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Price comparison of heat pumps vs gas furnace and AC systems

Additional submitted attachment is included below.

Memorandum

To: Commissioner McAllister and CEC Staff

From: Pierre Delforge, Natural Resources Defense Council

Date: November 12, 2020

Subject: Electric vs. gas space heating cost comparison

Summary

The following memo summarizes market data showing that residential heat pump space conditioning equipment costs are lower than, or similar to gas furnace combined with split air conditioning systems (“gas furnace/AC” systems) in new construction.

The data does not cover installation costs, but heat pumps are less complex to install than conventional gas furnace/AC systems, because installing a central heat pump system only requires the installation of two pieces of equipment, the outdoor unit and indoor air handler (equal to the AC system), whereas gas furnace/AC systems require the installation of three pieces of equipment: the outdoor unit, indoor air handler, and gas furnace; Gas furnaces also require additional gas plumbing and venting inside the buildings, which add to the gas and AC system installation labor and material costs.

This data, including distributor data, NRDC’s own research of online wholesale prices, and the California Building Industry Association’s (CBIA) own commissioned research, shows that there is no cost barrier to including heat pump space conditioning in the baseline for new single- and multi-family homes in the 2022 Building Energy code. In fact, this has the potential to significantly reduce the cost of construction and help boost new housing development in the state while making home ownership more affordable. In addition, homes with heat pump space heating will have lower utility bills, as rooftop solar generation that is now required for new homes since the 2019 building code will offset a significant portion of heat pump operating costs.

A space heating heat pump installed today in California already reduces air and climate pollution from heating by half and will ultimately produce zero emission as California decarbonizes its electric grid.¹

Existing Published Studies

According to a 2018 study conducted by Navigant for the California Building Industry Association (CBIA), electric space heating also has a lower first cost than natural gas space heating. Specifically, that report, which looked at total installed costs, states that **“electric appliances for space heating, cooking, and clothes drying have lower costs than natural gas options”** in new construction.²

¹ Brockway A., Delforge P., “Emissions reduction potential from electric heat pumps in California homes,” The Electricity Journal, November 2018.

² *California Building Industry Association Comments – Impacts of Residential Appliance Electrification*, Docketed 9/20/2018, <https://efiling.energy.ca.gov/GetDocument.aspx?tn=224761>

Electricity is also the most common space heating fuel throughout the United States with **43.9 percent of all homes heating with electricity** and 42.8 percent of homes heating with gas.³

This percentage has generally been growing in newly constructed homes, as documented in the chart below, with nearly **60 percent of new homes currently being constructed with electric space heating**.⁴

Home Heating Fuel by Decade Home Was Built

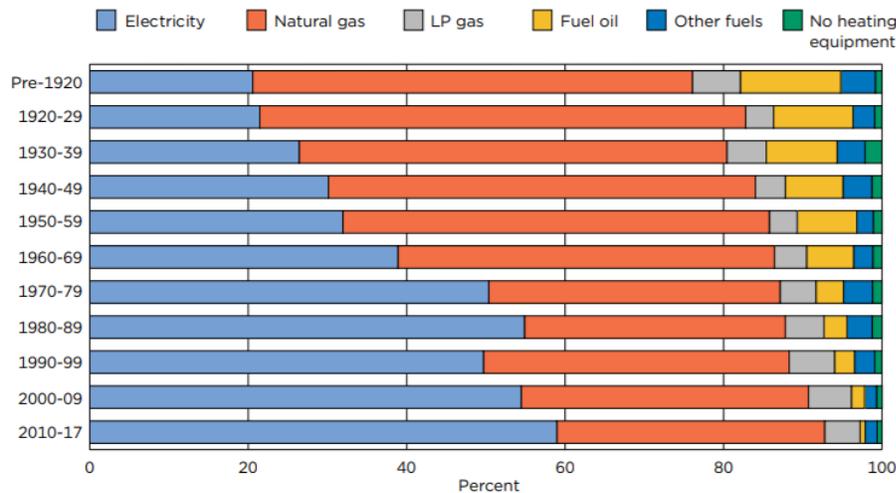


Figure 1: US Census Data Documenting Home Heating Fuel by Decade of Construction

Manufacturer Distributor Data

In addition to this existing published data, NRDC obtained distributor data from an anonymous distributor⁵ for four brands of residential heat pumps and combination gas furnace air conditioners which is summarized in Table 1. This data represents wholesale base price information that would be available to a low-volume contractor and does not include any volume discounts that production builders would be able to obtain.

It represents equipment cost only and not installation cost, which would typically be higher for gas appliances due to the installation of three instead of two pieces of equipment, as well as venting and installation of a second fuel type. Overall, this data shows that on average **a baseline code-compliant gas furnace/AC system unit is 14% more expensive than a baseline heat pump**.

The table below also provides cost data for ultra-low NOx furnaces, which are required in key California markets including the South Coast and San Joaquin valley air districts. For these units, **the average cost of the furnace/AC unit is 29% higher** (considering 0.80 AFUE ULN units only).

³ <https://www.census.gov/content/dam/Census/library/publications/2019/demo/h150-19.pdf>

⁴ *ibid*

⁵ Provided to NRDC via email in October 2020

Description	Cost	Increased cost of gas equipment
Brand A		
Electric: 14 SEER, 8.2 HSPF, 3-ton, Single-speed, central ducted HP system	\$2309	
Gas: Low-NOx gas/split 14 SEER, .80 AFUE	\$2434	+5%
Gas: Ultra-Low NOx gas/split 14 SEER, .80 AFUE	\$2771	+20%
Brand B		
Electric: 14 SEER, 8.2 HSPF, 3-ton, Single-speed, central ducted HP system	\$2682	
Gas: Ultra-Low NOx gas/split 3-ton, 14 SEER, .90 AFUE (condensing)	\$3537	+32%
Brand C		
Electric: 14 SEER, 8.2 HSPF, 3-ton, Single-speed, central ducted HP system	\$2004	
Gas: Low-NOx gas/split 14 SEER, .80 AFUE	\$2445	+22%
Gas: Ultra-Low NOx gas/split 3-ton, 14 SEER, .80 AFUE	\$2753	+37%
Brand D		
Electric: 14 SEER, 8.2 HSPF, 3-ton, Single-speed, central ducted HP system	\$2512	
Gas: Low-NOx gas/split 14 SEER, .80 AFUE	\$2867	+14%
Gas: Ultra-Low NOx gas/split 3-ton, 14 SEER, .90 AFUE	\$3275	+30%

Table 1: Distributor Cost Data

Online Distributor Data

Finally, NRDC conducted a separate analysis of prices for split heat pumps and gas furnace/AC systems using price data found on online wholesaler websites in October 2020.⁶ While not necessarily representative of builder pricing, which may include negotiated contracts and bulk discounts, online wholesale retailers are typically similar to distributor wholesale pricing. In general, heat pumps and gas furnace/AC systems of the same capacities and efficiencies were compared. This pricing is for equipment only and does not include the price of installation, which is likely to be higher for dual-fuel, three-piece gas furnace/AC systems than for two-piece split heat pumps. Similar to the distributor data, NRDC’s analysis found that heat pumps were generally offered at a similar or lower price than their gas furnace/AC equivalents.

⁶ Acwholesalers.com, HVACdirect.com, nationalairwarehouse.com

#	Brand	Cooling Capacity ⁷	SEER	AFUE/HSPF	HP Price	Gas furnace /AC Price	Source
1)	Airquest/Carrier	3 tons	14	80%/8.2	\$2,224	\$2,248	HVACdirect.com
2)a)	Goodman	3 tons	14	80%/8.2	\$2,155	\$1,909	acwholesalers.com
2b)	Goodman	3 tons	14	80%/8.2	\$2,394	\$2,344	HVACdirect.com
3)	Goodman	3 tons	16	96%/9.5	\$2,678	\$2,910	acwholesalers.com
4)	Rheem	3 tons	14/14.5 ⁸	80%/8.2	\$2,442	\$2,776	Nationalairwarehouse.com

Table 2: Online Distributor Data Gas Furnace/AC

Conclusion

In summary, data from multiple sources indicates that heat pump space heating is generally the lowest first cost option for new construction. Costs are therefore not a barrier to CEC setting the baseline space heating type to a heat pump for all residential construction in the 2022 Title 24 Standards. Doing so will lower construction costs, reduce occupants' utility bills, and cut air and climate pollution by half and more over the life of these buildings.

⁷ Note that gas furnace/ACs typically have higher heating capacities than their equivalent HP

⁸ Gas unit is 14.5 SEER

Appendix – Documentation of Online Price Data

1)

PRODUCT	PRICE	QTY	SUBTOTAL	
 <p>3 TON 14 SEER AIRQUEST HEAT PUMP WITH AIR HANDLER <i>SKU: R4H436GKC / FEM4X3600BL</i> ID: 56526</p> <p>Heat Pump: 1 x 3 Ton 14 SEER AirQuest by Carrier Heat Pump \$1,494.00</p> <p>Air Handler: 1 x 3 Ton Multi-Positional AirQuest Air Handler \$729.95</p> 	\$2,223.95	<input type="text" value="1"/> Edit	\$2,223.95	
 <p>3 TON 14 SEER 80% AFUE 44,000 BTU AIRQUEST GAS FURNACE AND AIR CONDITIONER SYSTEM - UPFLOW/DOWNFLOW <i>SKU: R4A436GK / END4X36L17A / N8oESNo451712A</i> ID: 79255</p> <p>Furnace: 1 x 44,000 BTU 80% AFUE Single Stage Multi-Positional AirQuest Gas Furnace \$704.00</p> <p>Air Conditioner: 1 x 3 Ton 14 SEER AirQuest Air Conditioner Condenser \$1,156.00</p> <p>Coil: 1 x AirQuest 3 Ton 17.5" Width Vertical Evaporator Cased Coil \$388.00</p> 	\$2,248.00	<input type="text" value="1"/> Edit	\$2,248.00	

2) a)



(Bundle)
Goodman 3 Ton 14 SEER Heat Pump Air Conditioner System
Model: **GSZ140361 ARUF37D14**
Item Number: **76005**

1
Update
Remove

\$2,154.60
Freight Shipping

This Bundle Includes 2 Items



(Bundle)
Goodman 3 Ton 14.0 SEER 80% AFUE Gas Electric Air Conditioner System
Model: **GSX130361 GMES800603BN CAPF3137B6**
Item Number: **101212**

1
Update
Remove

\$1,909.10
Freight Shipping

This Bundle Includes 3 Items



2)b)

3 Ton 14 SEER 80% AFUE 80,000 BTU Goodman Gas Furnace and Air Conditioner System - Horizontal

By: Goodman Model: GSX140361 / CHPF3642C6 / GMES800804CN ID: 51731



Suggested Retail: ~~\$2,795.00~~

Price as configured:

\$2,344.00

Payments as low as \$108.16 / Month *

FREE SHIPPING



3 Ton 14 SEER Goodman Heat Pump Air Conditioner System

By: Goodman Model: GSZ140361 / ARUF37D14 ID: 694

MOST POPULAR



Suggested Retail: ~~\$2,873.00~~

Price as configured:

\$2,394.00

Payments as low as \$110.46 / Month *

FREE SHIPPING

Usually Ships in

★★★★★ 4 Review(s)



Heat Pump *

 3 Ton 14 SEER Goodman Heat Pump
View Item

3)

	<p>(Bundle) Goodman 3 Ton 16 SEER Heat Pump Air Conditioner System Model: GSZ160361 ASPT37C14 Item Number: 76012 This Bundle Includes 2 Items</p>	<p>1</p> <p>Update Remove</p>	<p>\$2,677.50 Freight Shipping</p>
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	<p>(Bundle) Goodman 3 Ton 16 SEER 96% AFUE Gas Electric Air Conditioner System Model: GSX160371 GMEC961004CN CHPF3743C6 TXV-42 Item Number: 75627 This Bundle Includes 4 Items</p>	<p>1</p> <p>Update Remove</p>	<p>\$2,910.00 Freight Shipping</p>
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4)

3 Ton Rheem 14 SEER R410A Heat Pump Split System

\$2,442.17



* Heat Strip Size

* Required Fields

-- Please Select --

\$2,442.17

Qty: 1

Add to Cart

+ Add to Compare

3 Ton Rheem 14.5 SEER R410A 80% AFUE 75,000 BTU Single Stage Upflow/Horizontal Gas Furnace Split System

\$2,776.41



* Propane Conversion Kit

* Required Fields

No, I do not need one.

Yes, please add one to my order. **+\$99.00**

\$2,776.41

Qty: 1

Add to Cart

+ Add to Compare