Introduction to Natural Gas Heat Pumps
6/3/26

ENERGY SOLUTIONS CENTER

Eric Burgis, ESC
Eddie Caton, Yanmar
Kevin Koch, Robur

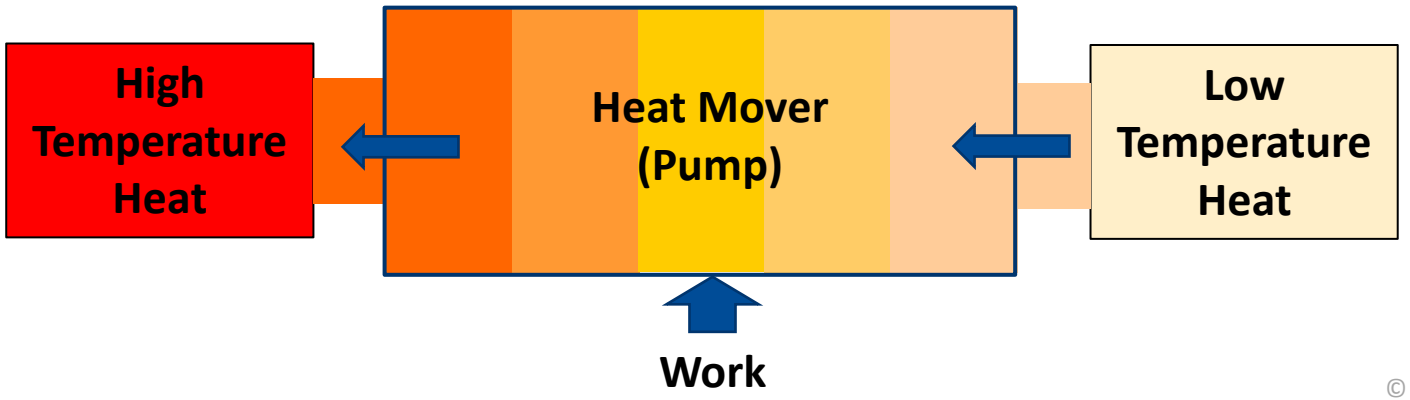
Topics

- Heat Pump Overview & Terminologies
- How Heat Pumps work
- Gas Heat Pumps (GHP)
- Efficiencies & Economics
- Environmental Benefits
- GHP Products
- Q&A with Panel of Experts

ENERGY SOLUTIONS CENTER

What is a “Heat Pump”

- Device that transfers thermal energy from a heat source to a heat sink
- Move thermal energy in a direction which is opposite to the direction of spontaneous heat flow
- A heat pump uses energy to accomplish the desired transfer of thermal energy from heat source to heat sink and vice versa based on winter or summer operation



ENERGY SOLUTIONS CENTER

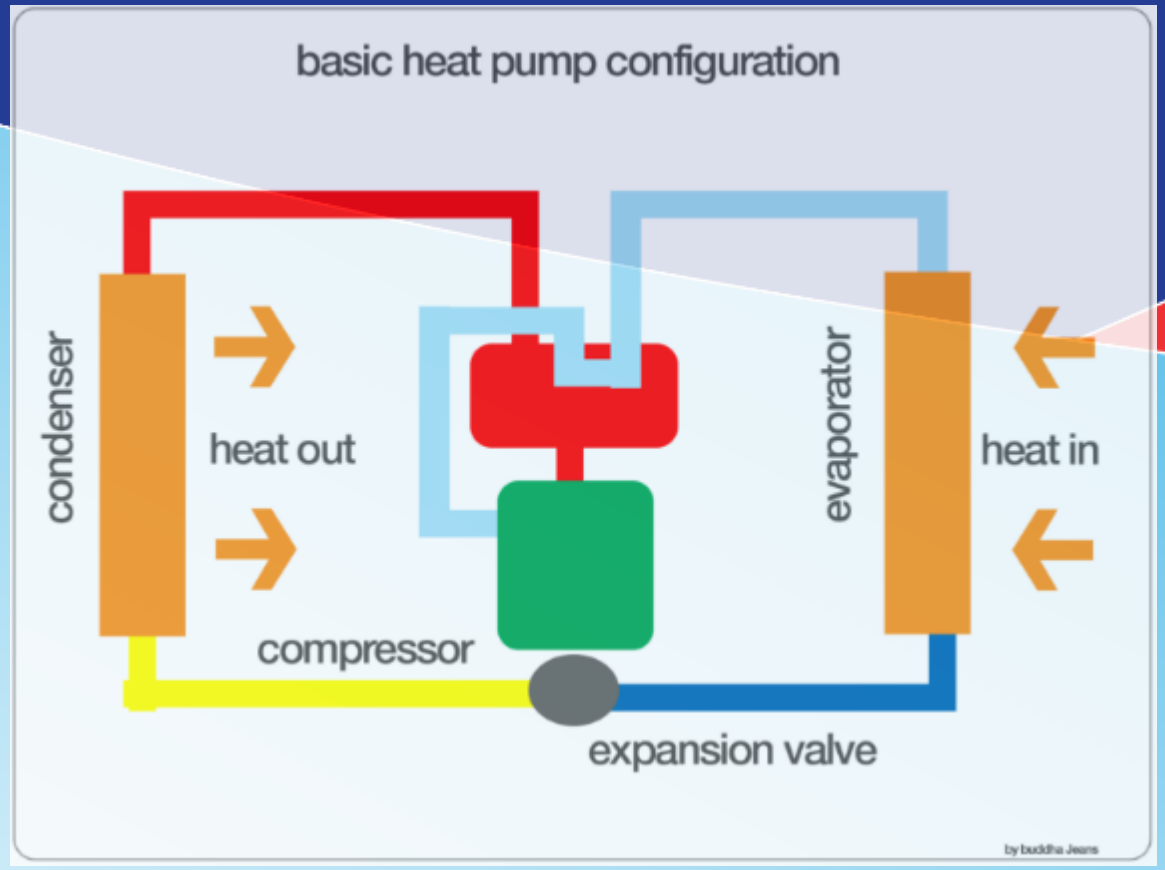
Cooling System Efficiency Terminology

- Coefficient of Performance – (COP) is the ratio of the heat removed from the cold reservoir to input work (**Output ÷ Input**)
- Seasonal Energy Efficiency Ratio (SEER) = BTU/hr ÷ Watts for Unitary Systems
- Heating Seasonal Performance Factor 2 (HSPF2) - ratio of heat output (measured in BTUs) over the heating season to electricity used (measured in watt-hours)
  - Note the difference between HSPF and HSPF2 is that HSPF2 uses harsher conditions in the calculation
- KW/Ton for Electric Chillers
- Gas Utilization Efficiency (GUE) is the ratio of the energy supplied by a gas-fired heat pump or boiler to the energy consumed by the burner

Note: there is no one standard test method for all systems.

ENERGY SOLUTIONS CENTER

How Heat Pumps Work (Electric or Gas)

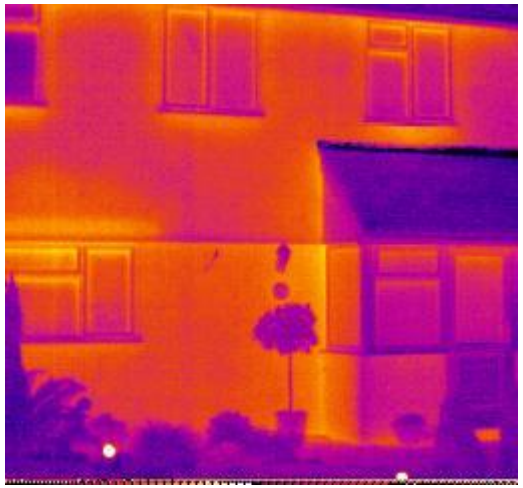


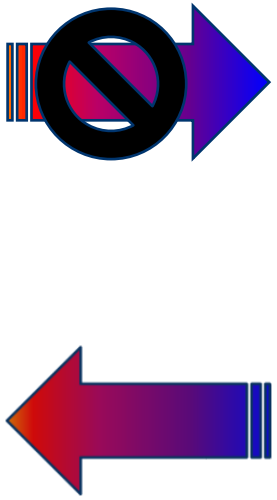
How Heat Pumps Work

How they “trick” nature

Thermodynamic Laws

Heat flows naturally from a **higher-temperature** region to a **lower-temperature** region





Indoor : 72°F (22°C)

Outdoor: -8°F (-22°C)

Heat Pump

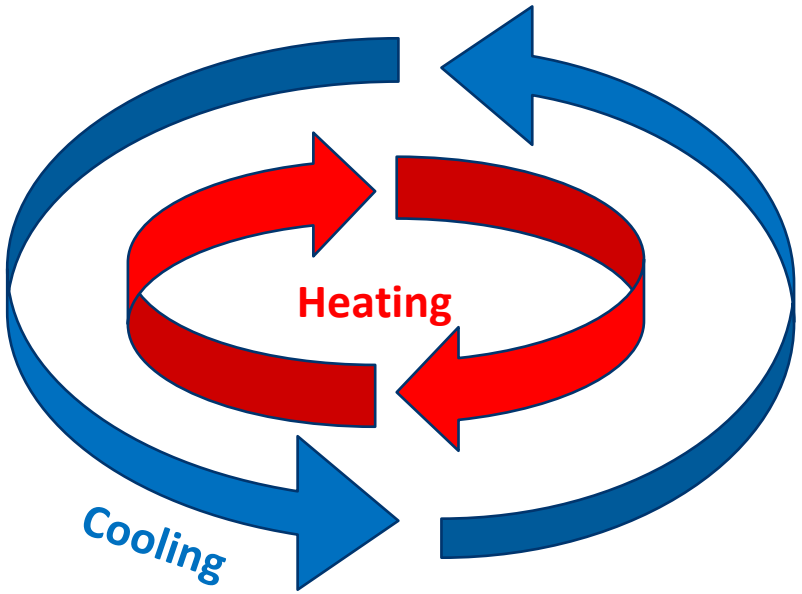
They “trick” nature by using **low-temperature** heat (outdoor) and transferring it to a **high-temperature** region (indoor)

ENERGY SOLUTIONS CENTER

How it Works in Heating Mode

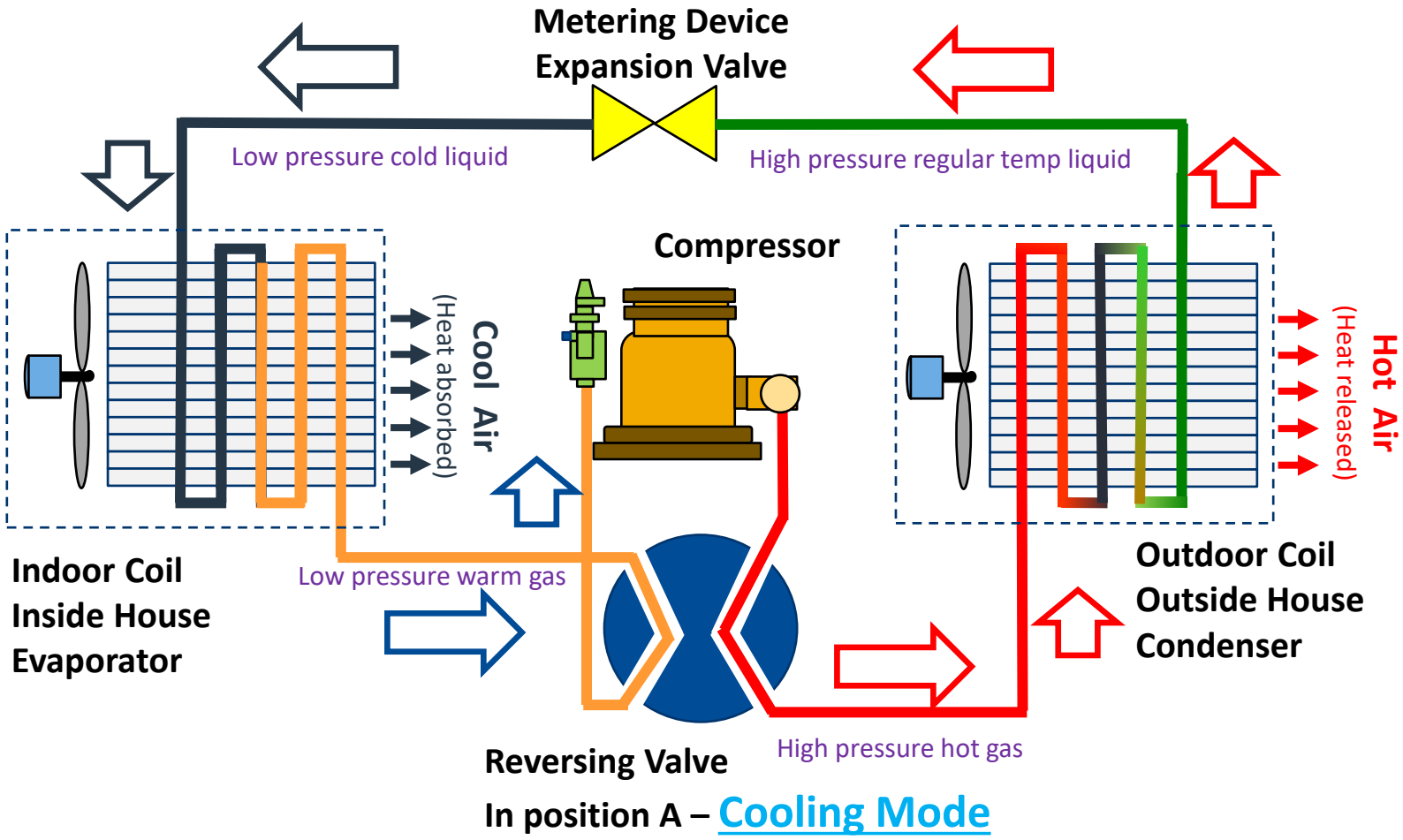
Vapor Compression for Electric and Gas Engine Heat Pumps

- Refrigerant flow is reversed via a valve in the system
  - Reversing valve rotates 90°
  - Changes the direction of the flow of the refrigerant
  - Flow is in the opposite direction – the reverse of the cooling cycle



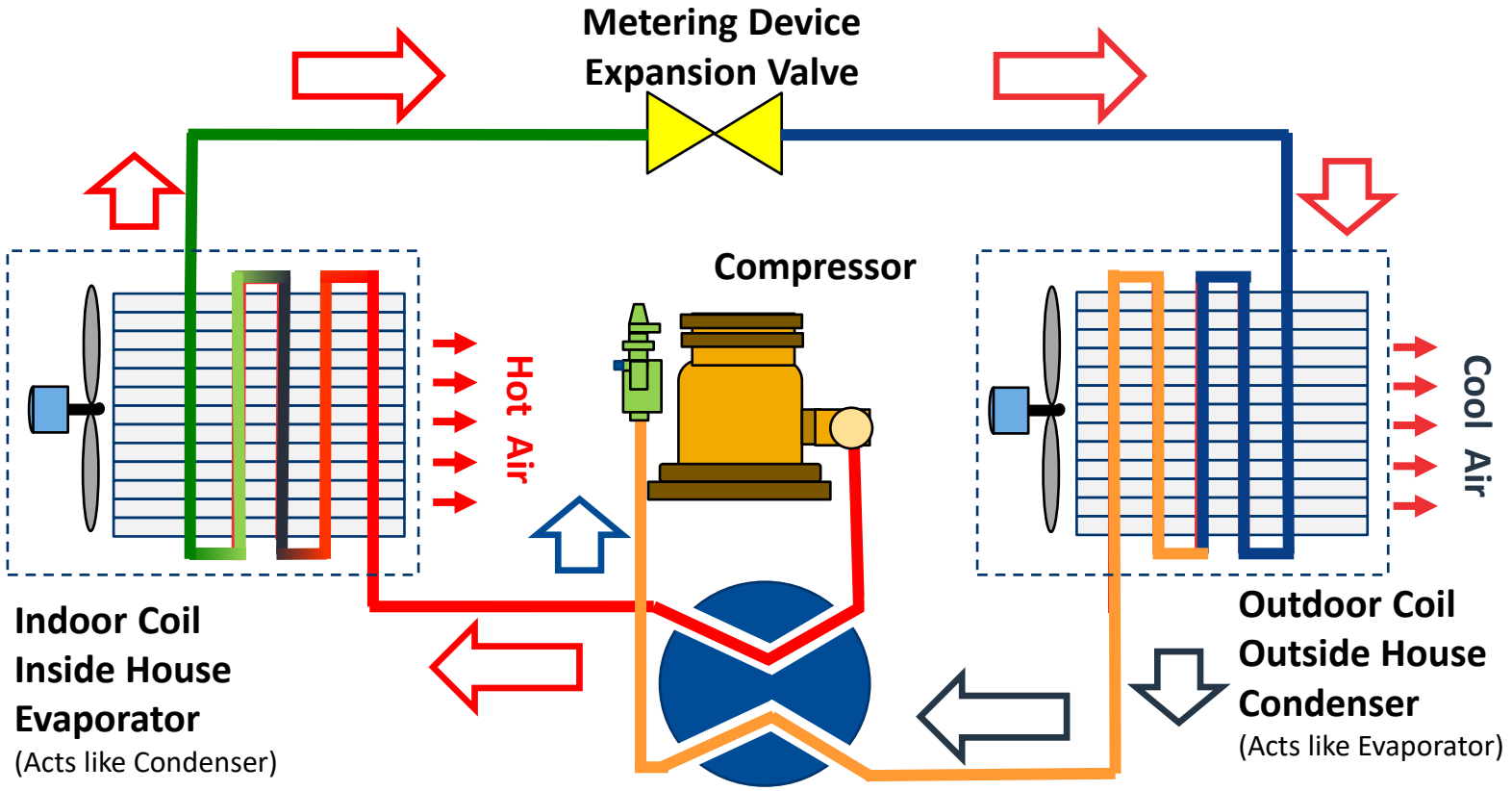
ENERGY SOLUTIONS CENTER

Air Source System in Cooling Mode
(Typical Electric Air Conditioning)



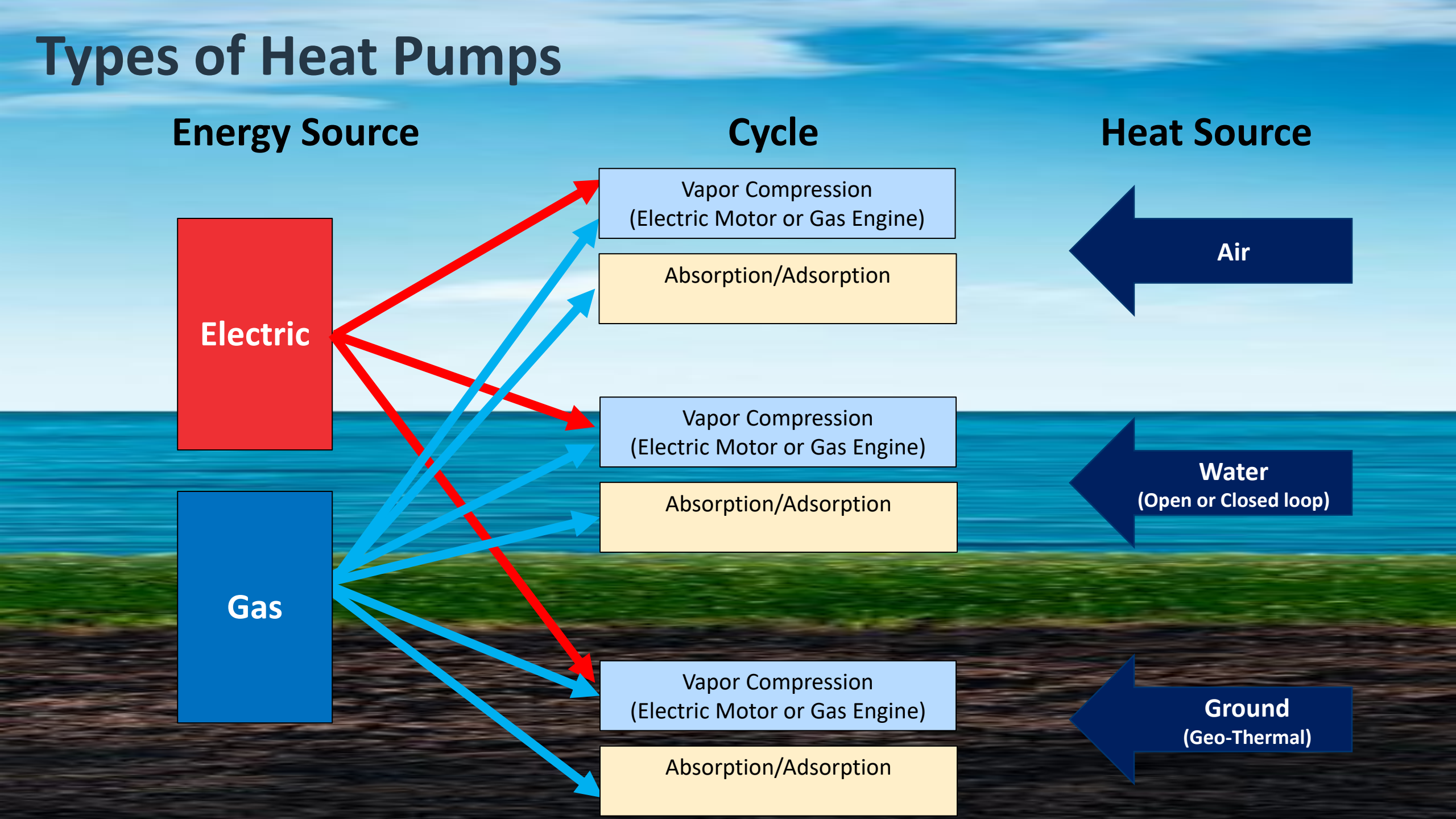
ENERGY SOLUTIONS CENTER

Air Source Heating Mode



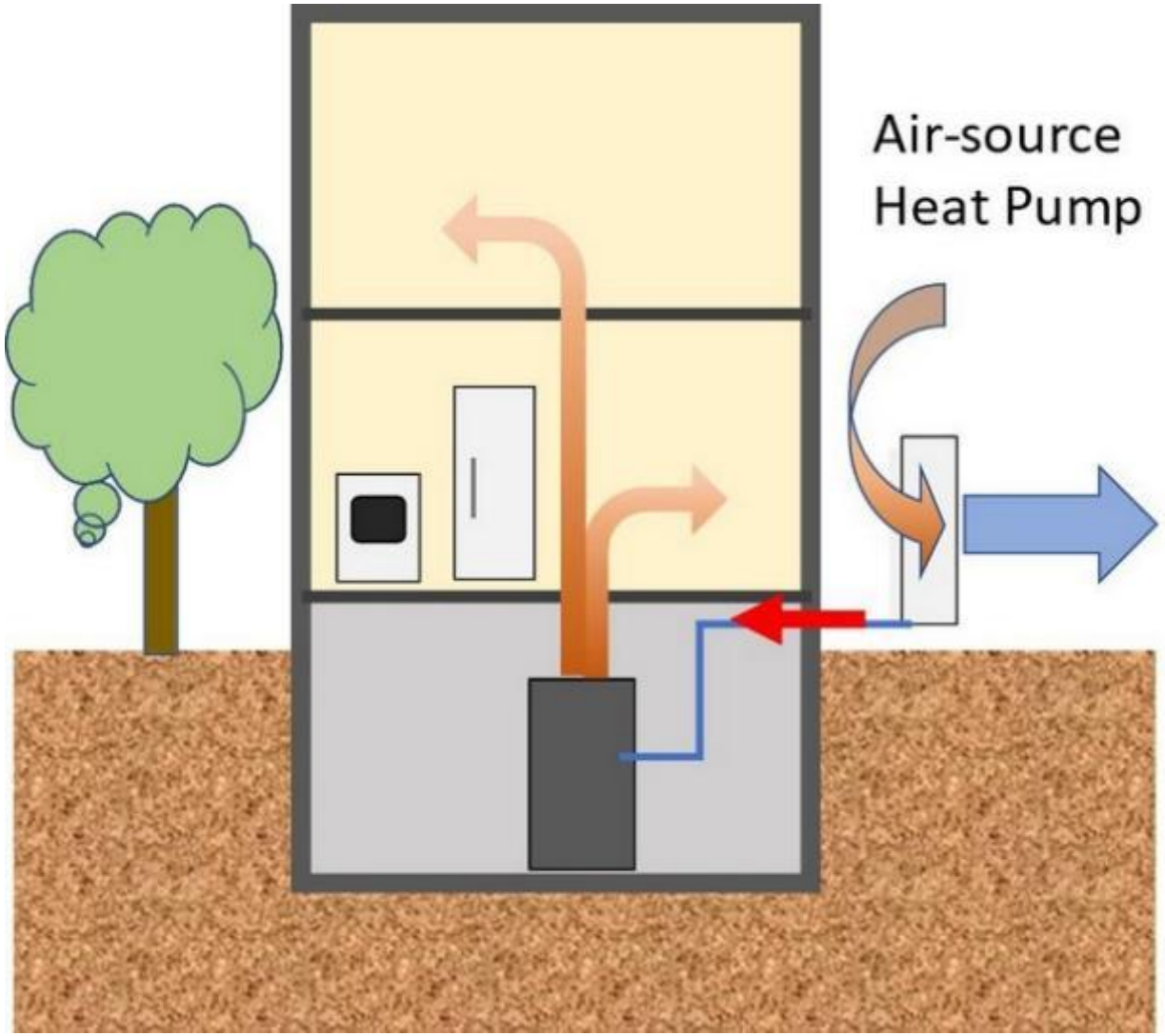
ENERGY SOLUTIONS CENTER

Types of Heat Pumps



Air Source

- Takes heat from air in the winter and uses it to heat the space
- Takes heat away from the space in the summer to cool the indoor air
- Outside unit could be electric, gas engine or absorber



ENERGY SOLUTIONS CENTER

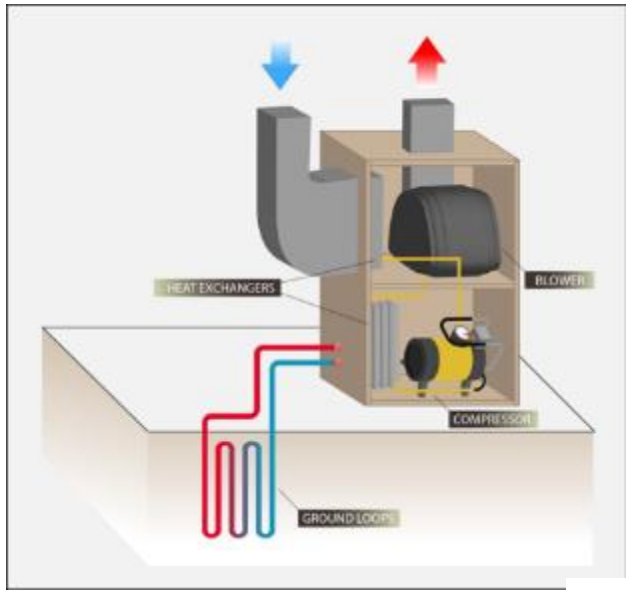
Water Source Heat Pumps

- Closed Loop
  - Just like ground source, antifreeze solution is in a closed circuit and completely isolated from the water source
  - Water from a close by lake or pond is used as the heat source/sink
- Open Loop
  - Lake or pond water is circulated directly through the loop

ENERGY SOLUTIONS CENTER

Ground Source Heat Pumps

- Soil temperature is almost constant year round
  - Warmer than air in the winter
  - Cooler than air in the summer
- Types of Ground Source Heat Pumps
  - Electric heat pumps
  - Gas engine heat pumps
  - Absorption heat pumps



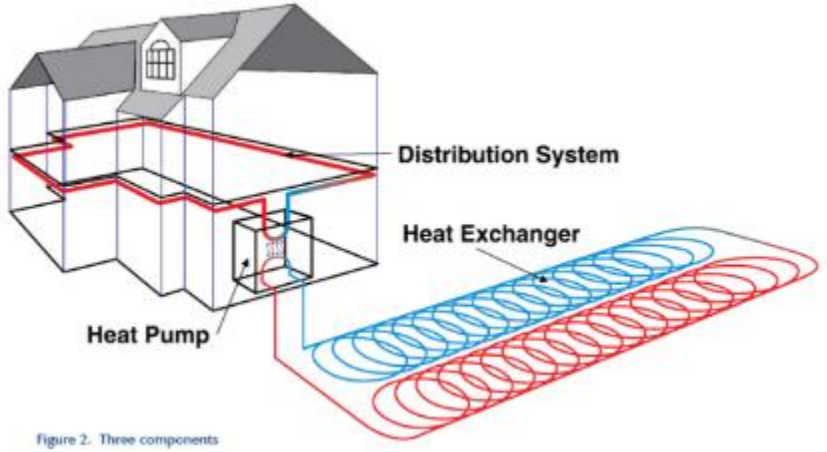
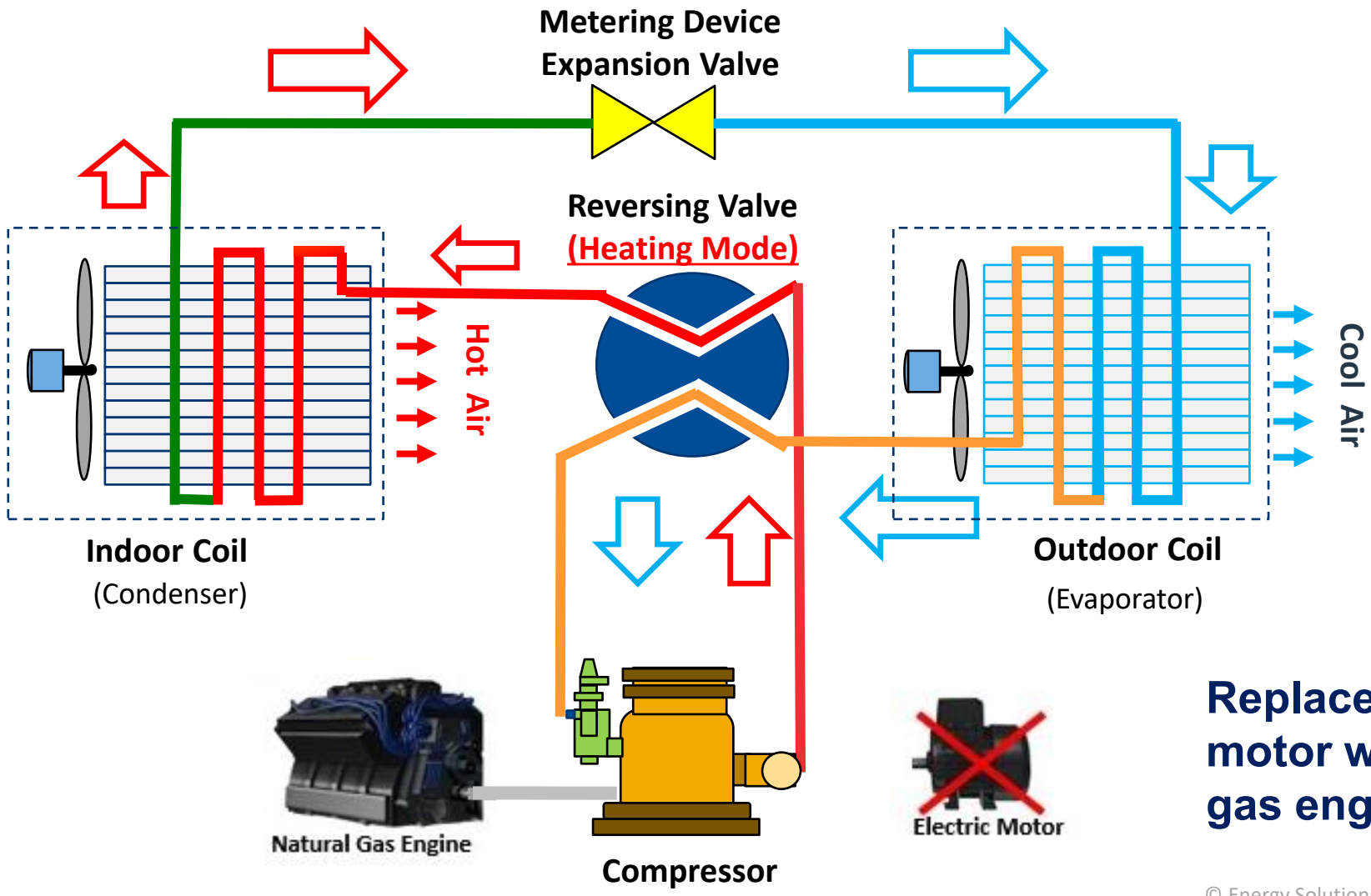


Figure 2. Three components

ENERGY SOLUTIONS CENTER

Gas Heat Pumps

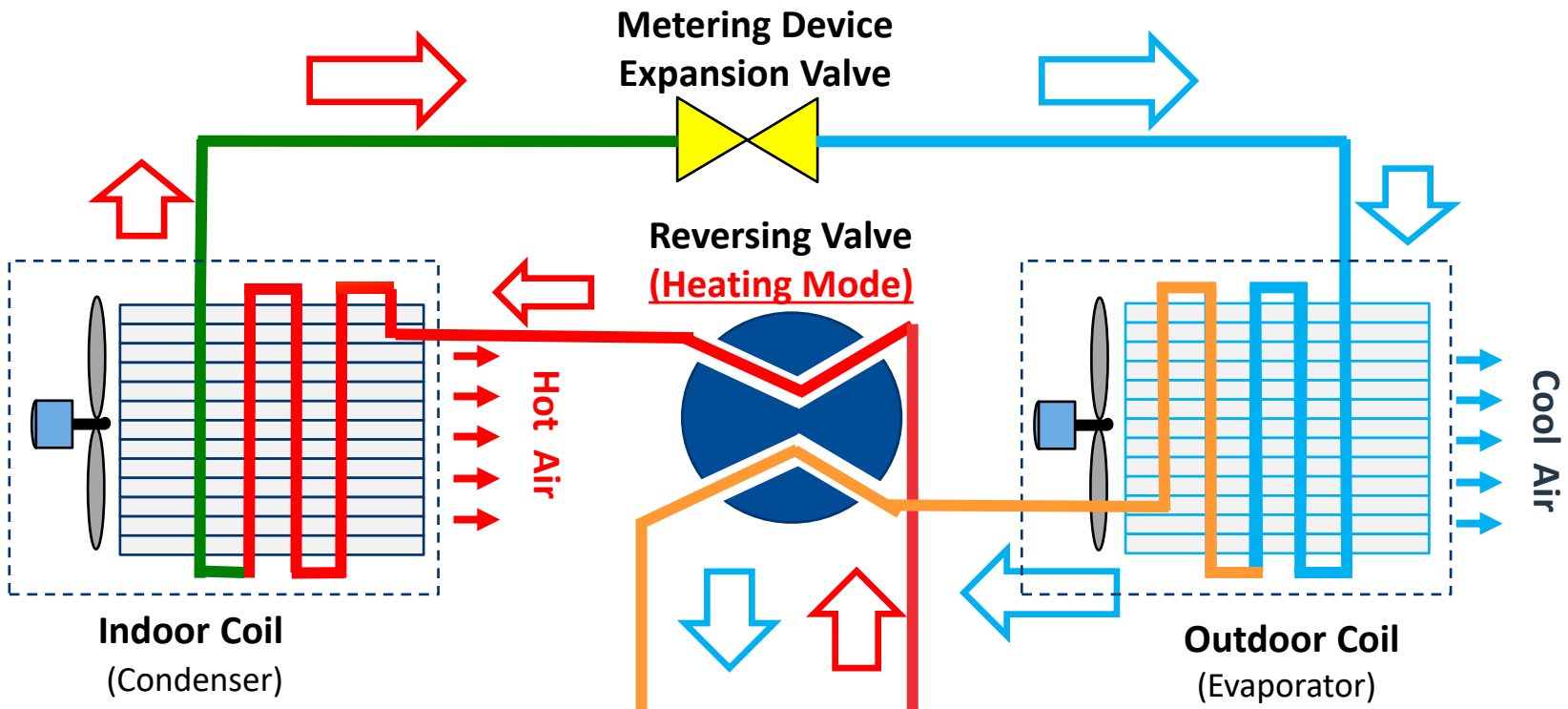
GHP: Engine Driven (Heating mode)



Replace electric motor with natural gas engine

ENERGY SOLUTIONS CENTER

GHP: Absorption (Heating mode)

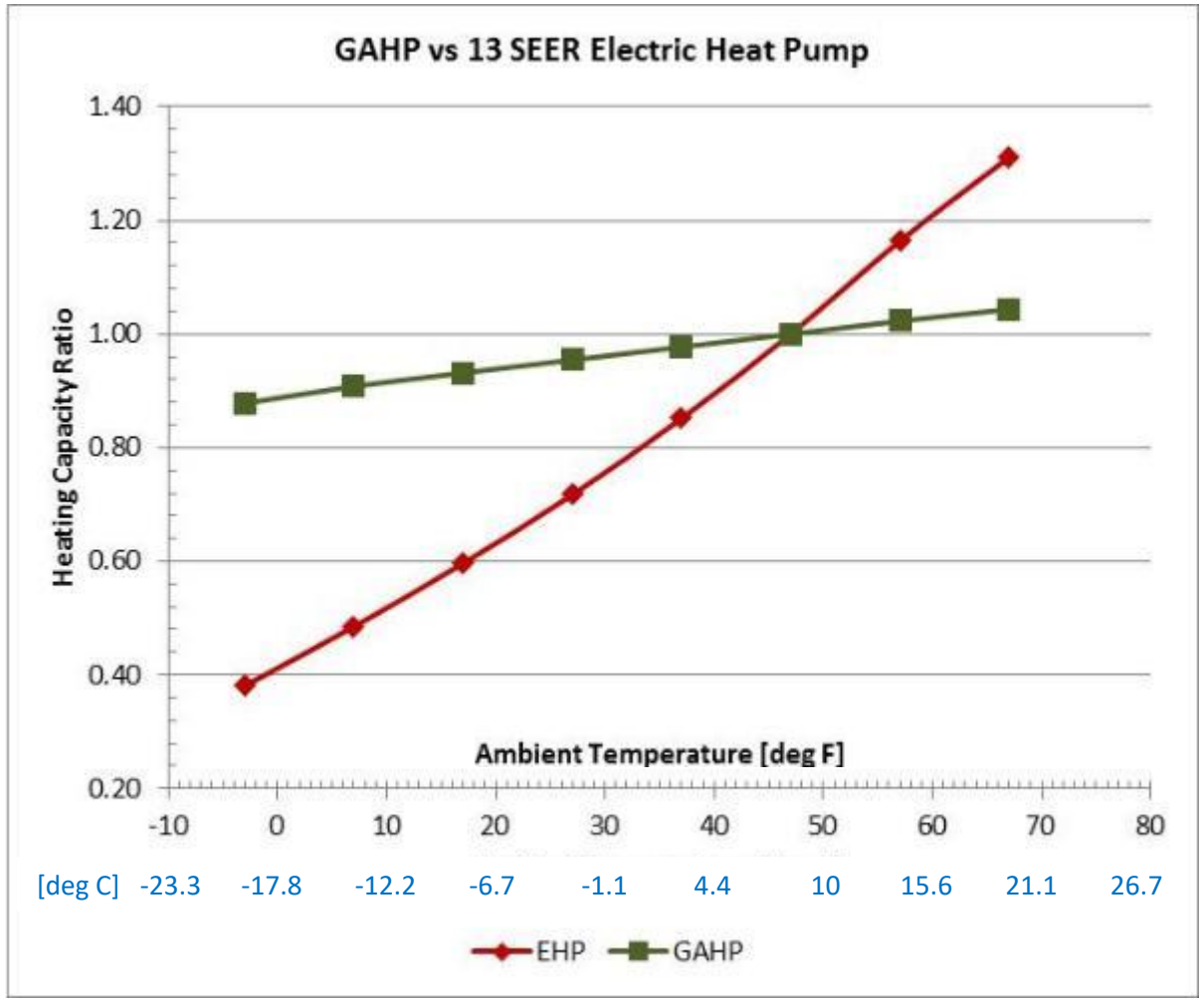


Similar to vapor compression, except the motor & compressor is replaced by absorber, pump and desorber.

ENERGY SOLUTIONS CENTER

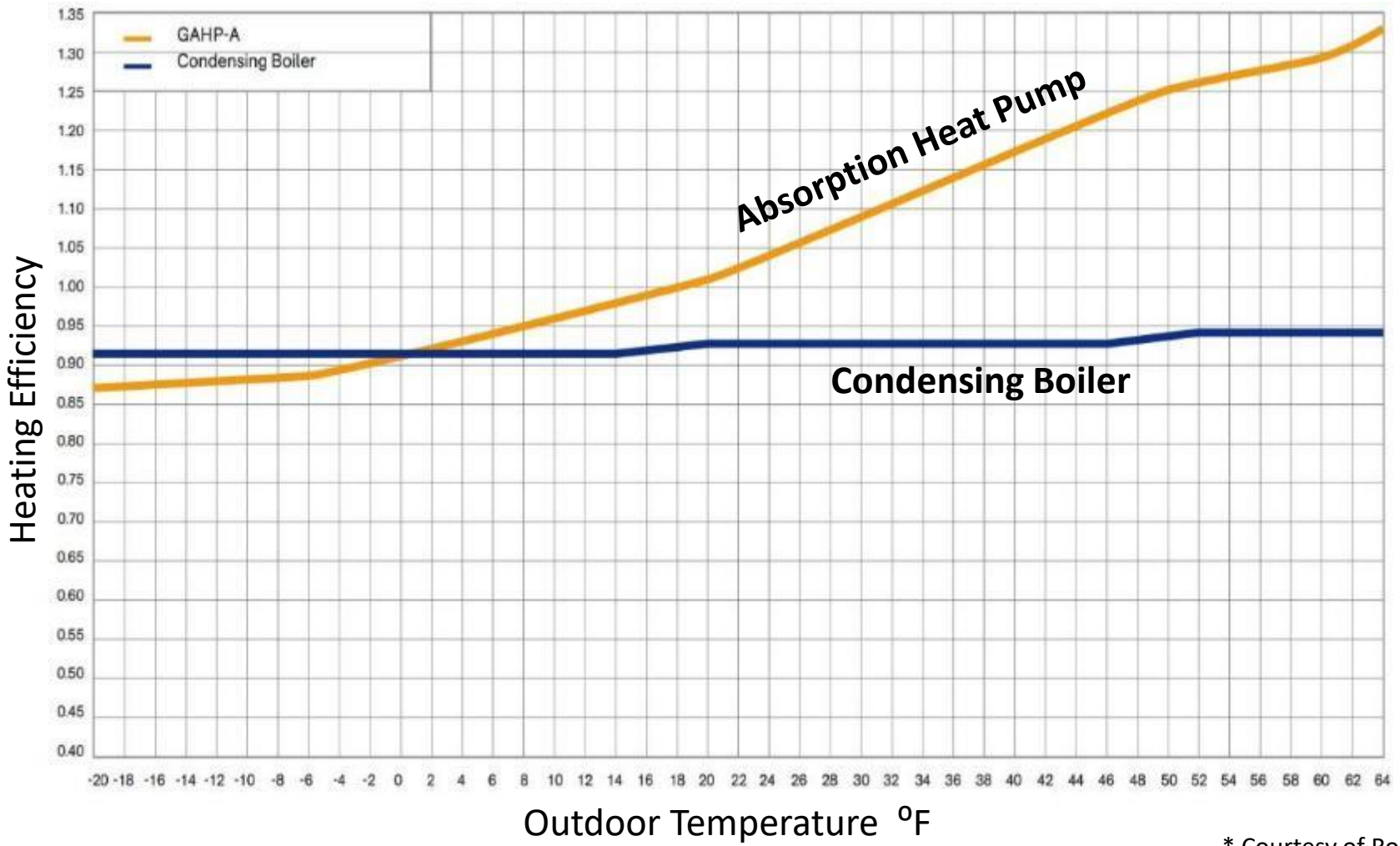
Gas Heat Pump vs EHP Heating Capacity

Gas heat pumps continue to operate at lower temperatures than electric heat pumps.



* Courtesy of Stone Mountain Technologies

Condensing Boiler vs. Air Source Heat Pump



* Courtesy of Robur

ENERGY SOLUTIONS CENTER

GHP Flexibility

Modular Designs

VRF Capable

Works with a variety of Air Handlers

Round Flow

Ducted Type

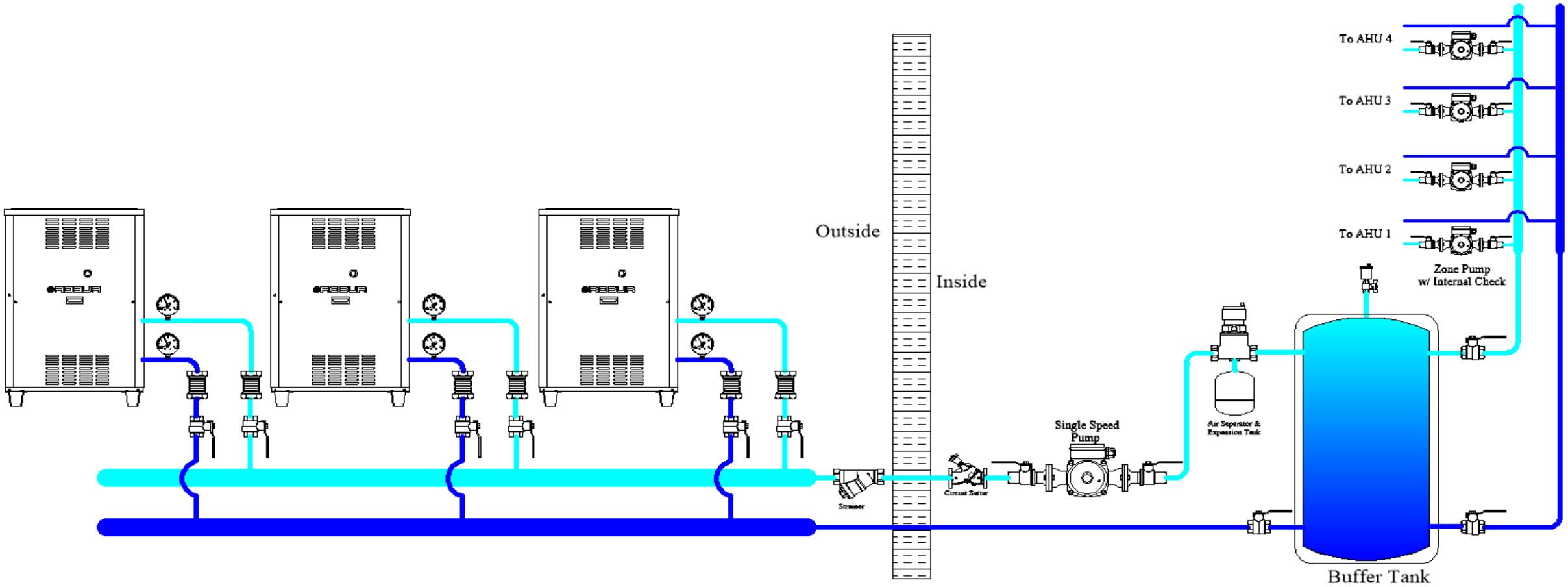
T Bar Type

Wall Mounted

Floor Standing

ENERGY SOLUTIONS CENTER

Modular Systems



* Courtesy of Robur

Modular Systems

ENERGY SOLUTIONS CENTER

Variable Refrigerant Flow (VRF)

VRF is a modular, commercially applied air conditioning and heating system that distributes refrigerant from the outdoor unit to multiple indoor units, providing efficiency, comfortable individual user control and reliability in one flexible package.

Gas Heat Pump VRF Systems are built on 4 basic product elements

Outdoor Unit

+

Indoor Unit

+

Piping

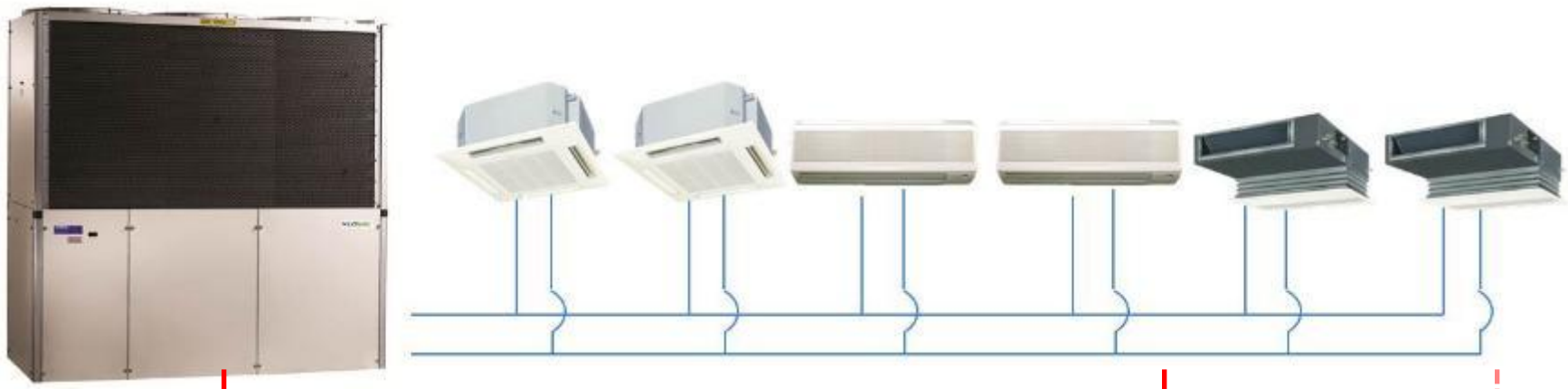
+

Controls

ENERGY SOLUTIONS CENTER

Flexibility Design & Diversity

- Multiple zones – any combination of ducted or ductless air handlers



ENERGY SOLUTIONS CENTER

Typical GHP Applications

- Space Heating Only
- Space Heating & Domestic Hot Water Heating
- Domestic Water Heating Only
- Alternating Heating & Cooling
- Commercial water heating

Special Applications:

- Simultaneous Heating & Cooling
- Variable Refrigerant Flow (VRF)
- Process Applications
- District Heating or Cooling

ENERGY SOLUTIONS CENTER

Why Use Gas Heat Pumps

Natural gas heat pumps have system efficiencies that exceed the traditional 100% barrier and offer pathways to substantially reduce greenhouse gas emissions across various climates for residential, commercial & industrial space and water heating.

Advantages of gas heat pumps include:

- GHPs reduce peak electric demands on the grid:
  - Reduce electricity grid demand, congestion & constraints
  - Avoid potential electrical infrastructure upgrades
- GHPs offer environmental benefits:
  - Typically has lower emissions than conventional HVAC
  - Ability to operate on RNG and hydrogen blends and play a key role in reducing emissions to further help reach net-zero goals
  - Some models to operate without the use of harmful refrigerants (No Global Warming Potential)

…continued

ENERGY SOLUTIONS CENTER

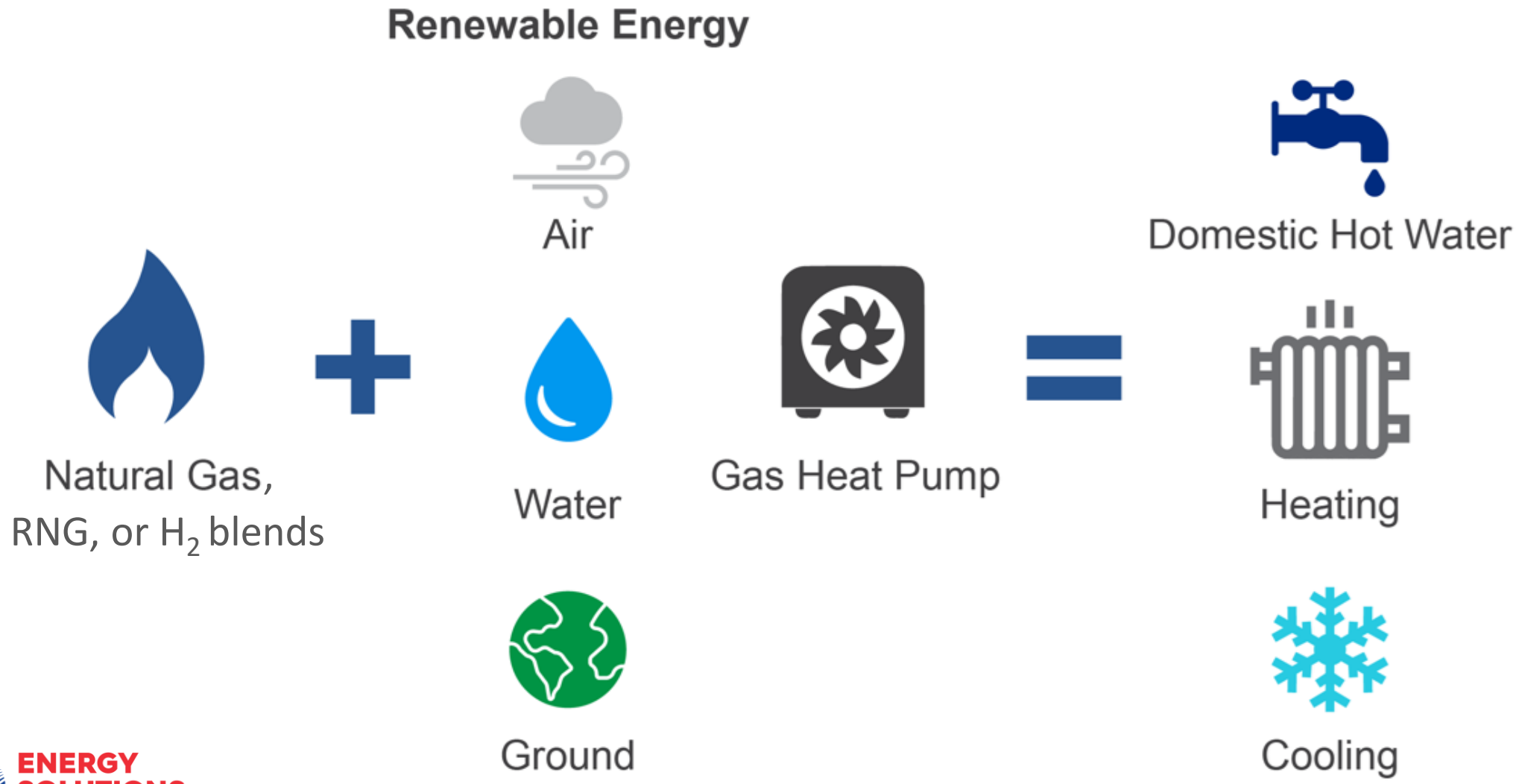
Why Use Gas Heat Pumps….continued

Other GHP features:

- Save consumers money by lowering operating costs as compared to existing gas heating equipment or EHPs
- Higher performance in cold climates because GHPs use gas combustion to deliver the majority of the system's heating load
- Some GHPs provide cooling as well as heating
- Can be 'plug and play' with existing ductwork
- Fit under policy initiatives to adopt technologies with system efficiencies over 100%.

ENERGY SOLUTIONS CENTER

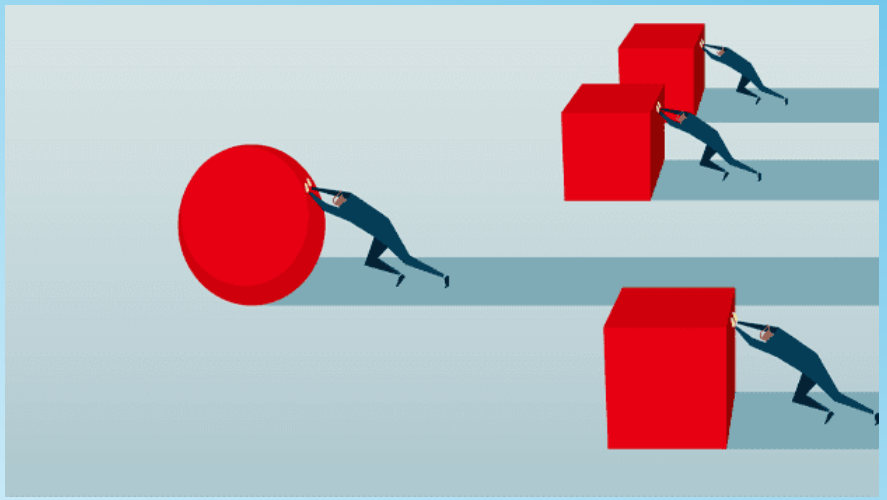
GHP Summary



Heating & water heating efficiencies are well over 100%

ENERGY SOLUTIONS CENTER

GHP Efficiencies and Economics



Typical Efficiencies

- **Typical COPs**
  - Single effect absorber ~ .6
  - Double effect absorber ~ 1.1
  - Triple effect absorber ~ 1.8
  - Engine chiller ~ 1.2 (1.4 with heat recovery)
  - Gas Heat Pumps:
    - Absorption Heating ~1.4, Cooling .6
    - Engine Heating ~ 1.4, Cooling 1.1
- **Typical SEERs of electric cooling** ~13 to 25
- **Typical Heating Seasonal Performance Factor 2's** ~7.5 to 9

ENERGY SOLUTIONS CENTER

Achieving >100% Thermal Efficiency

10%
Heat flue loss

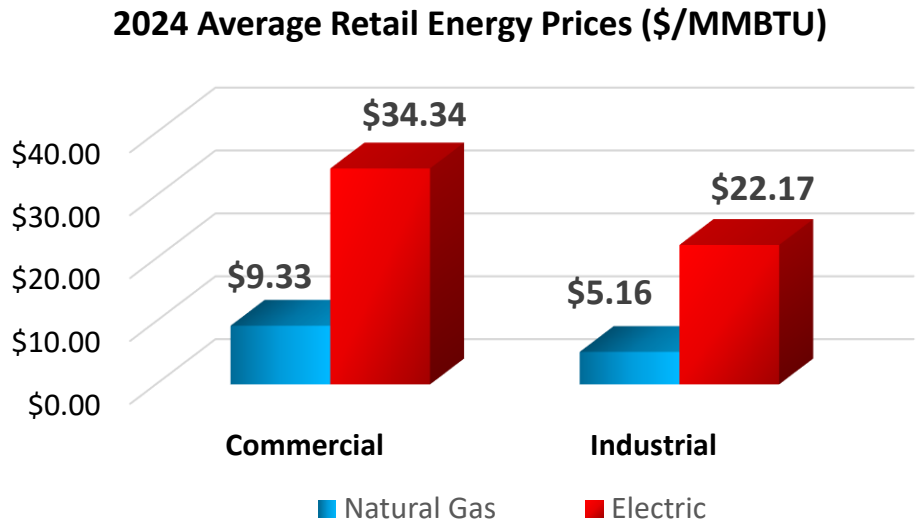
50%
Energy from
natural source
(ground, water, air)

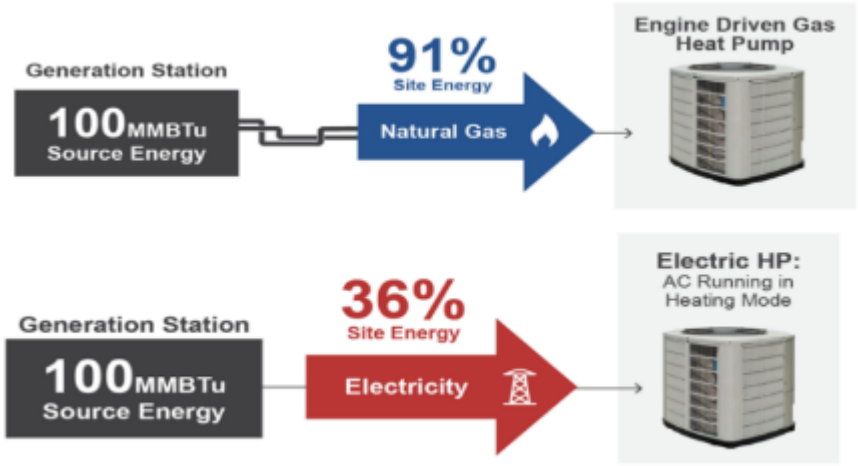
~ 140%
Heat
Energy available

100%
Inlet primary Energy for the combustion

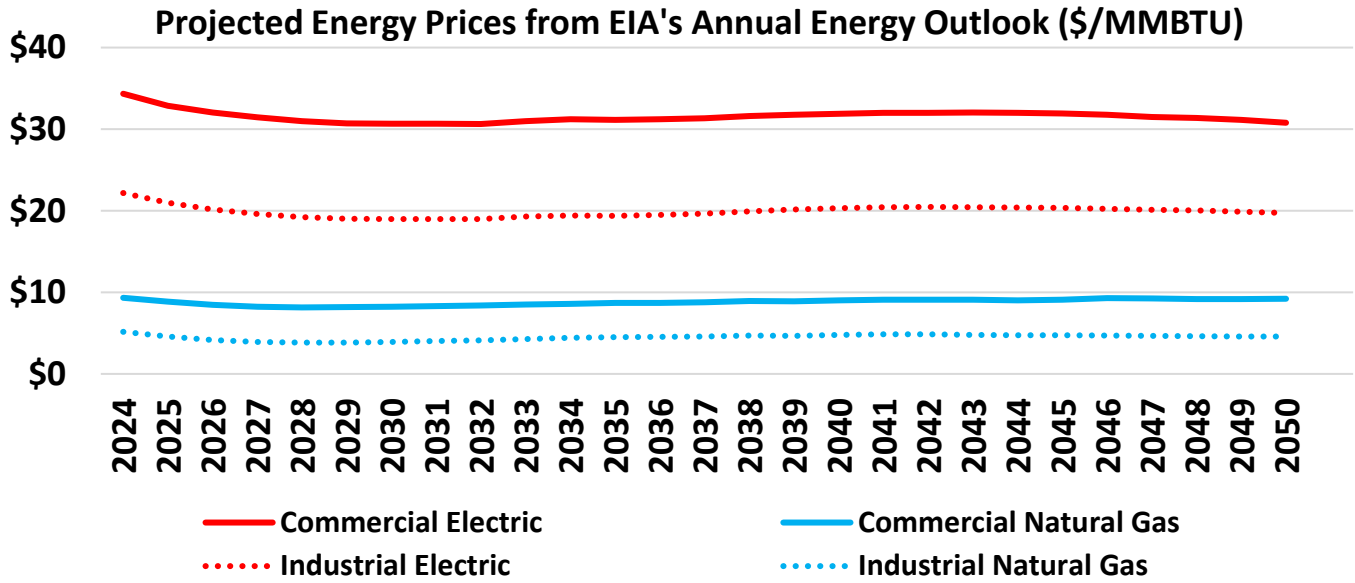
ENERGY SOLUTIONS CENTER

Energy Efficiency & Costs





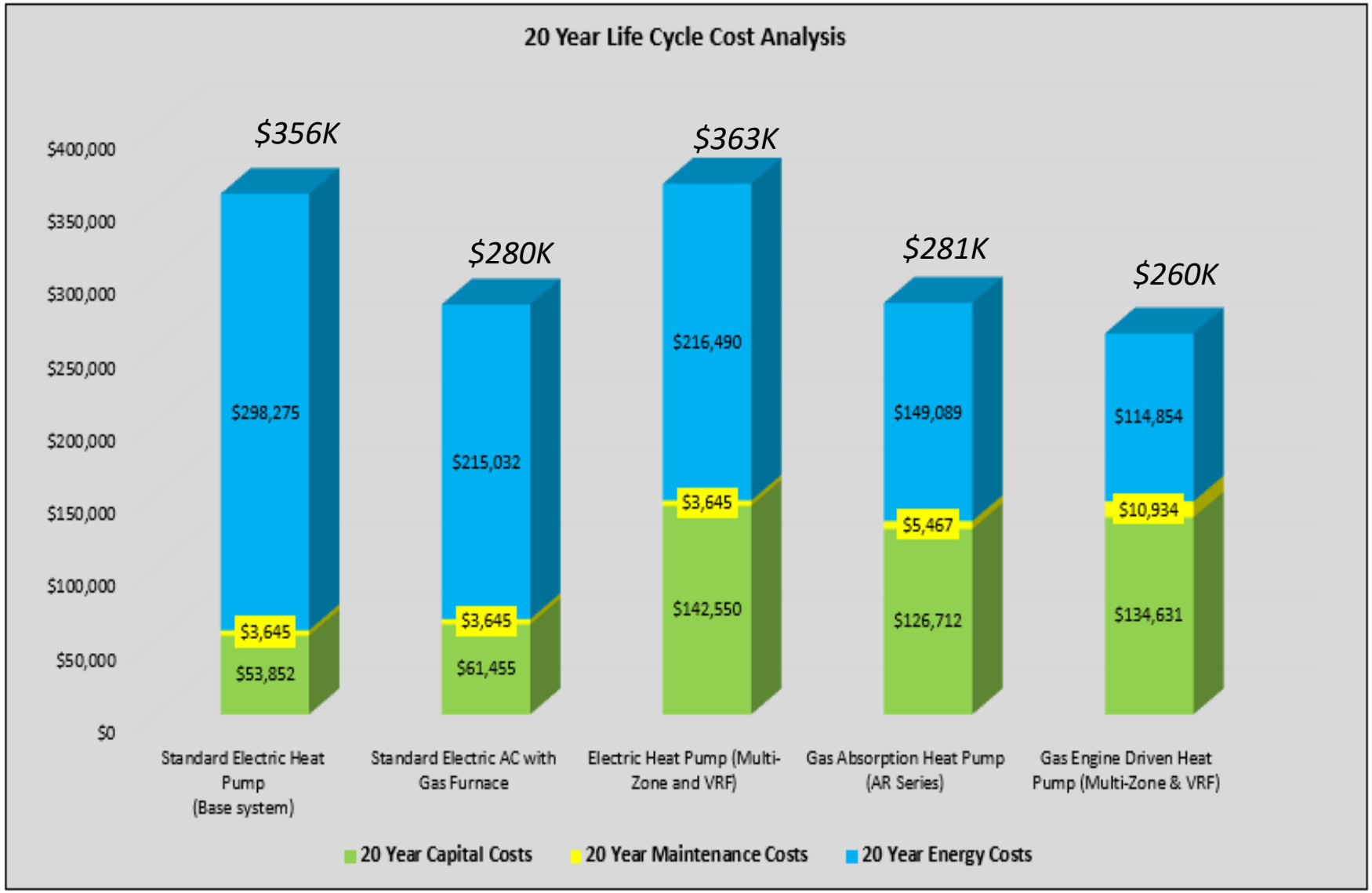
Electric generation efficiency impacts the price of electric.



ENERGY SOLUTIONS CENTER

https://www.eia.gov/outlooks/aeo/

Life Cycle Costs of GHPs



Note: GHPs can cost 3X that of conventional HVAC systems, but generally have overall lower life cycle costs than conventional systems.

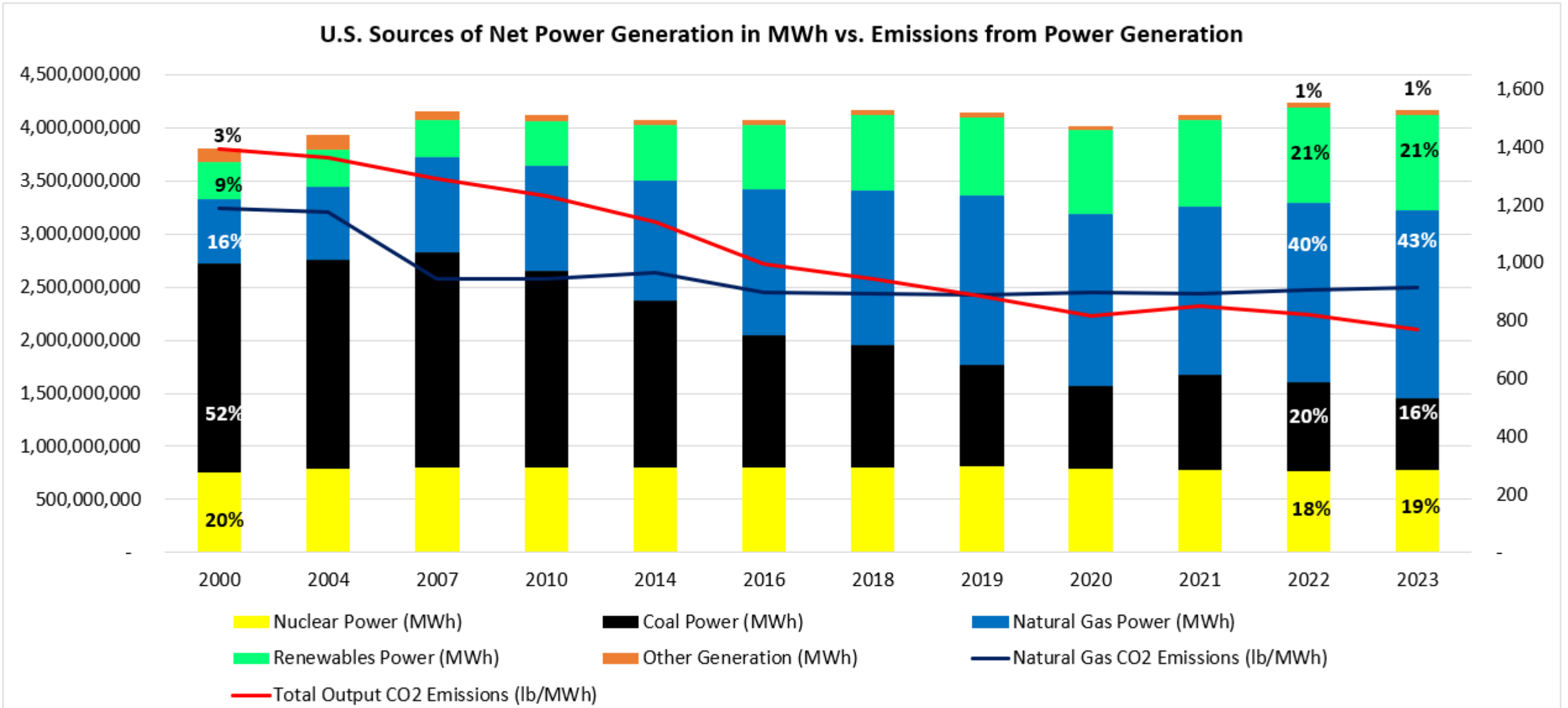
Assumptions: 20-ton system amortized over 20 years at 5% interest with $.15/kWh, $10/kW, and $.65/Therm energy rates, with 2% energy & maintenance inflation rates.

Note that life cycle costs will vary based on regional energy rates.

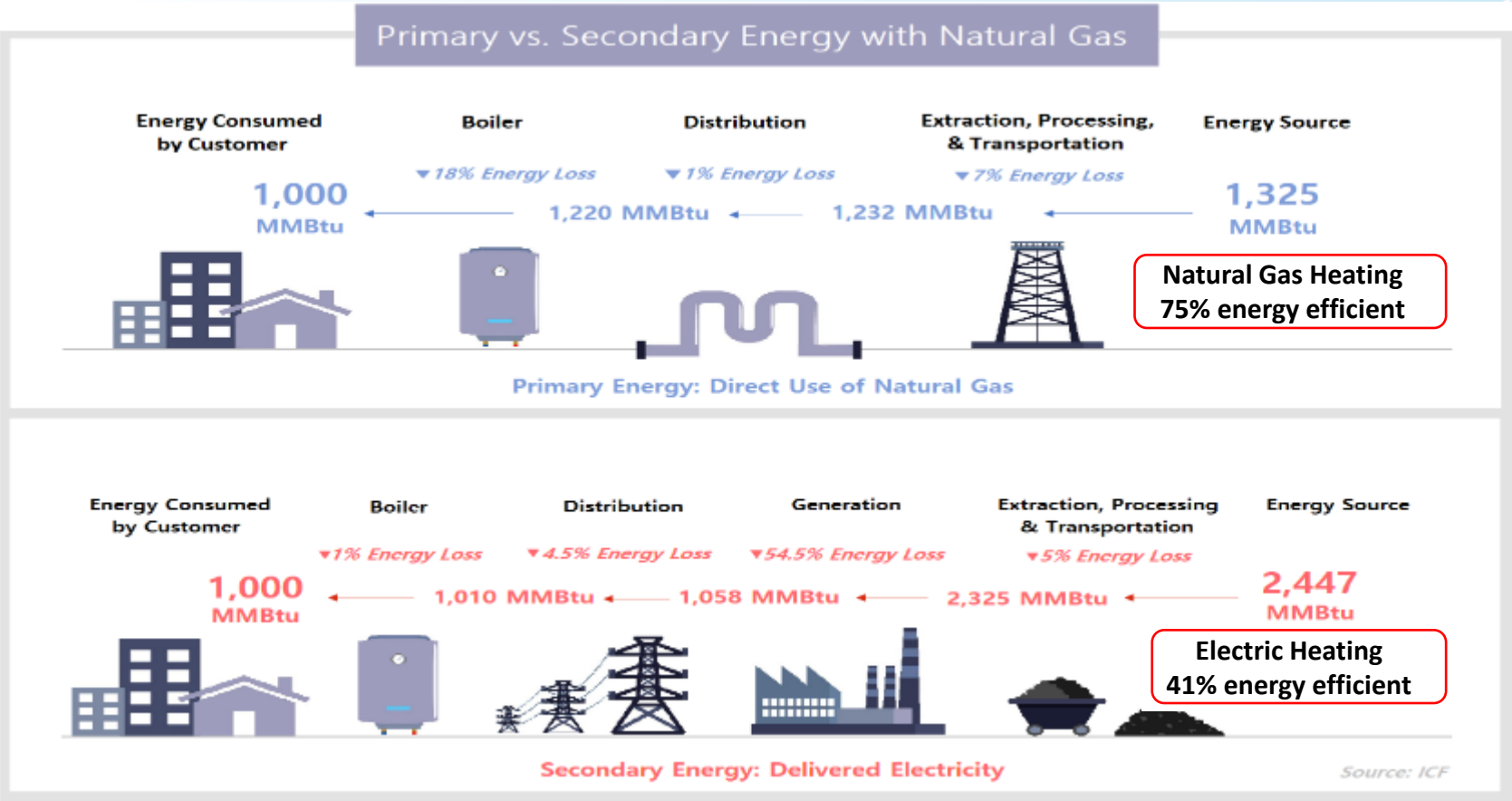
https://gasairconditioning.com/general-resources/tools/

Environmental Benefits

Grid Power Mix Impacts Source to Site Efficiency



Source to Site Energy Efficiency

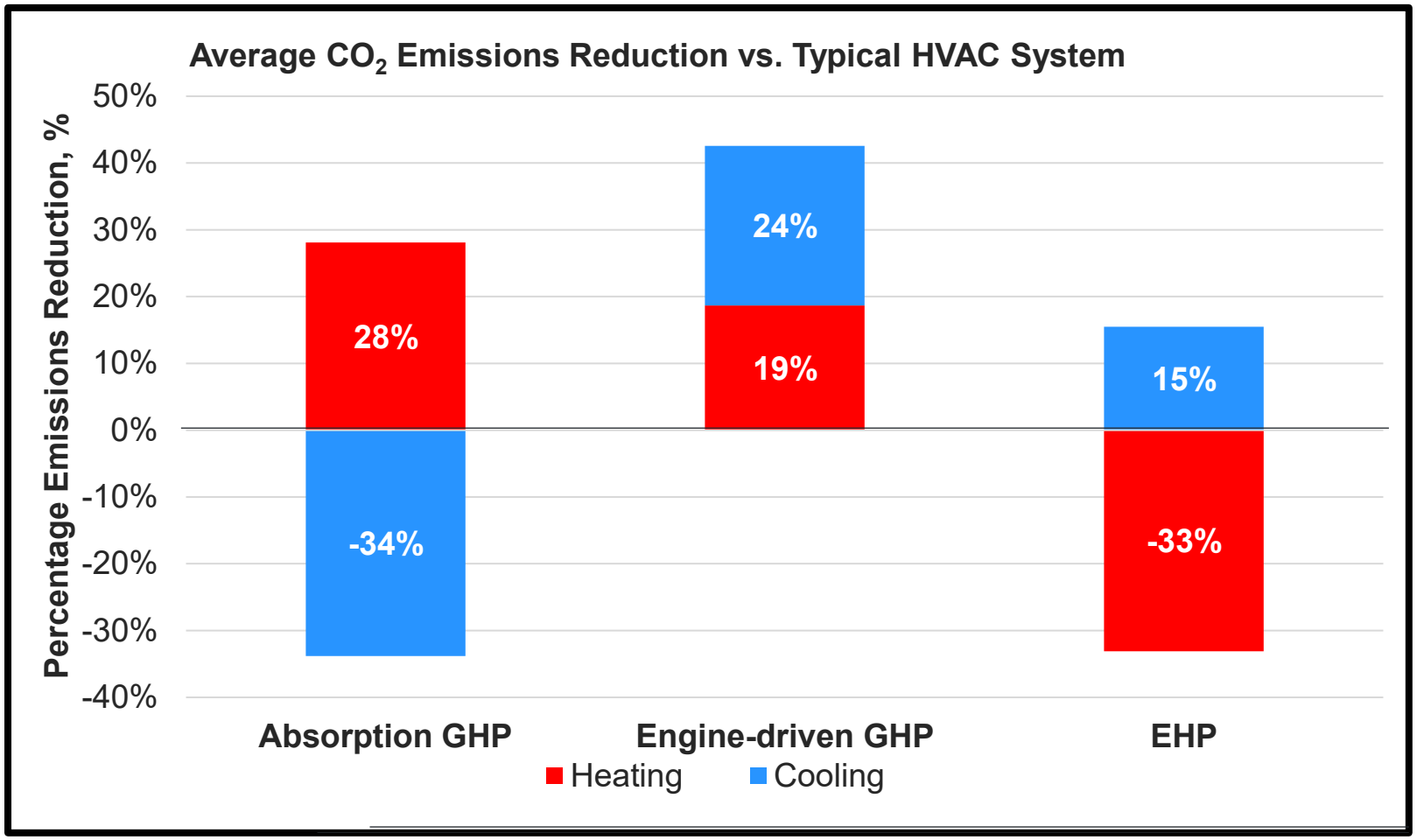


	Energy Used (MMBtu)	Energy Required (MMBtu)	On-Site CO_2 Emissions (lbs)	Off-Site CO_2 Emissions (lbs)	Total CO_2 Emissions (lbs)
Gas Boiler ***Direct Use of Natural Gas***	1,000	1,220	142,317	11,385	153,702
Electric Boiler ***eGRID Average***	1,000	1,010	0	276,856	276,856
Electric Boiler ***eGRID Average Non-Baseload***	1,000	1,010	0	458,016	458,016

ENERGY SOLUTIONS CENTER

Lifetime Emissions for Gas and Electric Heat Pumps at Commercial Buildings

Baseline is RTU with gas heat & electric cooling.



Source:GHP Operating Costs Emissions Study - ICF-August 2021

ENERGY SOLUTIONS CENTER

Commercially Available GHP Products

> 3,000 GHPs installed

The 1st GHPs installed in North America were in 2005.

GHP Products

Company	Type	Technology	Best Applications	Status	Heat Sizes	Cooling Sizes
Blue Mountain Energy		IC Engine		Commercially available, 5 & 11 Ton, field testing others	91,000 to 410,000 BTU/h	5, 8, 11, 15, and 30 Tons
Broad USA		Absorption		Commercially available	962,000 BTU to 57,800,000 BTU/h	30 to 3,968 Tons
Energy Concepts		Absorption		Commercially available	396,000 to 40,000,000 BTU/h	20 Tons to 2,000 Tons, down to -50ºF
HeatAmp		Adsorption (Chemisorption)		Field test 2023	Up to 50,000 BTU/h	n/a
Robur		Absorption		Commercially available	120,000 BTU/h	5 Tons
Thermax		Absorption (Waste heat fired)		Commercially available	835,035 to 136,484,680 BTU/h	n/a
Yanmar		IC Engine		Commercially available	108,000 to 198,000 BTU/h	8, 10, 12, and 14 tons
York		Absorption (Waste heat fired)		Commercially available	10,000,000 to 24,000,000 BTU/h	n/a
Vicot		Absorption		Commercially available. Resid. units: Field Trial	68,000 BTU to 290,000 BTU/h	n/a

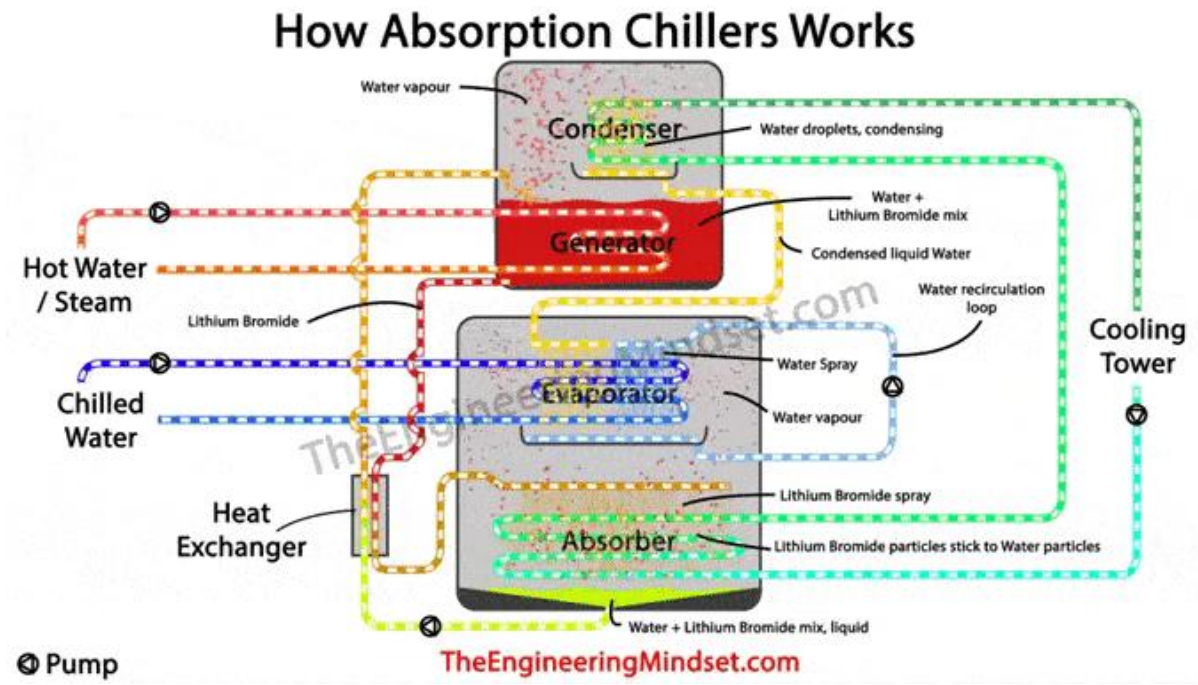
Key: Residential, Commercial, Industrial, Heating, Cooling, Water Heating

https:///consortia.myescenter.com/GHP/ESC-GHP_Avialability_Chart.pdf

© Energy Solutions Center Inc. – All Rights Reserved

Absorption Heat Pumps

- Broad USA
- Energy Concepts
- HeatAmp
- Homy/Vicot
- Robur
- Thermax
- York



ENERGY SOLUTIONS CENTER

Robur Corporation

- GAHP Systems
  - 5 Tons cooling, 120,000 BTU heating
  - Water-ammonia absorption heat pump
  - Air-source, water source or ground source heat pumps
  - Up to 149°F (65°C) hot water available
  - Single phase power requirements
  - Can be linked using single or multiple controllers
  - No CFC, HFC, HCFCs. Uses R-717 (Ammonia)

ROBUR
caring for the environment

Commercially available

ENERGY SOLUTIONS CENTER

Robur Product Offerings

HEAT PUMPS

GAHP A Plus
Air-Source Heat Pump
Heating & DHW

GAHP AR Plus
Air-Source Reversible Heat Pump
Heating, Cooling & Supplemental DHW

CHILLERS

GA Series

ACF HT
High Ambient Chiller

ACF ST
Chiller

ACF HR
Chiller with Heat Recovery

ACF TK
Low Ambient Chiller

ACF LB
Low Brine Chiller

LINKS

Pre-assembled Group

ENERGY SOLUTIONS CENTER

Robur Corporation

Up to 149°F DHW production and efficiency over 129%

Robur GAHP has just got better.

Here it comes the new Robur GAHP Plus range - the best, easiest and most efficient choice to produce hot water for comfort heating or sanitary purposes. A perfect solution for both retrofit and new buildings.

- GAHP-A Plus for high efficiency DHW production and space heating
- GAHP-AR Plus for high efficiency space heating and cooling

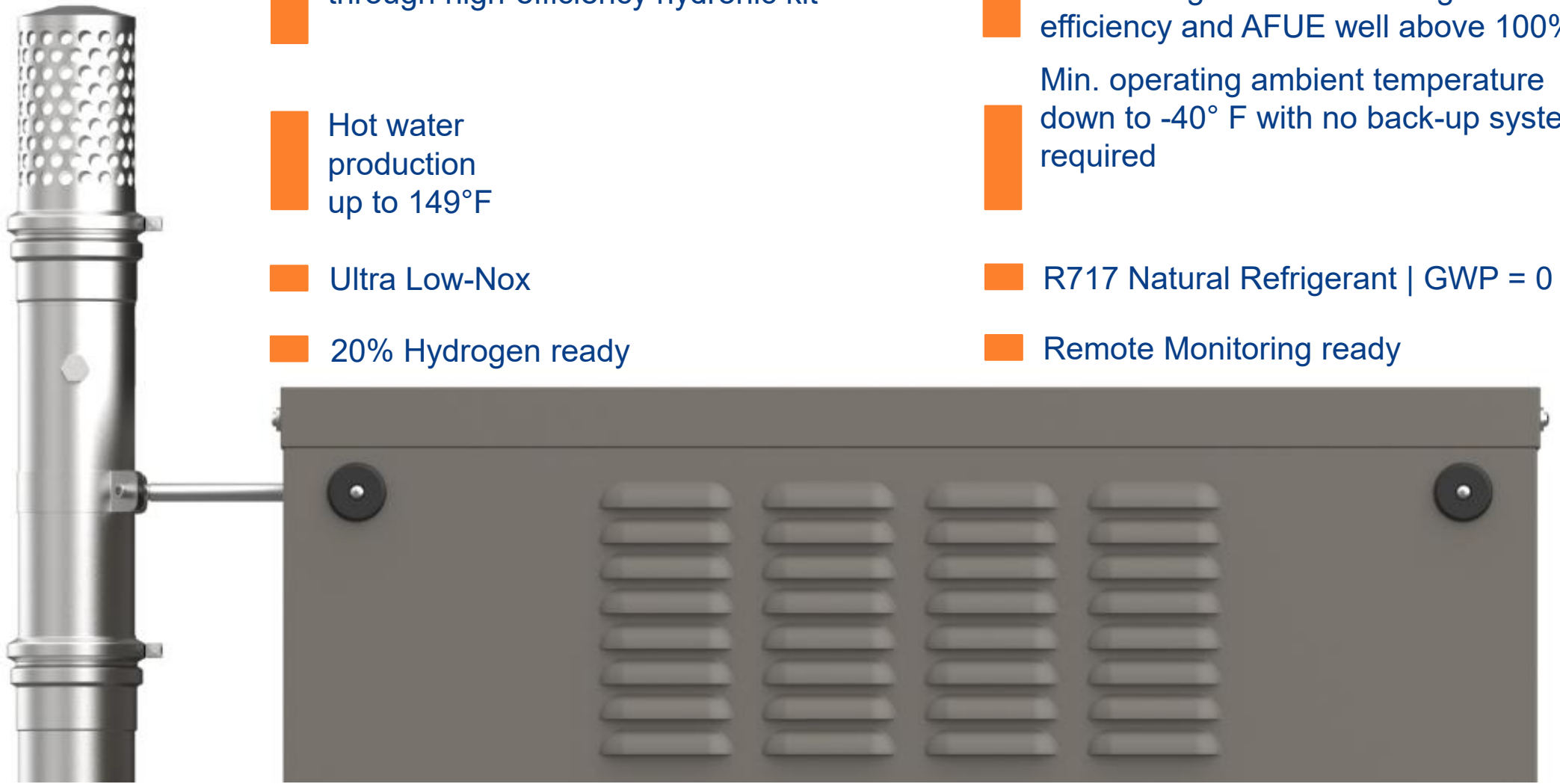
October 1, 2025

ENERGY SOLUTIONS CENTER

Robur | New GAHP *Plus* Range

Robur Corporation

- DHW Production with 130 FHR through high-efficiency hydronic kit
- Hot water production up to 149°F
- Ultra Low-Nox
- 20% Hydrogen ready
- 120,000 Btu/h heat pump with outstanding seasonal heating efficiency and AFUE well above 100%
- Min. operating ambient temperature down to -40° F with no back-up system required
- R717 Natural Refrigerant | GWP = 0 and ODP = 0
- Remote Monitoring ready



Robur Corporation

Applications

- Best-in-class solution for space heating and DHW even in very cold climates.
- Ideal for any kind of retrofit and new buildings


Multifamily residential


Hospitality facilities, hotels and restaurants


Retail and services


Industrial


Warehouses and large material storage spaces


Craft workshops


Schools buildings


Public administration


Sport facilities


Places of worship


Light Commercial


Got any special requests? Just holler!

ENERGY SOLUTIONS CENTER

43

Robur Corporation

		GAHP A Plus
Heating mode		
Heating capacity **ANSI conditions: 47 °F ambient, 95°F return**	kBtu/h	134.8
Gas input	kBtu/h	95.5
COP / GUE		1.41
Hot water supply temperature (max)	°F	149
Hot water return temperature (max)	°F	131
Heating water flow (nominal)	GPM	14.7
AFUE (according to ANSI Z21.40.4:2023)	%	111
FHR First Hour Rate - DHWmode only		130
Ambient operating temperature (min)	°F	-40
NOx (Rules 1146.2 and 1121)	ppm (3% O_2)	11
Electrical specifications		
Power supply	V	208-230
	-	single-phase
	Hz	60
Total electrical operationg consumption	kW	0.9
Noise pressure at 16 ft. free field	dB(A)	56
General information		
Cooling fluid		ammonia R717
		water H_2O
GWP Global Warminng Potential		0
ODP Ozone Depletion Potential		0

ENERGY SOLUTIONS CENTER

Robur Corporation

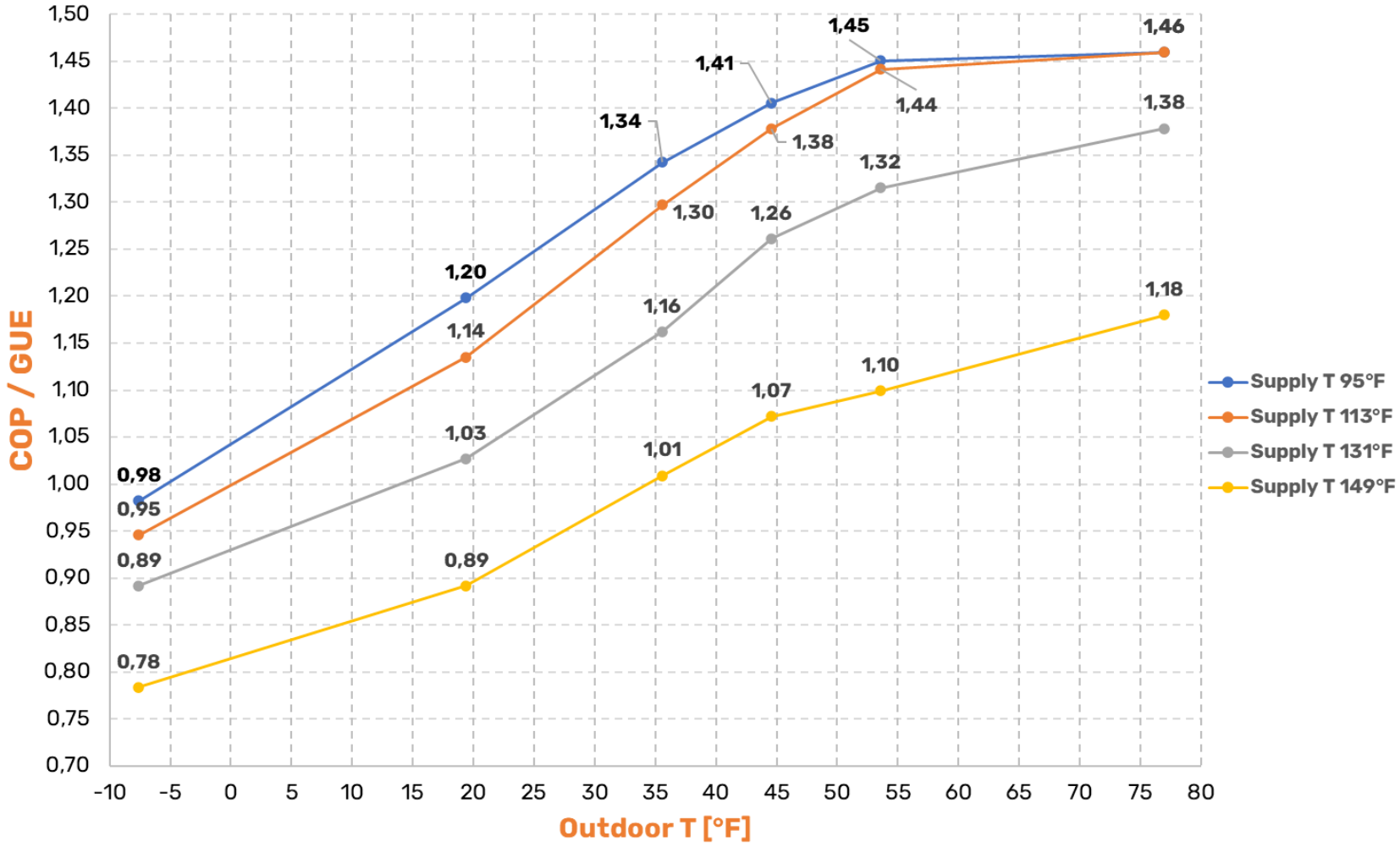
		GAHP AR Plus
Heating mode		
Heating capacity **ANSI conditions 47 °F ambient, 95°F return**	kBtu/h	133.0
Gas input	kBtu/h	95.5
COP / GUE		1.39
Hot water supply temperature (max)	°F	140
Hot water return temperature (max)	°F	122
Heating water flow (nominal)	GPM	14.4
AFUE (according to ANSI Z21.40.4:2023)	%	106
Ambient operating temperature (min)	°F	-40
NOx (Rules 1146.2 and 1121)	ppm (3% O_2)	11
Cooling mode		
Cooling capacity	kBtu/h	58.0
Gas input	kBtu/h	95.5
COP / GUE		0.6
Cold water supply temperature (min)	°F	37.4
Cooling water flow (nominal)	GPM	12.8
Ambient operating temperature (max)	°F	120
Electrical specifications		
Power supply	V	208-230
	-	single-phase
	Hz	60
Total electrical operationg consumption	kW	0.75
Noise pressure at 16 ft. free field	dB(A)	56
General information		
Cooling fluid		ammonia R717
		water H_2O
GWP Global Warminng Potential		0
ODP Ozone Depletion Potential		0

ENERGY SOLUTIONS CENTER

Robur Corporation

GAHP A *Plus*

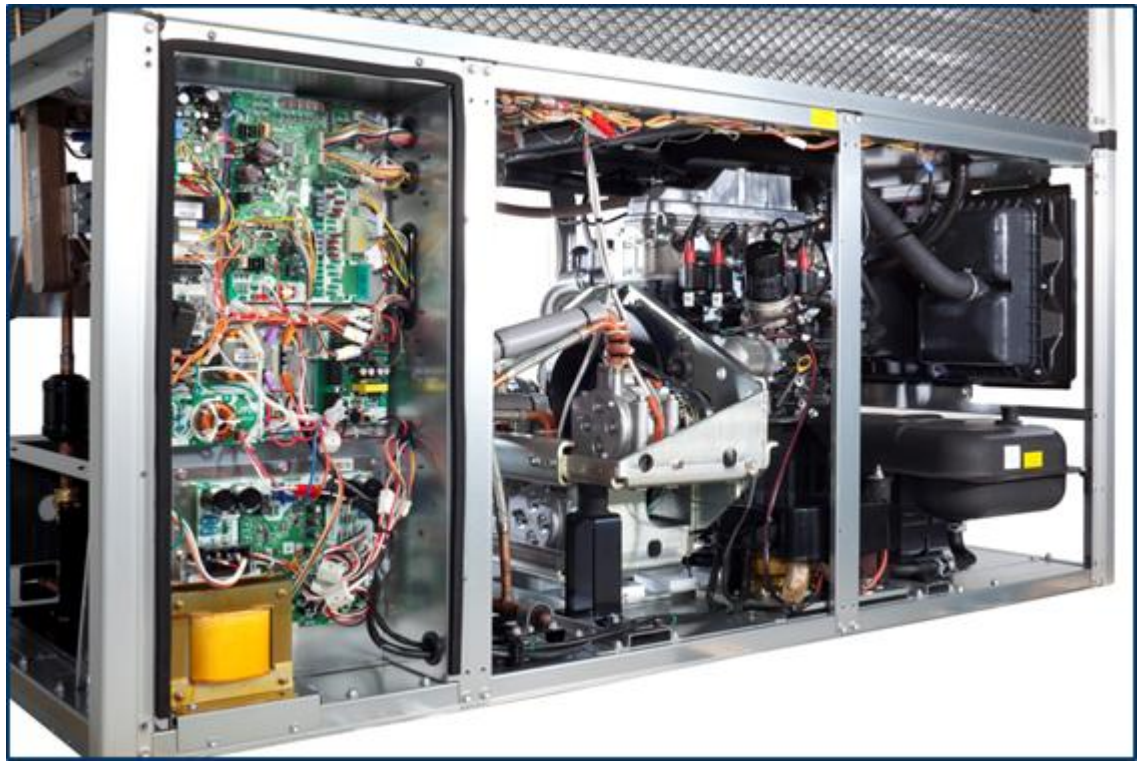
Performance Chart



ENERGY SOLUTIONS CENTER

Engine Driven Heat Pumps

- Similar to electric heat pumps
- Electric motor replaced with a natural gas driven engine
- Excellent part load efficiencies
- Multiple zone capable
- Heating efficiency equivalent to 140%



ENERGY SOLUTIONS CENTER

BME-Product Line Up

BLUE MOUNTAIN ENERGY

11 refrigerant tons
VFR capacity
coming soon

8 refrigerant tons
Up to 13 - DX zones

15 refrigerant tons Up to 25 - DX zones, 51 zones if GHP are twinned

AWS –Heat Pump Exchanger (15 & 30 ton modules)

The Multi-Zone Gas-Fired Heat Pump (MZ GHP) that provides both space heating and cooling with variable refrigerant flow (VRF) technology.

ENERGY SOLUTIONS CENTER

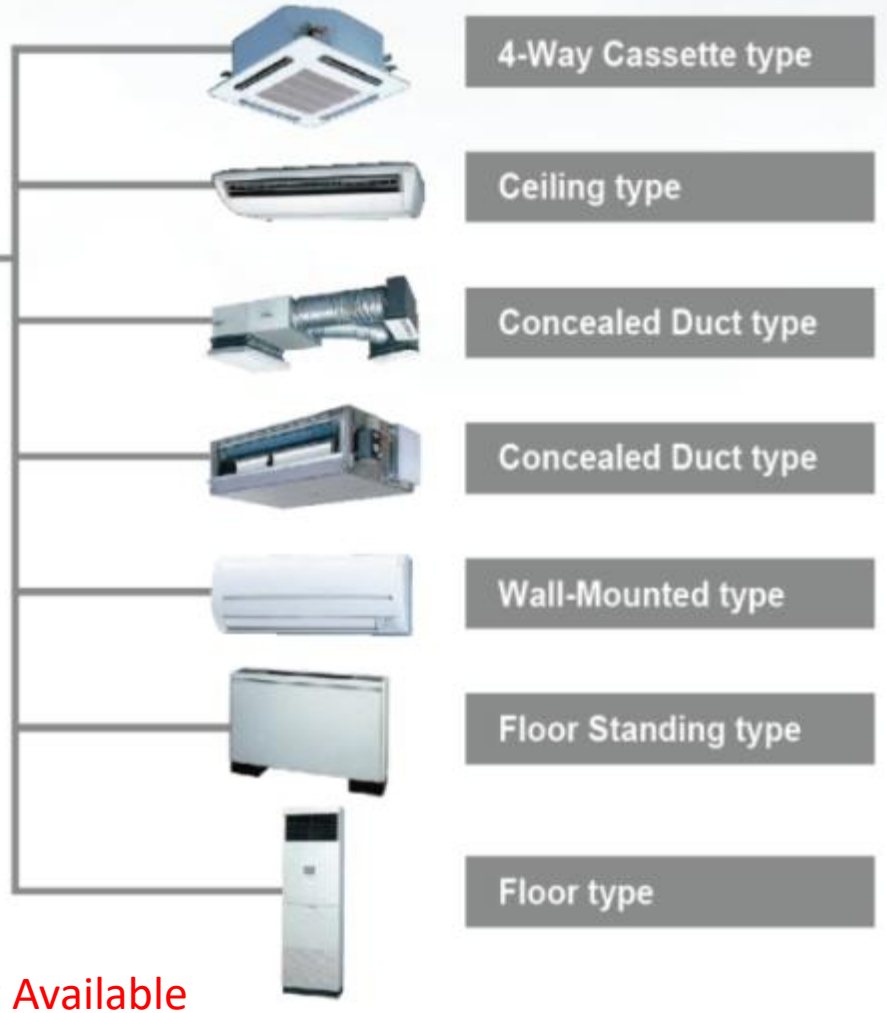
Yanmar: VRF / GHPs

YANMAR

Outdoor Unit

Outdoor unit line-up	Indoor unit connection capacity
10-ton type	20 units
14-ton type	29 units

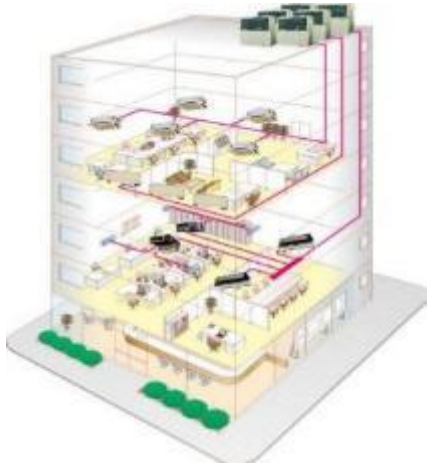
Indoor Unit



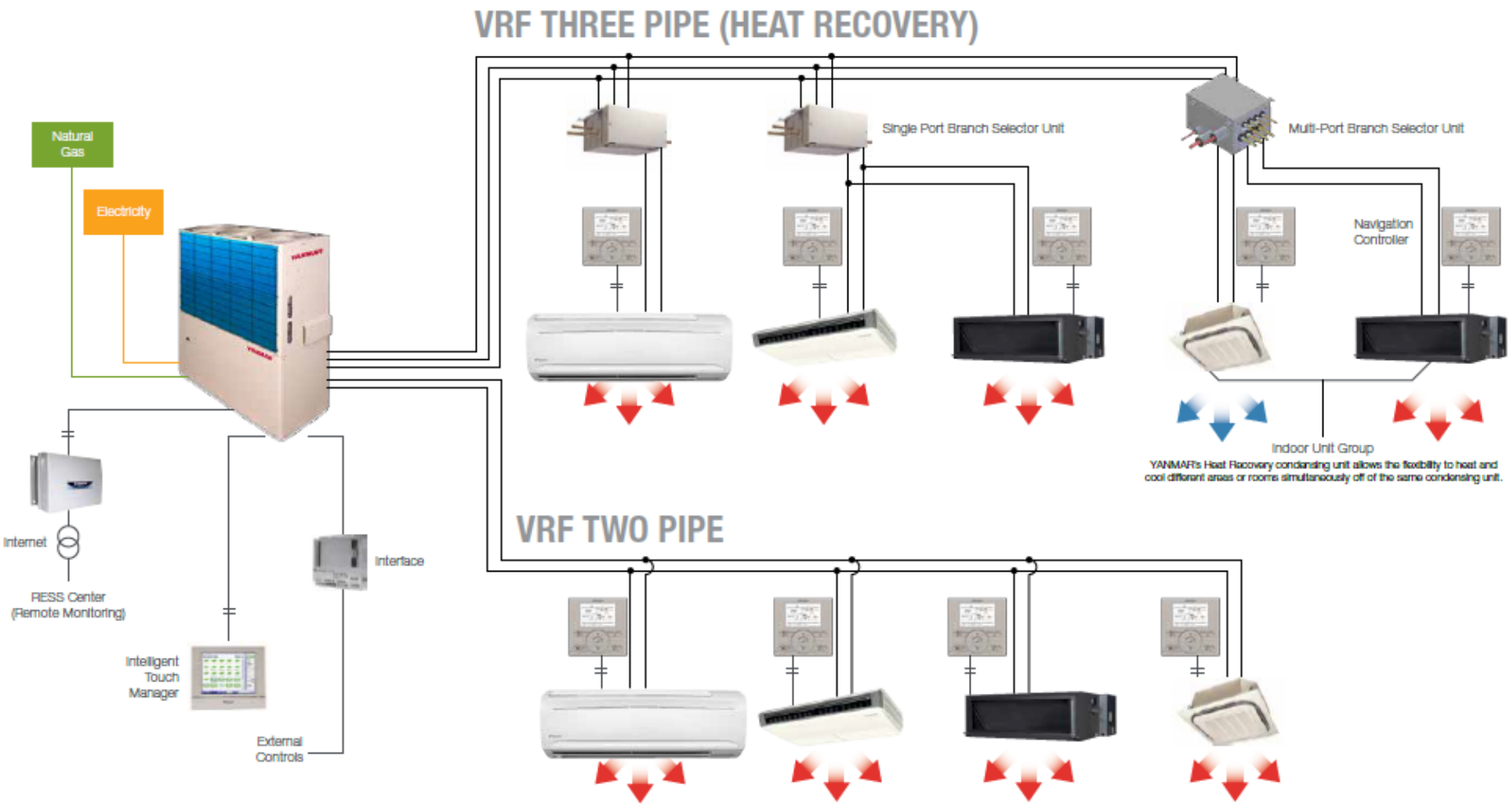
Commercially Available

Yanmar VRF Specifications

					YANMAR NNCP120J	YANMAR NNCP168J	YANMAR NFZP168J
	MANUFACTURER / MODEL						
PERFORMANCE	Capacity	Cooling Capacity	Nominal Tons		10	14	14
			kW		35	49	49
		Heating Capacity	BTU/Hr.		134,000	189,000	189,000
			kW		39	55	55
		Low Temp / Cold Temp Heating	BTU/Hr.		137,000	178,000	178,000
			kW		40	52	52



Yanmar - VRF



ENERGY SOLUTIONS CENTER

Yanmar: VRF Maintenance

- Yearly maintenance is a minimal
- Engine service
  - The engine typically needs to be serviced every 10,000 engine hours or 5 years. This includes changing the oil, oil filter, air cleaner element, and spark plugs. The system will warn you when service is due.
- Filter element and air cleaner
  - These components need to be inspected and replaced regularly, and the frequency depends on the operating environment.
- Remote monitoring
  - Yanmar's Remote Monitoring System and certified dealer network can help improve the precision and reliability of maintenance support services.

ENERGY SOLUTIONS CENTER

Yanmar Gas Engine Heat Pump With Hydrobox

As an air-to-water system, the gas engine heat pump situated in the outside area is connected in classic split construction with the Hydrobox positioned inside the building. Frost protection measures can thus be dispensed with. The system is suitable for monovalent operation as a result of the internal use of the engine and exhaust heat. Moreover, this heat is used for defrosting the registers without heating interruption.

- Simultaneous heating and cooling with integrated heat recovery
- Power adjustment by means of modulating operation
- High efficiency due to use of condensing technology
- Lower operating costs compared to boilers and electric water chillers
- Low noise emissions
- Engine waste heat can be recovered and reused, allowing simultaneous cooling and heating e.g. for domestic hot water heating (heat recovery optional)
- Cascadable up to the MW range
- No frost protection measures necessary for the lines between the gas engine heat pump (outdoor unit) and Hydrobox (indoor unit)
- Optionally, a complete input of parameters is possible via remote monitoring
- No heating interruption in defrost mode
- Outlet Temperature Range - Cooling 43°F to 64°F / Heating 81°F to 122°F

PRODUCT	RATED CAPACITY
ENCP 450 L1	Heating: 51 kW / Cooling: 43 kW *
ENCP 560 L1	Heating: 64 kW / Cooling: 53 kW *
ENCP 710 L1	Heating: 79 kW / Cooling: 64 kW *
ENCP 850 L1	Heating: 89 kW / Cooling: 70 kW *
HB 450 V(P)L4.0	Heating: 51 kW / Cooling: 43 kW
HB 560 V(P)L4.0	Heating: 64 kW / Cooling: 53 kW
HB 710 V(P)L4.0	Heating: 79 kW / Cooling: 64 kW
HB 850 V(P)L4.0	Heating: 89 kW / Cooling: 70 kW

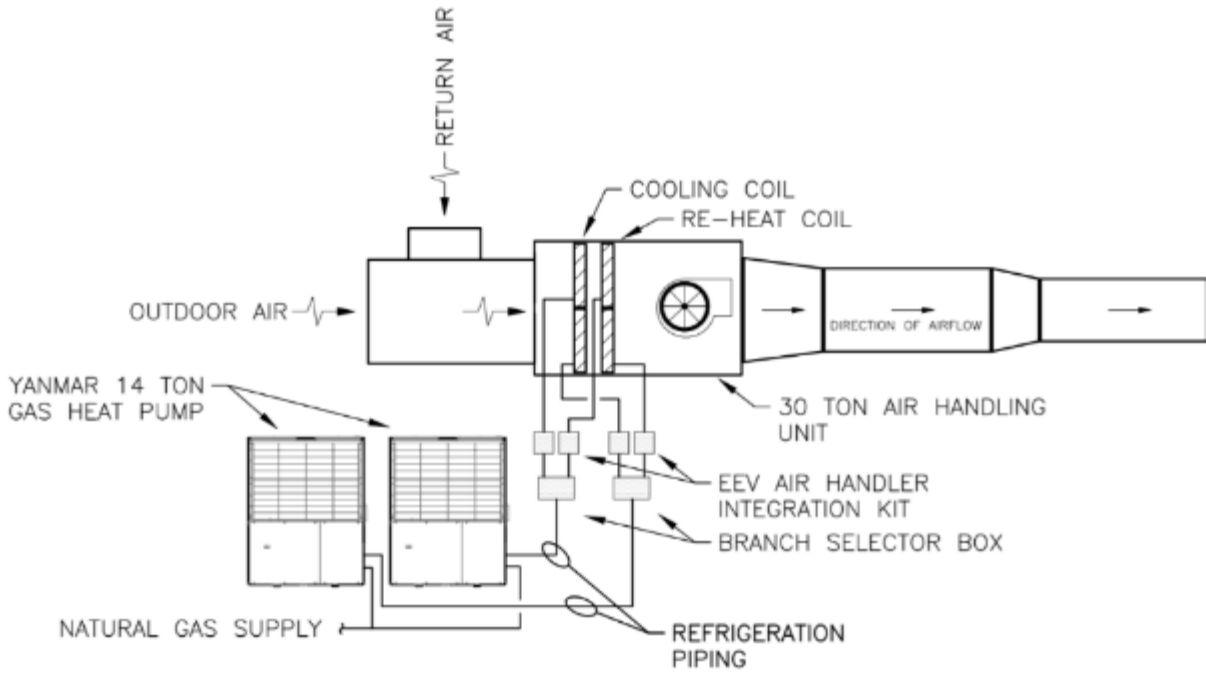
ENERGY SOLUTIONS CENTER

Yanmar: Air Handling Unit Integration Kit

Daikin Air Handling Unit (AHU) Integration Kit enables any Yanmar VRF Gas Heat Pump to be fully integrated with any Roof Top Unit or other Air Handling Units, allowing the benefits of inverter technology to extend to custom terminal units and air handling equipment.

A kit consists of one Control Box and one EEV (Electronic Expansion Valve) Box. Two different control methods can be used for an evaporator coil of up to 16 tons.

- Easily connect any Yanmar VRF Gas Heat Pump with an existing Roof Top Unit (RTU) or Air handling Unit (AHU) and distribution systems.
- Maximize efficiency. Increase operational efficiency of any RTU / ADU from 60% / 80% (on average) to well over 135%, and higher.
- Yanmar & Daikin communication compatibility - can be used with both Daikin iTM and NAV controller.
- Separate Control Box and EEV (Electronic Expansion Valve) Box accommodates flexible installation



INTEGRATION OF YANMAR GAS HEAT PUMP INTO AIR HANDLING SYSTEM
NOT TO SCALE

ENERGY SOLUTIONS CENTER

GHPs That Can be Ordered or are Coming Soon

Broad USA

- Heating: 962,000 BTU to 57,800,000 BTU/h
  - Heating up to 203°F
  - Heating COP: 1.7~2.4
- Cooling: 30 to 3,968 Tons
- Driving Source: Natural gas, Biogas, Steam, Hot water, Exhaust gas

Photo courtesy of Broad USA

Commercially available

Broad USA Absorption Heat Pump

Absorption heat pump is based on lithium bromide absorption technology

Uses heat as the driving source to recover the heat from the low-temp heat source

Provides mid-temp and high-temp water for process or heating

It transfers heat from low temperature to high temperature.

Driving Source: Natural gas, Biogas, Steam, Hot water, Exhaust gas

Main Application:

Central heating, **B**uilding heating, **P**rocess heating

Heating up to **203°F**

Heating COP: **1.7~2.4**

ENERGY SOLUTIONS CENTER

Energy Concepts

- Absorption 15 - 300 tons
- Heat Pumps (absorption based)
- Custom systems to 15,000 tons
- Simultaneous heat and cooling, or refrigeration
- Air or water cooled, (ammonia water)
- Delivers both chilling and hot water
- Provides 160°F hot water at a COP of 1.5

Energy Concepts

"Providing practical solutions to pressing world energy problems."

Commercially available

ENERGY SOLUTIONS CENTER

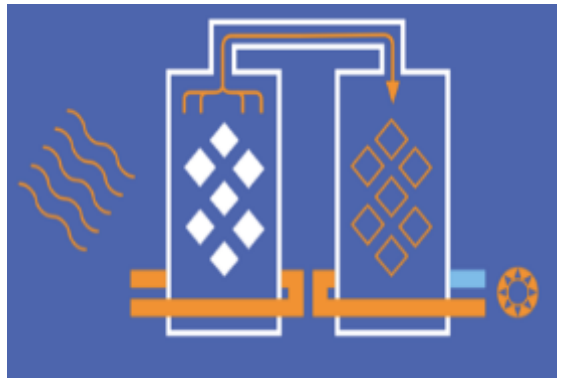
HeatAmp

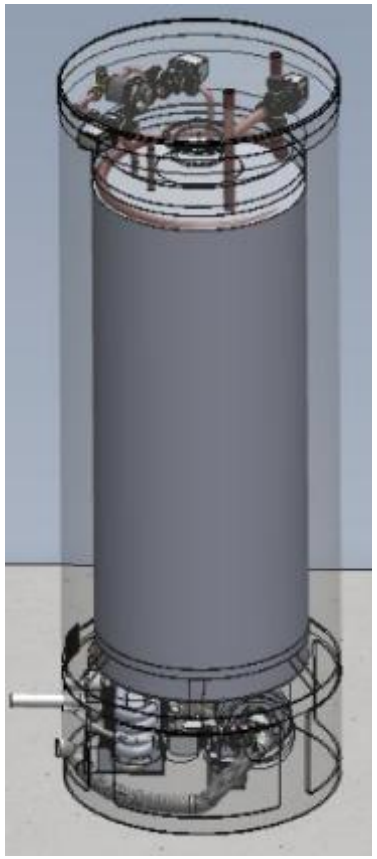
High performance 40-50 gal. drop-in replacement gas-fired heat pump water heater for the residential market in North America with a UEF >1.25.

- 35 kBTU/hr (10 kW) Direct-Firing at condensing efficiency
- Triple-state sorption is neither absorption nor adsorption cycle: intentionally crystallizes salt in reactor, for high energy density
- Ammonia refrigerant, housed in outdoor unit with no moving seals (fully hermetic), enables high delivery temperature at low ambient

Field testing

Chemisorption/Adsorption





Draft rendering of a final GHP HeatAmp product

Current Alfa prototype under testing

ENERGY SOLUTIONS CENTER

HeatAmp

Homy / Vicot

- **Heating and water heating:** ~ 65 MBH and 290 MBH models
- **Efficiency up to 140%**
- **Carbon Reduction:** 45% less energy consumption compared to common boilers and furnaces
- **Stepless burner control:** a solution for heating load instability
- **Refrigerant:** Ammonia with 0 GWP & 0 ODP
- **Low electricity consumption :** Using no compressor
- **Long Life Expectancy :** Less moving parts
- **Low noise level**: around 54 dB for a 65 Kw GAHP
- **Cold Climate Equipment:** Maintain Desired Capacity and Efficiency at Very Low Ambient Temperatures -22°F **(-30°C)**
- **Modular installation**

HOMY BUILDING SOLUTIONS

VICOT

ENERGY SOLUTIONS CENTER

Working on Certification

Homy / Vicot

Residential

Model: V20
Capacity: 68 MBH GAHP
Application: Heating/Domestic Homes

Commercial

Model: V65:
Capacity: 221 MBH GAHP

Model: V85
Capacity: 290 MBH GAHP

Combo Type (Higher Capacities)

Combination of GAHP and a Condensing boiler

Model: V35 Combo
68 MBH GAHP
+ 52 MBH boiler
Total heat capacity = 120 MBH

Model: V140
290 MBH GAHP
+187 MBH BOILER
Total heat capacity = 477 MBH

ENERGY SOLUTIONS CENTER

JCI - York

- ~ 10 to 24 MMBTUs heating
- Heating COP 1.7

Can be ordered

Thermax

- ~.85 MMBTU to 136 MMBTUs Heating
- COP: 1.65 – 1.75
- Hot water temperature: Up to 90 °C (194 °F)
- High Grade Heat Source: Exhaust gas, steam, hot water & liquid/gas fuels (individually or in combination)

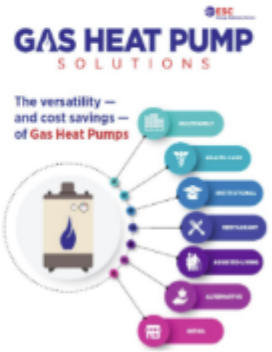
ESC | Gas Heat Pump Consortium

GHP Resources from ESC's GHP Consortium

Gas Heat Pumps – Extremely Energy Efficient – Even at Low Outside Temperatures

Natural gas heat pump options are available today that provide heating and cooling for residential, commercial & industrial customers. These systems utilize natural gas or renewable energy making them very reliable and energy efficient.

These innovative heat pumps can be configured as air source, water source, or ground source (geo-thermal) systems. Check out our video and Magazine:



www.gasheatpumps.com

Thank you !
Q&A Session with our GHP Experts

Type your questions into the Question pain of the control panel and please list which manufacturer for your question.

ENERGY SOLUTIONS CENTER

Eric Burgis
Director, Commercial & Industrial Markets
Energy Solutions Center

Panel: ROBUR YANMAR

Company	Name	E-mail
Robur	Kevin Koch	kkoch@robur.com
Yanmar	Eddie Caton	eddie_caton@yanmar.com