Kevin Barker
Senior Manager
Energy and Environmental Policy
555 West 5th Street
Los Angeles, CA 90013
Tel: (916) 492-4252
KBarker@socalgas.com

March 8, 2024

Yanrong Zhu
Program Supervisor
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Subject: Comments on the Initial Preliminary Draft of Proposed Amended Rule 1146.2

Dear Ms. Zhu:

Southern California Gas Company (SoCalGas) appreciates the opportunity to provide public comments on the South Coast Air Quality Management District (South Coast AQMD) Initial Preliminary Draft of Proposed Amended Rule (PAR) 1146.2. SoCalGas has multiple facilities which will be affected by this rule and has been an active participant in the South Coast AQMD rulemaking. SoCalGas recommends South Coast AQMD provide an adequate compliance schedule for entities with multiple facilities in order to accommodate the heavy workload necessary to design, engineer, contract, equipment/materials procurement and construction of these new equipment.

SoCalGas supports policies incentivizing the adoption of zero-emissions appliances and equipment as part of a broader strategy to achieve NOx reductions, provided such policies are feasible, permitted by federal law, cost-effective, and commercially available. However, SoCalGas has concerns that the proposed rule effectively bans certain appliances covered by the federal Energy Policy and Conservation Act (EPCA).

Under a recent ruling by the Ninth Circuit, *California Restaurant Association v. City of Berkeley*, 89 F.4th 1094 (9th Cir. 2024) the Court held that EPCA preempts all regulations "that relate to 'the quantity of [natural gas] directly consumed by' certain consumer appliances at the place where those products are used." *Id.* at 1101. "[A] regulation on 'energy use' fairly encompasses an ordinance that effectively eliminates the 'use' of an energy source." *Id.* at 1102. Here, similar to the Berkeley ordinance, the effect of the proposed rule is to reduce the quantity of gas consumed by EPCA-covered appliances to zero. Under *Berkeley*, States and localities cannot avoid EPCA's preemption provisions “by doing *indirectly* what Congress says they can’t do *directly*.” *Id.* at 1107 (emphasis in original).

Putting EPCA aside, the South Coast AQMD’s cost-effectiveness analysis has focused on single pieces of equipment at a single facility. It has not evaluated the costs associated with retrofits at larger commercial and/or industrial facilities that have multiple affected pieces of equipment, many of which are located in multiple buildings/structures on the site. The South Coast AQMD has also not included costs for cutting concrete and/or asphalt and trenching to distribute new on-site electrical power distribution to these pieces of equipment and/or buildings, which will be the costliest aspects of conversion.

The South Coast AQMD should perform an analysis that incorporates this type of cost and its impact on cost-effectiveness. This type of cost, as well as other costs, have not typically been accounted for in the South Coast AQMD’s previous Best Available Retrofit Control Technology (BARCT) rule analyses, as historically, BARCT rules only required retrofits (burners or add-on emission controls) or replacement of existing natural gas fueled equipment with similar natural gas fueled equipment which had a much smaller reconstruction cost and footprint. Replacement with electric driven equipment is a much different project with new construction beyond the equipment location and new power supply requirements. These new costs must be included when evaluating a project’s cost-effectiveness. Due to these and other factors, the cost-effectiveness of transitioning existing buildings to zero emissions space and water heating equipment can vary significantly.

Accordingly, based on the information provided at the PAR 1146.2 workgroup meetings and SoCalGas’ meeting with South Coast AQMD staff in January, we asked Ramboll to apply the South Coast AQMDs cost-effectiveness analysis technique of the proposed zero emission standard for Large Water Heaters, Small Boilers and Process Heaters (Appendix) to get a better understanding of the actual installation costs associated with the transition to electric water heaters and boilers at our facilities. SoCalGas recently presented this information to South Coast AQMD staff and will follow up with additional information requested in that meeting. The analysis shows that:

- With design and engineering costs and electrical infrastructure upgrade costs (including the concrete cutting and trenching mentioned above) included in the cost effectiveness (CE) calculations for new zero-emission units, replacing 5 NG units with electric resistance heaters and boilers incurred an incremental installation cost of approximately $1.81 million, while heat pumps resulted in even higher costs at $1.89 million. This is significantly higher than the incremental installation cost assumptions in Staff’s CE calculations.
- Zero-emission units are not cost effective when all components of the installation costs are considered in the CE analysis. The CE values are between $2.6 million and $5.4 million dollars per ton of NOx emission reductions for the SoCalGas facilities we examined.

There will be cases where it will not be practical or financially viable to retrofit existing buildings with zero-emissions space and water heating equipment. Therefore, PAR 1146.2 should incorporate measures to handle situations where such equipment isn't feasible or where power supply to a facility is unavailable. In cases where installing zero-emissions units isn't feasible, transitional alternatives such as low-NOx technologies should be allowed.

Conclusion

SoCalGas appreciates the chance to provide feedback on PAR 1146.2. Prioritizing control measures that enhance reliability and resiliency will yield reductions in NOx and other criteria pollutants, including reductions in GHG. Exploring a diversified energy supply will ensure enduring and cost-effective emission reductions. SoCalGas eagerly anticipates working together to mutually pursue California's shared objectives of advancing air quality objectives.

Respectfully,

/s/ Kevin Barker

Kevin Barker
Senior Manager
Energy and Environmental Policy

Appendix

COMMENTS ON SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SOUTH COAST AQMD) COST EFFECTIVENESS CALCULATIONS FOR THE PROPOSED AMENDED RULE (PAR) 1146.2: CONTROL OF OXIDES OF NITROGEN (NO_X) FROM LARGE WATER HEATERS, SMALL BOILERS AND PROCESS HEATERS

Comment 1: South Coast AQMD should consider design & engineering costs and electrical infrastructure upgrade costs in their cost effectiveness (CE) calculations for new zero-emission units.

As noted in the South Coast AQMD Preliminary Draft Staff Report: Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters, Small Boilers and Process Heaters (Staff Report),[1] Staff have assumed that there is no incremental cost difference in the installation cost for a zero-emission (ZE) unit as compared to a natural gas (NG) unit. Installation costs typically include demolition costs for existing equipment, design and engineering costs for new equipment installation, electrical infrastructure upgrade costs for new electric units replacing existing NG units, and construction costs. While Staff includes a cost of $2,500-$4,200 per unit for electrical infrastructure (panel) upgrades, which is adjusted from $5,000 based on equipment lifetime,[2] we are concerned that these costs may be underestimated.

In order to get a better understanding of the installation costs associated with the transition to electric water heaters and boilers, SoCalGas has requested a quote from one of its contractors for replacing existing NG units at one of its facilities with electric units. The rough order of magnitude (ROMs) costs provided by the contractor are presented below in **Table 1**. As shown in this table, replacing 5 NG units with electric resistance heaters and boilers incurred an incremental installation cost of approximately $1.81 million, while heat pumps resulted in even higher costs at $1.89 million. This is significantly higher than the incremental installation cost assumptions in Staff's Cost-Effectiveness (CE) calculations. Therefore, we strongly recommend Staff conduct a survey of manufacturers and equipment installers to gather installation cost information and update the existing installation cost assumptions in the CE analysis. Note, the May 2023 manufacturer survey[3] did not include questions related to installation costs.

---

1 South Coast Air Quality Management District (South Coast AQMD). 2024. Preliminary Draft Staff Report: Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters, Small Boilers and Process Heaters. Available at: https://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/rule-1146-1146.1-and-1146.2/par-1146-2-preliminary-draft-staff-report-january-2024.pdf . Accessed: February 2024.

2 Ibid.

3 South Coast AQMD). 2023. Manufacturer Survey. Available at: https://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/rule-1146-1146.1-and-1146.2/manufacturer-survey---may-10.xlsx?sfvrsn=6. Accessed: January 2024.

Table 1. Installation Costs for Water Heaters and Boilers

Building	Technology Type	Equipment Type/Make/Model	Equipment Rating	Design/ Engineering ROM Cost	Electrical Infrastructure Upgrade ROM Cost[1]	Demolition ROM Cost	Construction Cost	Total Installation Cost	Incremental Installation Costs Compared to Natural Gas
Building-A	Natural Gas	Boiler	800,000 Btu/hr	$0.00	$0	$3,300	$50,000	$127,200	NA
		Boiler	800,000 Btu/hr			$3,300			
Building-C		Boiler	650,000 Btu/hr			$6,600	$25,000		
		Water Heater	180,000 Btu/hr			$1,400	$5,000		
Building-D		Boiler	1,999,999 Btu/hr			$6,600	$26,000		
Building-A	Electric Resistance	Bryan BE-240 Boiler	240 kW	$114,000	$243,000	$3,300	$50,000	$1,939,200	**$1,812,000**
		Bryan BE-240 Boiler	240 kW			$3,300			
Building-C		Bryan BE-180 Boiler	180 kW		$675,000	$6,600	$25,000		
		Bock CE119 Water Heater	54 kW			$1,400	$5,000		
Building-D		Bryan 540BH Boiler	540 kW		$780,000	$6,600	$26,000		
Building-A	Electric Heat Pump	Three (3) DCE 150 kW Units	450 kW (total)	$128,000	$243,000	$3,300	$75,000	$2,012,200	**$1,885,000**
						$3,300			
Building-C		Two (2) DCE 100kW Units	200 kW (total)		$675,000	$6,600	$38,000		
		CAHP 120 Water Heater	12 kW			$1,400	$7,000		
Building-D		Four (4) DCE 150kW Units	600 kW (total)		$780,000	$6,600	$45,000		

[1]The ROM costs for electric infrastructure upgrades for the electric resistance and heat pump technologies are similar. This is because the primary driver for these infrastructure upgrade costs is trenching, which is unlikely to change despite the difference in the ampacity requirements for these two technologies.

Comment 2: Zero-emission units are not cost effective when all components of the installation costs are considered in the CE analysis.

As noted in the previous comment, SoCalGas requested a quote from one of its contractors for replacing existing NG units at one of its facilities with electric units. Using this dataset and South Coast AQMD's CE calculation methodology described in the Staff Report,[4] Ramboll estimated the cost effectiveness of replacing a 180,000 Btu/hr NG water heater and a 650,000 Btu/hr NG boiler with various electric alternatives. Ramboll's analysis remained consistent with the method and assumptions described in the Staff Report, supplemented by the following customer values:

- **Installation Cost**: as have discussed in Comment 1, Ramboll updated the installation cost of equipment replacement to account for demolition costs for existing equipment, design and engineering costs for new equipment installation, electrical infrastructure upgrade costs for new electric units replacing existing NG units, and construction costs.
- **Heat Pump Coefficient of Performance (COP)**: Ramboll updated the heat pump COP assumptions based on equipment brochure obtained from manufacturer. We have attached a copy of the brochures to this comment letter for your reference.
- **Adjustment to Electrical Panel Upgrade Cost for Equipment Useful Life**: Ramboll did not adjust the electric infrastructure upgrade cost, which includes the electrical panel upgrade cost, by equipment useful life, as these upgrades are essential for installing the equipment. Please note that even if these electrical infrastructure upgrade costs were adjusted by the equipment useful life, it would not change the conclusions on the Cost-Effectiveness (CE) analysis.

A summary of these results is shown in **Table 2** below with additional details in Appendix. The CE values for these four electric transition scenarios are between $2.6 million and $5.4 million dollars[5] per ton of NO_X emission reductions, which are significantly higher than CE effectiveness values presented by Staff for similar equipment in the Staff Report. These values are also well above South Coast AQMD's CE threshold of $349,000 per ton. Therefore, we request Staff to review these calculations and ensure that all components of capital and operational & maintenance costs are included in their CE analysis before proposing any amendment to the existing rule.

Table 2. CE Analysis for Converting Natural Gas Units to Electric Units

	180,000 Btu/hr NG Water Heater		650,000 Btu/hr NG Boiler	
	Electric Resistance Water Heater	**Heat Pump Water Heater**	**Electric Resistance Water Heater**	**Heat Pump Water Heater**
Lifetime NOx Emissions Reductions (tons)	0.061	0.061	0.367	0.367
Incremental Capital Costs ($)	176,600	181,600	546,000	814,000
Incremental Lifetime Operation and Maintenance Costs ($)	151,046	9,283	749,199	127,641

[4] South Coast Air Quality Management District (South Coast AQMD). 2024. Preliminary Draft Staff Report: Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters, Small Boilers and Process Heaters. Available at: https://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/rule-1146-1146.1-and-1146.2/par-1146-2-preliminary-draft-staff-report-january-2024.pdf . Accessed: February 2024.

[5] Even after adjusting for electrical infrastructure upgrade cost based on equipment useful life, our estimated CE range is $1.8 million to $4.1 million per unit.

Table 2. CE Analysis for Converting Natural Gas Units to Electric Units				
	180,000 Btu/hr NG Water Heater		**650,000 Btu/hr NG Boiler**	
	Electric Resistance Water Heater	**Heat Pump Water Heater**	**Electric Resistance Water Heater**	**Heat Pump Water Heater**
Incremental Lifetime Transition Costs ($)	327,646	190,883	1,295,199	941,641
NO_X Cost Effectiveness ($/ton)	**5,369,288**	**3,128,094**	**3,526,624**	**2,563,943**

Comment 3: AQMD should disclose all assumptions and methods used to estimate electricity and natural gas unit prices that were used in the CE analysis to allow transparency.

We respectfully request that the AQMD staff provide full disclosure regarding the calculation assumptions for electricity and natural gas (NG) unit prices used in the CE analysis presented in the Staff Report. It will allow the public to gain a comprehensive understanding of the analysis results. Specifically, the absence of unit values for electricity and NG prices in the Staff Report poses a significant gap in transparency. Merely acknowledging the data source and its associated caveats falls short of addressing the essential need for public process. Given that electricity and NG unit prices are pivotal factors directly influencing operating costs and overall CE results, it is crucial that these values be made publicly available. Therefore, we urge the AQMD to disclose these critical data points. We would also like staff to disclose the details of the calculation methodology for estimating these electricity and NG prices to better understand the assumptions made.

COMMERCIAL
HEAT PUMP WATER HEATERS

CHP SERIES
FULLY INTEGRATED HEAT PUMP WATER HEATER

The CHP-120 heat pump water heater is an integrated system designed specifically for the commercial market.

FEATURES

ENERGY SAVING AND ENVIRONMENTALLY FRIENDLY

- Heat pump transfers heat from surrounding area into the tank
- Industry leading 4.2 COP
- Multiple operating modes maximizes efficiency while meeting specific hot water needs
- Large capacity tank enables heat pump to operate more frequently than electric elements, saving money for the end user
- Meets the standby loss requirements of U.S. Department of Energy and the current edition of ASHRAE 118.1
- Environmentally friendly R-134a refrigerant
- ENERGY STAR® Qualified

COMMERCIAL PERFORMANCE

- First hour delivery of 150 GPH
- Rated heat pump power of 3.15 HP (240Vac) or 3.05 (208Vac)
- Electric heating element capacity of 12 kW (240Vac) or 9 kW (208Vac)
- Max water temperature of 150°F in efficiency/ Hybrid modes and 180°F in electric mode
- Operating ambient range of 40-110° F
- Low operating sound measured at 59 dB (A)
- Dual evaporator fans maximize performance and provide room cooling
- 3/4" NPT water inlet and outlet

EASE OF OPERATION

- Integrated design and pre-charged refrigeration system makes for quick and easy install
- Large touch screen LCD display allows for mode selection, provides run information and includes troubleshooting alerts and detail
- Choose from three operating modes: Efficiency, Hybrid or Electric

DEPENDABLE AND LONG LASTING DESIGN

- A. O. Smith-developed glass coated tank
- Tank rated at 160 PSI working pressure
- Commercial grade anode protects the tank and extends the service life
- Proven heat pump technology
- Electric elements have incoloy sheathing and provide excellent protection from oxidation and scaling

THREE YEAR LIMITED TANK WARRANTY

- Backed by 3-year tank and 1-year parts/ compressor limited warranties
- For complete warranty information, consult written warranty or go to hotwater.com

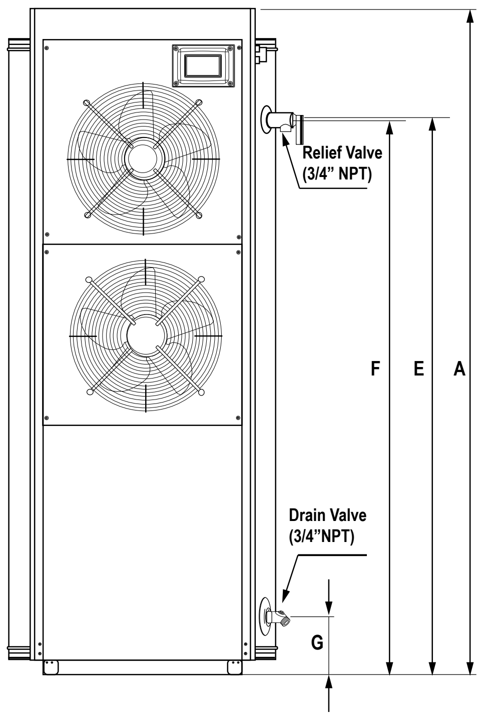
MODEL CAHP 120

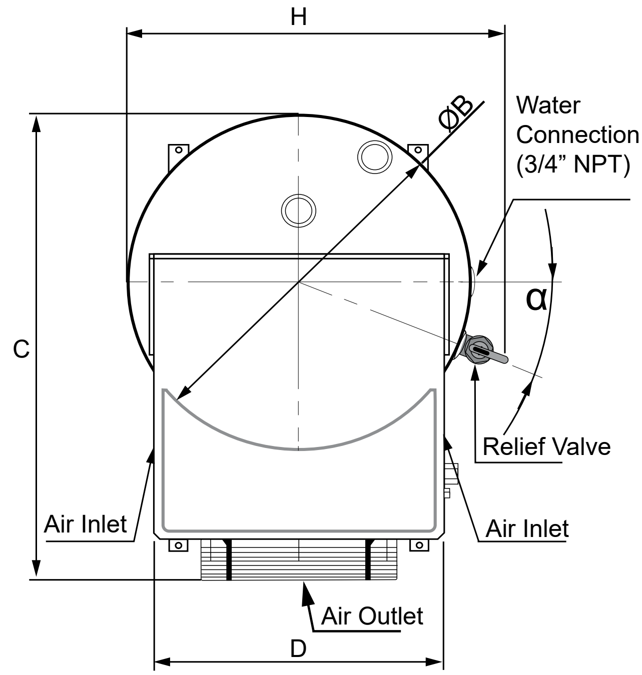
LISTED

Low Lead Content

ENERGY STAR

hotwater.com | 800-527-1953 Toll-Free USA | A. O. Smith Corporation | 500 Tennessee Waltz Parkway | Ashland City, TN 37015





ROUGH-IN DIMENSIONS

Physical Dimensions								
Total Height (A)	**Tank Diameter (B)**	**Maximum Depth (C)**	**Service Panel Width (D)**	**Relief Valve Height (E)**	**Water Outlet Height (F)**	**Water Inlet Height (G)**	**Relief Valve Angle α (°)**	**Maximum Width (H)**
69 11/16	28 1/32	39 11/64	23 5/8	58 7/64	57 51/64	6 1/32	22	30 29/32

MODEL SPECIFICATIONS

Model Number	Nominal Capacity	COP	Number of Elements	Total Element Wattage (both elements at 240V)	First Hour Delivery in Hybrid Mode (Gallons)	Recovery in GPH at 100° Temperature Rise in Hybrid Mode	Depends on mode of operation per chart below:	Approx. Shipping Weight (lbs)
CAHP 120	119	4.2	2	12,000	150	90	Efficiency = 41 Hybrid = 90 Electric = 50	620

RECOVERY CAPACITIES

Recovery Rate In Gallons Per Hour

Mode of Operation	Input		Temperature Rise °F												
	BTU/ Hour	kW	°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F	110°F	120°F	130°F	140°F
			°C	17°C	22°C	28°C	33°C	39°C	45°C	50°C	56°C	61°C	67°C	72°C	78°C
Efficiency	33,678	10	GPH	136	102	82	68	58	51	45	41	37	34	31	29
			LPH	515	386	309	258	221	193	172	155	140	129	119	110
Hybrid	74,624	22	GPH	302	226	181	151	129	113	101	90	82	75	70	65
			LPH	1141	856	685	571	489	428	380	342	311	285	263	245
Electric	40,946	12	GPH	165	124	99	83	71	62	55	50	45	41	38	35
			LPH	626	470	376	313	268	235	209	188	171	157	145	134

Technical Characteristics

Model Type	Integrated Heat Pump Water Heater	
COP	4.2	
HP Rated Input Power	3.15 HP (2.35 kW)	
HP Rated Heating Output Capacity	11.13 kW	
Power Specification	208/240Vac ~ 60Hz 1Ph	
Maximum Operation Current	67 A	
Refrigerant	R134a	
Refrigerant Charge Quantity	3.3 Lbs (1.5 Kg)	
Electrical Heating Capacity	12.0 kW @ 240Vac and 9.0 kW @ 208Vac	
Measured Tank Capacity	111.76 Gal (423 L)	
Operation Modes	Efficiency, Hybrid, Electric	
Max. Water Temperature	Efficiency/Hybrid	Electric
	150°F (66°C)	180°F (82°C)
Operating Ambient Temperature	40 - 110°F (4.4 - 43.3°C)	
Unit Operation Noise	59 dB (A)	
Approx. Heater Weight	498 Lbs (226 Kg)	
Approx. Shipping Weight	620 Lbs (281 Kg)	

Installation Key Considerations	
Service clearances	A service clearance of 24 inches should be maintained from serviceable parts such as the T&P valve, control system components, drain valve, and anode.
Ambient air temperature	In Efficiency Mode the ambient air temperature must be above 45°F and below 110°F
Room size requirement	Recommended to have a minimum installation space of approximately 3,200 cubic feet. Installation spaces less than the recommended could result in reduced water heater efficiency and performance. If the water heater is installed in a confined space with less than 3,200 cubic feet, provisions should be made to ensure sufficient airflow, such as installing louvered grills or fully louvered doors to ensure the most efficient operation of the water heater. Failure to do so could result in reduced heater efficiency and performance.
Amperage/Overcurrent protection	This water heater requires a 208 or 240 VAC single phase power supply. 208V requires 80 amp power supply at 60 Hz; 240V requires 90 amp power supply at 60 Hz.
Condensate draining	This water heater produces condensate and must be properly drained.
Ducting	There is not an optional ducting kit. Discharge air from the front of the water heater must be into a suitable room.
Indoor/Outdoor	This water heater is approved for indoor use only.
This is a partial list. Please reference the Installation Manual for detailed installation considerations.	

SUGGESTED SPECIFICATION

The heater(s) shall be Commercial Heat Pump Model Number CAHP 120 as manufactured by A. O. Smith Water Products Company or equivalent. Heater(s) shall be rated at 12 kW @ 240V or 9 kW @ 208V, single phase, 60 cycle AC as listed by Underwriters' Laboratories. All models meet National Sanitation Foundation NSF-5 requirements. Water heater shall have LCD display with built-in diagnostic and troubleshooting information. Tank(s) shall be 119 gallon capacity with 160 psi working pressure and equipped with a commercial grade anode. All internal surfaces of the heater(s) exposed to water shall be glass-lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1400°F to 1600°F. Internal power circuit fusing shall be provided. The heat pump water heater shall be capable of operating in Efficiency, Hybrid or Electric only modes. 3/4" NPT inlet and outlet water connections shall be provided. The water heater tank shall have a three year limited warranty; the compressor, refrigeration components and all other parts shall have a one year limited warranty. Fully illustrated instruction manual to be included. Meets or exceeds the efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE 118.1.

For technical information, call 800-527-1953. A. O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

hotwater.com | 800-527-1953 Toll-Free USA | A. O. Smith Corporation | 500 Tennessee Waltz Parkway | Ashland City, TN 37015

DCE
DCE W

NATURAL REFRIGERANT

GWP=1

ODP=0

Specially designed for the production of very high temperature water using R744 natural refrigerant gas (CO_2).

Can reach hot water temperatures up to 90°C with an external air temperature of -20°C.

DCE RANGE

Heating capacity (A7;W80) 14,5 ÷124,9 kW

DCE W RANGE

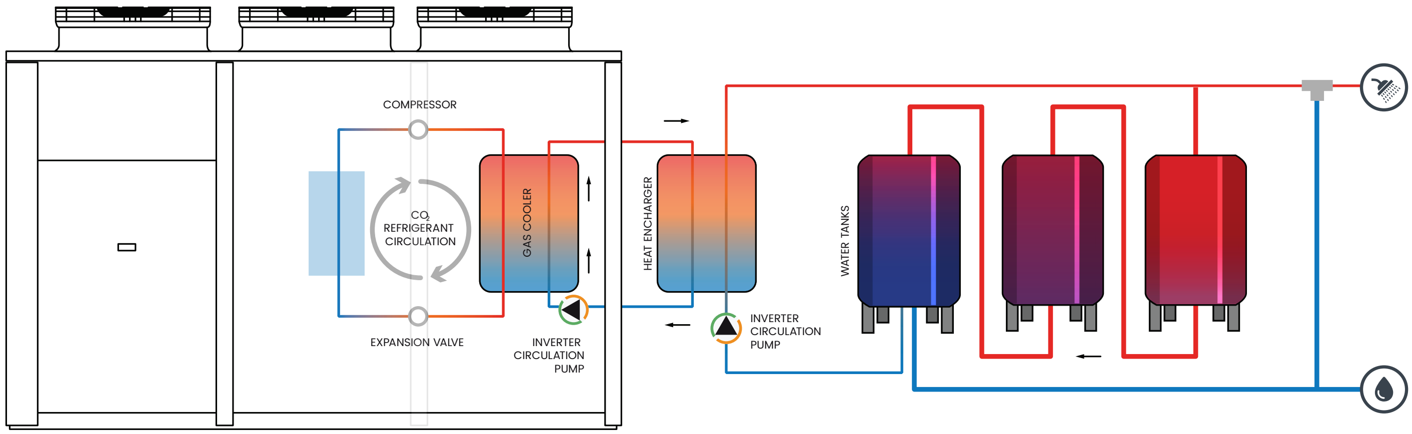
Heating capacity (W7;W80) 15,8 ÷ 133,2 kW

Heating | Semi-hermetic reciprocating compressors | Axial fans | Total cool recovery (Optional)

WORKING PRINCIPLE

Both DCE and DCE W heat pumps can produce hot water at a constant temperature at a specified set point.

- The inverter circulation pump on the unit is managed by the microprocessor.
- Installing a stratified water tank or several water tanks in a series will be necessary once the temperature probes are installed in order to manage the unit's on/off cycles.

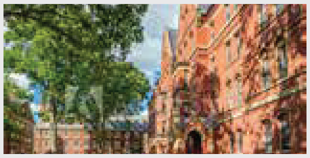


DHW PRODUCTION

OPTIONAL COOL RECOVERY: it can provide chilled water to fan coils and air handling units

Sport centres

2.500 l/day



Retirement homes

5.000 l/day

Hotels

10.000 l/day

Apartment blocks
Hospitals

15.000 l/day

PROCESS

OPTIONAL COOL RECOVERY: it can provide chilled water to control the process

Dairy factories

3.000 l/day

Breweries

5.000 l/day

Cleaning and Sanification

10.000 l/day

Industrial and food production processes

15.000 l/day

DCE AIR / WATER - TECHNICAL DATA

Model			DCE 18 kW	DCE 26 kW	DCE 48 kW	DCE 70 kW	DCE 100 kW	DCE 150 kW
USER: Heating (EN 14511 values) (A7;W80)								
Nominal heating capacity (A7;W80)	(1), (6)	kW	14,8	25,0	45,2	56,5	85,0	124,3
Total Power input	(1), (2), (6)	kW	4,7	8,1	13,1	17,5	26,6	39,4
COP	(1), (6)		3,15	3,09	3,44	3,23	3,19	3,16
Cool recovery version								
Heating + Cool recovery (EN 14511 values) (W80;W7)								
Nominal heating capacity	(7)	kW	16,0	27,8	46,7	63,2	93,4	137,9
Nominal cooling capacity	(7)	kW	11,5	20,4	34,0	46,1	67,8	100,6
Total Power input	(7)	kW	4,6	7,4	12,7	17,1	25,7	37,3
TER - Total efficiency ratio			6,02	6,51	6,37	6,40	6,28	6,40
Compressor								
Type			Reciprocating					
Quantity/Refrigerant circuits		n° / n°	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1
Capacity steps		n°	-	-	-	-	-	-
Circuit refrigerant charge		kg	9	11	19	20	20	25
Axial Fans								
Quantity		n°	1	1	3	3	2	2
User Side exchanger								
Type			Plate exchanger					
Water flow (A7/W80)	(1)	l/h	213	360	649	812	1222	1786
Pressure drops (A7/W80)	(1)	kPa	11	14	20	20	14	13
Source Side exchanger (Cold recovery version)								
Type			Plate exchanger					
Water flow (W7/W80)	(7)	l/h	1982	3527	5883	7952	11720	17380
Pressure drops (W7/W80)	(7)	kPa	35,0	47,5	57,4	28,0	53,2	45,1
Hydraulic module user side								
Type			EC motor circulation pump					
Nominal Power input of pump		W	72	90	90	90	90	90
Available pressure head (W7/W80)	(1)	kPa	55,3	75,3	70,9	70,6	74,8	73,7
Connection			1"	1"	1"	1"1/2"	1"1/2"	1"1/2"
Hydraulic module source side (Cold recovery version)								
Nominal Power input of pump		W	75	190	500	1.100	1.100	1.100
Available pump pressure (W7/W80)	(1)	kPa	100,7	12,3	37,9	120,4	86,3	161,3
Connection			1"	1"	1"	1"1/2"	1"1/2"	2"

(1) External air temperature, 7°C U.R. 87%, User side inlet-outlet water 20-80 °C
(2) Total power input is sum of compressors and fans power input and pump, according with EN 14511
(3) Sound power level calculated in compliance with ISO 3744
(4) Sound pressure level at 10 m calculated in compliance with ISO 3744
(5) Sound level at the follow conditions: External Air temperature 7°C, usere side water 20-80°C .
(6) Values calculate in compliance with EN 14511
(7) Source side inlet/outlet water temperatura, 12/7°C, User side inlet-outlet water 20-80 °C

This datasheet gives the characteristic data of the basic and standard versions of the series; for details refer to the specific documentation

Model			DCE 18 kW	DCE 26 kW	DCE 48 kW	DCE 70 kW	DCE 100 kW	DCE 150 kW
Sound level STD version								
Sound power value	(3), (5)	dB(A)	77	82	86	88	94	97
Sound pressure value	(4), (5)	dB(A)	45	50	54	56	62	65
Sound level LN version								
Sound power value	(3), (5)	dB(A)	75	80	84	86	92	95
Sound pressure value	(4), (5)	dB(A)	43	48	52	54	60	63
Basic unit size and weights								
Width		mm	1600	1408	2650	1200	3510	3510
Depth		mm	850	1268	1040	1040	1210	1260
Height		mm	1780	2015	1820	1819	1916	1916
Delivery weight		kg	644	554	752	791	1185	1270
Operating weight		kg	649	557	757	796	1193	1281

DCE - AIR / WATER ELECTRICAL DATA

Model			DCE 18 kW	DCE 26 kW	DCE 48 kW	DCE 70 kW	DCE 100 kW	DCE 150 kW
Maximum absorbed power	(1)	kW	6	10	16	19	33	47
Maximum starting current	(2)	A	13	27	37	47	66	80
Full load current	(3)	A	47	114	144	186	255	300
Fan motor nominal power		n° x kW	1 x 0,6	1 x 1,6	3 x 0,6	3 x 0,6	2 x 1,6	2 x 1,6
Fan motor nominal absorbed current		n° x A	1 x 2,62	1 x 3,9	3 x 2,62	3 x 2,62	2 x 3,9	2 x 3,9
User side pump nominal absorbed power		W	72	90	90	90	90	90
User side pump nominal absorbed current		A	0,7	0,7	0,7	0,7	0,7	0,7
Power supply		V/ph/Hz	400/3N~/50 ±5%					
Power supply		V/ph/Hz	230/1~/50 ±5%					

(1) Mains power supply to allow unit operation
(2) Maximum current before safety cut-outs stop the unit. This value is never exceeded and must be used to size the electrical supply cables and relevant safety devices (refer to electrical wiring diagram supplied with the unit).
(3) Maximum starting current calculated considering the bigger size compressor starting current plus the maximum absorbed power of the other electrical devices (pumps, fans)