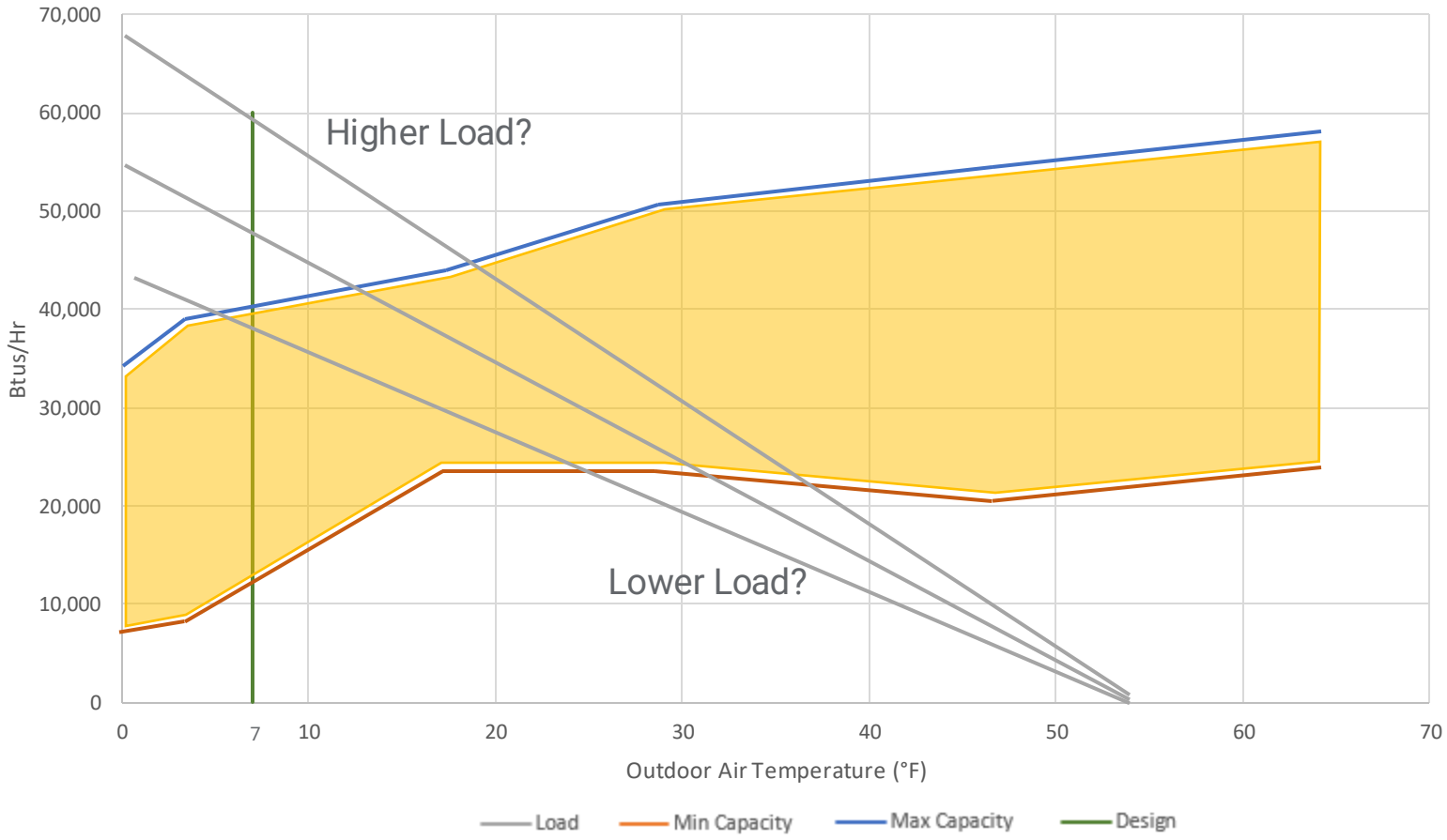
Modulating Heat Pump

Short Cycling, Inefficient Operation



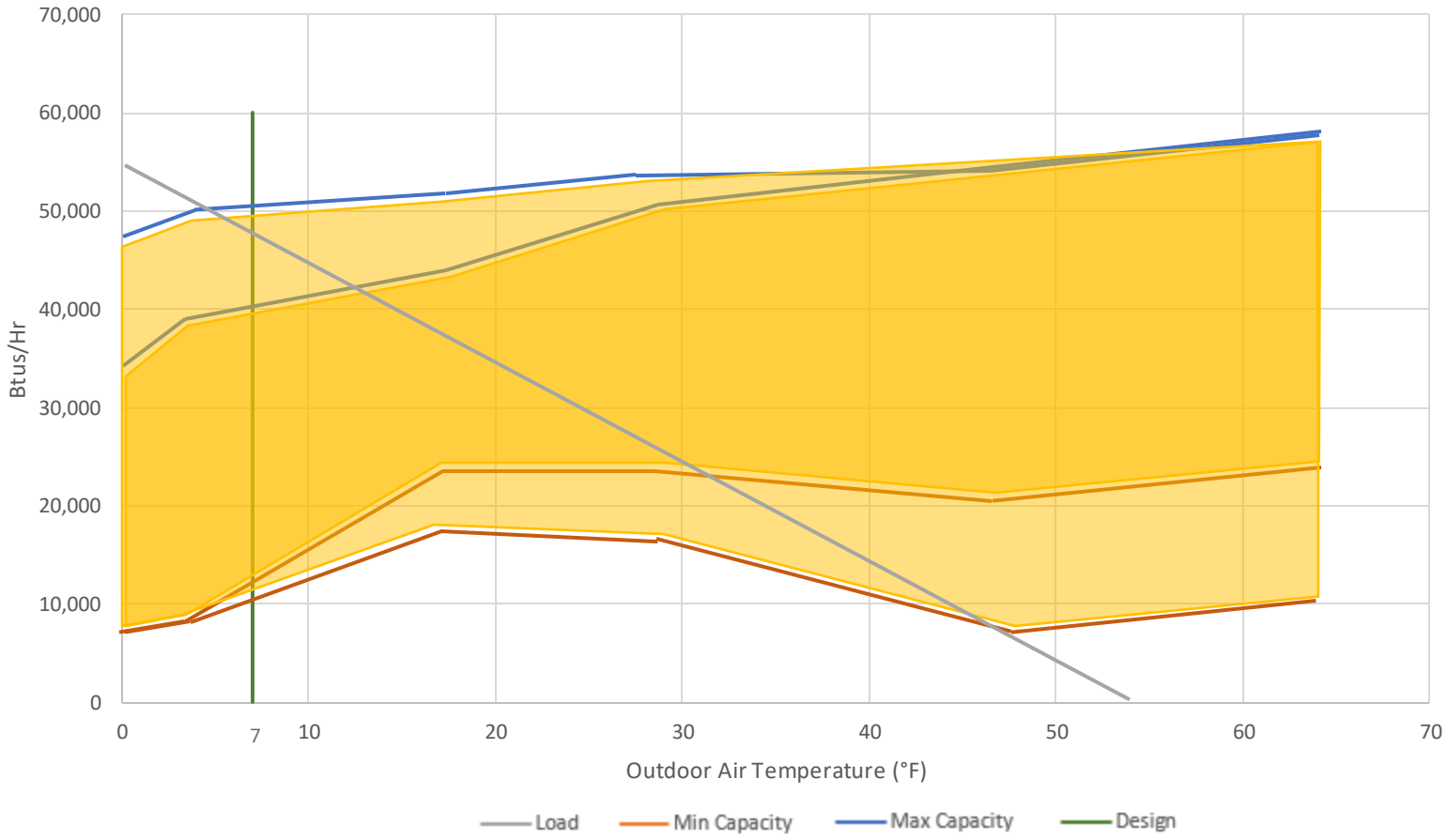
Wrong/Improved Load Line?

Modulating
Heat Pump



Better Sizing – Different Heat Pump?

Modulating
Heat Pump

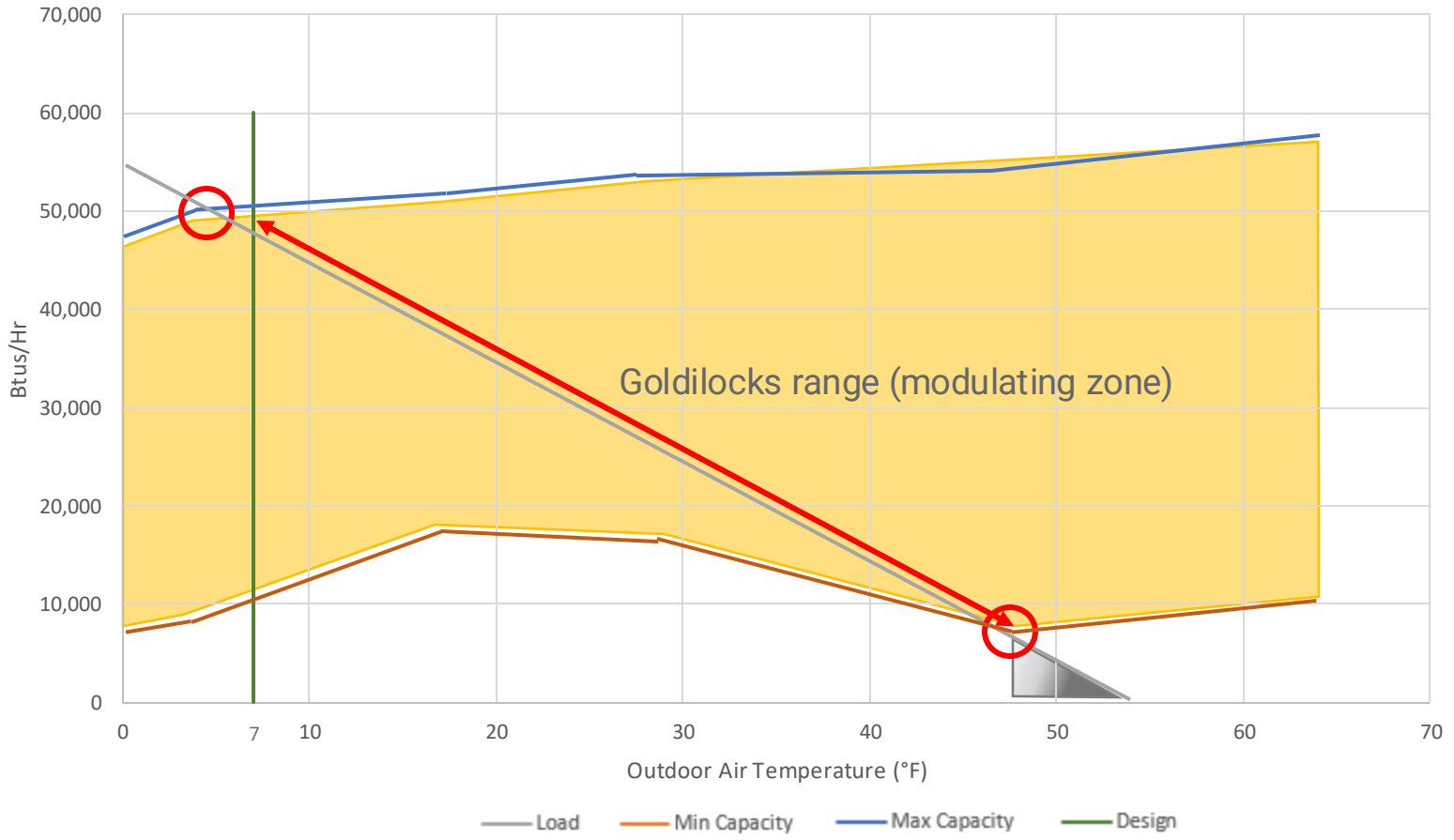


Better Sizing – Different Heat Pump?

~~Backup Heat~~

Modulating Heat Pump

Short Cycling, Minor, above 47°F

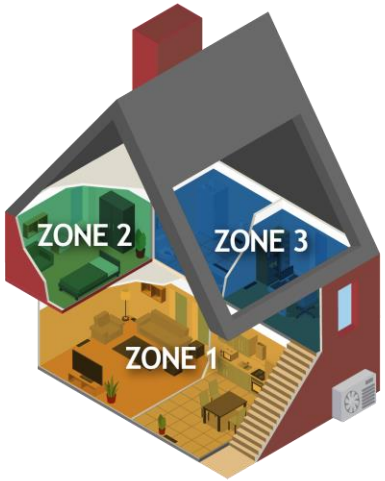


How to Avoid Oversizing

- Conduct an ACCA Manual J Load Calculation
- Use the Correct Design Temperature
- Complete Building Take-offs
- Prepare for the Building's Future
- Look for Systems with Higher Turndown Ratios
- Look at the latent-cooling load, and be prepared to install supplementary dehumidification as needed

Heat Pump Selection and Sizing

Goal #1: Meeting home heating load on the coldest day

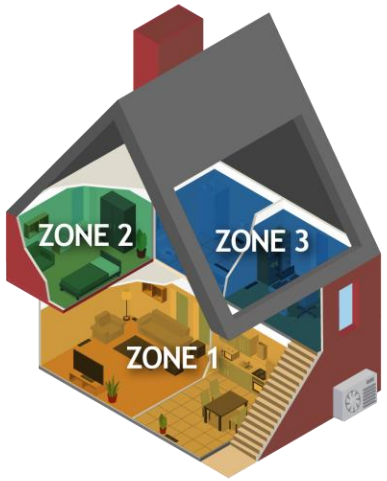


Design Load = 28,450 at 7°F

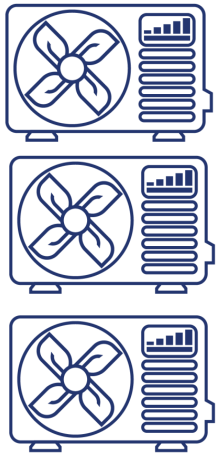
Equipment Candidate	Max Output (Btu/hr)
	✗ 21,400 at 7°F
	✓ 31,743 at 7°F
	✗ 40,850 at 7°F

Heat Pump Selection and Sizing

Goal #2: Not providing too much heat on mild days

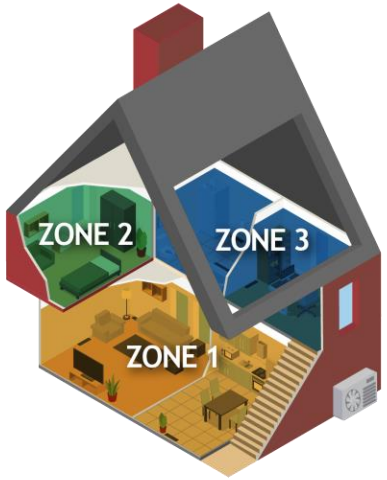


Design Load = 28,450 at 7°F
Load at 47°F = 4,740 Btu/hr

Equipment Candidate	Max Output (Btu/hr)	Min Output (Btu/hr)
	✓ 28,600 at 7°F	✗ 16,600 at 47°F
	✓ 31,743 at 7°F	✗ 12,780 at 47°F
	✓ 32,900 at 7°F	✓ 7,460 at 47°F

Heat Pump Selection and Sizing

Goal #3: Choose the right product for your need



- Energy efficiency
  - Heating – Heating Seasonal Performance Factor (HSPF): **>10** is preferred
  - Cooling – Seasonal Energy Efficiency Rating (SEER): **>15** is preferred
  - Manufacturer's extended performance data has higher granularity of efficiency ratings that can help optimize the decision
- Other features/functions
  - Automation and controls
  - Integrated back-up heat
  - Noise rating
- Price – higher efficiency tends to be more expensive

Don’t Oversize

- This resource provides information on:
  - The risks of oversizing a heat pump
  - How to identify signs of oversizing
  - How to avoid oversizing
  - Terms to know

- PDF available on the Clean Heat Connect website
  - CHC-CON-ashp-oversize-fs-1-v1.pdf (ny.gov)

Over-zoning

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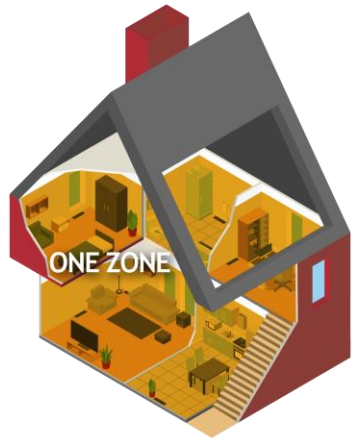
Design Intention: Zonal vs. Whole Home

- The home is split into zones, each with its own heating
- Each zone has its own thermostat and controls
- Best for larger homes
- Best for complicated layout

Zonal

- One thermostat controls the entire home
- Best for smaller homes of simple geometry
- Best with ducted systems

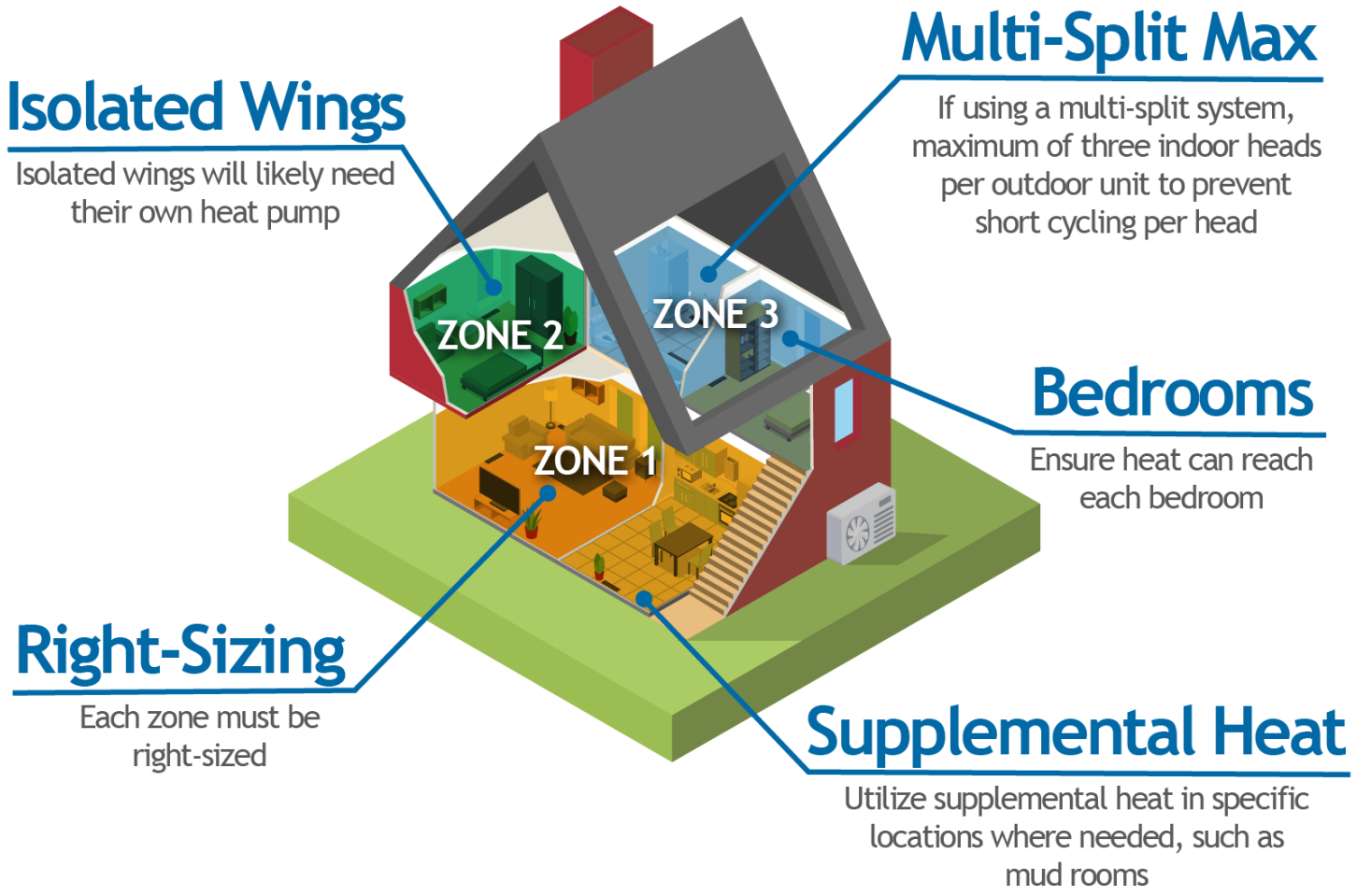


Whole Home

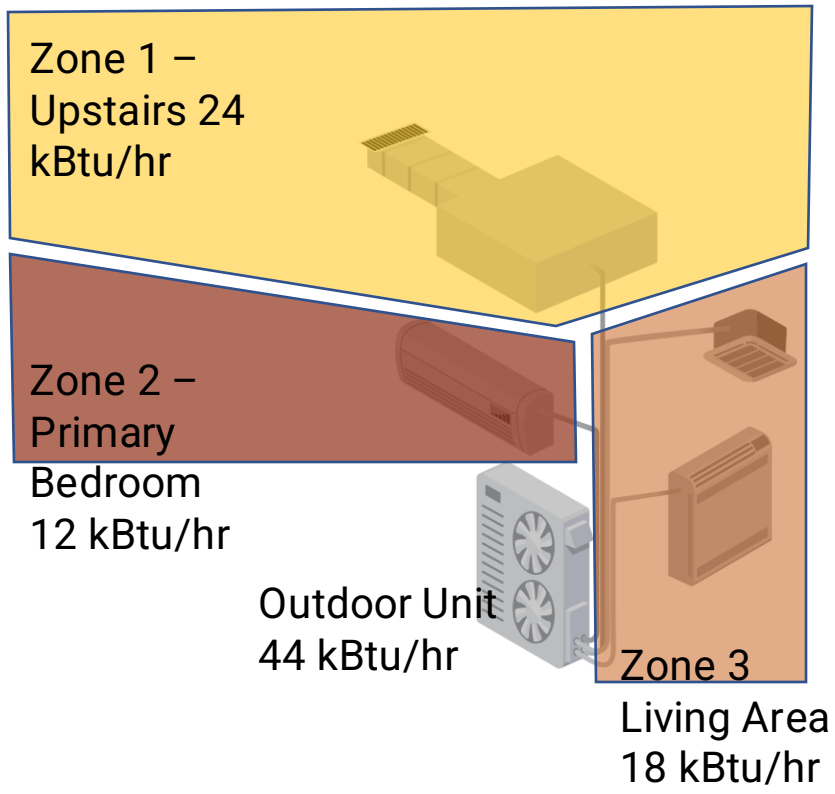
Heat Pump Selection and Sizing
Multi-Zone or Multi-Split Design

For more information about multi-split and single-split head systems, checkout NYSERDA's Clean Heat Connect resources at cleanheatconnect.ny.gov.

Link to PDF: https://cleanheatconnect.ny.gov/assets/pdf/Multi_vs_Single_SplitSystems_10_2024_v1.pdf



Avoid Multi-Split Oversizing

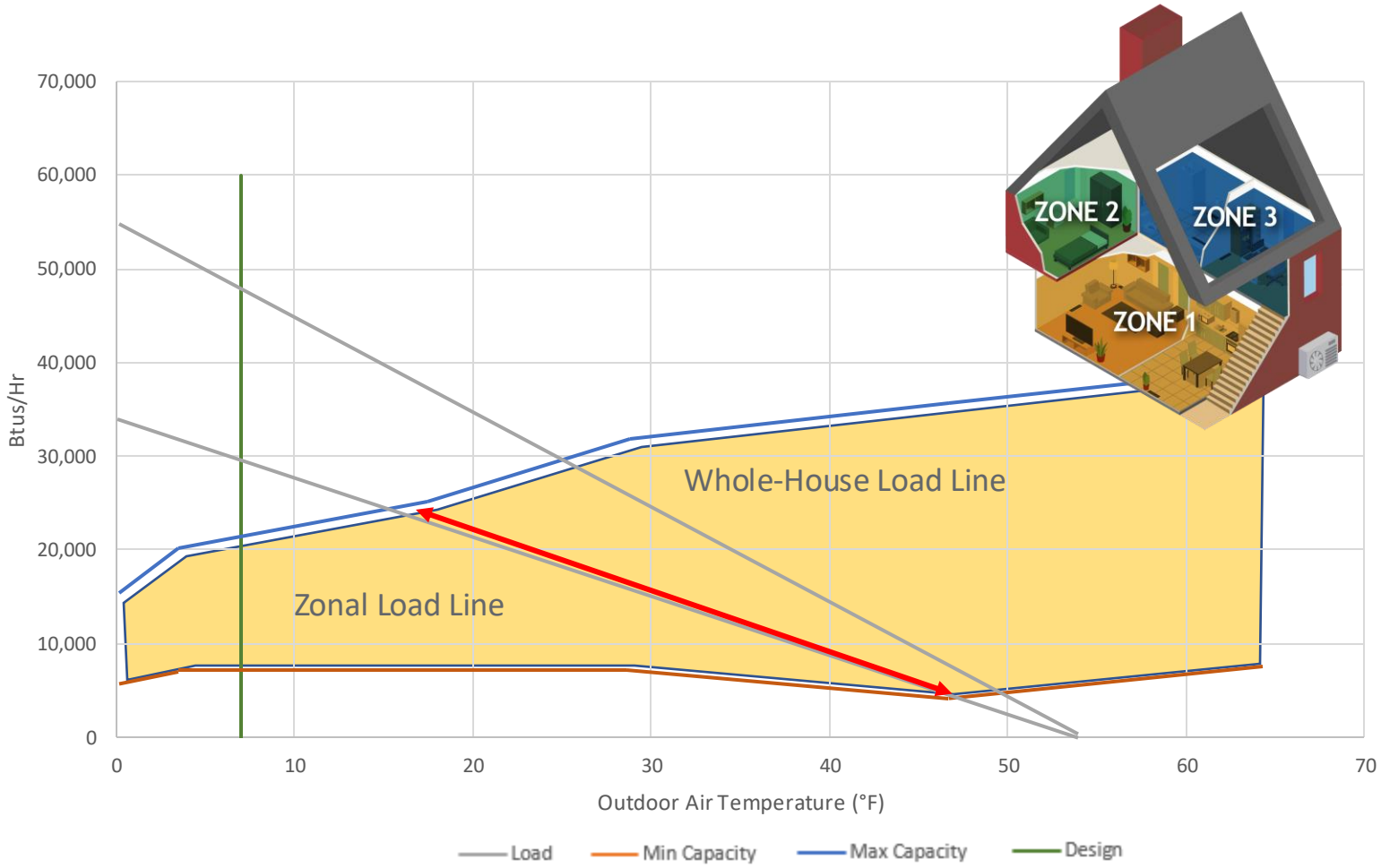


What happens when only one zone is calling for heat?

- Confirm zonal turn down and minimum capacity
- Can impact humidity control as well if short cycling during the cooling season

Zonal Load Sizing

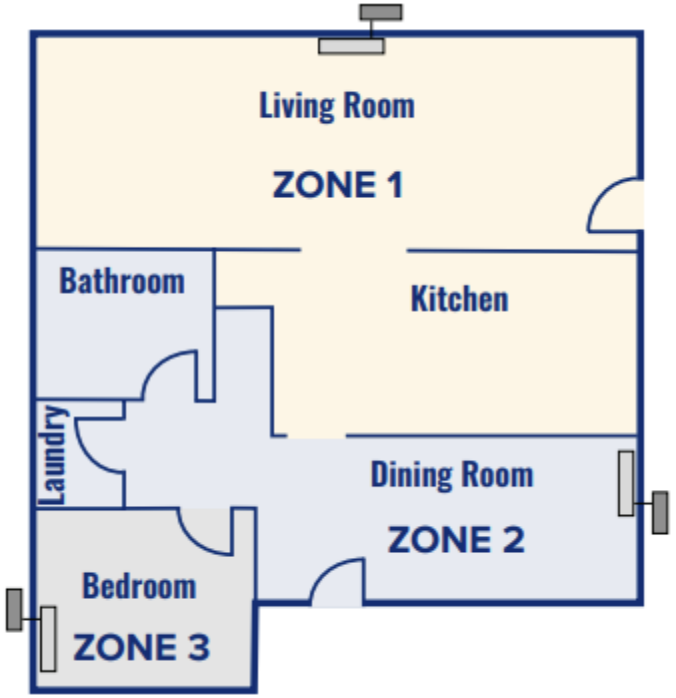
Modulating
Heat Pump

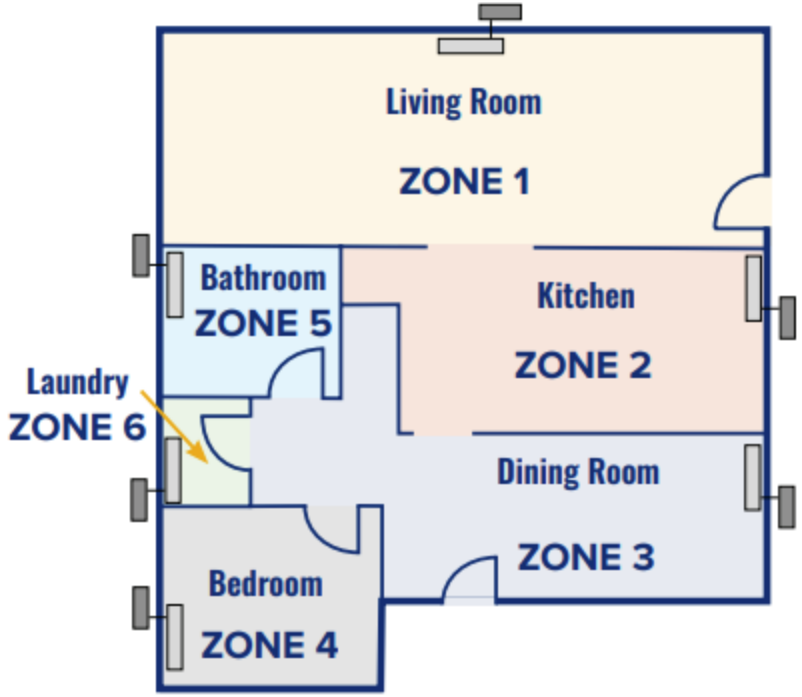


Correctly Zoned vs Over-Zoned

Example home:

- Single-family
- Two story
- Saratoga county
- Design temperature: 1°F
- Equipment specifications from ductless single zone products listed on the NEEP ASHP Product List.



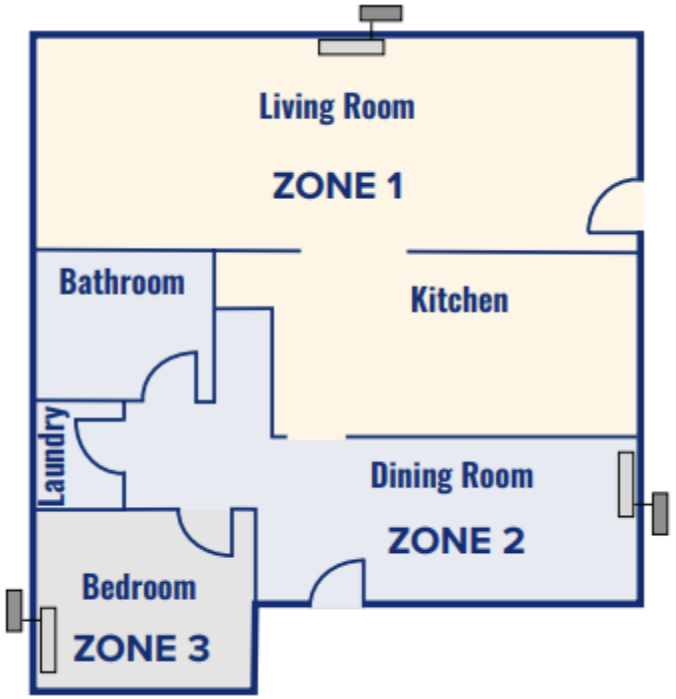


Room by room design load

Room	Living Room	Kitchen	Dining Room	Bedroom	Bathroom	Laundry Room	Total
Design Load (Btu/hour)	15,641	3,535	14,690	8,416	3,018	1,356	46,656

Proper Zoning Design Equipment Performance

Clear air pathways between rooms allow this system to provide sufficient comfort.



	PROPER ZONING			
	Zone 1	Zone 2	Zone 3	Total
	Living Room Kitchen	Dining Room Bathroom Laundry	Bedroom	
Nominal Capacity (Btu/hour)	15,000	18,000	6,000[1]	39,000
Max. Capacity at Design Temp. (˚F)	18,258	21,689	9,778	49,725
Percent Design Load Served[2]	**99.6%**	**113.8%**	**116.2%**	**107%**
Percent Annual Heating Load Modulating[3]	**75.2%**	**79.6%**	**86.8%**	-
Percent Annual Heating Load with Low Load Cycling[4]	**14.7%**	**12.7%**	**6.2%**	-

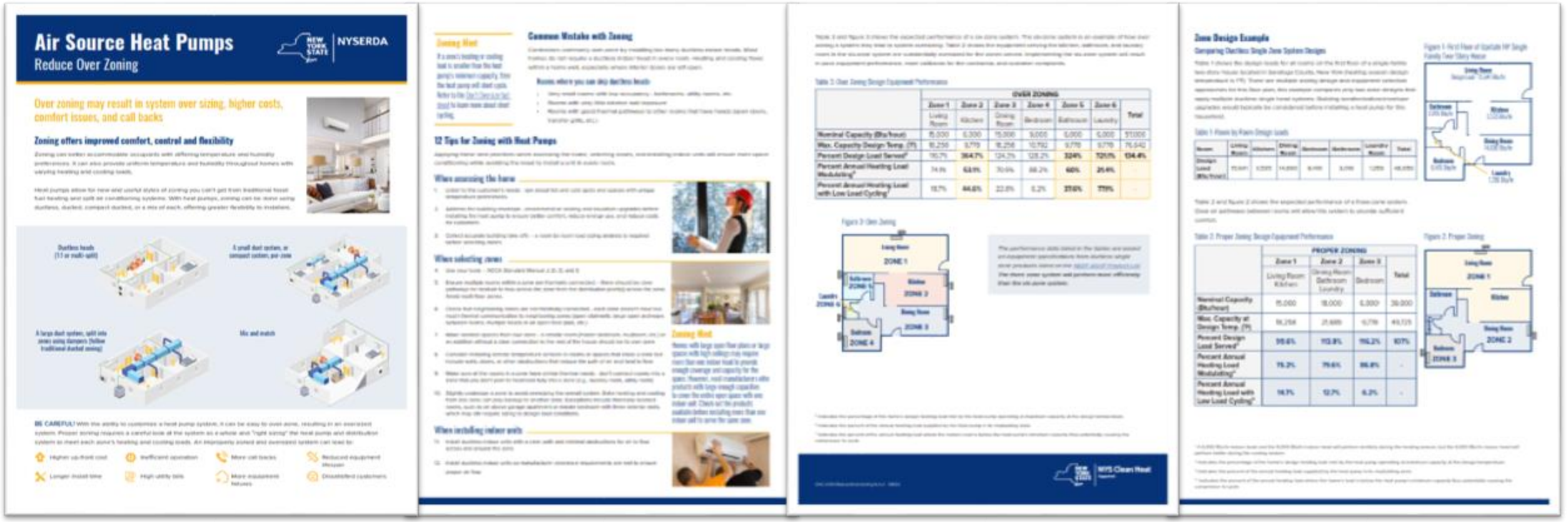
Over-Zoning Design Equipment Performance

	OVER ZONING						
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**	**Total**
	Living Room	Kitchen	Dining Room	Bedroom	Bathroom	Laundry	
Nominal Capacity (Btu/hour)	15,000	6,000	15,000	9,000	6,000	6,000	57,000
Max. Capacity Design Temp. (°F)	18,258	9,778	18,258	10,792	9,778	9,778	76,642
Percent Design Load Served[5]	116.7%	**364.7%**	124.3%	128.2%	**324%**	**721.1%**	**134.4%**
Percent Annual Heating Load Modulating[6]	74.1%	**53.1%**	70.9%	88.2%	**60%**	**21.4%**	-
Percent Annual Heating Load with Low Load Cycling[7]	18.7%	**44.6%**	22.8%	6.2%	**37.6%**	**77.1%**	-

The six-zone system performance data shows how improperly zoning a system may lead to oversizing. Three of the systems are substantially oversized, even when using the smallest available products.

This system will result in poor performance, more callbacks, and customer complaints.

Reduce Over Zoning



Link to PDF: https://cleanheatconnect.ny.gov/assets/pdf/Reduce%20Overzoning_10_2024_v2.pdf

Existing Duct Management

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Assessing Existing Ductwork

- Is ductwork visible?
- When was the duct work installed?
  - Older ductwork may not be installed to current building codes
- Was the ductwork installed for heating or cooling?
  - If sized for heating and are newer ducts, may be able to modify for a heat pump system
  - If sized for cooling, the ductwork may be undersized and require more work to make ready for a heat pump system
- Is the ductwork in good condition and properly sealed?

Evaluating a Duct System

- Best practices:
  - Kitchen table discussion
  - Visual inspection
  - Sizing evaluation
  - Duct testing
  - Duct balancing
  - *Always use an approved Manual D for duct sizing*

Duct Retrofit Best Practices

- ✓ Interview the homeowner
- ✓ Visually evaluate the ducts
- ✓ Confirm duct capacity meets heat pump needs
- ✓ Non-diagnostic commissioning

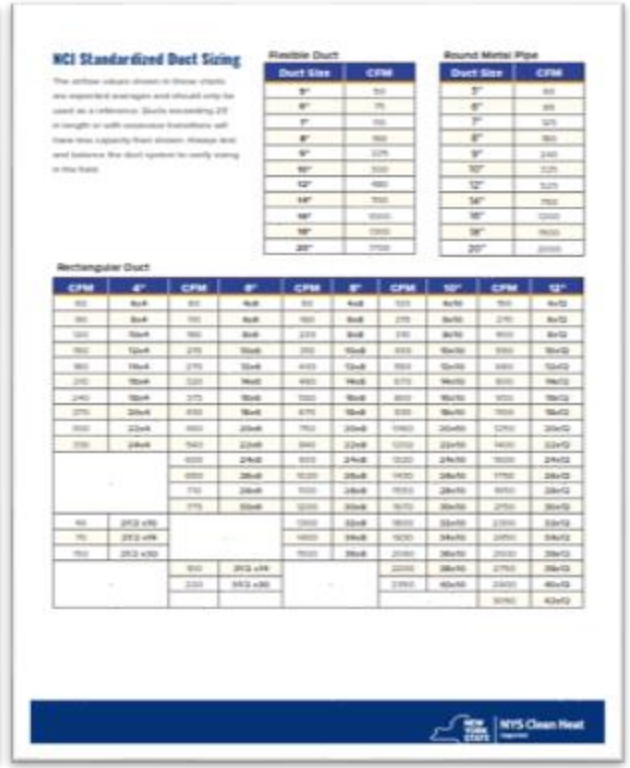
- ✓ All ★ items
- ✓ Check total external static pressure (TESP)
- ✓ Verify duct balancing
- ✓ Measure airflow at registers with flow-hood

- ✓ All ★ and ★★ items
- ✓ Assess duct leakage with duct-blaster or blower door and pressure pan
- ✓ Complete a Manual D and compare to existing ducts

Testing the Ductwork

- Measure air flow
- Check for duct leakage
- Verify duct balancing
- Inform the homeowner:
  - Condition of ducts
  - Needed repairs
  - Necessary modifications
  - Why the ductwork should ***not*** be reused (when applicable)

Air Source Heat Pump:
Cold-Climate Duct Evaluation Guide



Link to PDF: https://cleanheatconnect.ny.gov/assets/pdf/CHC-CON-ashp-oversize-fs-1-v2_acc.pdf

What is in the Duct Evaluation Guide

- Duct Evaluation Guide guides through the duct evaluation process at the time of bid
  - Understanding the difference between a heat pump and a furnace supply air temperature
  - The need for properly sized ductwork and how to determine duct sizing
  - What impacts the cost of duct replacement
- Help your customers determine when to:
  - Use existing ducts
  - Modify ducts
  - Replace or decommission ducts

- Additional resources at CEE1.org

NEEP ccASHP Product List

Heat Pump Sizing and Selection Tutorial

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NEEP ccASHP Product List

> Tool Summary
> Selecting Inputs
> Sizing a Heat Pump
> Comparing Products
> Building a Multiple Compressor System
> Other Features

Tool Summary

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NEEP Tool Walkthrough

- The NEEP Tool is a product selection tool that searches NEEP's database for cold-climate ASHPs that best fit your project.
- You can use this tool to select properly sized equipment, compare alternative systems, print submittal documents, and show your customer how well the proposed system fits their home.
- All information is manufacturer submitted.
- Open the below link and follow along while we walk you through a mock product selection.
- https://ashp.neep.org/#!/

NEEP Selection Tool

Ready to search the list?

Product Type 

Central Air Conditioning Hea

Ducting Configuration

All Ducting Configurations

Brand

All Brands

AHRI[+] or Model#

AHRI, Model or Ur

Refrigerant

ENERGY STAR Certified

- [ ] ENERGY STAR V6.1
- [ ] ENERGY STAR V6.1 Cold Climate

Eligible for Federal Tax Credit

- [ ] North
- [ ] South

Heat Cap. 47°F Rated Btu/h[+]

0 — 80000

Heat Cap. 5°F Max Btu/h

0 — 80000

SEARCH THE LIST

Advanced Search - Sizing for Heating and Cooling

Selecting Inputs

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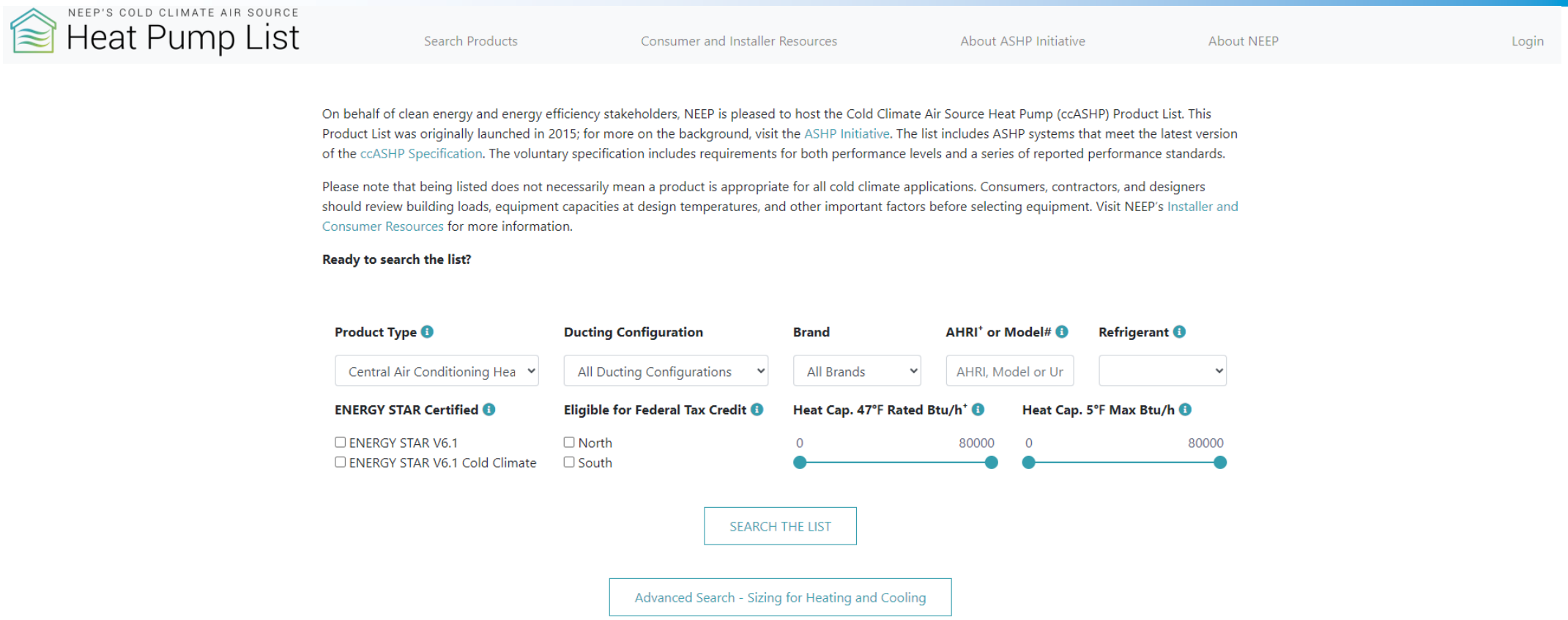
NEEP Sizing and Selection ccASHP



Step 1) Select *Advanced Search – Sizing for Heating*

Ready to search the list?

Product Type | **Ducting Configuration** | **Brand** | **AHRI⁺ or Model#** | **Refrigerant**

Central Air Conditioning Hea | All Ducting Configurations | All Brands | AHRI, Model or Ur |

ENERGY STAR Certified

- ☐ ENERGY STAR V6.1
- ☐ ENERGY STAR V6.1 Cold Climate

Eligible for Federal Tax Credit

- ☐ North
- ☐ South

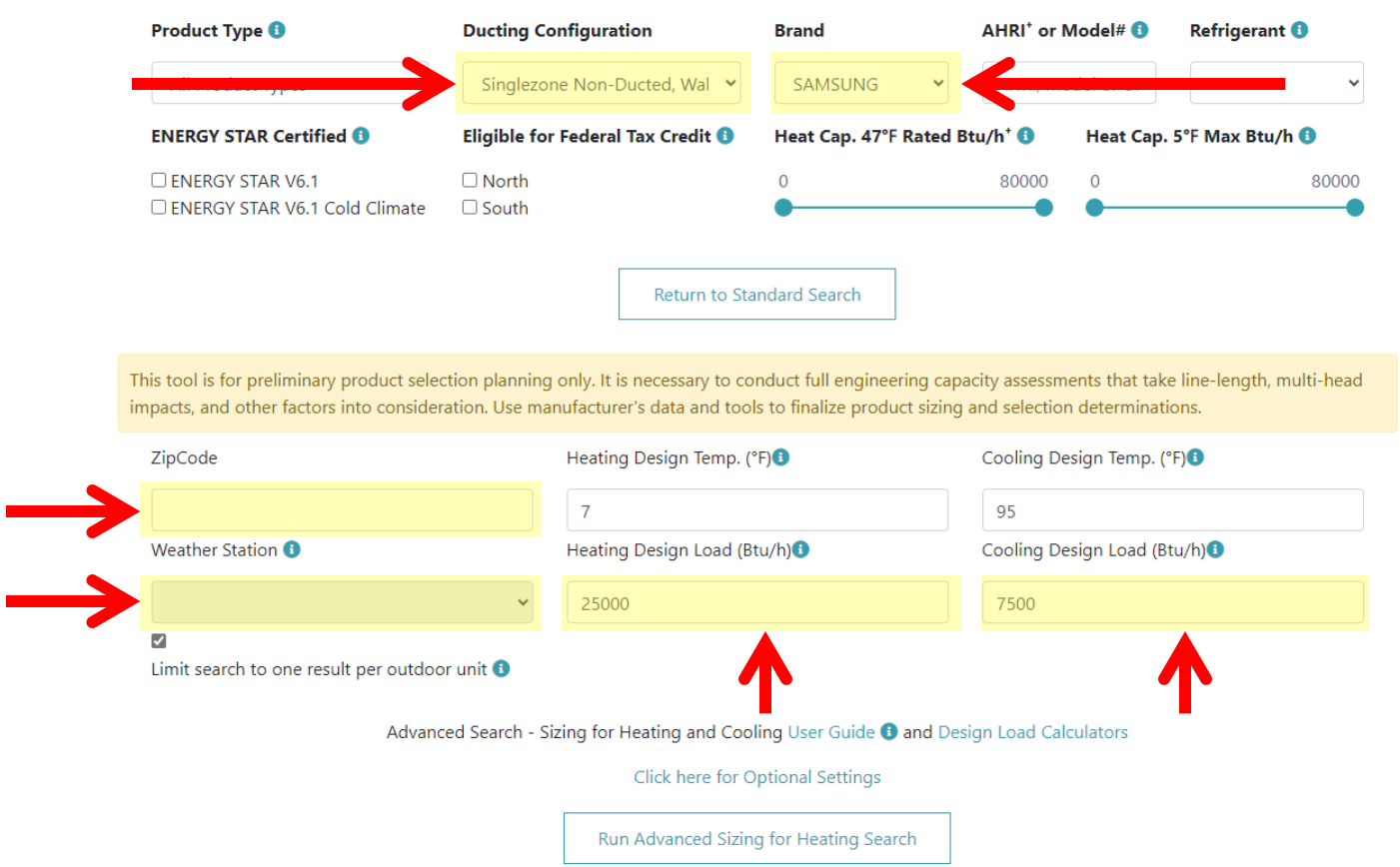
Heat Cap. 47°F Rated Btu/h⁺ 0 – 80000

Heat Cap. 5°F Max Btu/h 0 – 80000

SEARCH THE LIST

Advanced Search - Sizing for Heating and Cooling

Step 2) Initial Data



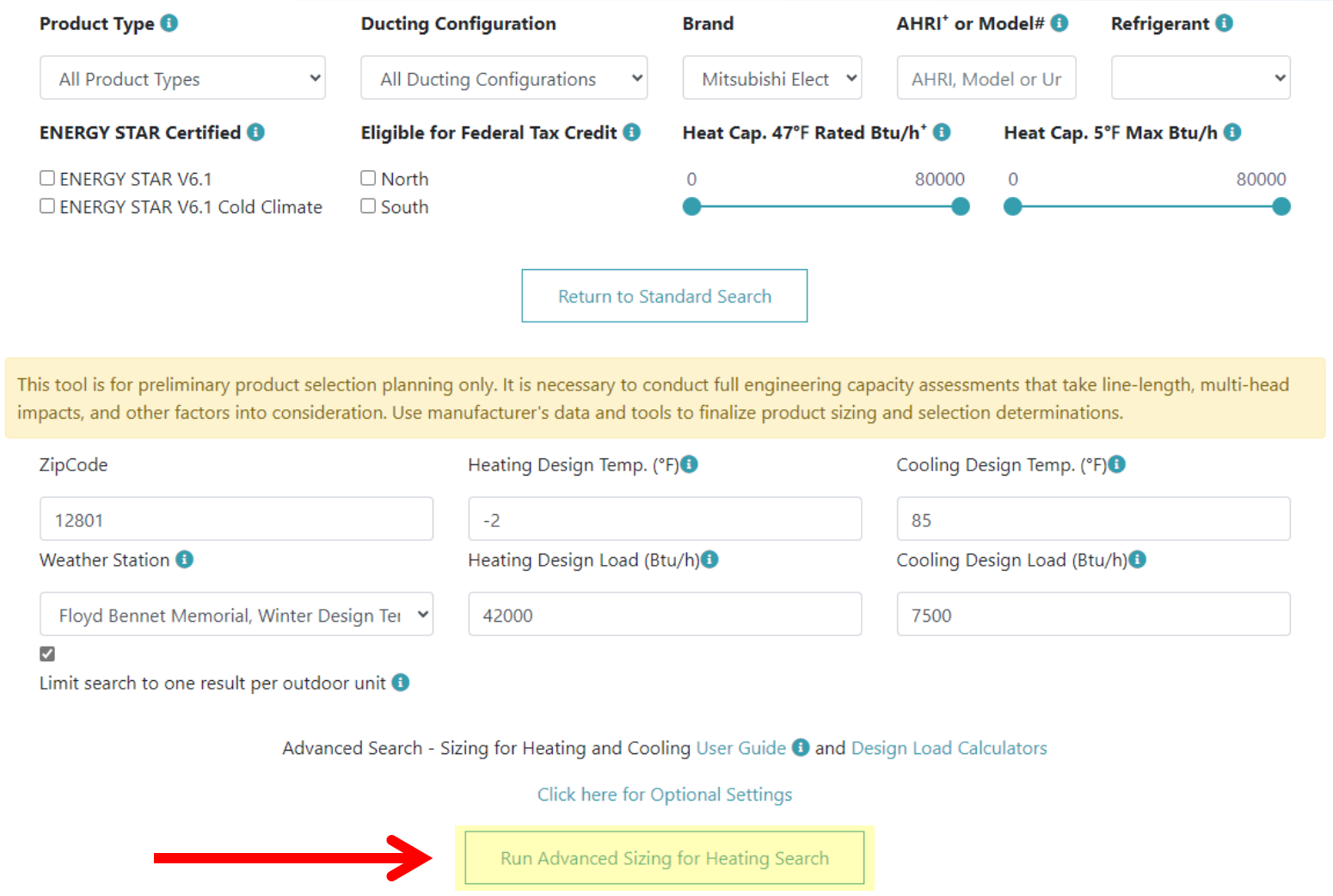
Our mock project is best suited for a multi-zone ductless system.

The project is located in Glens Falls, NY nearest to the Floyd Bennet Memorial weather station.

The Manual J we conducted resulted in a Heating Design Load of 42,000 Btu/h.

The mock distributor sells mainly Mitsubishi Electric products.

Step 3) Click *Run Advanced Sizing for Heating Search*



Sizing a Heat Pump

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Step 4) Sort and analyze the products

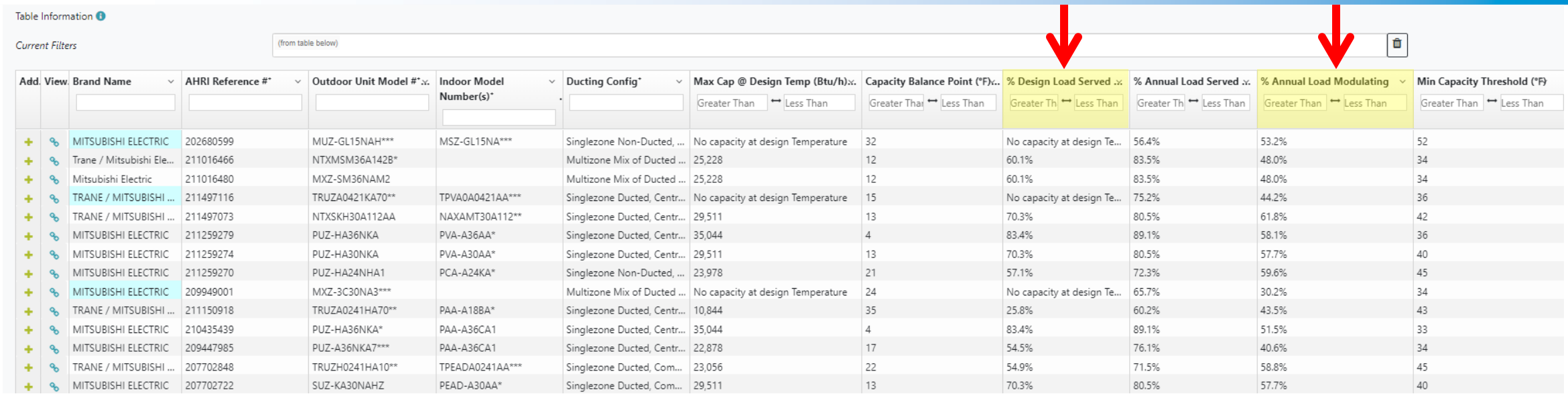


Table Information

Current Filters (from table below)

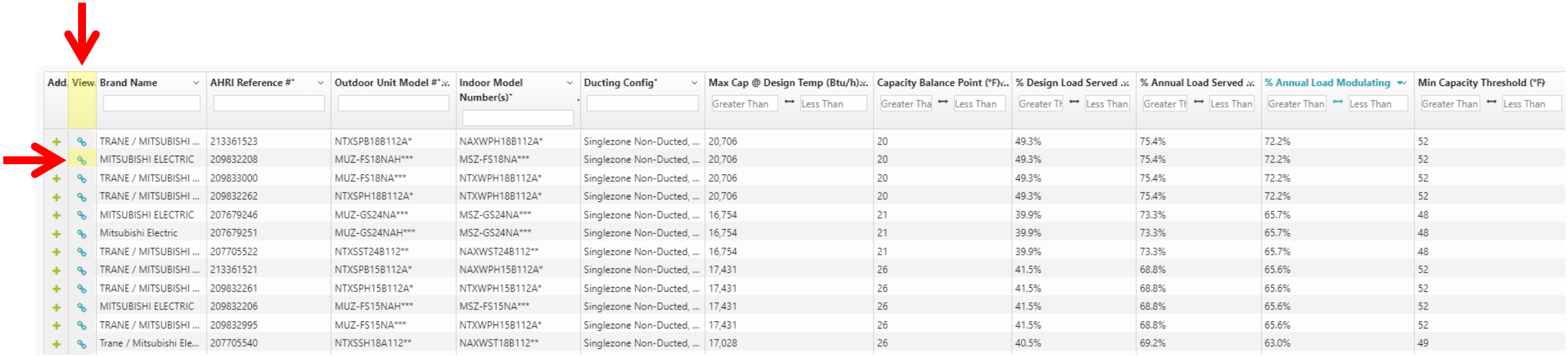
Add	View	Brand Name	AHRI Reference #*	Outdoor Unit Model #*	Indoor Model Number(s)*	Ducting Config*	Max Cap @ Design Temp (Btu/h)	Capacity Balance Point (°F)	% Design Load Served	% Annual Load Served	% Annual Load Modulating	Min Capacity Threshold (°F)
							Greater Than – Less Than	Greater Than – Less Than	Greater Than – Less Than	Greater Than – Less Than	Greater Than – Less Than	Greater Than – Less Than
+		MITSUBISHI ELECTRIC	202680599	MUZ-GL15NAH***	MSZ-GL15NA***	Singlezone Non-Ducted, ...	No capacity at design Temperature	32	No capacity at design Te...	56.4%	53.2%	52
+		Trane / Mitsubishi Ele...	211016466	NTXMSM36A142B*		Multizone Mix of Ducted ...	25,228	12	60.1%	83.5%	48.0%	34
+		Mitsubishi Electric	211016480	MXZ-SM36NAM2		Multizone Mix of Ducted ...	25,228	12	60.1%	83.5%	48.0%	34
+		TRANE / MITSUBISHI ...	211497116	TRUZA0421KA70**	TPVA0A0421AA***	Singlezone Ducted, Centr...	No capacity at design Temperature	15	No capacity at design Te...	75.2%	44.2%	36
+		TRANE / MITSUBISHI ...	211497073	NTXSKH30A112AA	NAXAMT30A112**	Singlezone Ducted, Centr...	29,511	13	70.3%	80.5%	61.8%	42
+		MITSUBISHI ELECTRIC	211259279	PUZ-HA36NKA	PVA-A36AA*	Singlezone Ducted, Centr...	35,044	4	83.4%	89.1%	58.1%	36
+		MITSUBISHI ELECTRIC	211259274	PUZ-HA30NKA	PVA-A30AA*	Singlezone Ducted, Centr...	29,511	13	70.3%	80.5%	57.7%	40
+		MITSUBISHI ELECTRIC	211259270	PUZ-HA24NHA1	PCA-A24KA*	Singlezone Non-Ducted, ...	23,978	21	57.1%	72.3%	59.6%	45
+		MITSUBISHI ELECTRIC	209949001	MXZ-3C30NA3***		Multizone Mix of Ducted ...	No capacity at design Temperature	24	No capacity at design Te...	65.7%	30.2%	34
+		TRANE / MITSUBISHI ...	211150918	TRUZA0241HA70**	PAA-A18BA*	Singlezone Ducted, Centr...	10,844	35	25.8%	60.2%	43.5%	43
+		MITSUBISHI ELECTRIC	210435439	PUZ-HA36NKA*	PAA-A36CA1	Singlezone Ducted, Centr...	35,044	4	83.4%	89.1%	51.5%	33
+		MITSUBISHI ELECTRIC	209447985	PUZ-A36NKA7***	PAA-A36CA1	Singlezone Ducted, Centr...	22,878	17	54.5%	76.1%	40.6%	34
+		TRANE / MITSUBISHI ...	207702848	TRUZH0241HA10**	TPEADA0241AA***	Singlezone Ducted, Com...	23,056	22	54.9%	71.5%	58.8%	45
+		MITSUBISHI ELECTRIC	207702722	SUZ-KA30NAHZ	PEAD-A30AA*	Singlezone Ducted, Com...	29,511	13	70.3%	80.5%	57.7%	40

You can sort the products by clicking any of the categories. The most prevalent to product sizing are:

% Annual Load Modulating – The percentage of annual hours that the heat pump is operating within its modulating range. You want this to be as high as possible to maximize the efficiency and minimize the time spent cycling on/off.

% Design Load Served – The percentage of the home's heating load served by the heat pump at the design temperature. For a full-load system, you want this to be 100-120% to avoid the need for supplemental heat and avoid oversizing.

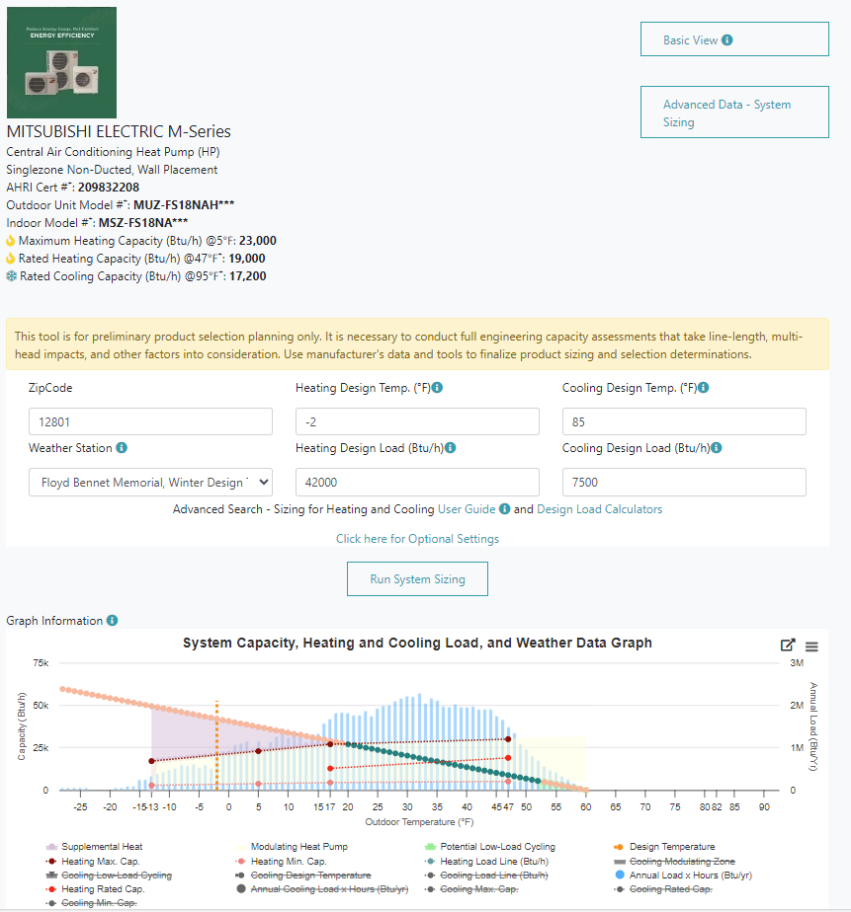
Step 5) Select a product to view more info



Add	View	Brand Name	AHRI Reference #	Outdoor Unit Model #	Indoor Model Number(s)	Ducting Config	Max Cap @ Design Temp (Btu/h)	Capacity Balance Point (°F)	% Design Load Served	% Annual Load Served	% Annual Load Modulating	Min Capacity Threshold (°F)
							Greater Than – Less Than	Greater Tha – Less Than	Greater Th – Less Than	Greater Th – Less Than	Greater Than – Less Than	Greater Than – Less Than
+		TRANE / MITSUBISHI ...	213361523	NTXSPB18B112A*	NAXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	209832208	MUZ-FS18NAH***	MSZ-FS18NA***	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209833000	MUZ-FS18NA***	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209832262	NTXSPH18B112A*	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	207679246	MUZ-GS24NA***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		Mitsubishi Electric	207679251	MUZ-GS24NAH***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	207705522	NTXSST24B112**	NAXWST24B112**	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	213361521	NTXSPB15B112A*	NAXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832261	NTXSPH15B112A*	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		MITSUBISHI ELECTRIC	209832206	MUZ-FS15NAH***	MSZ-FS15NA***	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832995	MUZ-FS15NA***	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		Trane / Mitsubishi Ele...	207705540	NTXSSH18A112**	NAXWST18B112**	Singlezone Non-Ducted, ...	17,028	26	40.5%	69.2%	63.0%	49

Note: You can select multiple products to provide alternate options. The first product is not always the best option or readily available at your distributor.

Available Data



MITSUBISHI ELECTRIC M-Series
Central Air Conditioning Heat Pump (HP)
Singlezone Non-Ducted, Wall Placement
AHRI Cert #*: **209832208**
Outdoor Unit Model #*: **MUZ-FS18NAH***
Indoor Model #*: **MSZ-FS18NA***
Maximum Heating Capacity (Btu/h) @5°F: **23,000**
Rated Heating Capacity (Btu/h) @47°F: **19,000**
Rated Cooling Capacity (Btu/h) @95°F: **17,200**

Basic View

Advanced Data - System Sizing

This tool is for preliminary product selection planning only. It is necessary to conduct full engineering capacity assessments that take line-length, multi-head impacts, and other factors into consideration. Use manufacturer's data and tools to finalize product sizing and selection determinations.

ZipCode: 12801
Heating Design Temp. (°F): -2
Cooling Design Temp. (°F): 85
Weather Station: Floyd Bennet Memorial, Winter Design
Heating Design Load (Btu/h): 42000
Cooling Design Load (Btu/h): 7500

Advanced Search - Sizing for Heating and Cooling User Guide and Design Load Calculators

Click here for Optional Settings

Run System Sizing

Graph Information

System Capacity, Heating and Cooling Load, and Weather Data Graph

Capacity (Btu/h) 75k 50k 25k 0
Annual Load (BTU/Yr) 3M 2M 1M 0
-25 -20 -15 13 -10 -5 0 5 10 15 17 20 25 30 35 40 45 47 50 55 60 65 70 75 80 82 85 90
Outdoor Temperature (°F)

Supplemental Heat
Heating Max. Cap.
Cooling Low-Load Cycling
Heating Rated Cap.
Cooling Min. Cap.
Modulating Heat Pump
Heating Min. Cap.
Cooling Design Temperature
Annual Cooling Load x Hours (Btu/yr)
Potential Low-Load Cycling
Heating Load Line (Btu/h)
Cooling Load Line (Btu/h)
Cooling Max. Cap.
Design Temperature
Cooling Modulating Zone
Annual Load x Hours (Btu/yr)
Cooling Rated Cap.

Product Sizing For Heating

View Oversizing Effects

Definition/Use Cases

Capacity Balance Point (°F)	20
Minimum Capacity Threshold (°F)	52
Maximum Capacity at Design Temp (Btu/h)	20,706
Percent Design Load Served	49.3%
Annual Heating Load (MMBtu)	96.0
Percent Annual Heating Load Served	75.4%

Definition/Use Cases

Annual Btu's Covered by Supplemental Heat (MMBtu)	23.6
Hours Requiring Supplemental Heat	958
Percent Hours Requiring Supplemental Heat	15.9%
Percent Annual Load Modulating	72.2%
Percent Annual Load with Low-Load Cycling	2.5%

Product Sizing For Cooling

View Oversizing Effects

Definition/Use Cases

Minimum Capacity Threshold (°F)	85
Maximum Capacity at Design Temp (Btu/h)	22,923
Percent Design Load Served	305.6%
Annual Cooling Load (MMBtu)	3.3

Definitions/Use Cases

Percent Annual Cooling Load Served	100.0%
Percent Annual Load Modulating	15.1%
Percent Annual Load with Low-Load Cycling	84.9%

Product Sizing For Cooling

View Oversizing Effects

Definition/Use Cases

Minimum Capacity Threshold (°F)	85
Maximum Capacity at Design Temp (Btu/h)	22,923
Percent Design Load Served	305.6%
Annual Cooling Load (MMBtu)	3.3

Definitions/Use Cases

Percent Annual Cooling Load Served	100.0%
Percent Annual Load Modulating	15.1%
Percent Annual Load with Low-Load Cycling	84.9%

Information Tables

Brand	MITSUBISHI ELECTRIC
Series	M-Series
Ducting Configuration	Singlezone Non-Ducted, Wall Placement
AHRI Certificate #*	209832208
Outdoor Unit Model #*	MUZ-FS18NAH***
Indoor Model #*	MSZ-FS18NA***
Indoor Unit Type*	Mini-Splits
Furnace Model* #	
EER*	12.5
SEER*	21
HSPF (Region IV)*	12
EER2*	12.5
SEER2*	21
HSPF2 (Region IV)*	10.3
HSPF2 (Region V)	8.1
ENERGY STAR V6.1	✓
ENERGY STAR V6.1 Cold Climate	✓
ENERGY STAR V5.0	
Federal Tax Credit Eligibility	✓

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated*	Max
Cooling	95°F	80°F	Btu/h*	6,450	17,200	21,000
			kW	0.41	1.38	2.22
			COP	4.61	3.65	2.77
Cooling	82°F	80°F	Btu/h*	7,150	-	23,500
			kW	0.31	-	1.87
			COP	6.76	-	3.68
Heating	47°F	70°F	Btu/h*	5,150	19,000	30,000
			kW	0.43	1.61	4
			COP	3.51	3.46	2.2
Heating	17°F	70°F	Btu/h*	4,460	12,800	27,000
			kW	0.73	1.28	3.82
			COP	1.79	2.93	2.07
Heating	5°F	70°F	Btu/h*	3,810	-	23,000
			kW	0.64	-	3.25
			COP	1.74	-	2.07
Heating	-13°F	70°F	Btu/h*	2,830	-	17,100
			kW	0.54	-	2.63
			COP	1.54	-	1.91

Comparing Products

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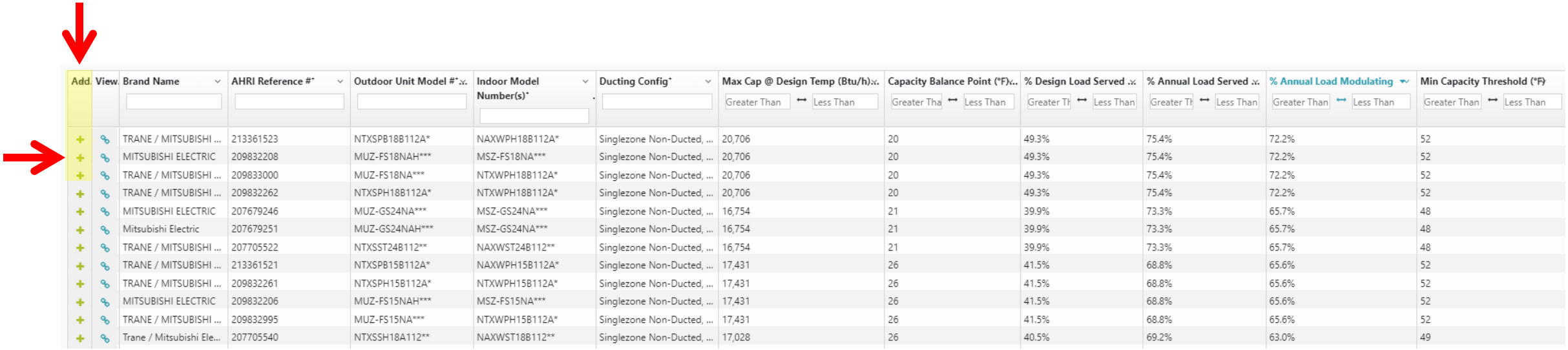
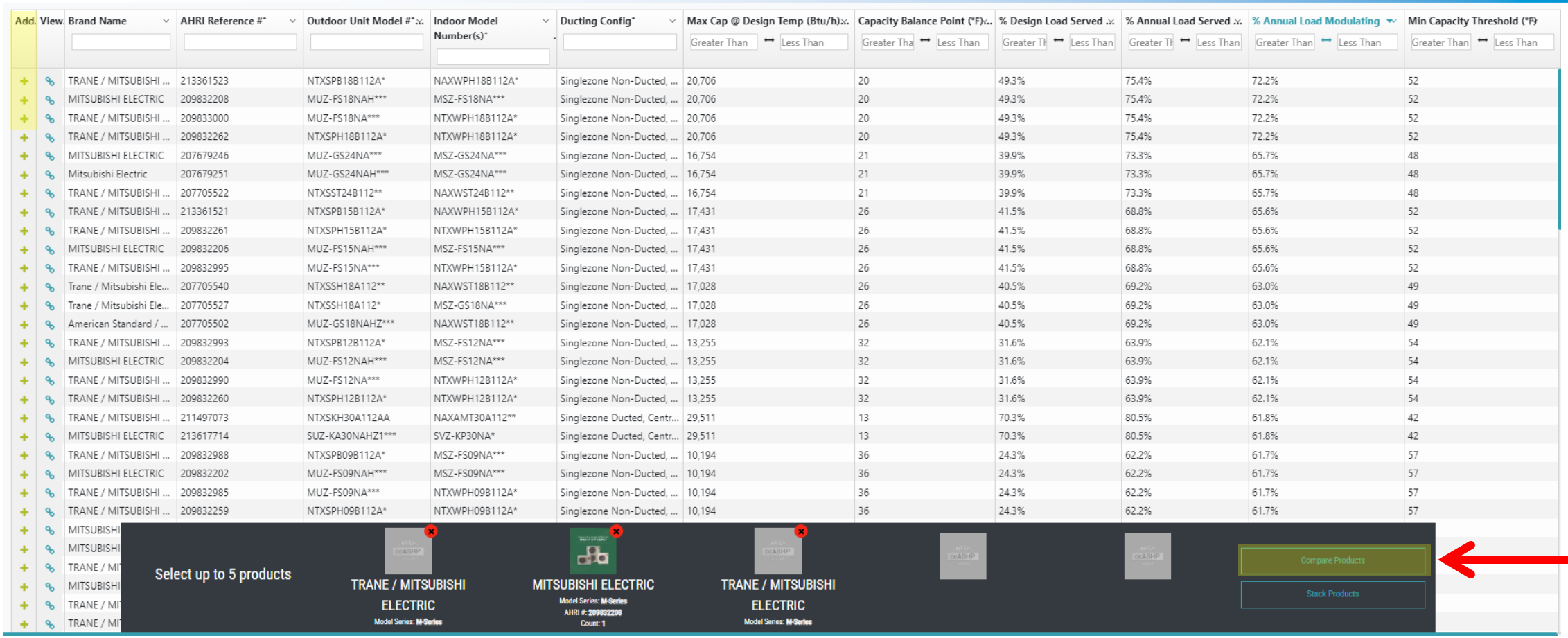
Step 6) Select a products to compare



Add	View	Brand Name	AHRI Reference #	Outdoor Unit Model #	Indoor Model Number(s)	Ducting Config	Max Cap @ Design Temp (Btu/h)	Capacity Balance Point (°F)	% Design Load Served	% Annual Load Served	% Annual Load Modulating	Min Capacity Threshold (°F)
							Greater Than – Less Than	Greater Tha – Less Than	Greater Th – Less Than	Greater Th – Less Than	Greater Than – Less Than	Greater Than – Less Than
+		TRANE / MITSUBISHI ...	213361523	NTXSPB18B112A*	NAXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	209832208	MUZ-FS18NAH***	MSZ-FS18NA***	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209833000	MUZ-FS18NA***	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209832262	NTXSPH18B112A*	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	207679246	MUZ-GS24NA***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		Mitsubishi Electric	207679251	MUZ-GS24NAH***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	207705522	NTXSST24B112**	NAXWST24B112**	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	213361521	NTXSPB15B112A*	NAXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832261	NTXSPH15B112A*	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		MITSUBISHI ELECTRIC	209832206	MUZ-FS15NAH***	MSZ-FS15NA***	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832995	MUZ-FS15NA***	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		Trane / Mitsubishi Ele...	207705540	NTXSSH18A112**	NAXWST18B112**	Singlezone Non-Ducted, ...	17,028	26	40.5%	69.2%	63.0%	49

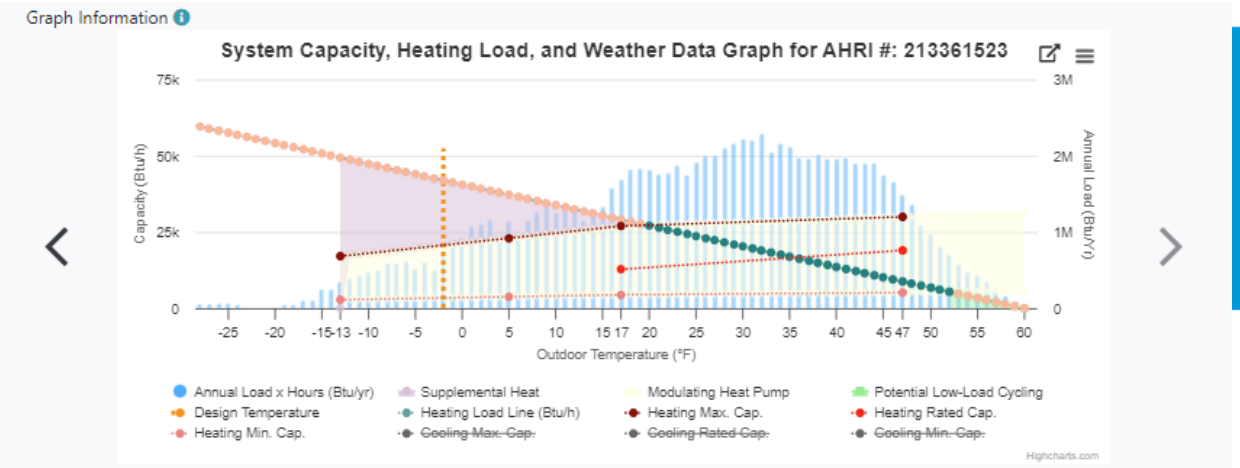
Note: You can select multiple products to compare. The first product is not always the best option or readily available at your distributor.

Step 7) Click Compare Products



Compare Products

- Graph displays only one product selected. You can cycle through the graph for each selected product.
- Data for all products selected will be displayed side by side below the graph.



	AHRI #: 213361523 Show Graph	AHRI #: 209832208 Show Graph	AHRI #: 209833000 Show Graph
General Information Section			
Brand	TRANE / MITSUBISHI ELECTRIC	MITSUBISHI ELECTRIC	TRANE / MITSUBISHI ELECTRIC
Series	M-Series	M-Series	M-Series
Ducting Configuration	Singlezone Non-Ducted, Wall Placement	Singlezone Non-Ducted, Wall Placement	Singlezone Non-Ducted, Wall Placement
AHRI Certificate #	213361523	209832208	209833000
Outdoor Unit Model #	NTXSPB18B112A*	MUZ-FS18NAH***	MUZ-FS18NA***
Indoor Model #	NAXWPH18B112A*	MSZ-FS18NA***	NTXWPH18B112A*
Indoor Unit Type	Mini-Splits	Mini-Splits	Mini-Splits
Furnace Model #			
EER		12.5	12.5
SEER		21	21
HSPF (Region IV)		12	12.5
EER2	12.5	12.5	12.5
SEER2	21	21	21
HSPF2 (Region IV)	10.3	10.3	10.7
HSPF2 (Region V)		8.1	

Building a Multiple Compressor System

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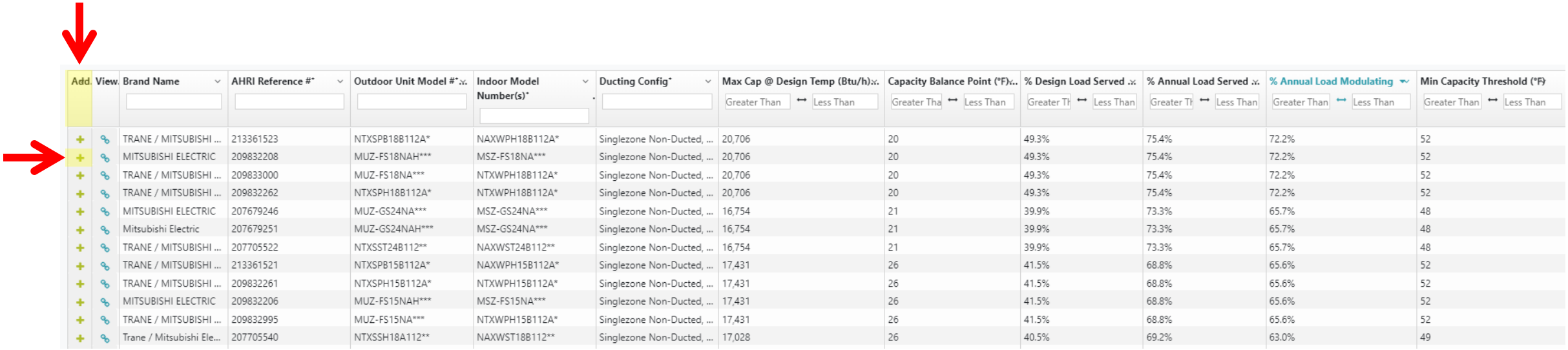
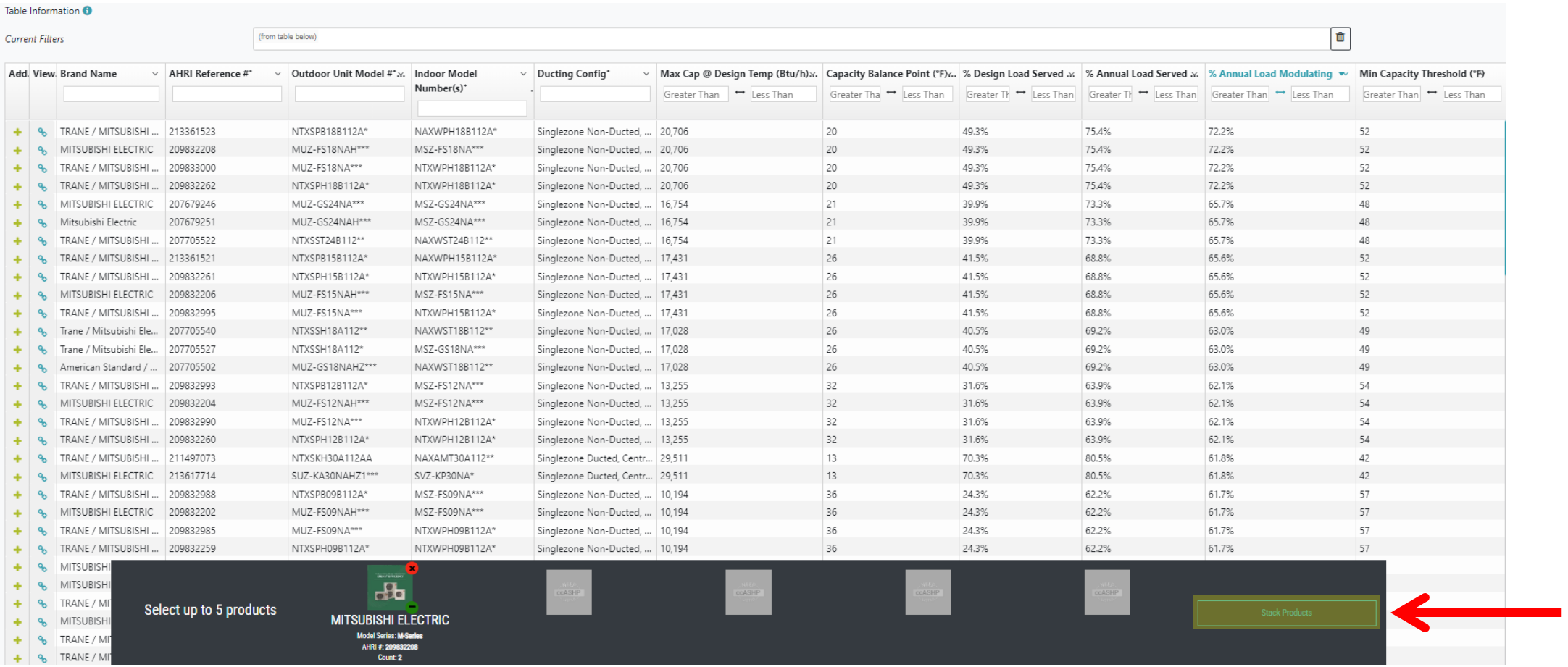
Step 8) Select a product to stack



Add	View	Brand Name	AHRI Reference #	Outdoor Unit Model #	Indoor Model Number(s)	Ducting Config	Max Cap @ Design Temp (Btu/h)	Capacity Balance Point (°F)	% Design Load Served	% Annual Load Served	% Annual Load Modulating	Min Capacity Threshold (°F)
							Greater Than – Less Than	Greater Tha – Less Than	Greater Th – Less Than	Greater Th – Less Than	Greater Than – Less Than	Greater Than – Less Than
+		TRANE / MITSUBISHI ...	213361523	NTXSPB18B112A*	NAXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	209832208	MUZ-FS18NAH***	MSZ-FS18NA***	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209833000	MUZ-FS18NA***	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		TRANE / MITSUBISHI ...	209832262	NTXSPH18B112A*	NTXWPH18B112A*	Singlezone Non-Ducted, ...	20,706	20	49.3%	75.4%	72.2%	52
+		MITSUBISHI ELECTRIC	207679246	MUZ-GS24NA***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		Mitsubishi Electric	207679251	MUZ-GS24NAH***	MSZ-GS24NA***	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	207705522	NTXSST24B112**	NAXWST24B112**	Singlezone Non-Ducted, ...	16,754	21	39.9%	73.3%	65.7%	48
+		TRANE / MITSUBISHI ...	213361521	NTXSPB15B112A*	NAXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832261	NTXSPH15B112A*	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		MITSUBISHI ELECTRIC	209832206	MUZ-FS15NAH***	MSZ-FS15NA***	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		TRANE / MITSUBISHI ...	209832995	MUZ-FS15NA***	NTXWPH15B112A*	Singlezone Non-Ducted, ...	17,431	26	41.5%	68.8%	65.6%	52
+		Trane / Mitsubishi Ele...	207705540	NTXSSH18A112**	NAXWST18B112**	Singlezone Non-Ducted, ...	17,028	26	40.5%	69.2%	63.0%	49

Note: You can select the same product, multiple times to stack. The first product is not always the best option or readily available at your distributor.

Step 9) Click Stack Products

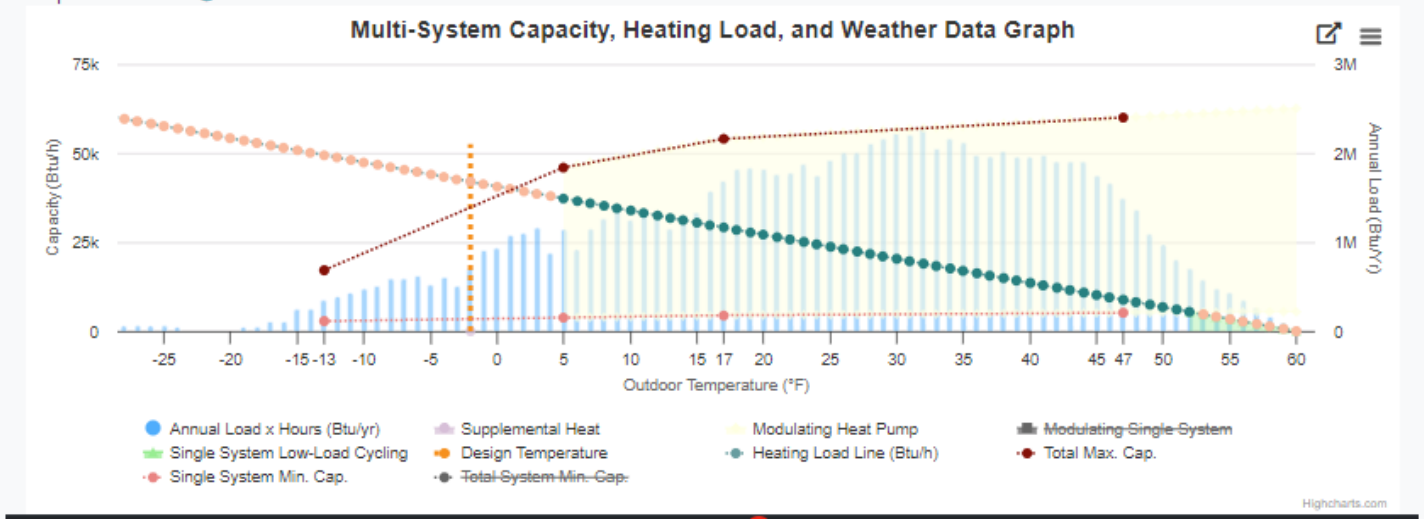


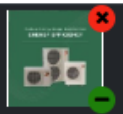
Stacked Products

- Shows multiple compressors and data based on running those products together graphically

- Shows multiple compressors and data based on running those products

Graph Information





AHRI #: 209832208

Count: 2

Stacked Product Sizing For Heating

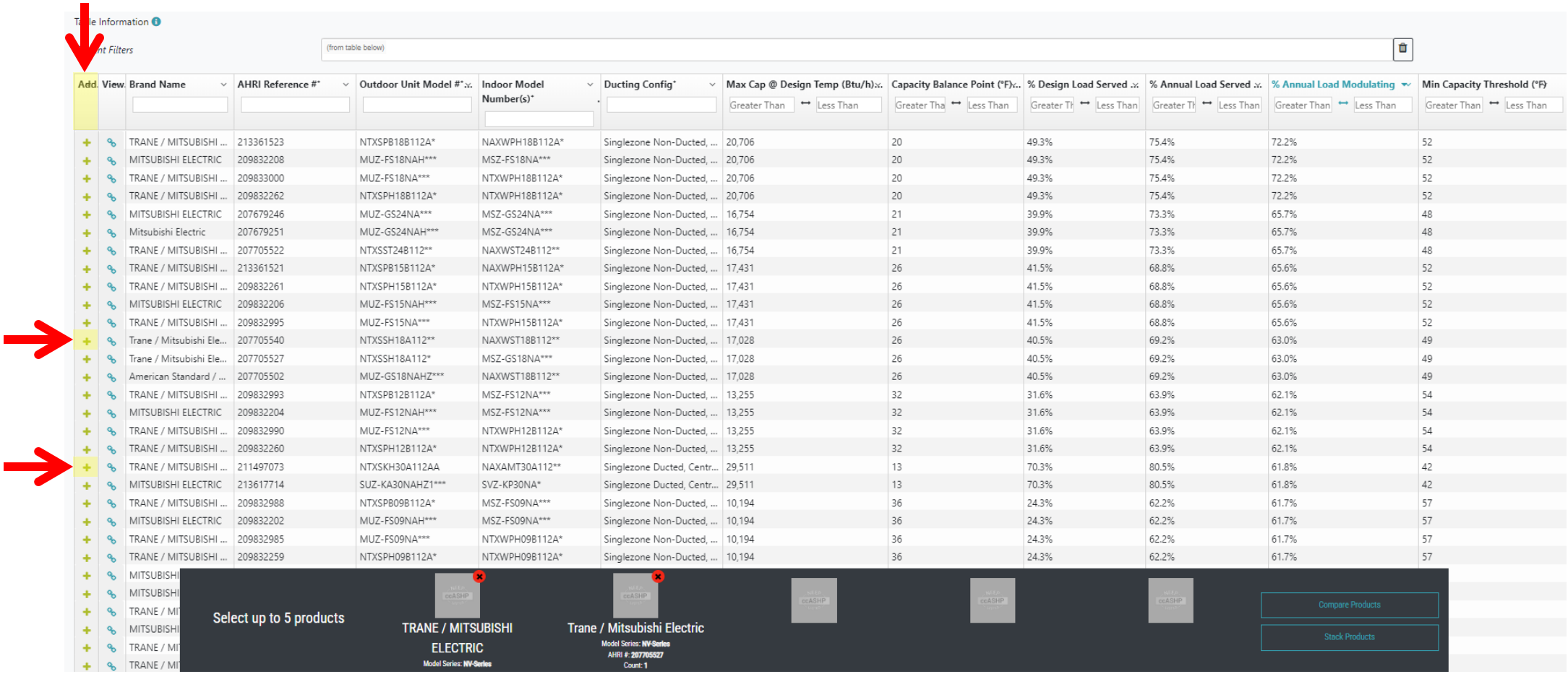
Field Information

Capacity Balance Point (°F)	-2
Minimum Capacity Threshold (°F)	52
Maximum Capacity at Design Temp (Btu/h)	No capacity at design Temperature
Percent Design Load Served	No capacity at design Temperature
Percent Annual Heating Load Served	93.0%
Annual Btu's Covered by Supplemental Heat (MMBtu)	6.7

Field Information

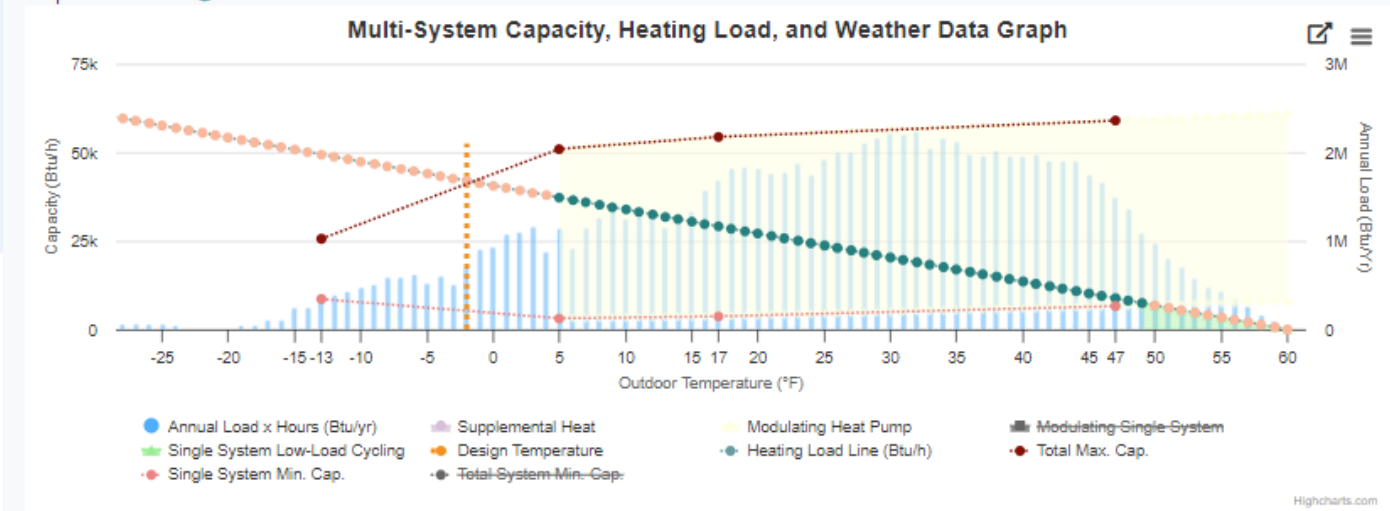
Hours Requiring Supplemental Heat	144
Percent Annual Load Modulating	89.8%
Percent Annual Load with Low-Load Cycling	%
Heat Pump Primacy Threshold	45
Annual Hours Primacy Cycling	1066
Percent Annual Load Primacy Cycling	8.4

Select better fitting products



Selecting the right equipment

Graph Information



Stacked Product Sizing For Heating

Field Information

Capacity Balance Point (°F)	-9
Minimum Capacity Threshold (°F)	49
Maximum Capacity at Design Temp (Btu/h)	No capacity at design Temperature
Percent Design Load Served	No capacity at design Temperature
Percent Annual Heating Load Served	97.1%
Annual Btu's Covered by Supplemental Heat (MMBtu)	2.8

Field Information

Hours Requiring Supplemental Heat	55
Percent Annual Load Modulating	90.9%
Percent Annual Load with Low-Load Cycling	%
Heat Pump Primacy Threshold	36
Annual Hours Primacy Cycling	2028
Percent Annual Load Primacy Cycling	23.9

Other Features

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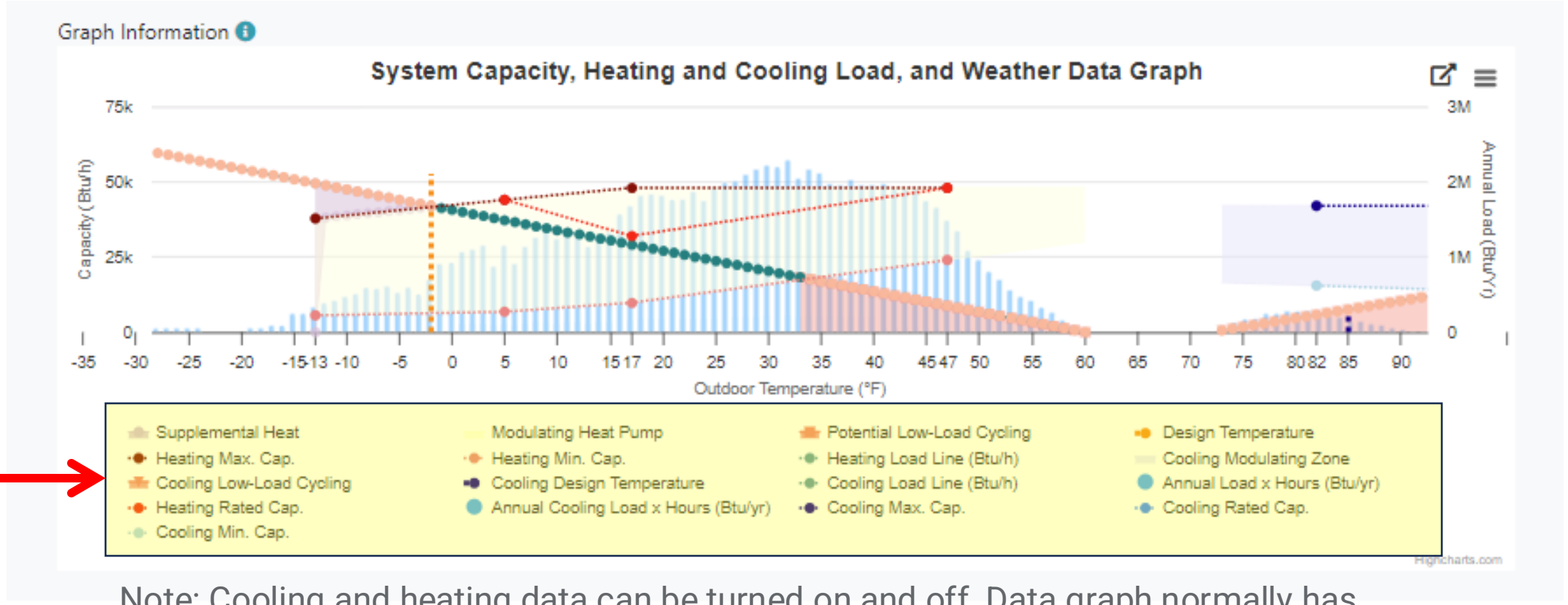
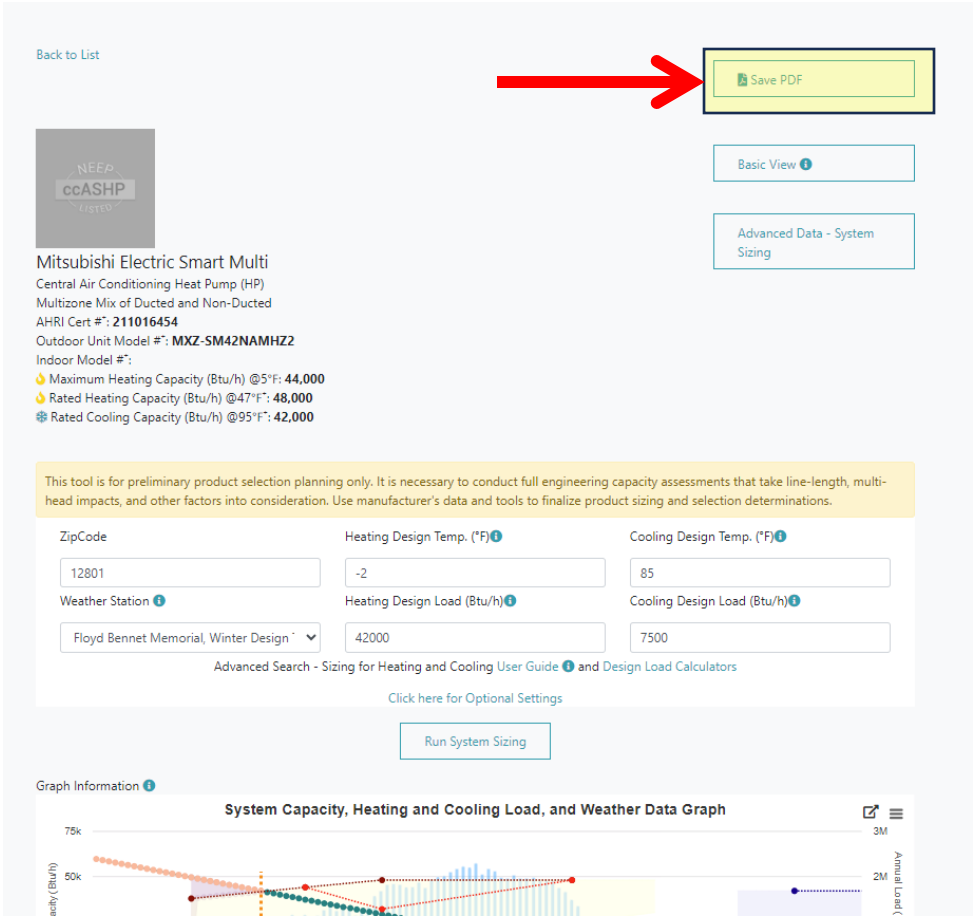
Cooling Load



Note: Cooling and heating data can be turned on and off. Data graph normally has cooling load data turned off.

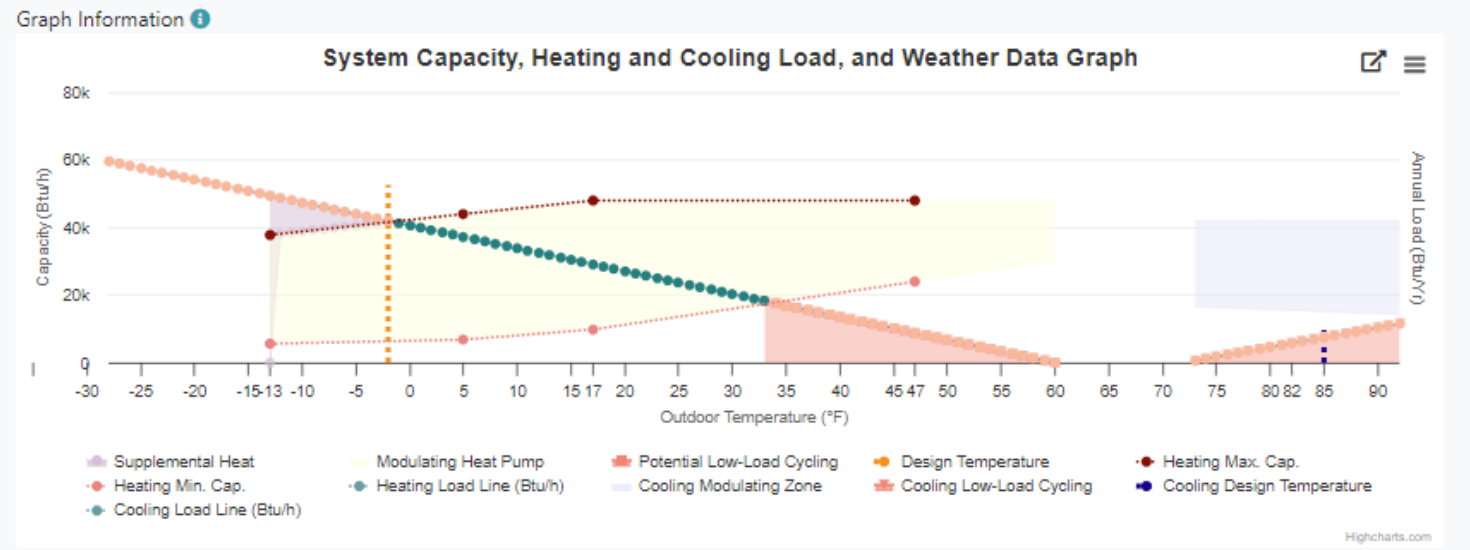
Download and Save

- Download and save a PDF version of the data for the heat pump system that you selected



Basic View

- Changes the graphically displayed information to a simpler version that can be used to show customers.



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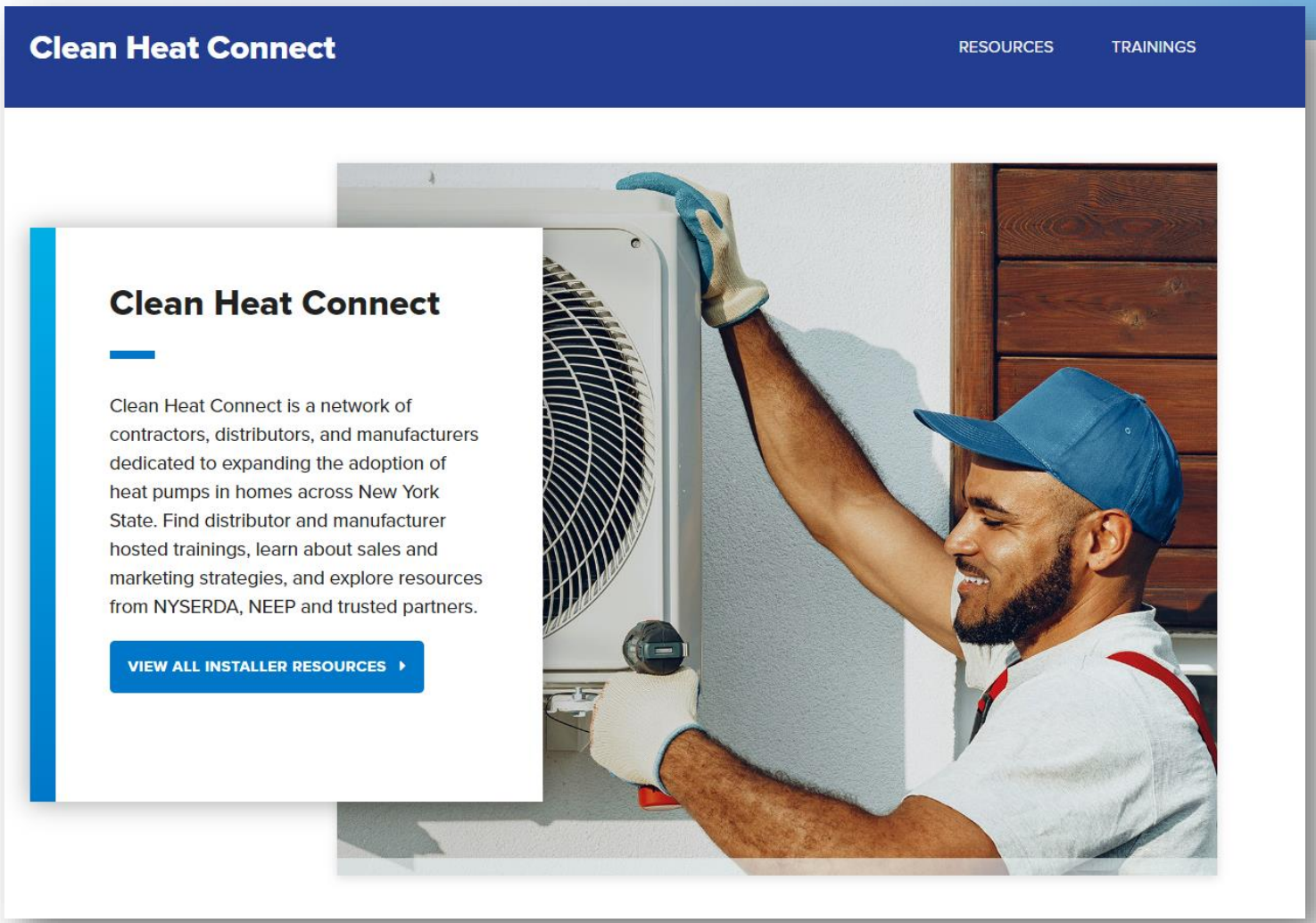

Thank You

JJ Sawicki

JSawicki@trccompanies.com

CleanHeatConnect@trccompanies.com

NEW YORK STATE | NYSERDA