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Memorandum

To: Massachusetts Program Administrators and Energy Efficiency Advisory Council

From: Danielle Vitoff, Terese Decker, and Justin Spencer, Navigant

Date: March 30, 2018

Re: Quick Hit Study: Ductless Mini-Split Heat Pump Survey (RES 29)

Study Background

Through the Mass Save® Heating and Cooling program, Massachusetts residential customers are offered prescriptive rebates for the installation of qualifying ductless mini-split heat pump (DMSHP) systems. The 2016 program qualifications for DMSHP systems are presented in Table 1.

Table 1. 2016 Mass Save DMSHP Qualifications

Qualifying Products	SEER	EER	HSPF	Rebate Amount (per indoor unit)
Mini-Split Heat Pump	≥18	N/A	≥10	$100
Mini-Split Heat Pump	≥20	N/A	≥12	$300

Source: Mass Save: https://www.masssave.com/en/saving/residential-rebates/electric-heating-and-cooling/#title4

In 2014, a Navigant evaluation team conducted a web survey of participants who had received incentives for installing DMSHPs.[1] The purpose of the previous survey was to understand participant motivations for participating in the program and how the DMSHP equipment was being used. From the survey results, the evaluation team was planning to determine the appropriate baseline for program incentivized DMSHPs. The web survey, which included responses from 430 participants, determined that 74% of participants installed their DMSHPs for both heating and cooling, while 24% of participants installed their DMSHPs for cooling only and only 1% installed their DMSHPs for heating only.

To further investigate the energy savings associated with the installation of DMSHPs, the Massachusetts Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC)

[1] While much the same population, in 2014 DMSHP rebates were distributed under the COOL SMART program (which has been renamed the Heating and Cooling Program) and rebate qualifying specifications were different. The results of the web survey are reported in the *Ductless Mini-Split Heat Pump Customer Survey Results* report dated September 2014 and available here: http://ma-eeac.org/wordpress/wp-content/uploads/Ductless-Min-Split-Heat-Pump-Customer-Survey-Results1.pdf

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directed a Cadmus evaluation team to complete a metering study of DMSHP program participants. Many of the inputs currently used to calculate the energy savings associated with rebated DMSHPs, in other words the EFLH value of 451, are derived from the *Ductless Mini-Split Heat Pump Impact Evaluation* completed in 2016.[2] Among other findings, the Cadmus study found a heating Equivalent Full Load Hour (EFLH) value for DMSHPs that was consistent with the Massachusetts TRM, but was lower than expected by program managers and the evaluation team. The heating EFLH values resulting from the 2016 Cadmus study are presented in Table 2.

Table 2. DMSHP Heating EFLHs

Population Description	EFLHs
MA TRM	447
Population average from winter 2016 metering	451
Population top 25% from winter 2016 metering	1,117

Source: Ductless Mini-Split Heat Pump Impact Evaluation, December 30, 2016, pg 144

Heating & Cooling Program Changes

Using DMSHPs more regularly as a primary source of home heating was determined to be beneficial to the customer and the Commonwealth. As a result, in 2017, the Heating and Cooling program began adopting changes to encourage greater use of the rebated DMSHPs for heating and support a higher EFLH value. The enacted program changes include:

- Changing the rebate structure so it is based on the number of indoor heads, instead of outdoor condensers, with no maximum number of heads rebated per home. This change was meant to encourage multi-head and whole-house heating.
- Increasing the HSPF from 9 to 11 to 10 and 12 to encourage cold climate systems.
- Adding consumer education information to the rebate form, including information around their heating function.
- Revising the program website (https://www.masssave.com/en/saving/residential-rebates/electric-heating-and-cooling/) to highlight that DMSHPs can be used to heat the whole home and how to best use DMSHPs, e.g. what temperature to switch to a backup system and not to use setbacks.
- Developing co-branded marketing materials with MassCEC and adding a link to MassCEC mini-split rebates on www.masssave.com.
- Emphasizing DMSHP whole-house heating solutions during contractor trainings

Together, the changes adopted by the Heating and Cooling program were expected to result in higher heating use for rebated DMSHP systems. This study, referred to as RES 29, was designed to test this hypothesis.

Research Approach

The primary research question explored by the RES 29 study was as follows: Have any recent changes to the DMSHP program resulted in changes to how participants use their installed DMSHP equipment, specifically whether they are using their DMSHPs more for heating? This question was assessed through a participation survey, which mirrored the participant survey (and in many cases replicated questions from the survey) completed in 2014. The evaluation team planned to compare

[2] http://ma-eeac.org/wordpress/wp-content/uploads/Ductless-Mini-Split-Heat-Pump-Impact-Evaluation.pdf

results between the two surveys to understand differences in participant activities resulting from program changes.

Because the evaluation team was already going through the effort of developing and fielding a participant survey, it was decided to collect data on a series of secondary research questions, all of which had been addressed in the previous survey effort:

- Why do participants buy DMSHPs?
- Do DMSHP incentives induce replacement or displacement of existing heating and/or cooling equipment?
- What types of equipment do DMSHPs primarily replace/displace?
- What other types of heating and cooling equipment do customers use in addition to DMSHPs?
- What motivates the purchase of the make/model of equipment ultimately installed in a participant's home?
- How do participant use patterns vary, per their primary motivation for purchasing units (e.g., adding cooling to increase occupant comfort, adding heating to increase occupant comfort, displacing other cooling sources to improve convenience and/or reduce cooling costs, displacing other heat sources to reduce heating costs)?
- What information about using their system did the owners receive from their contractors, and how did that information affect their use of their system?

Comparing the answers to the secondary research questions between the two survey populations also provided the evaluation team a more complete picture of the survey respondents allowing for a more thorough understanding of the reason for any changes in the program populations. Note that the secondary research question findings are not discussed in detail within this memorandum, as no differences from the 2014 survey results were identified. The complete results from all survey questions are included as an appendix.

Methodology

The evaluation team surveyed program participants via a web survey that very closely resembled the web based survey fielded in 2014. The population frame included 4,667 participants, all of whom had received rebates for DMSHPs in 2017. Emails were sent to a sample of 1,976 participants drawn from this population frame. In the email invite, participants were offered a $10 Amazon gift card for completion of the online survey. Of the sample that received email invites, 131 invites (6% of the sample) bounced-back, 1,291 invitees did not respond or complete the survey, and 554 participants (28% of the sample) completed the survey and received an incentive. The overall response rate for participants with valid emails was 30%.

Findings

The 2014 and 2017 customer surveys show almost identical results between the two participant populations for comparable questions, except for a few key differences highlighted in this report. In most cases the population distributions by category are within two percentage points for each of the categorical responses. Key demographical differences between the two survey populations are reported in Table 3

Table 3. Key Differences between 2014 and 2017 Survey Results

Category	Detailed Metric	2014 Study Result	2017 Study Result
Demographics	Single family homes	90%	92%
	Installation in primary residence *[For the 8% who indicated that the DMSHP was installed in a secondary residence, they also report spending more time in the secondary home than the previous survey.]*	89%	92%
Purchase Intent	In the absence of rebates or financing, respondent would have purchased a less expensive, less energy efficient DMSHP	7%	13%
Fuel Replaced	Heating for space had been served by natural gas	27%	34%
	Heating for space had been served by electric	11%	16%
	Heating for space had been served by oil *[NOTE: There was almost an exact match between the two surveys as to the distribution of rooms served and whether the space was heating or cooled before the DMSHP installation]*	46%	39%

Source: Navigant analysis of 2014 and 2017 DMSHP survey responses

By far, the most significant difference between the 2014 and 2017 survey responses is around how participants report using the DMSHPs (Table 4). In the 2014 survey, 75% of respondents indicated that they used their DMSHP for heating (either both heating and cooling or just heating). In the 2017 survey, 89% of survey respondents indicated that they used their DMSHP for heating, a 14% increase in heating use. This is directly related to a 14% decrease in cooling only use, from 25% in the 2014 survey to 11% in the 2017 survey.

Table 4. Is the DMSHP Used for Heating, Cooling, or Both

DMSHP Use	2014 Study Result	2017 Study Result
Both: Heating & Cooling	74%	88%
Cooling	25%	11%
Heating	1%	1%

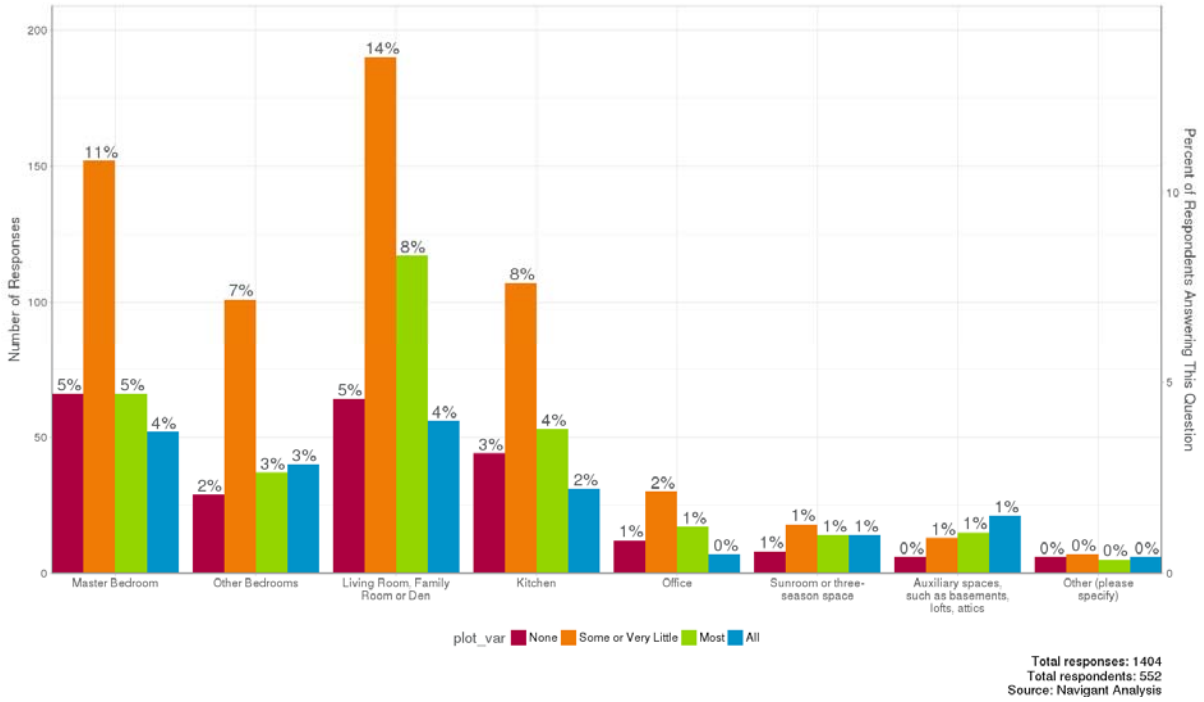
Source: Navigant analysis of 2014 and 2017 DMSHP survey responses

The 2017 survey asked participants how much of their heating was provided by the DMSHP: all, most, some or very little, or no heating. The responses to this question, are reported by space type in Figure 1. Overall, only 38% of survey respondents indicated that they use their DMSHP for all or most of the heat in their space. As a corollary, over half of the survey respondents indicated that the DMSHP is used for some heating or less; in other words, most respondents are still using their DMSHP to supplement an existing primary heating system. It is important to note that the 2014 survey did not ask a similar question about the amount of heating supplied by the DMSHP.

The finding that DMSHPs are used as supplementary heating sources is supported by the fact that 94% of respondents indicated that they did not remove the previous system when the DMSHP was installed, which is the same as what was found in the 2014 survey. All together these results indicate

a greater number of program participants in the 2017 population are using their rebated DMSHPs for heating, even if the DMSHPs may not be the primary heating sources.

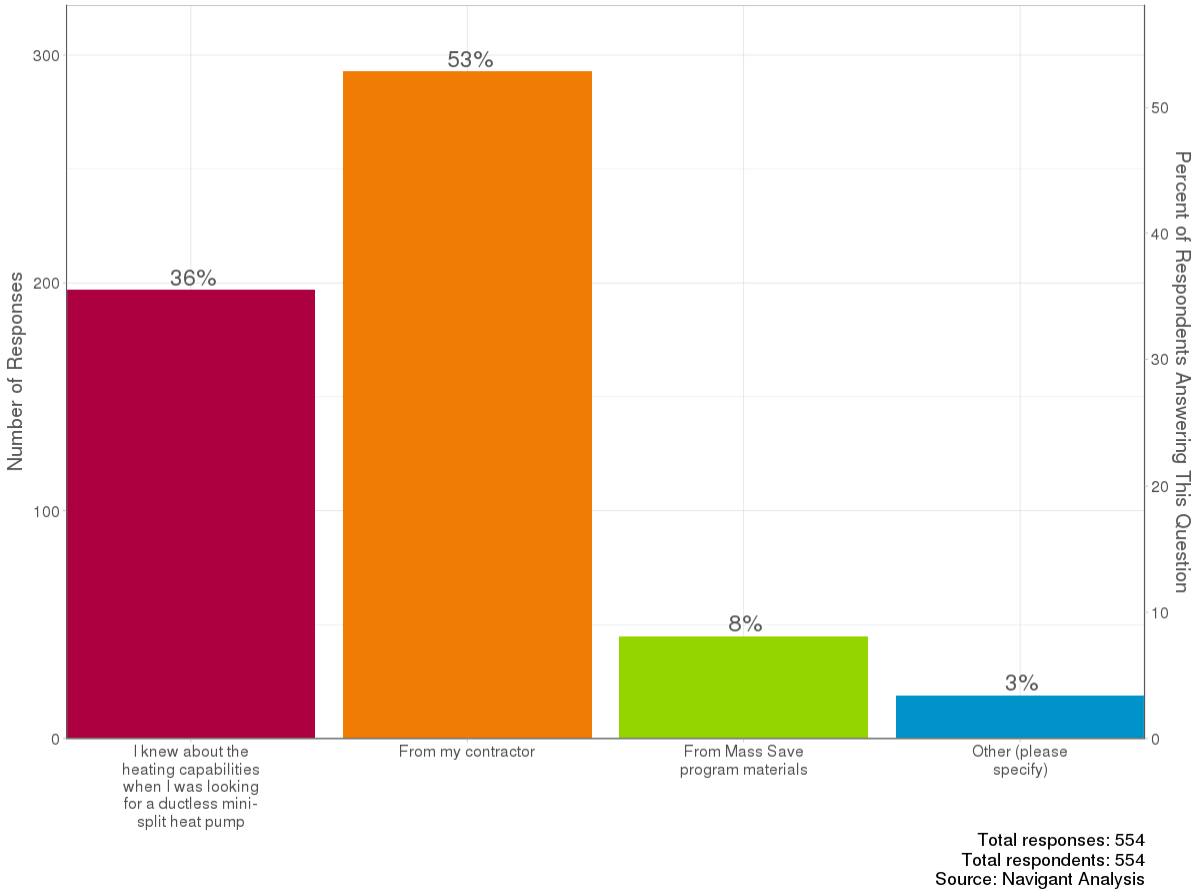
Figure 1. How Much Heating is Provided by the DMSHP, by Space



Source: Navigant analysis of 2017 DMSHP survey responses

The 2017 survey asked participants how they learned about the heating capabilities of the DMSHP system to understand if the program changes were working as designed. The majority of survey respondents (61%) indicated that they learned about the heating capabilities of the DMSHP from their contractor or Mass Save program materials, as illustrated in Figure 2. This result indicates that program design changes are resulting in more participants understanding the heating capabilities of the DMSHP systems, even if they may not be using the rebated systems as their primary heat source.

Figure 2. How Did Participants Learn About the Heating Capabilities of the DMSHP



Source: Navigant analysis of 2017 DMSHP survey responses

Conclusions

The primary finding from this survey is that a larger percentage (89%) of 2017 program participants are using the DMSHPs rebated through the Mass Save Heating & Cooling Program for heating than 2014 program participants (75%). The survey results also indicate that the enacted program changes are resulting in a significant number of program participants learning about the heating capabilities of their DMSHPs through contractors and program materials.

Finding 1: Fifteen percent more program participants report using their DMSHPs for heating through the 2017 participant survey as compared to the 2014 survey.

Recommendation 1: The program should adjust the heating EFLH value used for calculating savings from DMSHPs as shown in Equation 1.

Equation 1. Heating EFLH Derivation

$$535 \text{ EFHL} = \{1+[(0.89-0.75)/0.75]\} \times 451$$

The evaluation team therefore recommends that the program use 535 EFLHs as the basis for estimating heating savings for DMSHPs, which is higher than the average (451 EFLH) derived from the 2016 metering study and currently being used by the PAs.

Finding 2: Sixty-one percent of survey respondents indicated that they learned about the heating capabilities of their DMSHP from their contractor or the Mass Save program.

Recommendation 2: The Mass Save Heating & Cooling program should continue enforcing the program changes enacted in 2016, as these program changes are resulting in higher heating usage of rebated DMSHPs.

Ductless Mini-Split Heat Pump Survey (RES 29)

February 21, 2018

Prepared for:

Prepared by:

NAVIGANT

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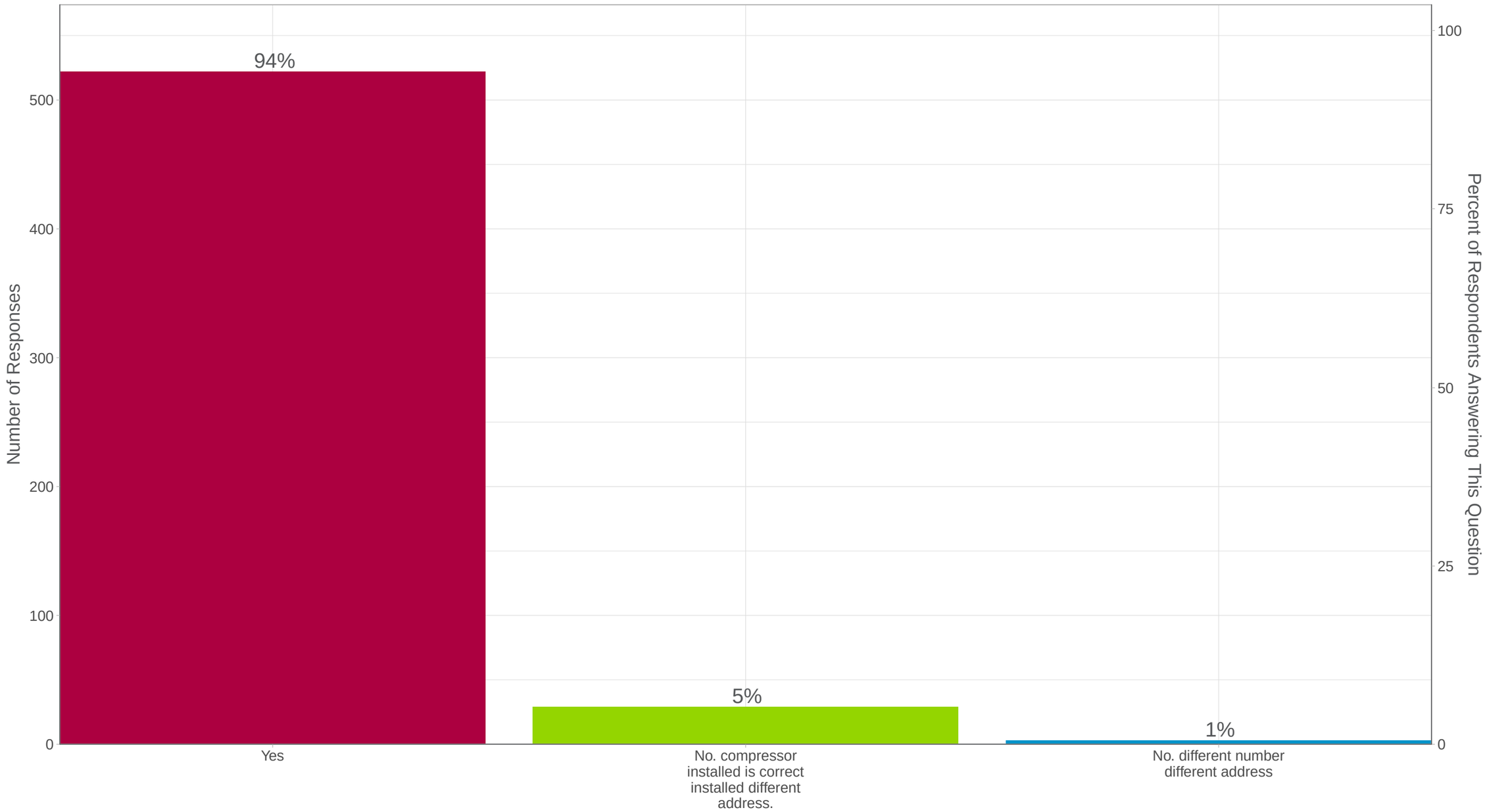
1 Survey Results

1.1 Question QI1a: Our records show that you received a rebate for installing ductless mini-split heat pump(s). Is this correct?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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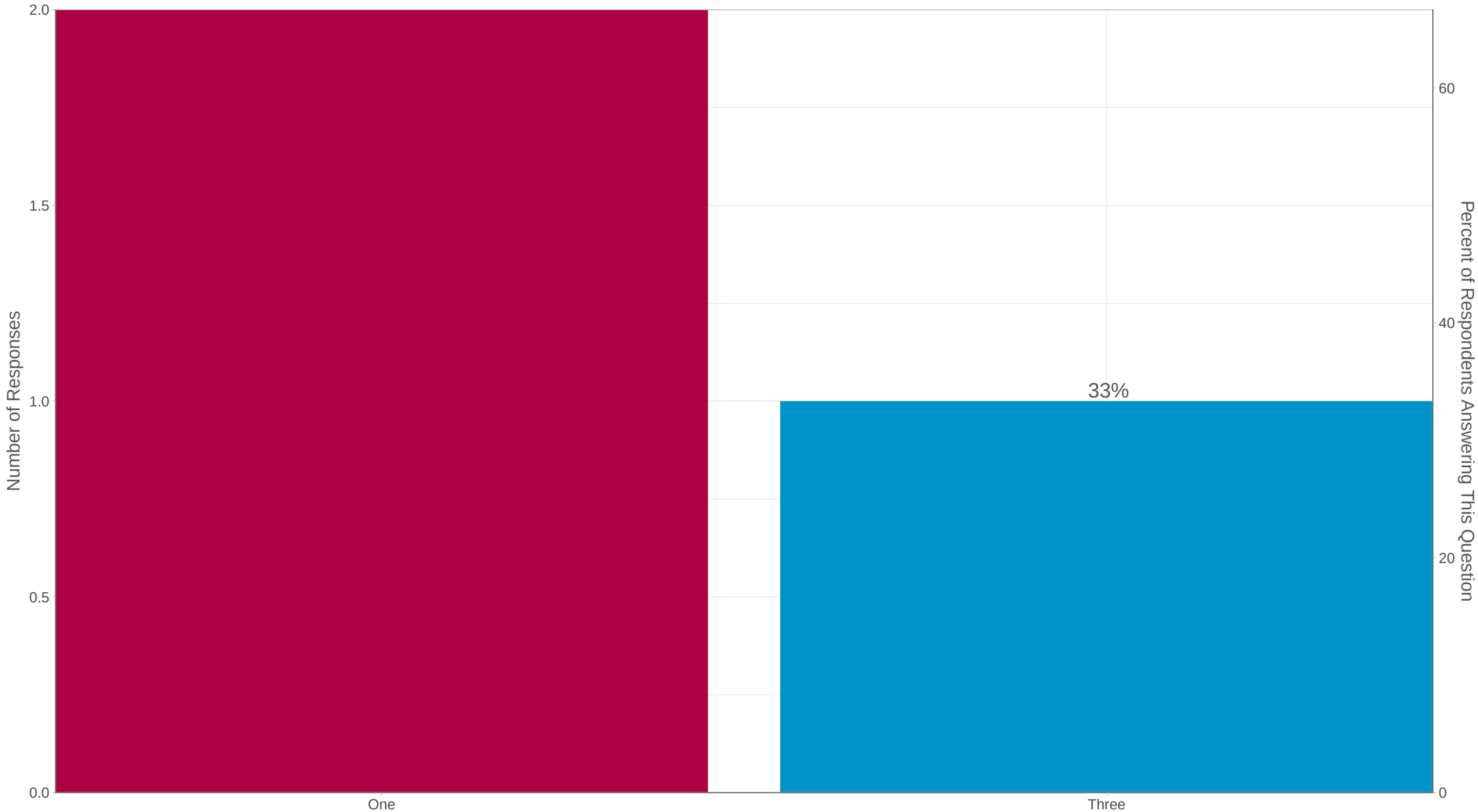
1.2 Question Qlb: Can you please tell us for how many ductless mini-split heat pump outdoor compressor units you received a rebate at this address?



Total responses: 3
Total respondents: 3
Source: Navigant Analysis

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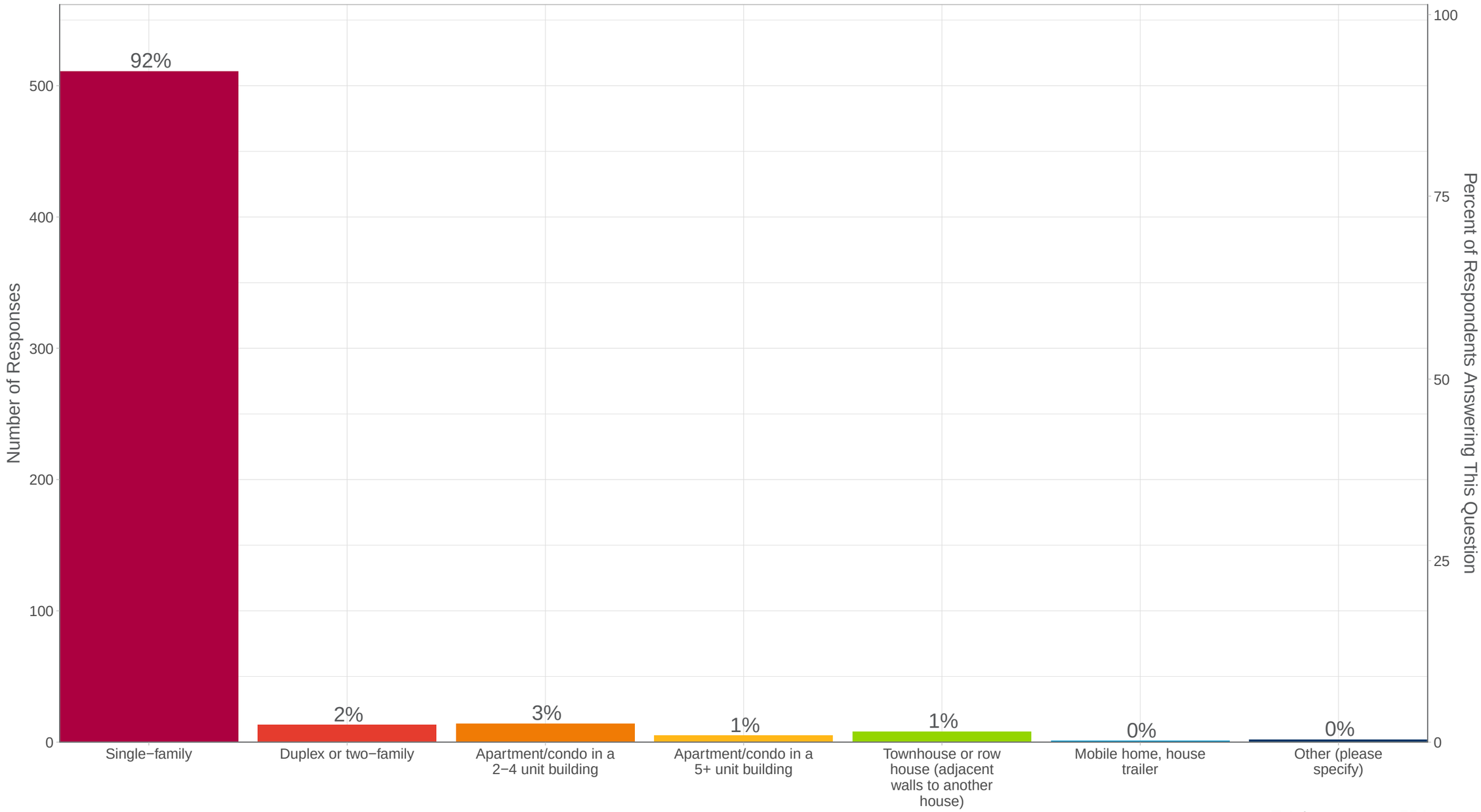
1.3 Question QI2: What type of residence is this?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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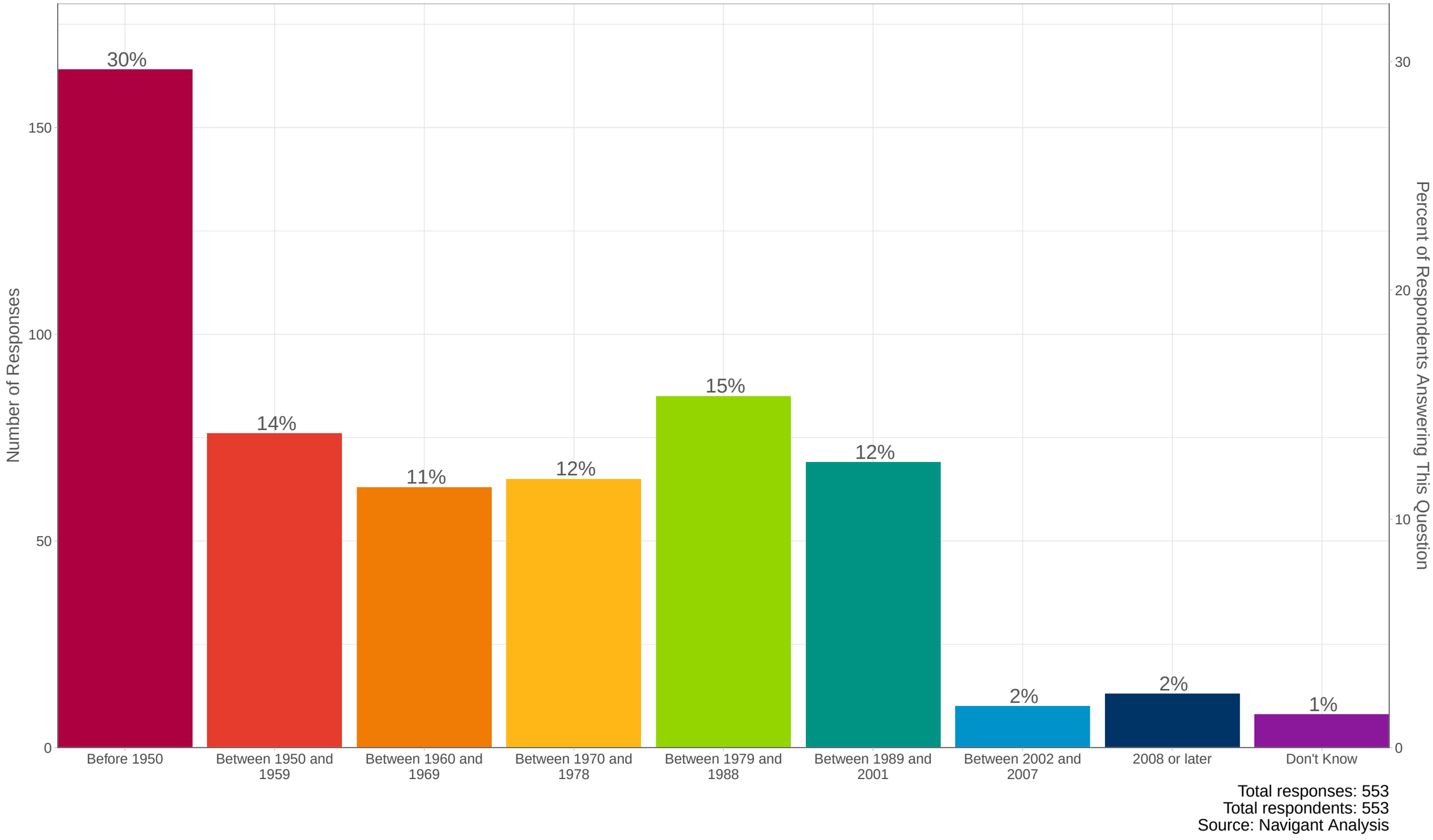
1.4 Question QI3a: Approximately, when was this residence first built?



Total responses: 553
Total respondents: 553
Source: Navigant Analysis

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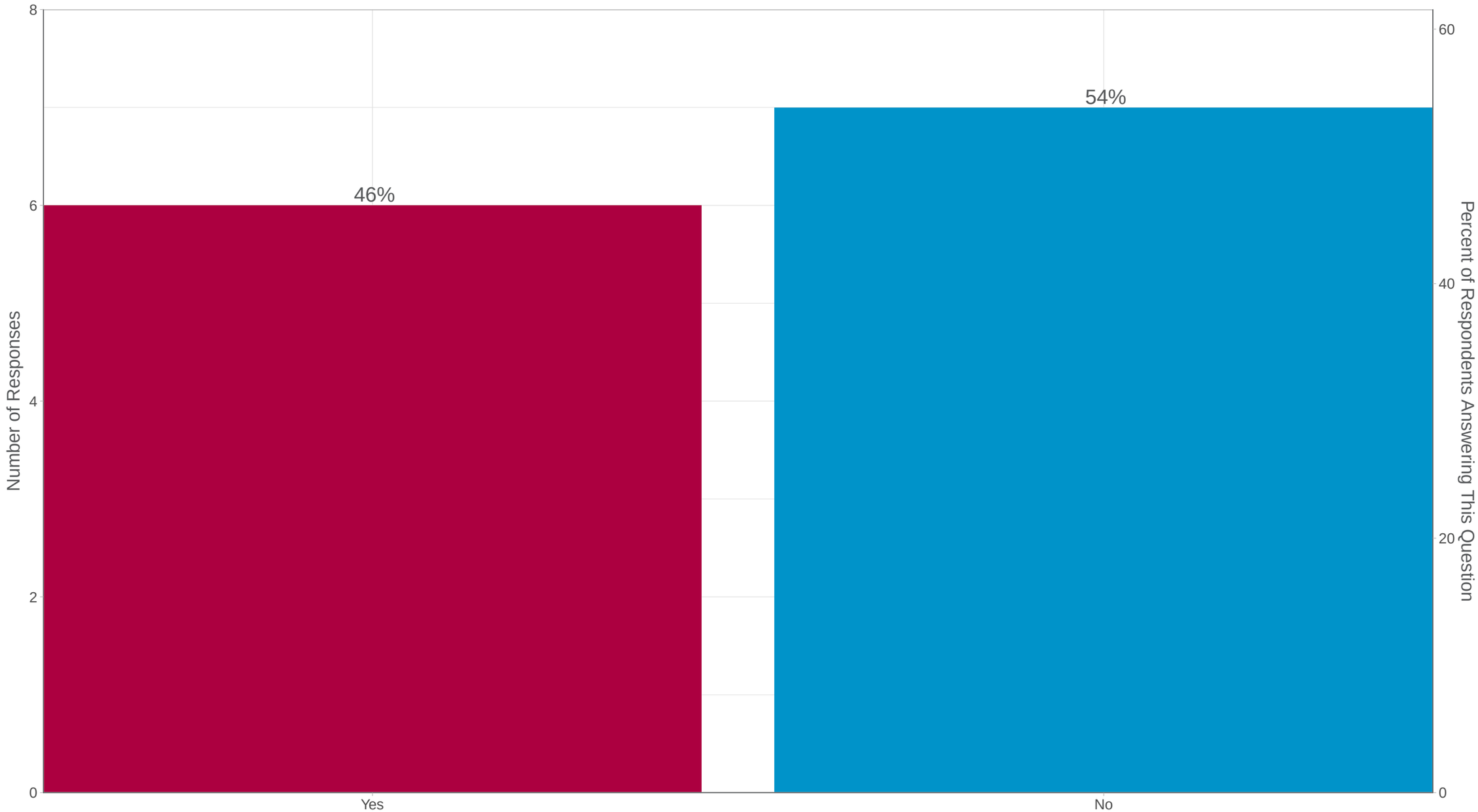
1.5 Question QI3b: Was this ductless mini-split heat pump system installed during the course of a new construction or major renovation project?



Total responses: 13
Total respondents: 13
Source: Navigant Analysis

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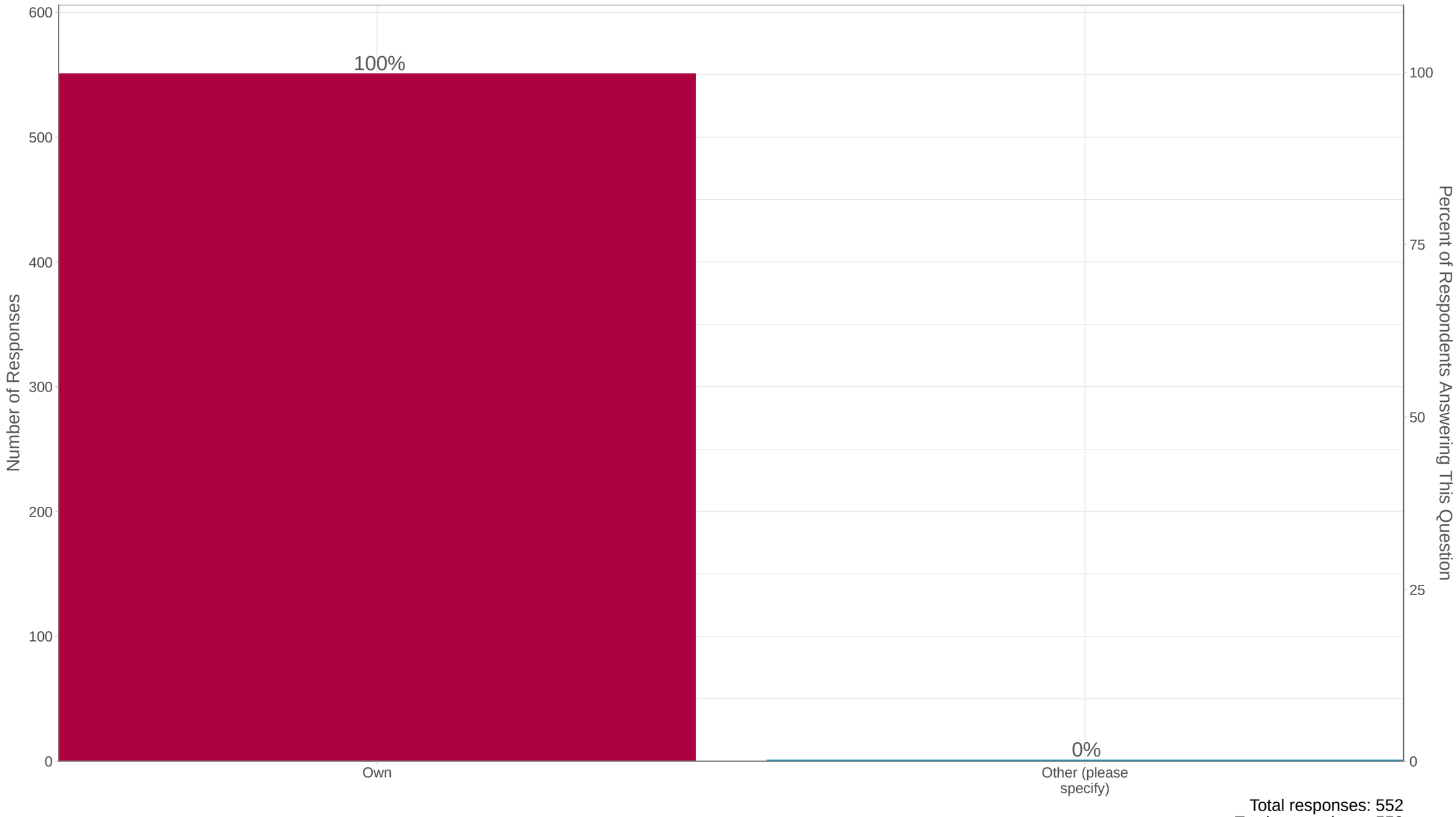
1.6 Question QI4a: Do you own or rent this residence?



Total responses: 552
Total respondents: 552
Source: Navigant Analysis

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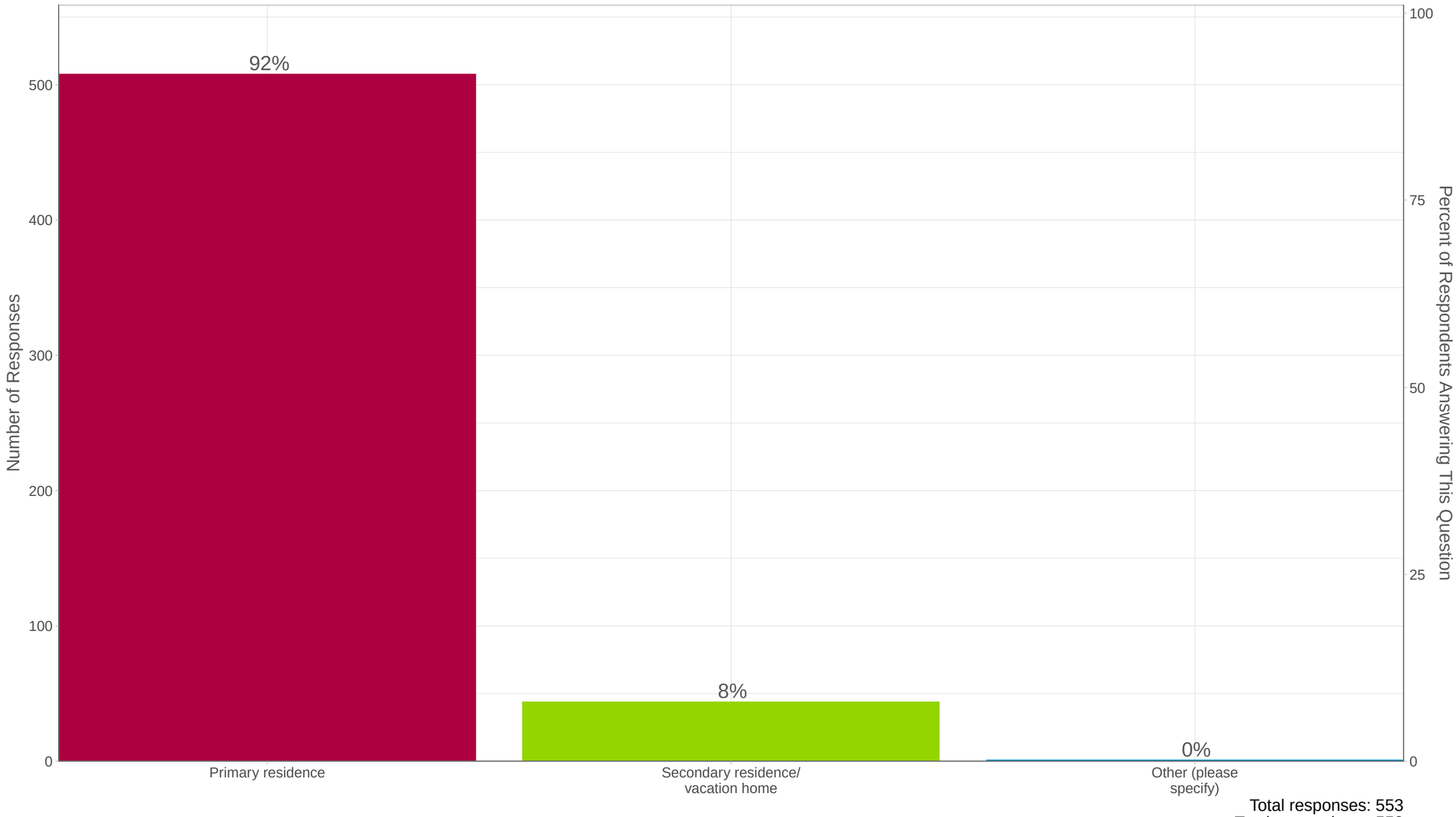
1.7 Question QI4b: Is this your primary residence or a secondary residence/vacation home?



Total responses: 553
Total respondents: 553
Source: Navigant Analysis

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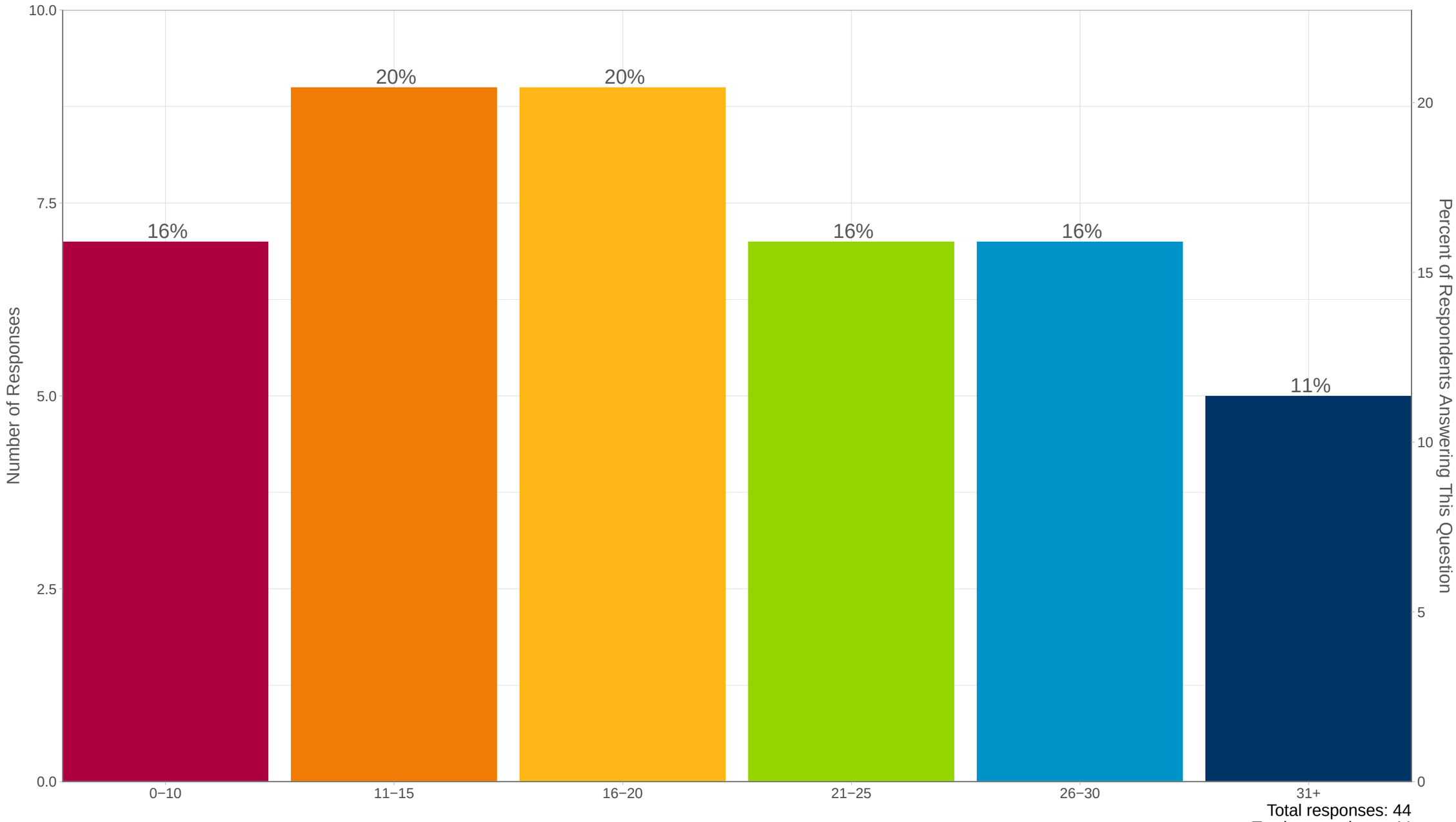
1.8 Question QI4c: How much time, in weeks, do you spend in this secondary residence/vacation home per year? (weeks per year 0-52)



Total responses: 44
Total respondents: 44
Source: Navigant Analysis

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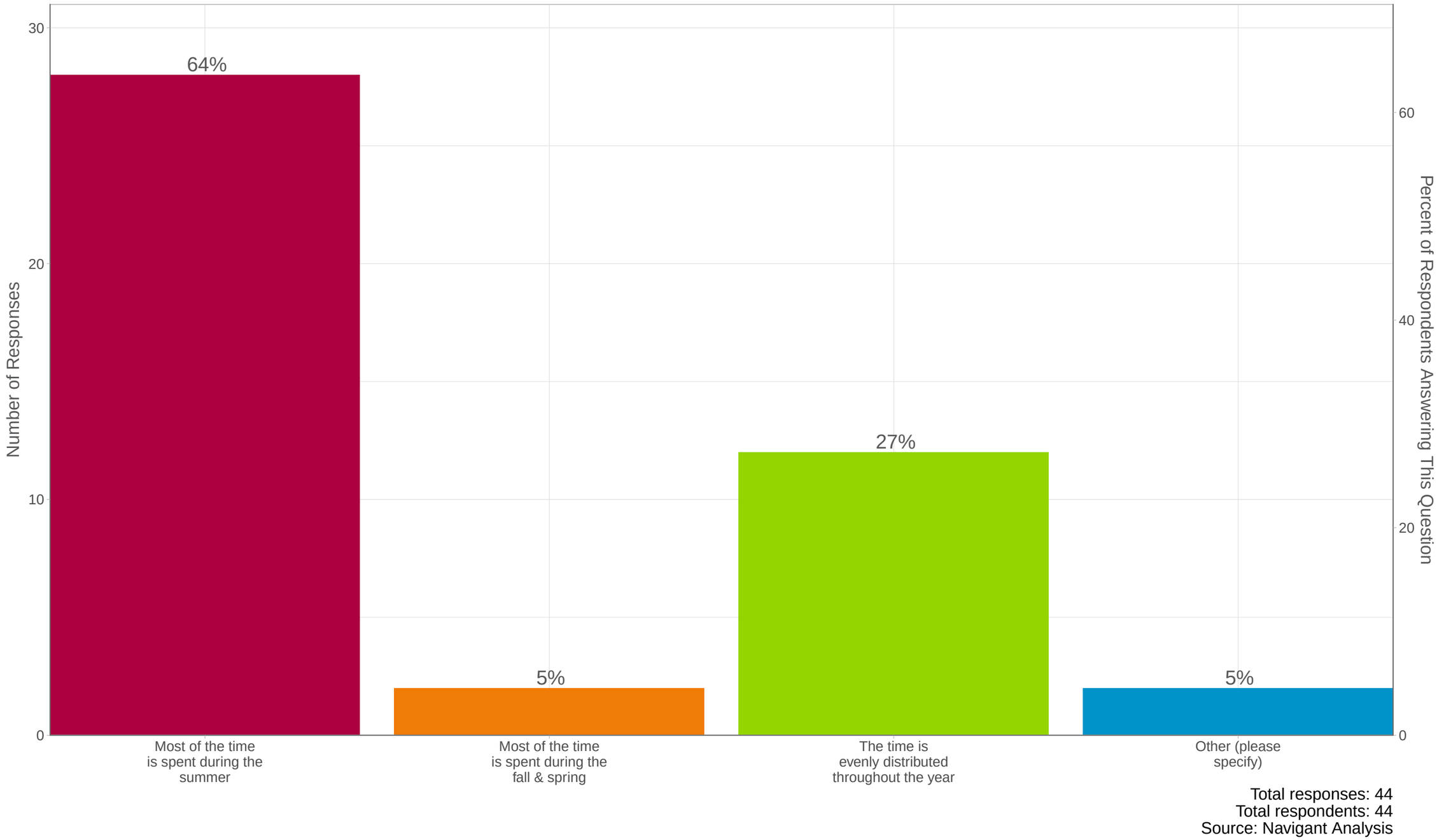
1.9 Question QI4d: When do you spend this time in the secondary residence/vacation home?



Total responses: 44
Total respondents: 44
Source: Navigant Analysis

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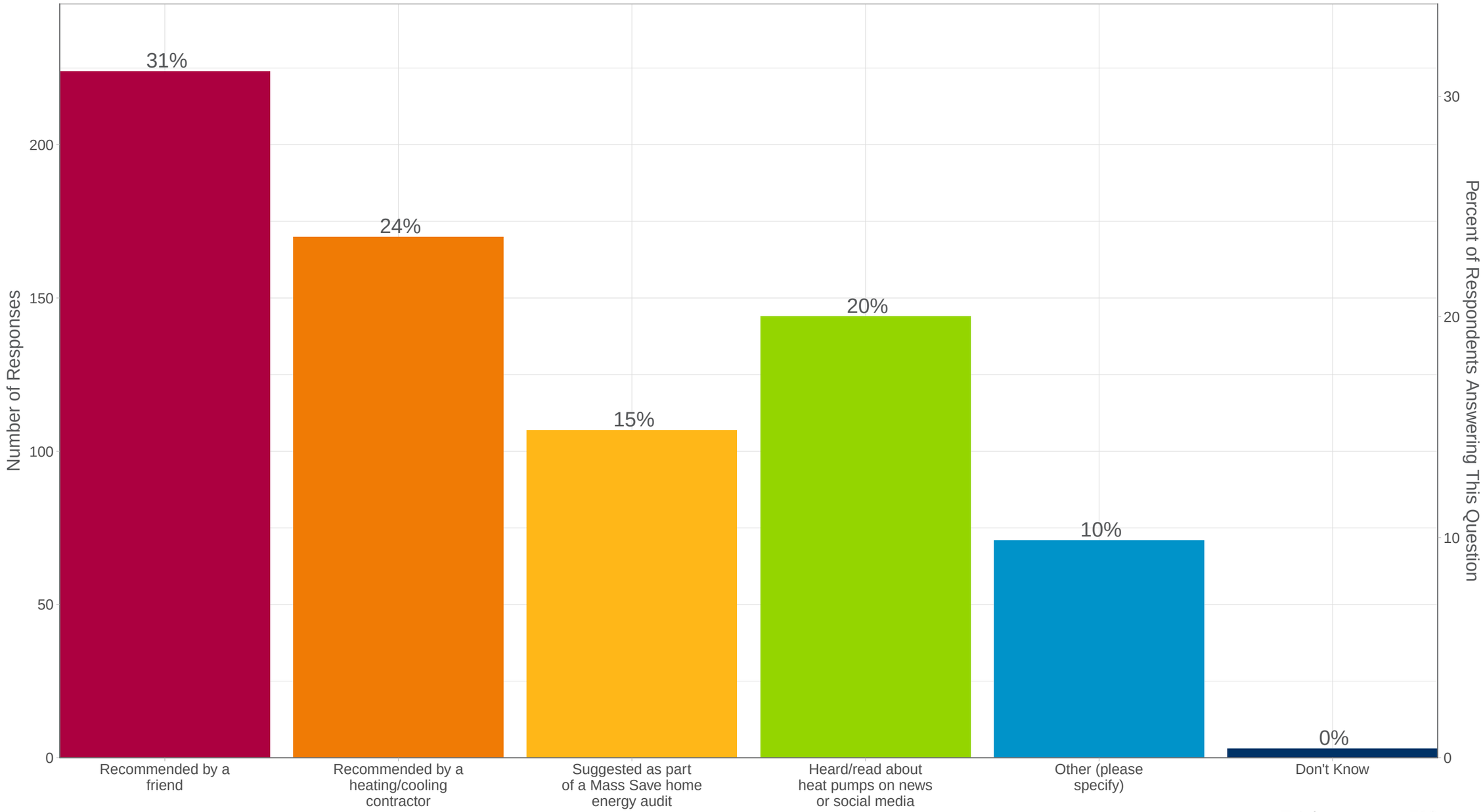
1.10 Question QD1: How did you get the idea to install a ductless mini-split heat pump in this space? (Select all that apply)



Total responses: 719
Total respondents: 554
Source: Navigant Analysis

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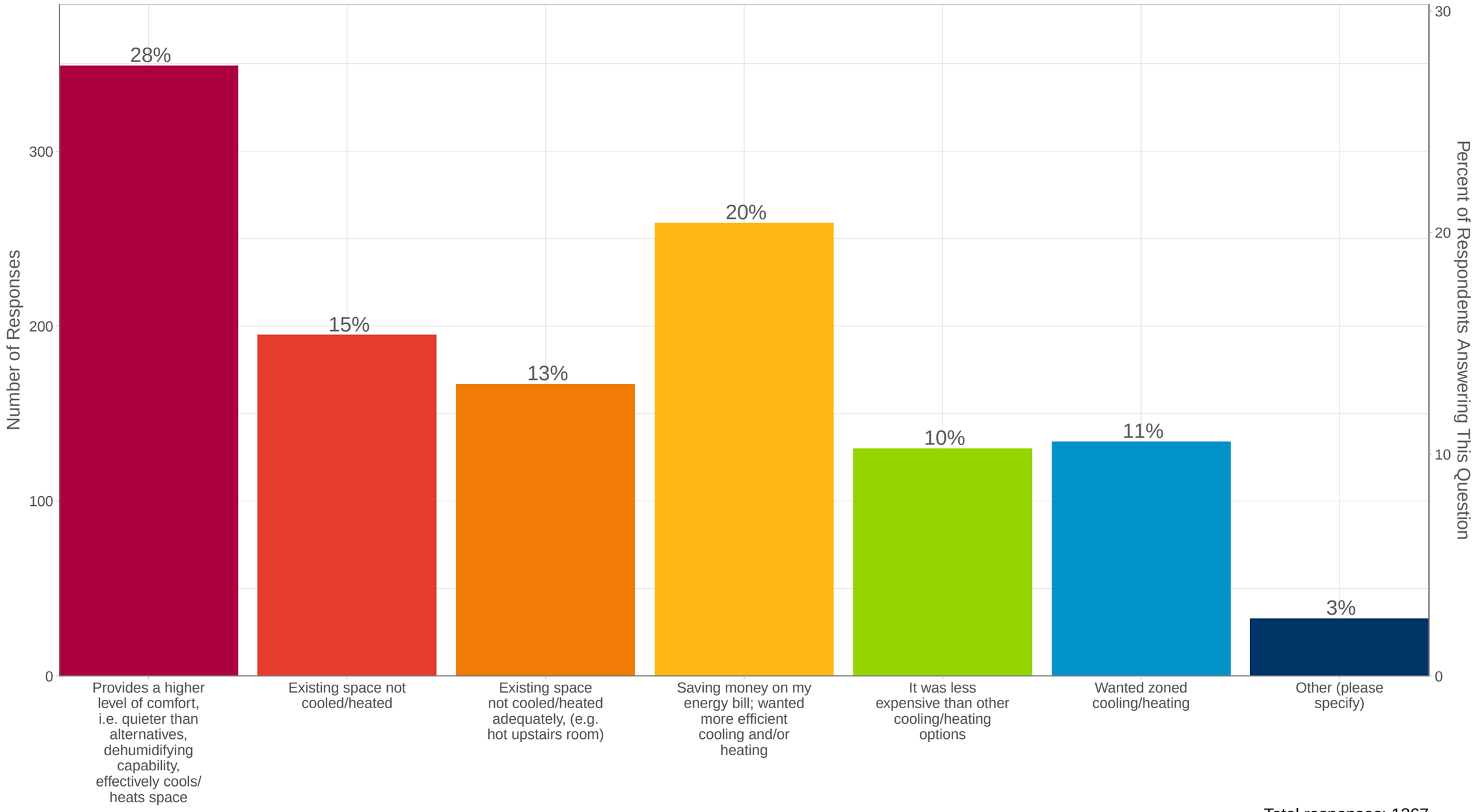
1.11 Question QD2a: What were your reasons for purchasing a ductless mini-split heat pump? (Select all that apply)



Total responses: 1267
Total respondents: 553
Source: Navigant Analysis

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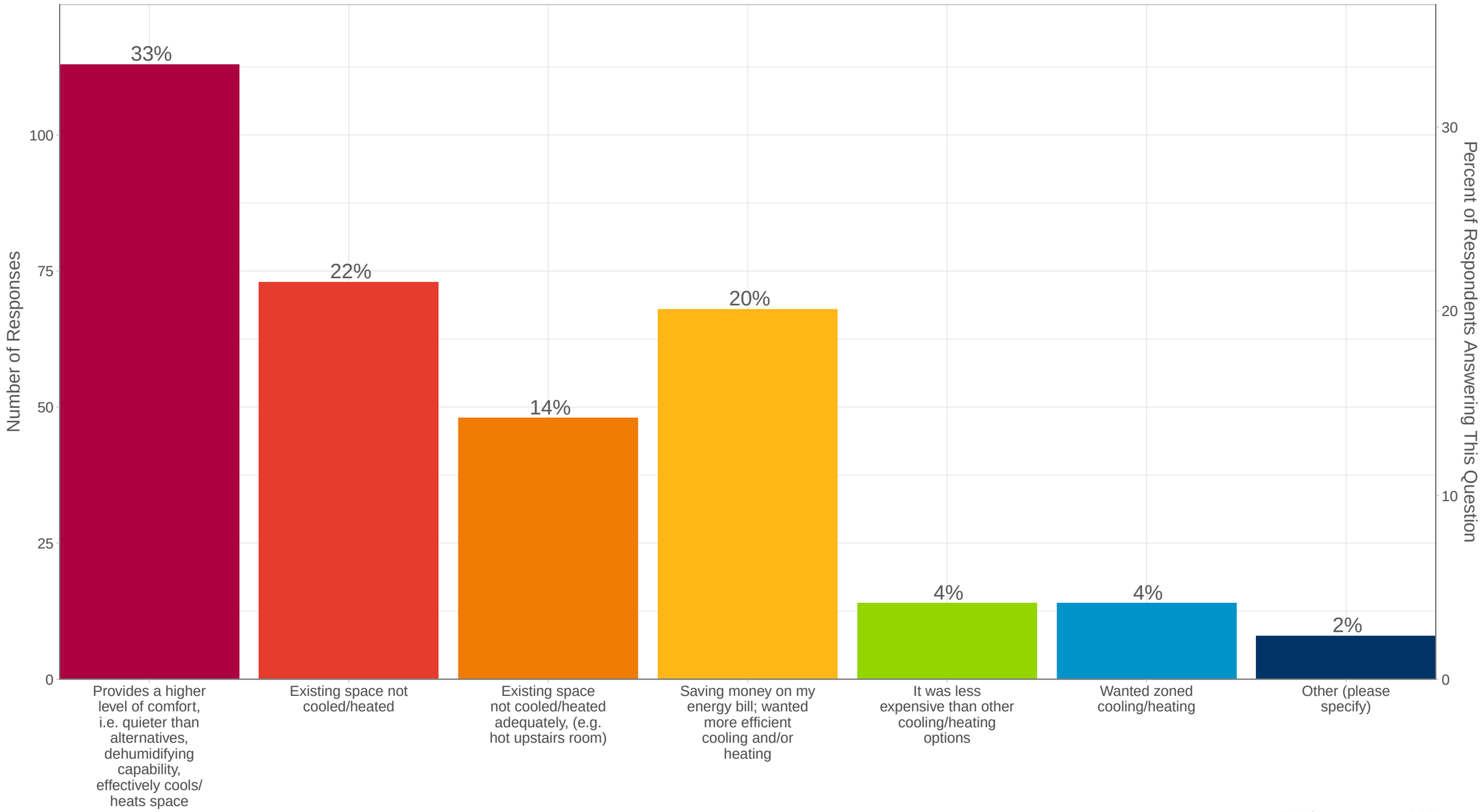
1.12 Question QD2b: From the reasons you just provided, what was your primary reason for purchasing a ductless mini-split heat pump?



Total responses: 338
Total respondents: 338
Source: Navigant Analysis

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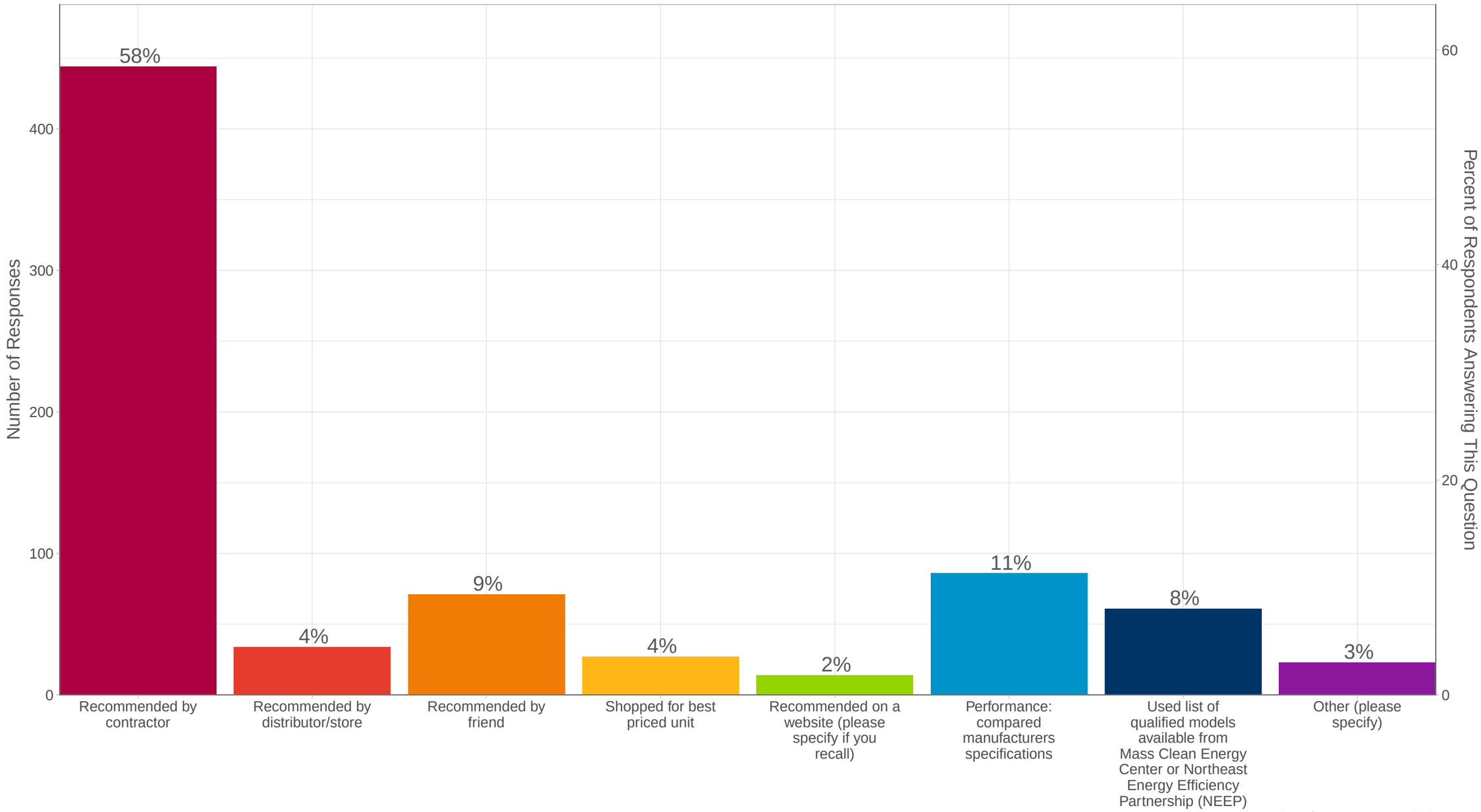
1.13 Question QD3: How did you determine which specific make and model of ductless mini-split heat pump(s) to install?



Total responses: 760
Total respondents: 554
Source: Navigant Analysis

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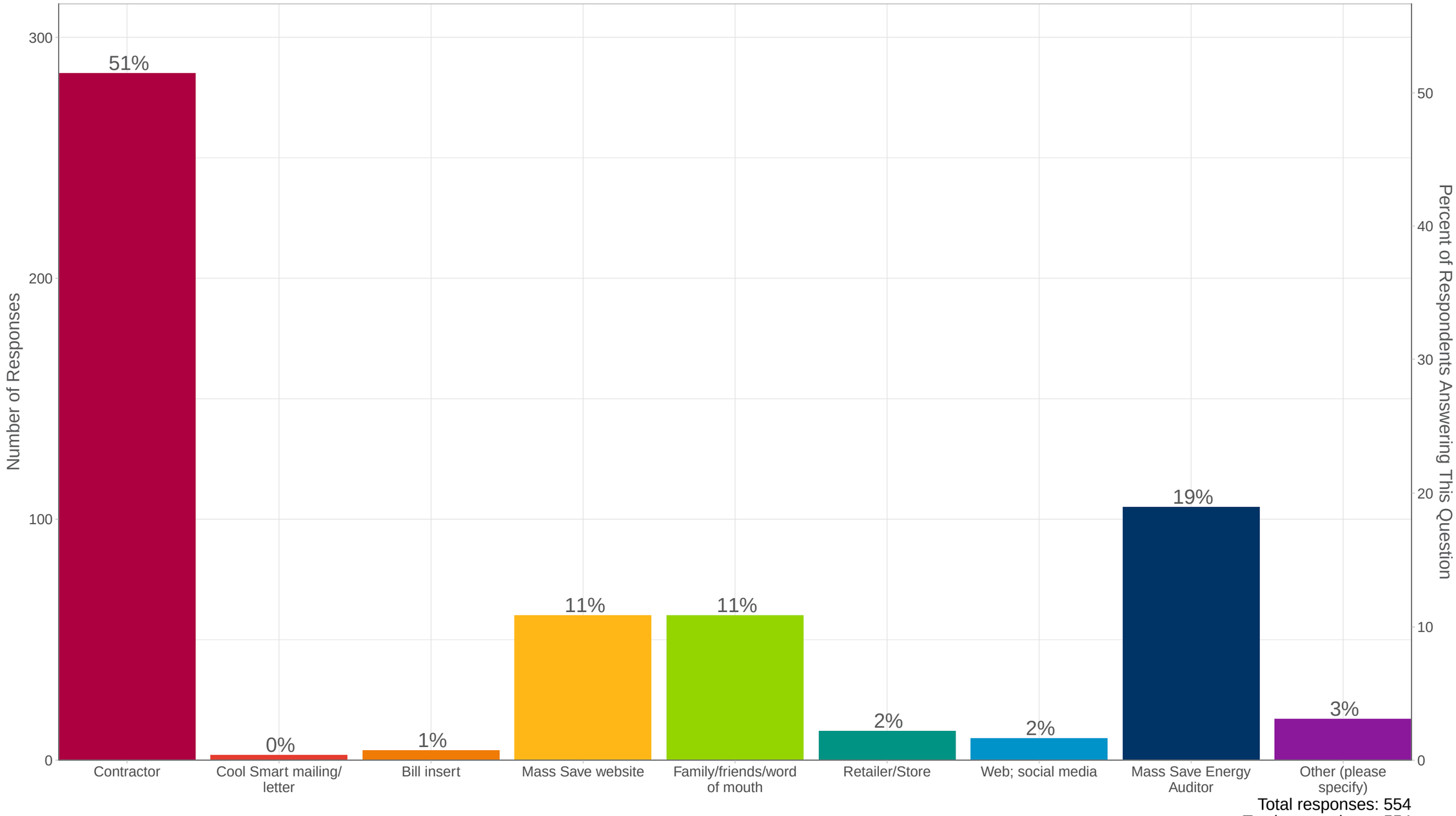
1.14 Question QD4: Where did you first learn about the Mass Save Cool Smart Program, from which you received the rebate for the ductless mini-split heat pump?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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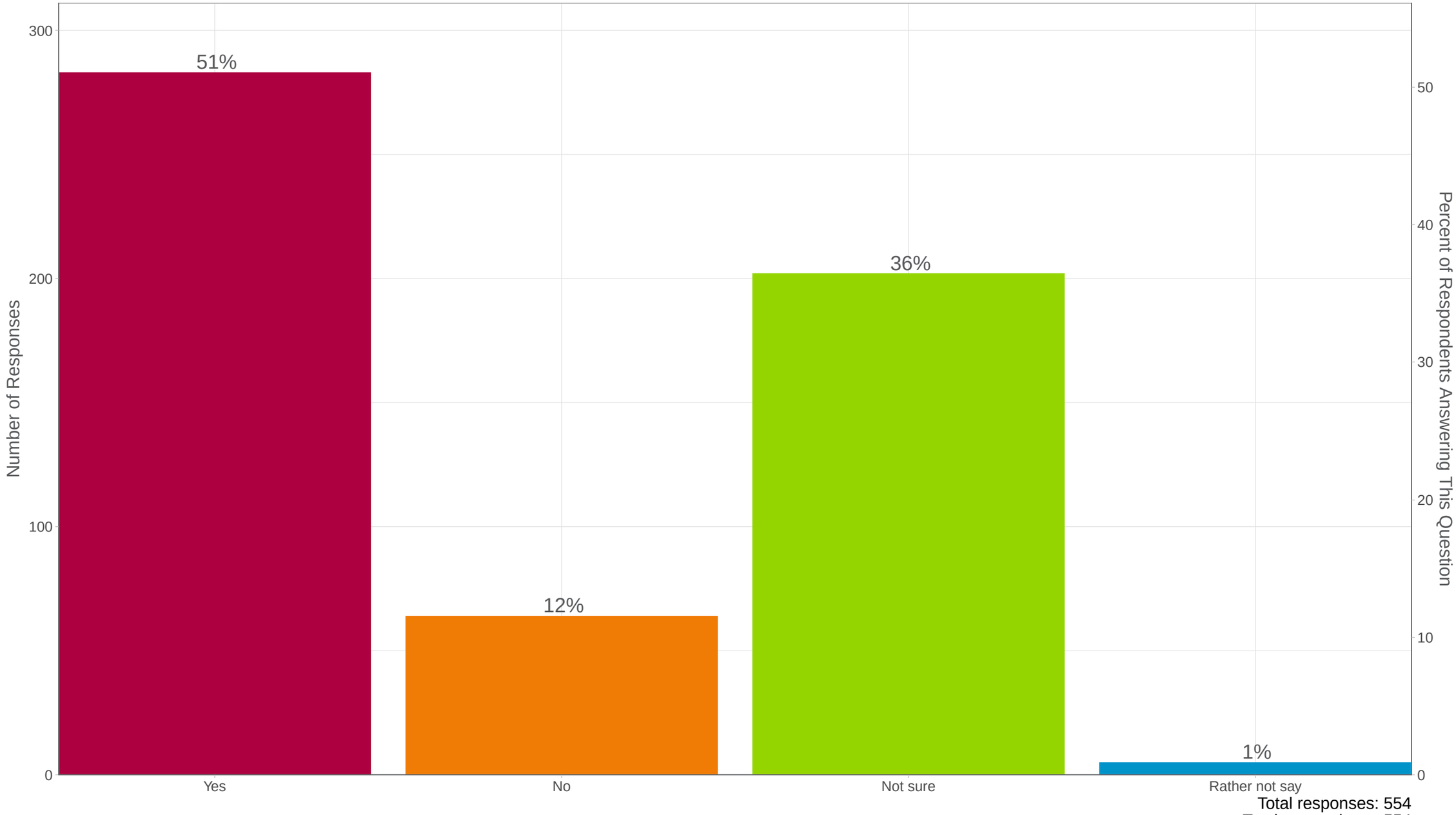
1.15 Question QD5: Would you have still purchased a ductless mini-split heat pump in the absence of available rebates or financing? As a reminder, based on the efficiency of the unit you installed, you should have received $100 or $300 per eligible indoor unit through the Mass Save program.



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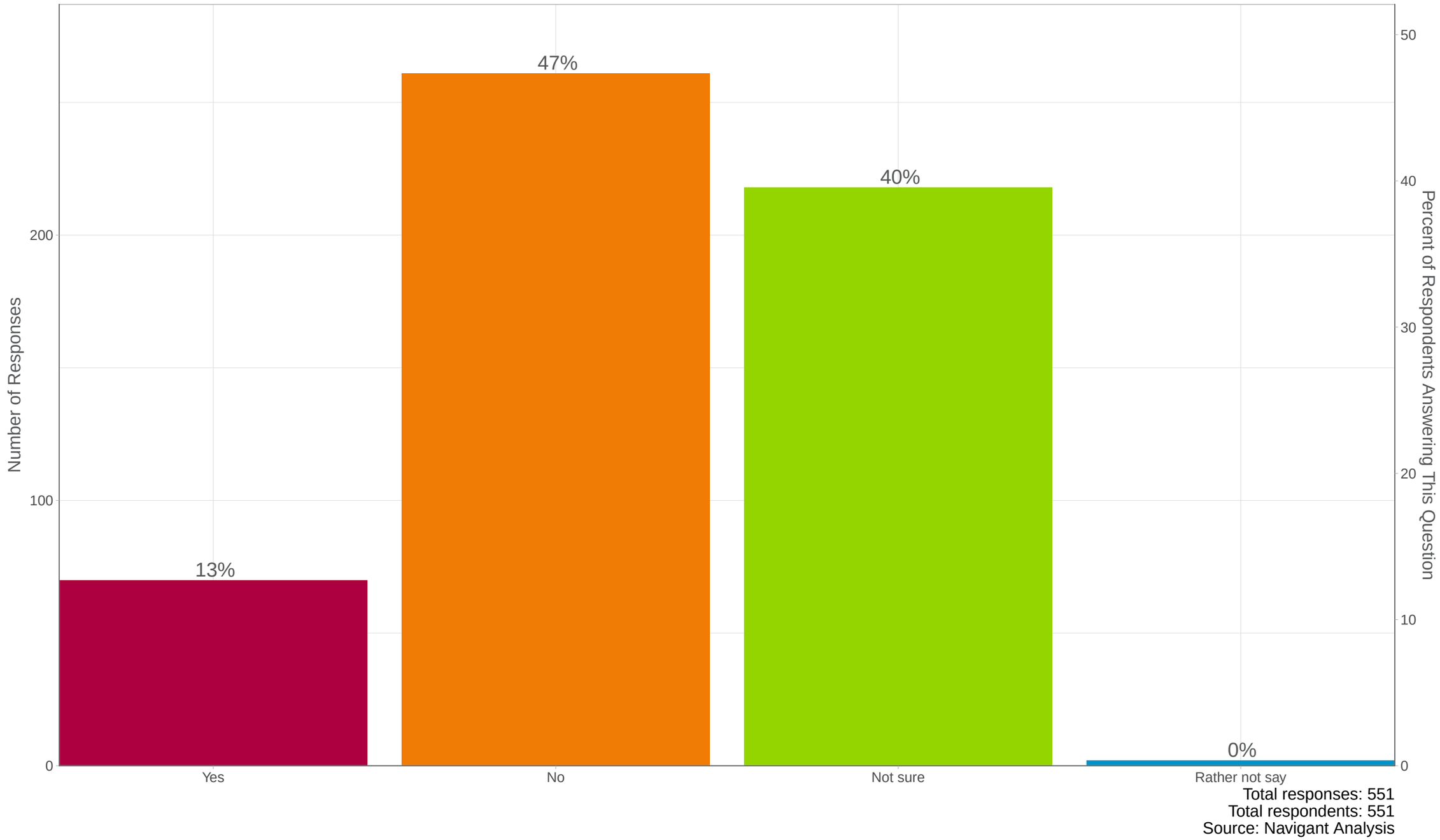
1.16 Question QD6: If rebates or financing had been unavailable, would you have purchased a less expensive, less energy efficient, ductless mini-split heat pump(s)?



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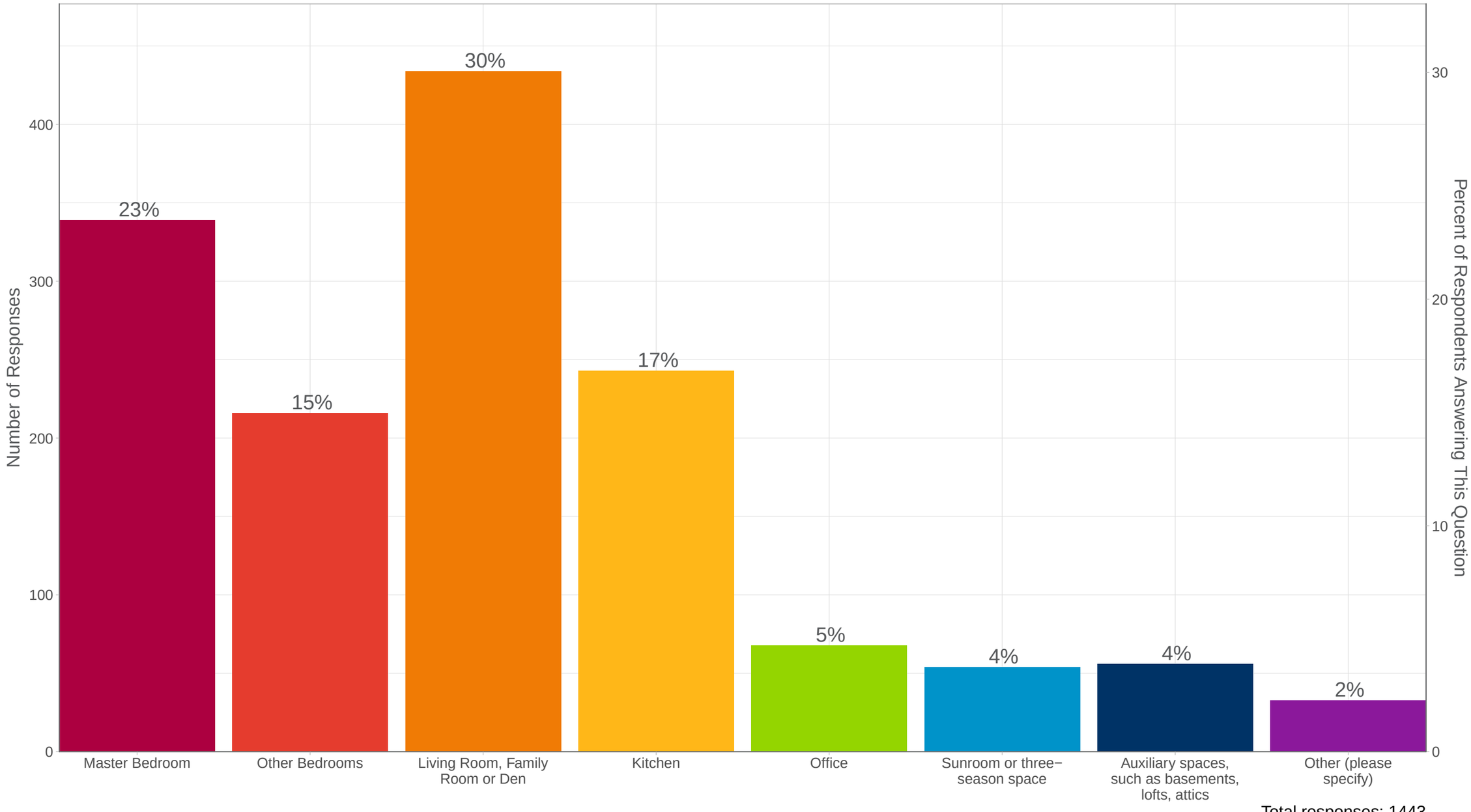
1.17 Question QF0a: What space(s) does/do your ductless mini-split heat pump system(s) serve? (Select all that apply)



Total responses: 1443
Total respondents: 554
Source: Navigant Analysis

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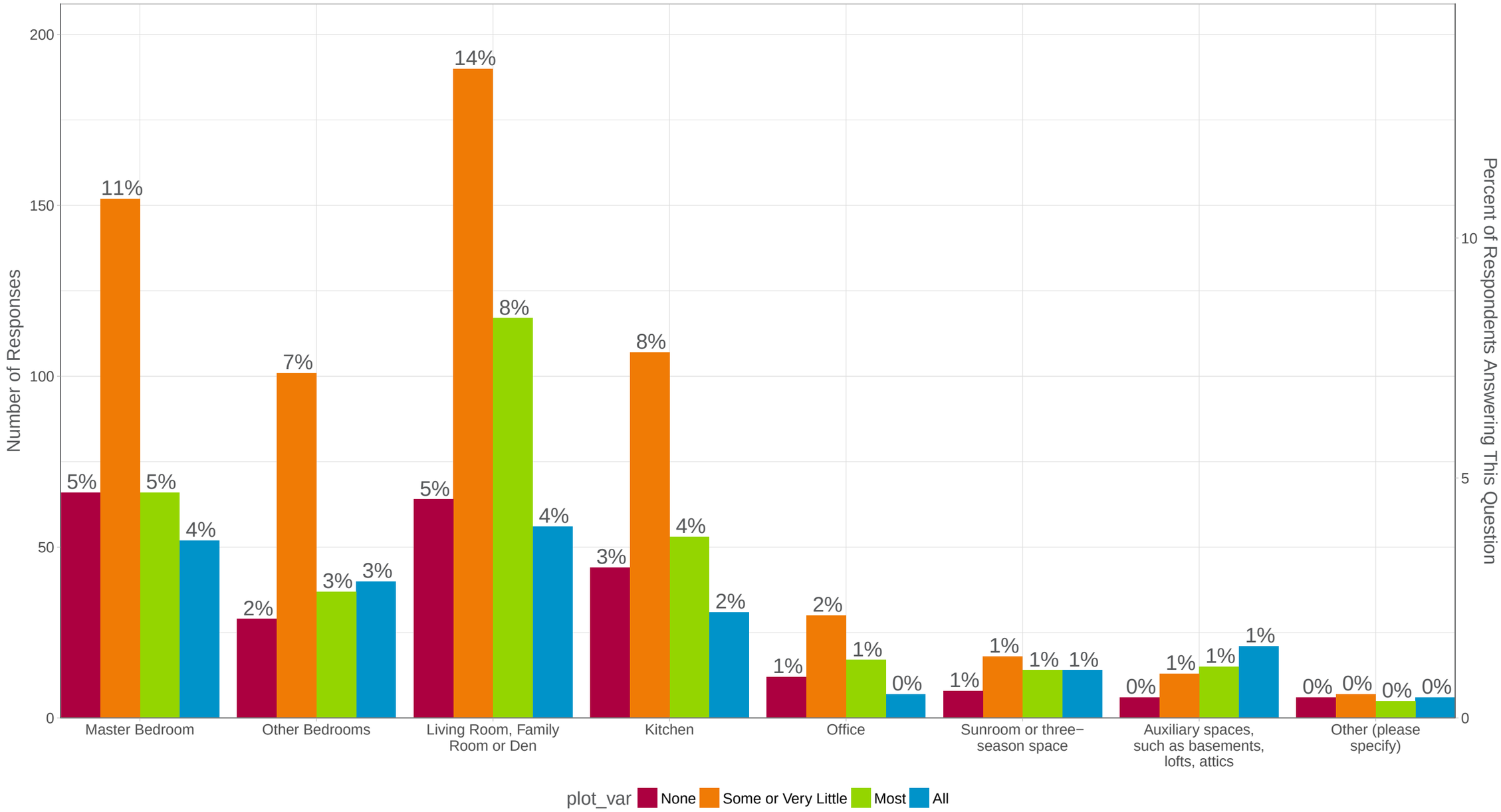
1.18 Question QF1a: How much of the heating that you typically need for each of the selected spaces is being provided by the ductless mini-split heat pump?



Total responses: 1404
Total respondents: 552
Source: Navigant Analysis

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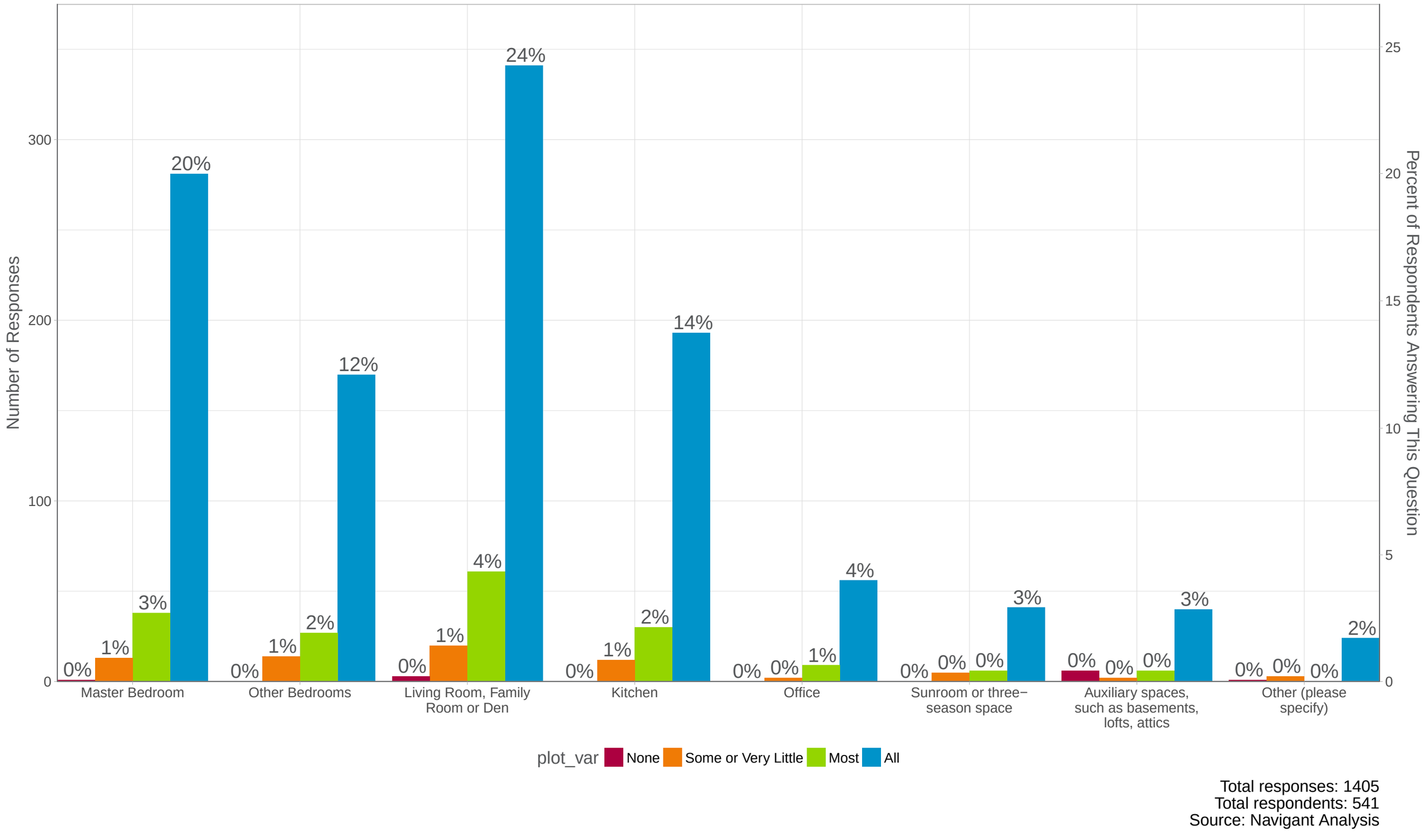
1.19 Question QF1b: How much of the cooling that you typically need for each of the selected spaces is being provided by the ductless mini-split heat pump?



Total responses: 1405
Total respondents: 541
Source: Navigant Analysis

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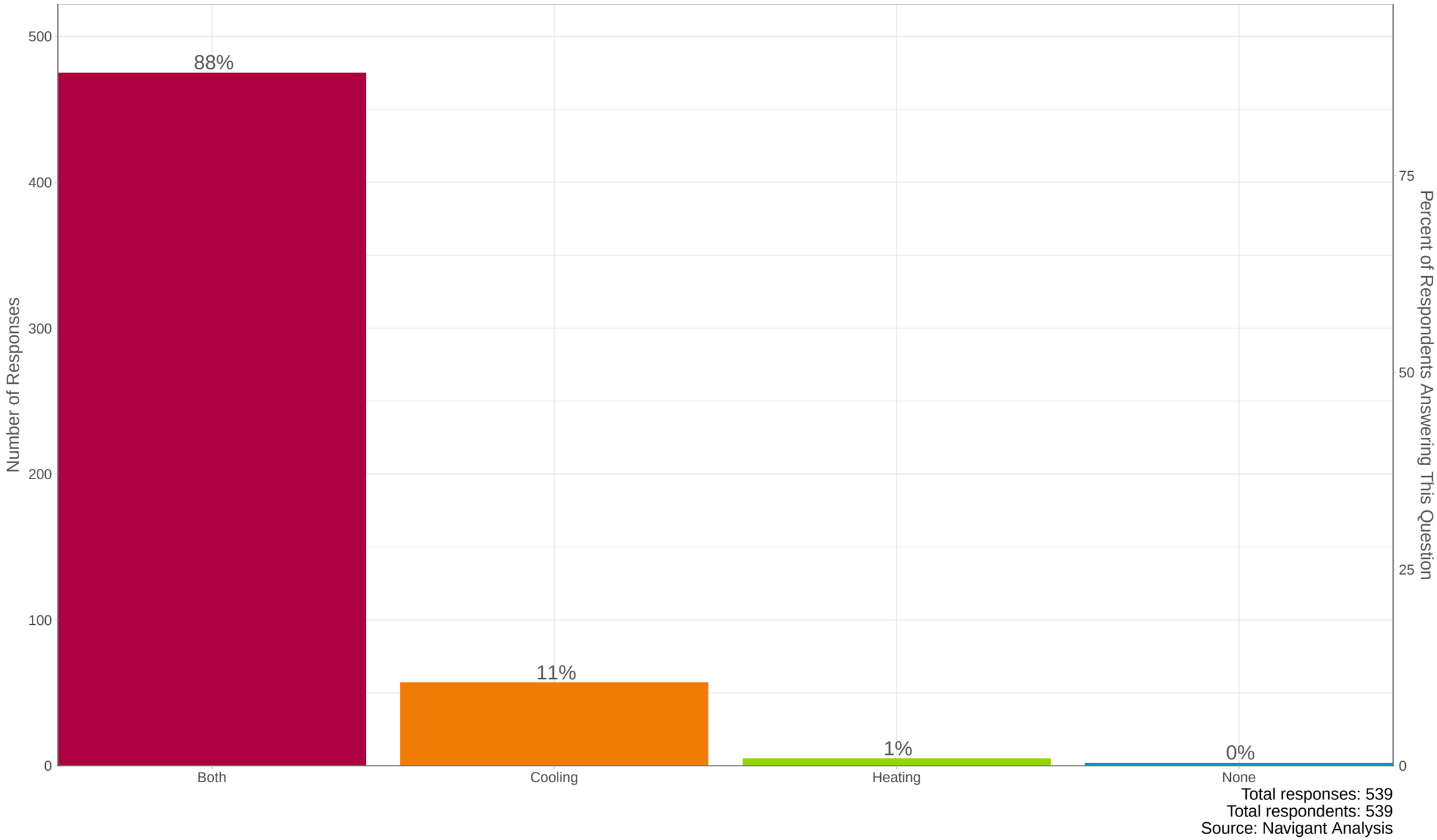
1.20 Question QF1: System Use



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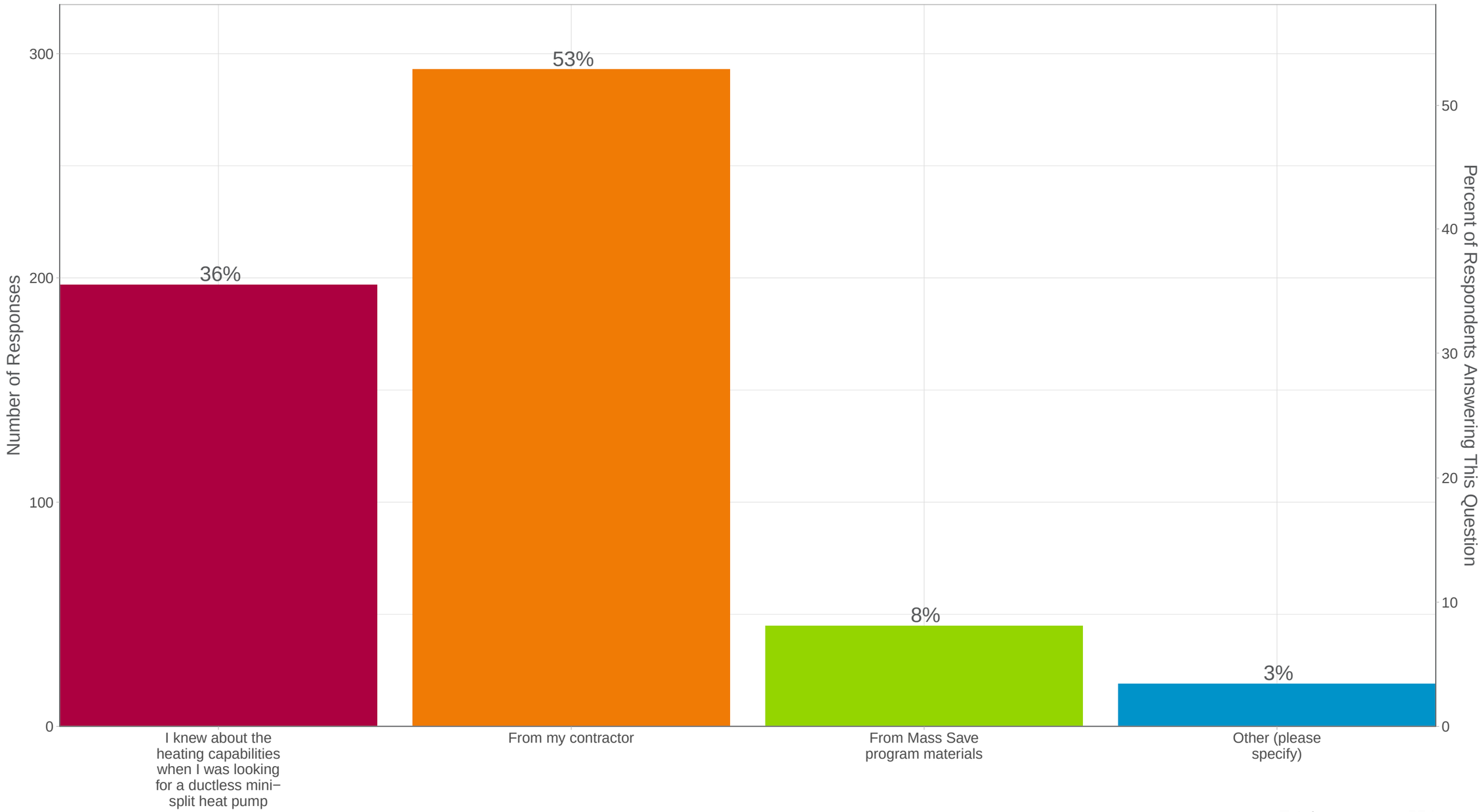
1.21 Question QF2: How did you learn about the heating capabilities of the ductless mini-split heat pump system?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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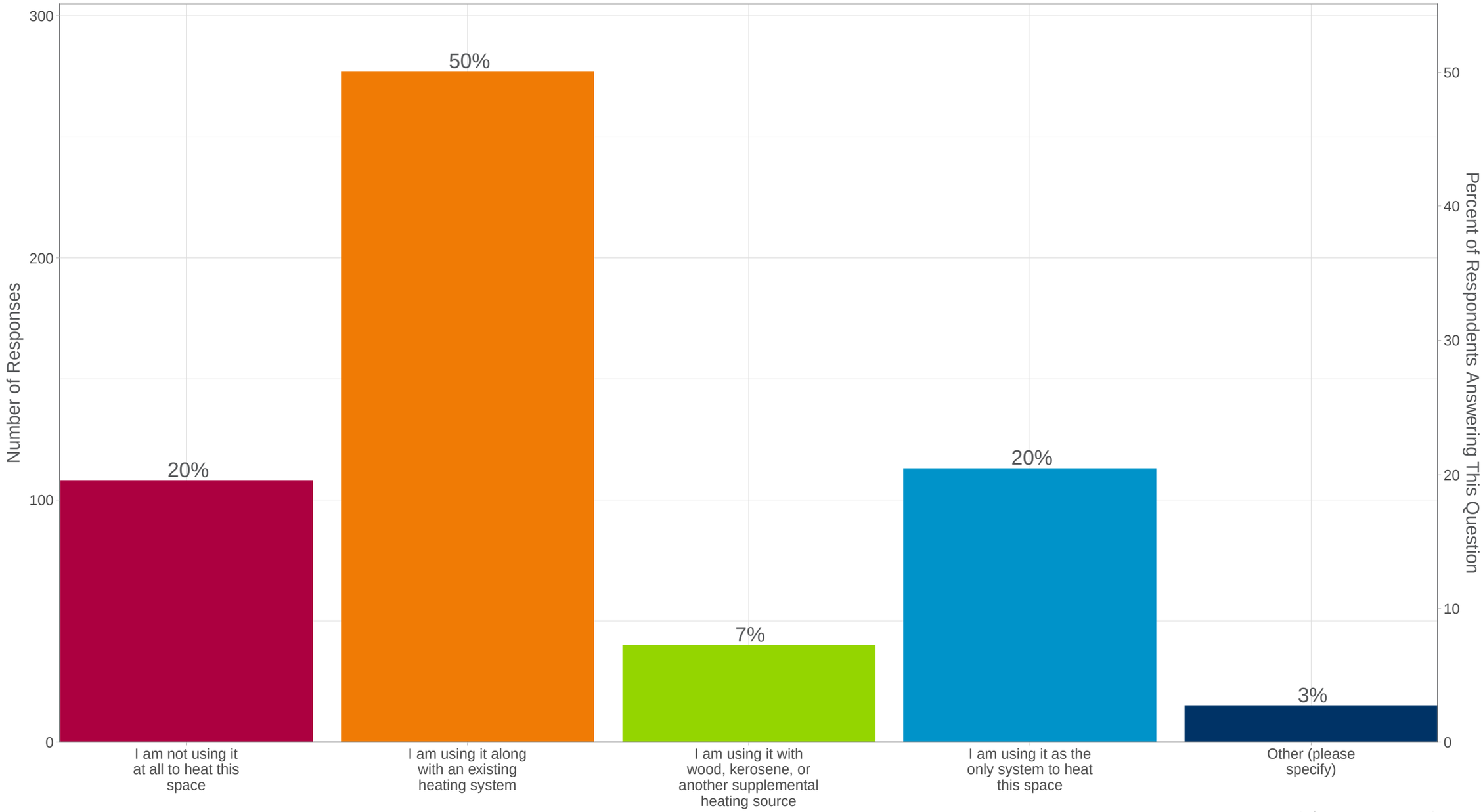
1.22 Question QF3a: This winter season, how are you using your ductless mini-split heat pump to heat the designated space?



Total responses: 553
Total respondents: 553
Source: Navigant Analysis

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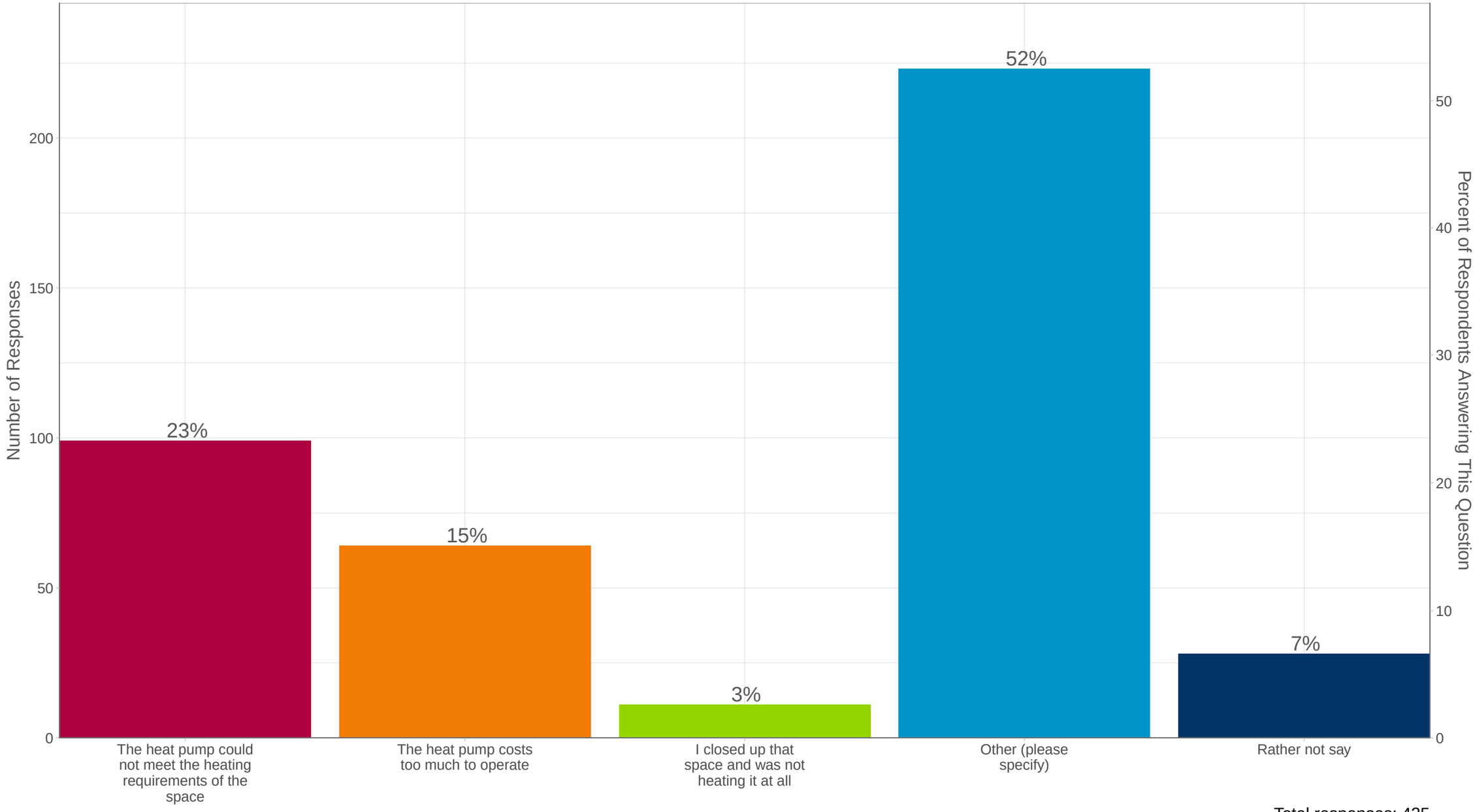
1.23 Question QF3b: What is the reason that you did not rely solely on the ductless mini-split heat pump to heat this space?



Total responses: 425
Total respondents: 425
Source: Navigant Analysis

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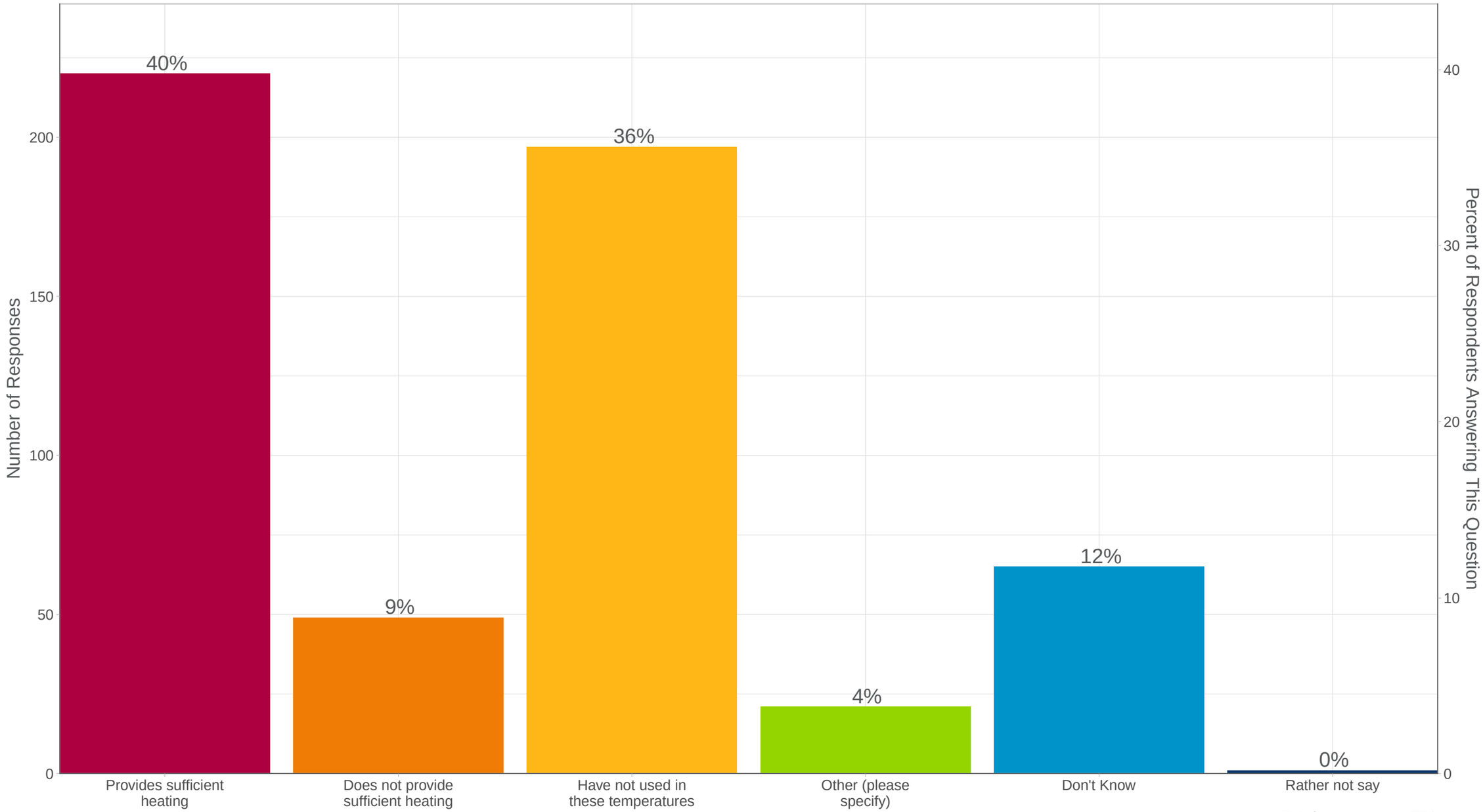
1.24 Question QF4a: How has the ductless mini-split heat pump system performed in terms of heating during extremely cold temperatures below 15°F?



Total responses: 553
Total respondents: 553
Source: Navigant Analysis

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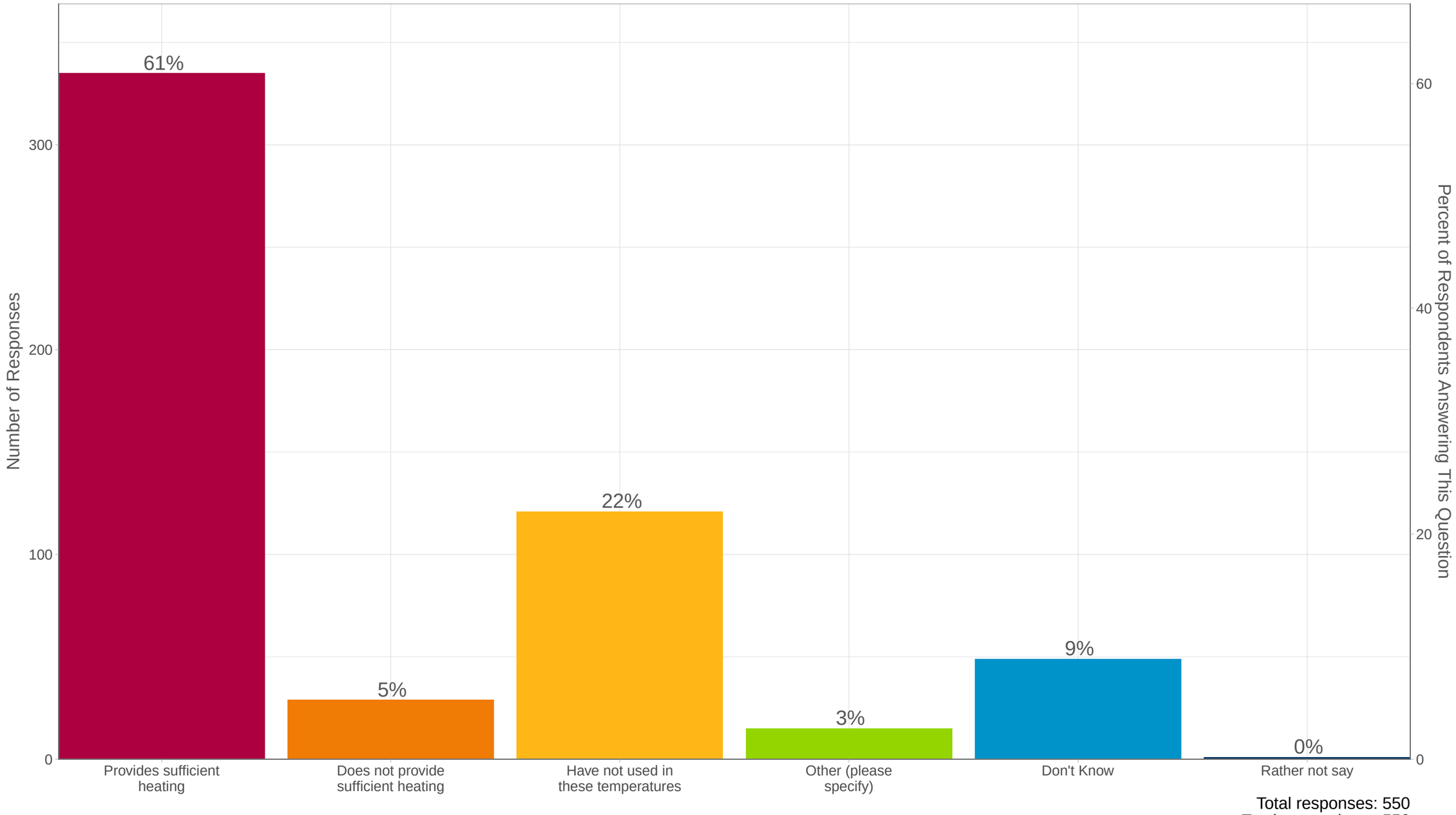
1.25 Question QF4b: How has the ductless mini-split heat pump system performed in terms of heating during cold temperatures between 15°F and 30°F?



Total responses: 550
Total respondents: 550
Source: Navigant Analysis

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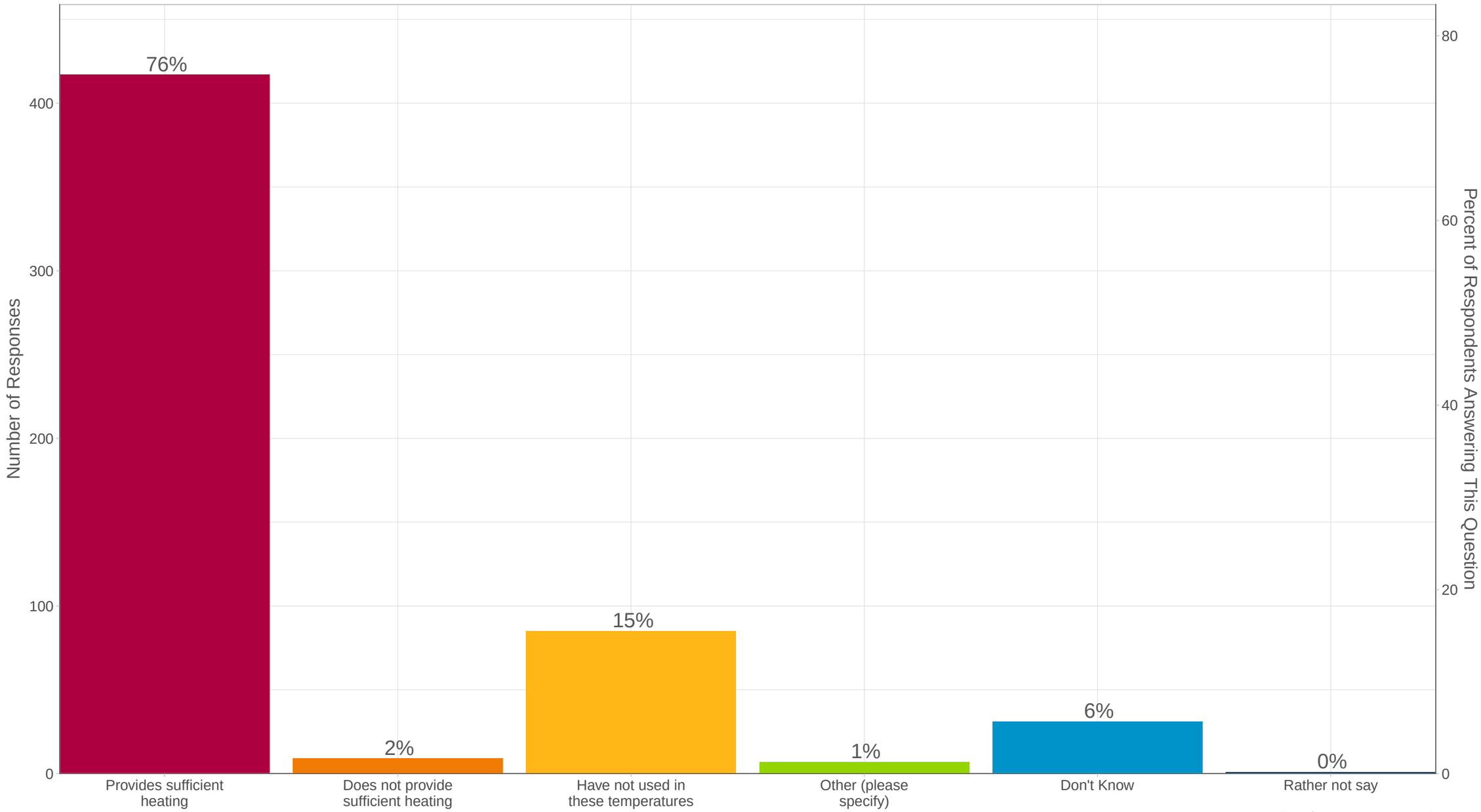
1.26 Question QF4c: How has the ductless mini-split heat pump system performed in terms of heating during cool temperatures between 30°F and 50°F?



Total responses: 550
Total respondents: 550
Source: Navigant Analysis

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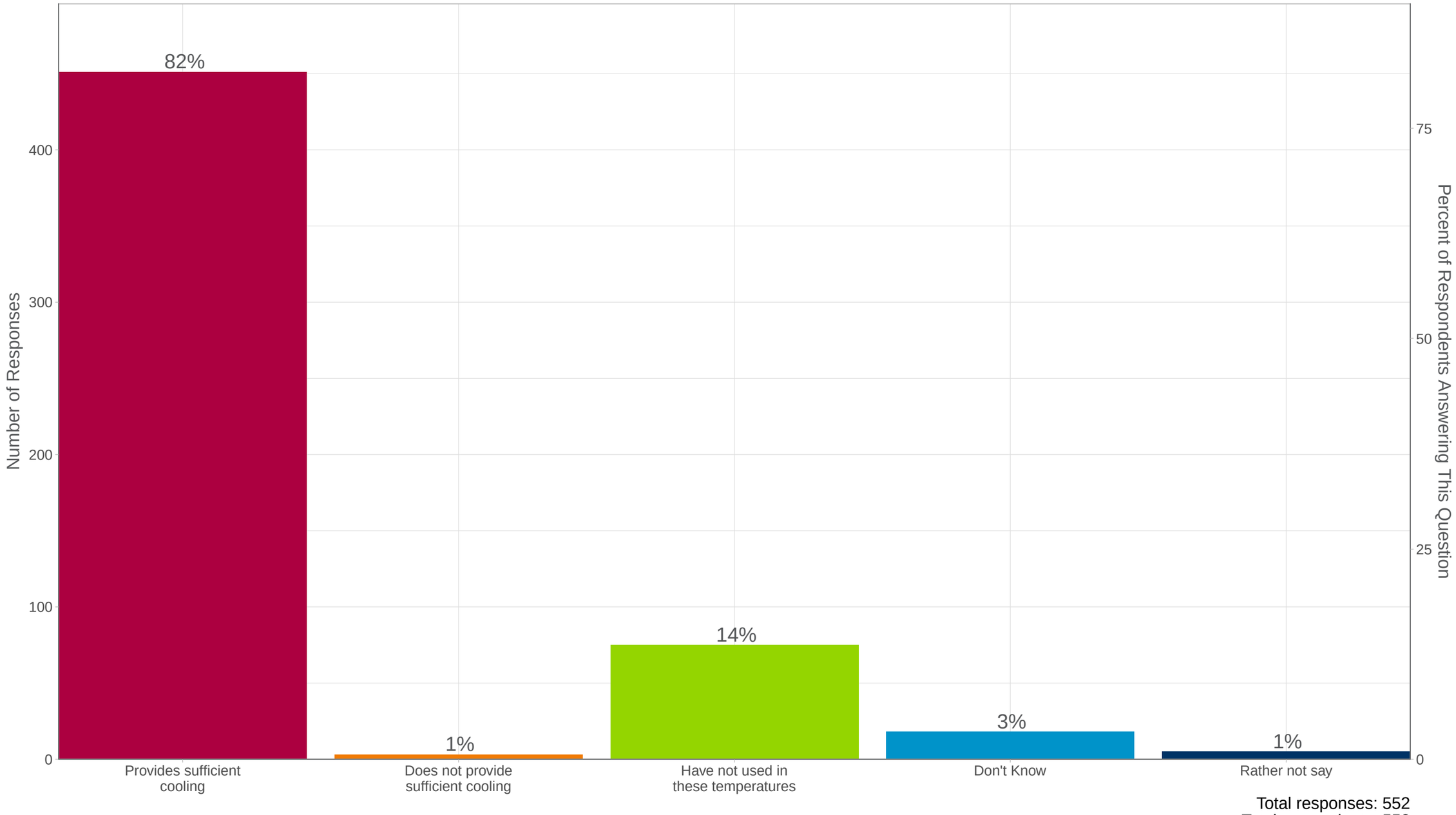
1.27 Question QF4d: How has the ductless mini-split heat pump system performed in terms of cooling during warm temperatures between 70°F and 80°F?



Total responses: 552
Total respondents: 552
Source: Navigant Analysis

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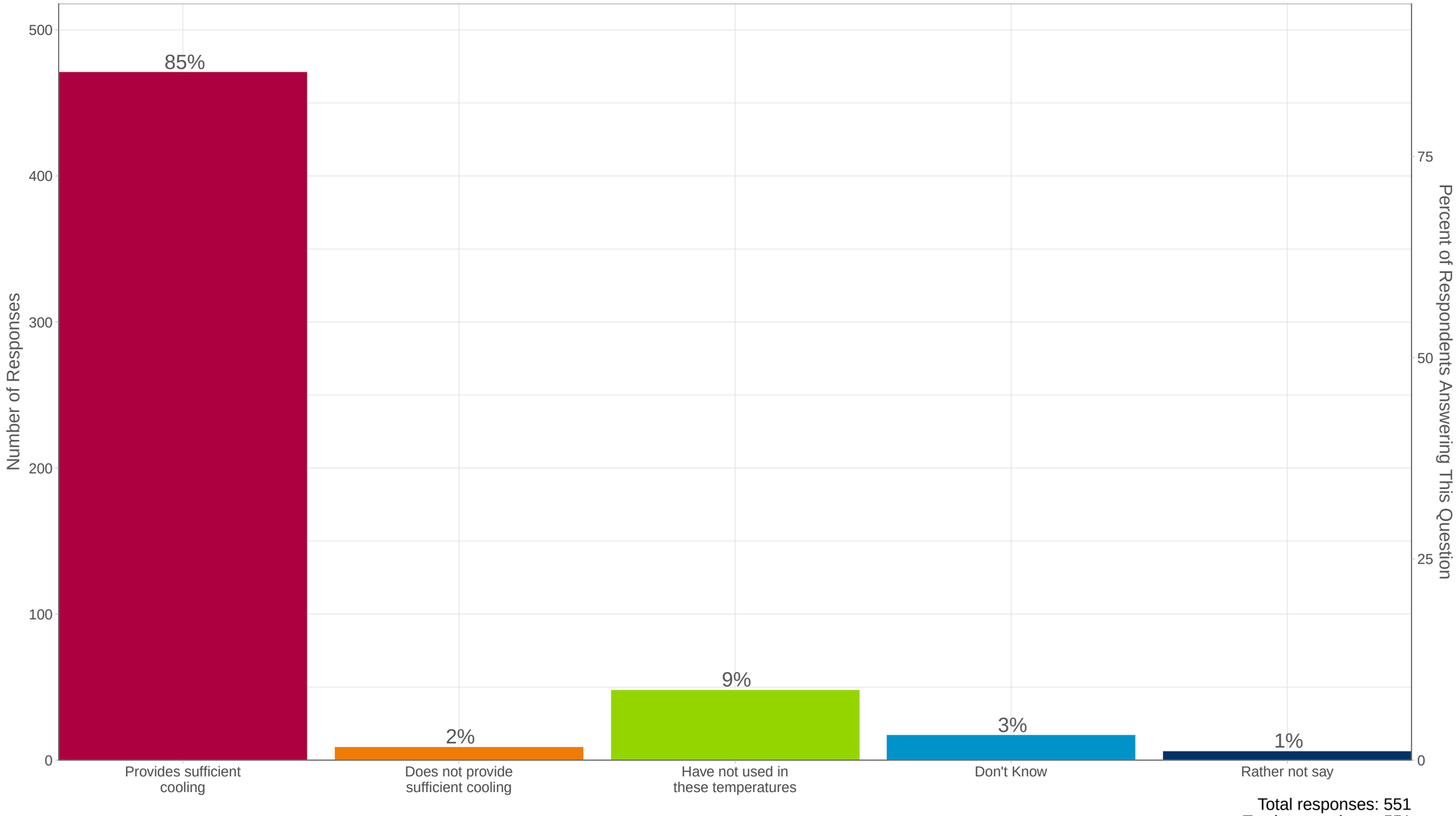
1.28 Question QF4e: How has the ductless mini-split heat pump system performed in terms of cooling during warm temperatures between 80°F and 90°F?



Total responses: 551
Total respondents: 551
Source: Navigant Analysis

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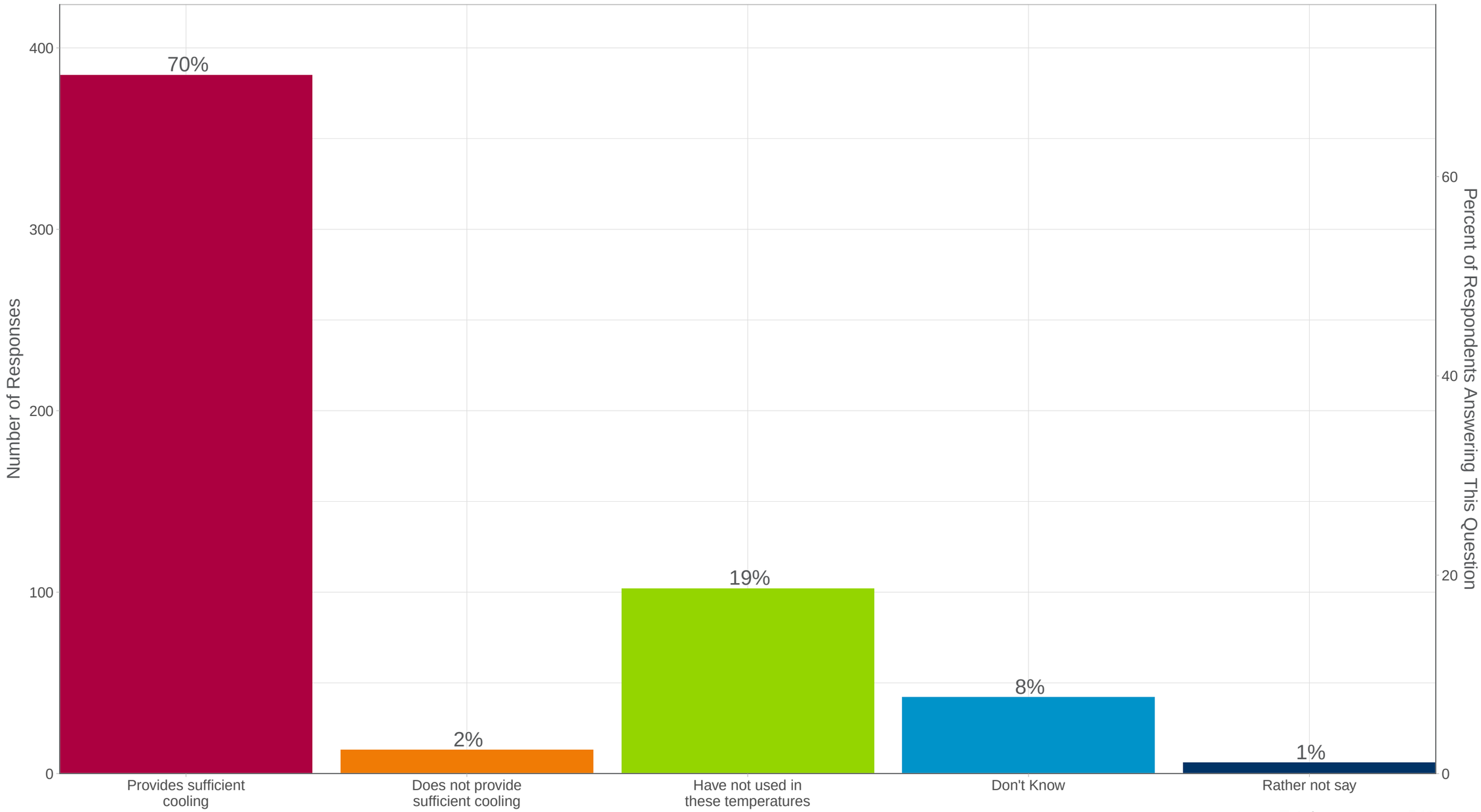
1.29 Question QF4f: How has the ductless mini-split heat pump system performed in terms of cooling during extremely hot temperatures above 90°F?



Total responses: 548
Total respondents: 548
Source: Navigant Analysis

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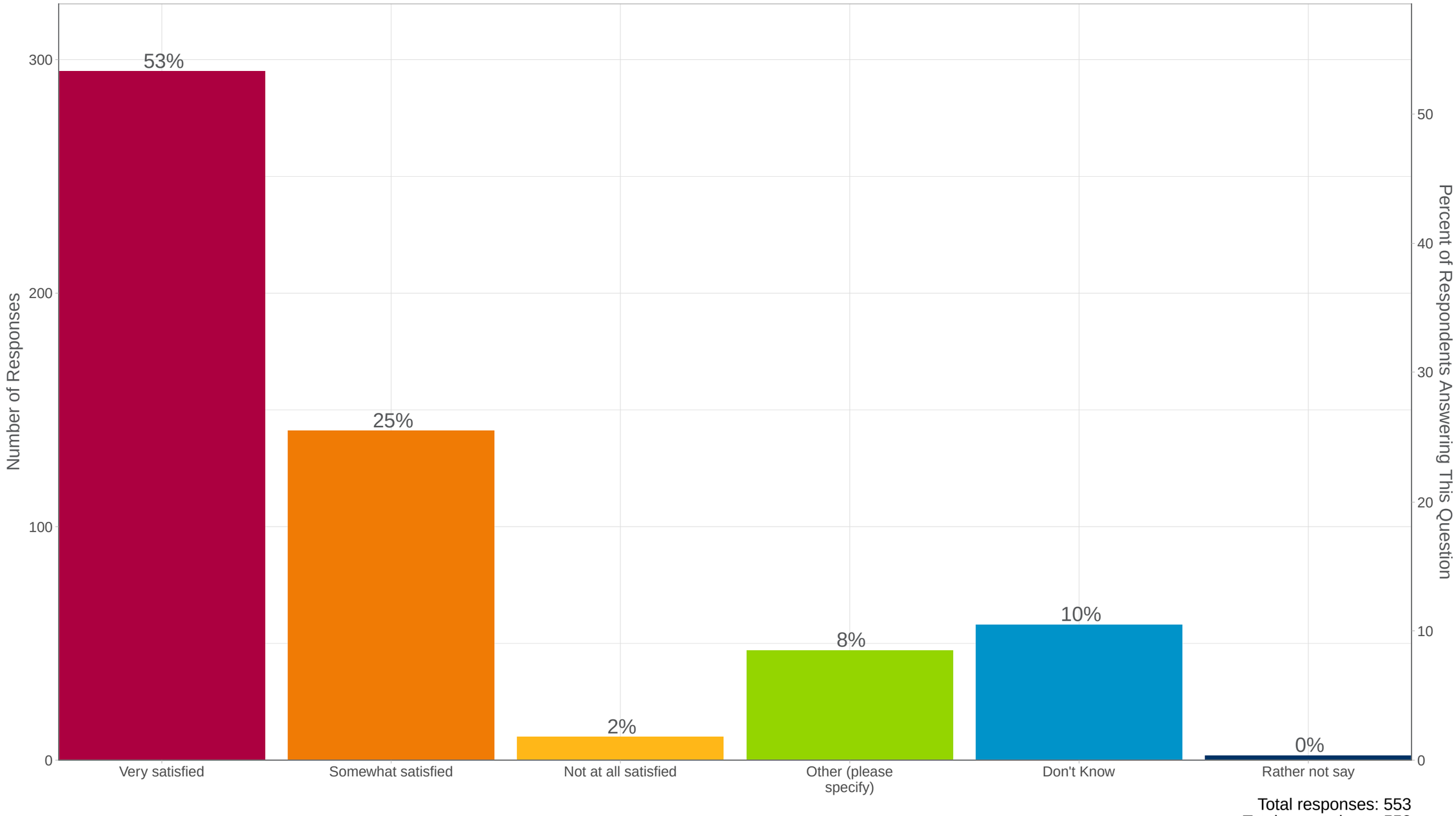
1.30 Question QF5: So far, how satisfied have you been with the cost of your heating using the ductless mini-split heat pump?



Total responses: 553
Total respondents: 553
Source: Navigant Analysis

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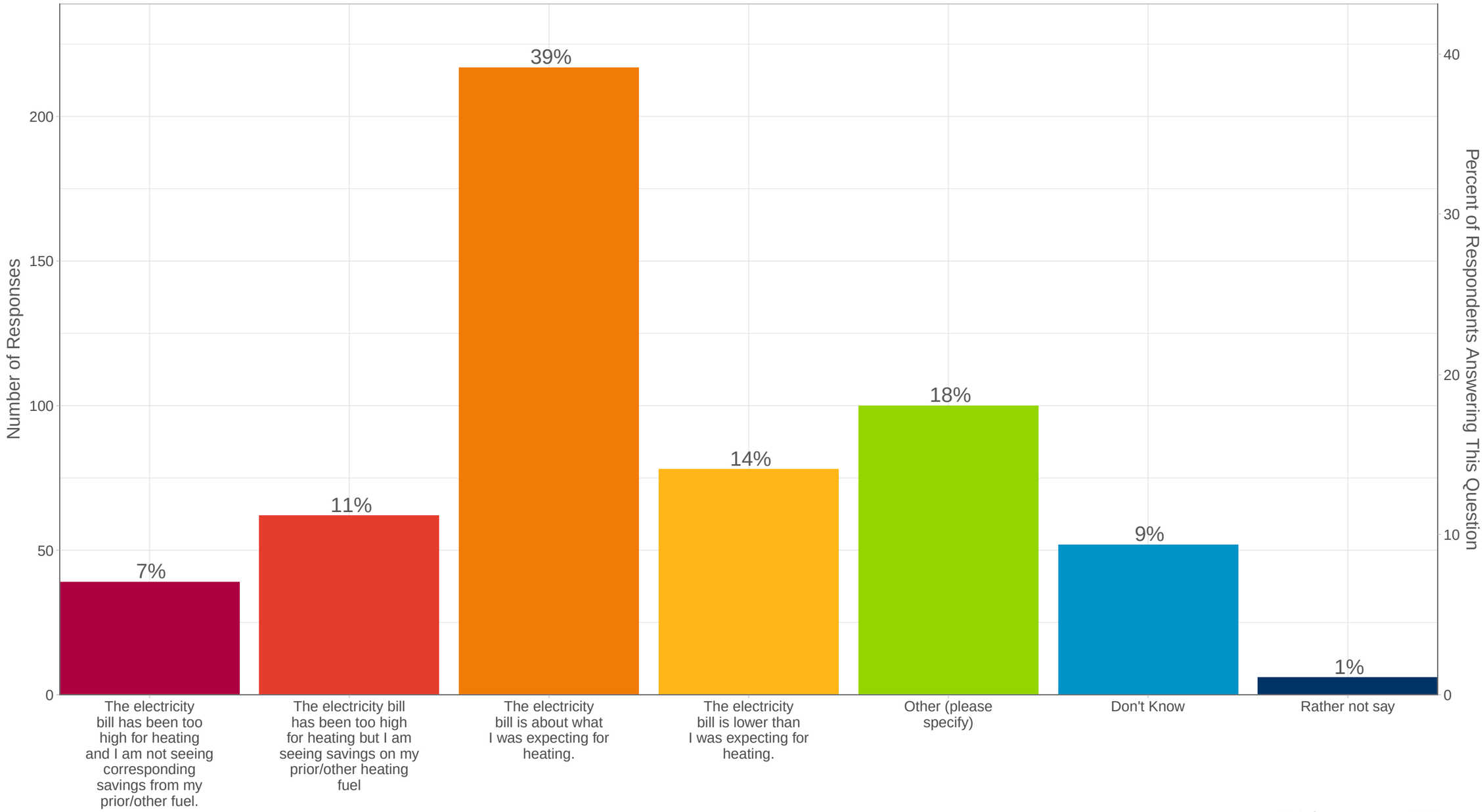
1.31 Question QF6: Why did you give the rating that you did on the previous question?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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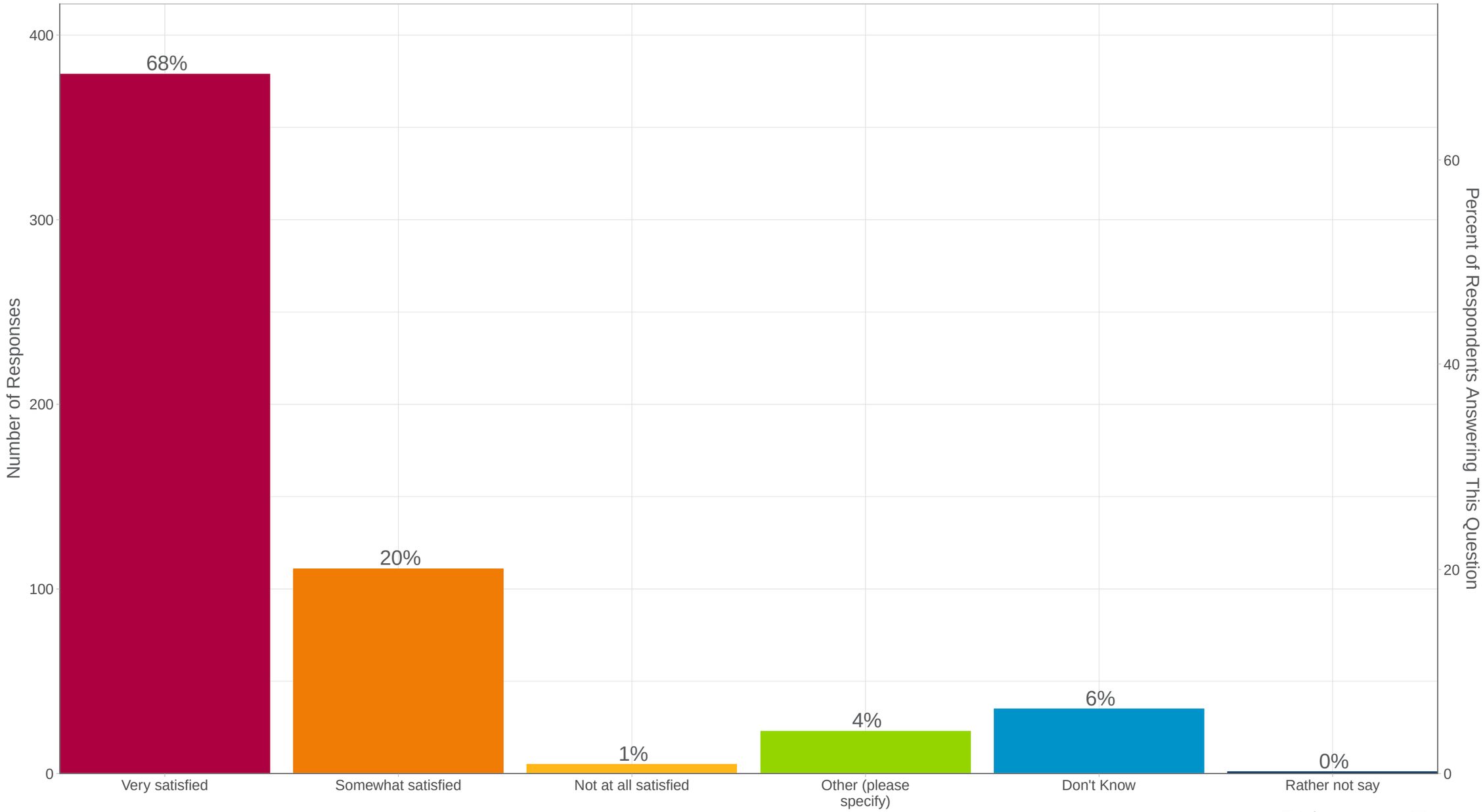
1.32 Question QF7: So far, how satisfied have you been with the cost of your cooling using the ductless mini-split heat pump?



Total responses: 554
Total respondents: 554
Source: Navigant Analysis

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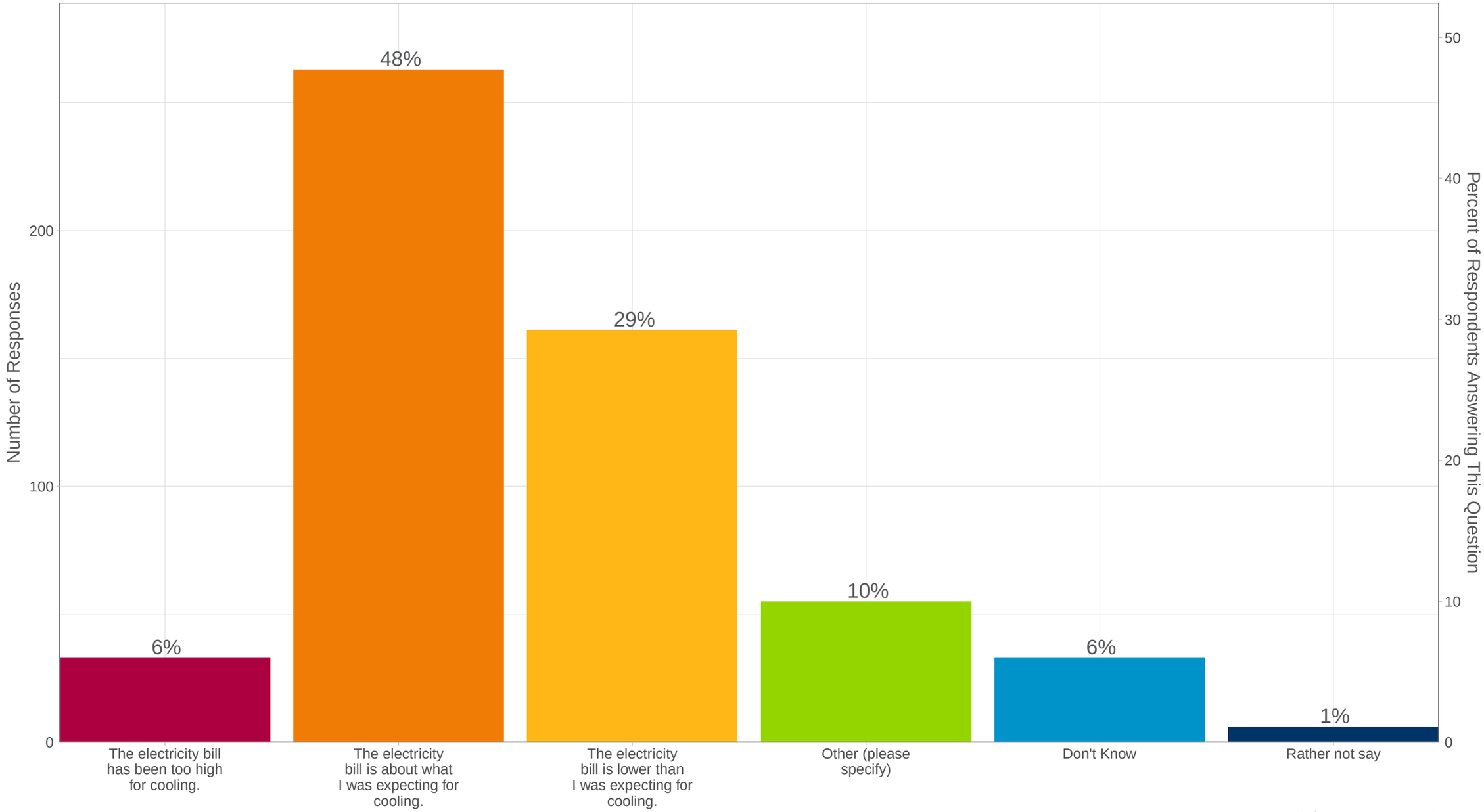
1.33 Question QF8: Why did you give the rating that you did on the previous question?



Total responses: 551
Total respondents: 551
Source: Navigant Analysis

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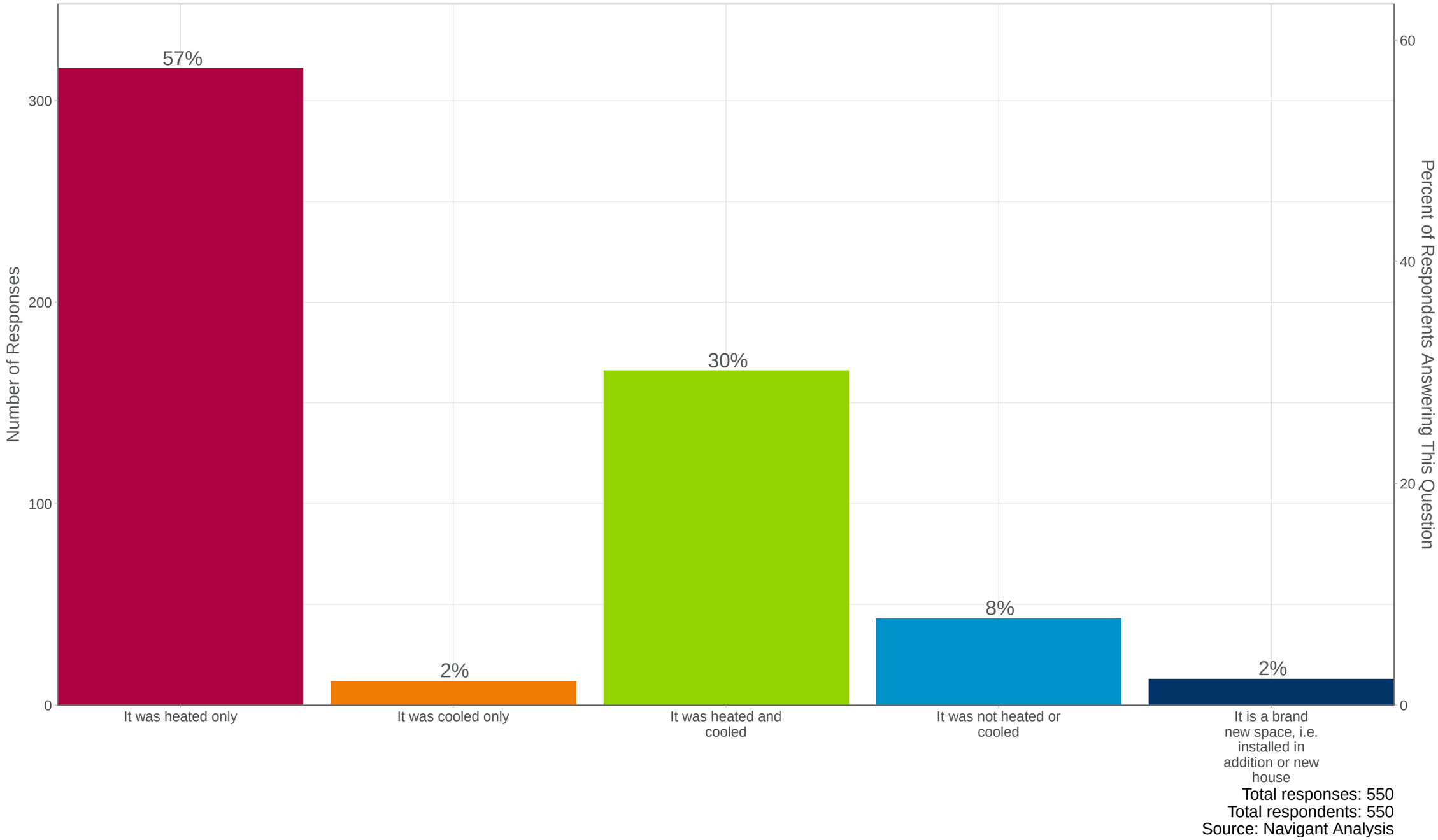
1.34 Question QB1: Was the space heated and/or cooled before the installation of the ductless mini-split heat pump?



Total responses: 550
Total respondents: 550
Source: Navigant Analysis

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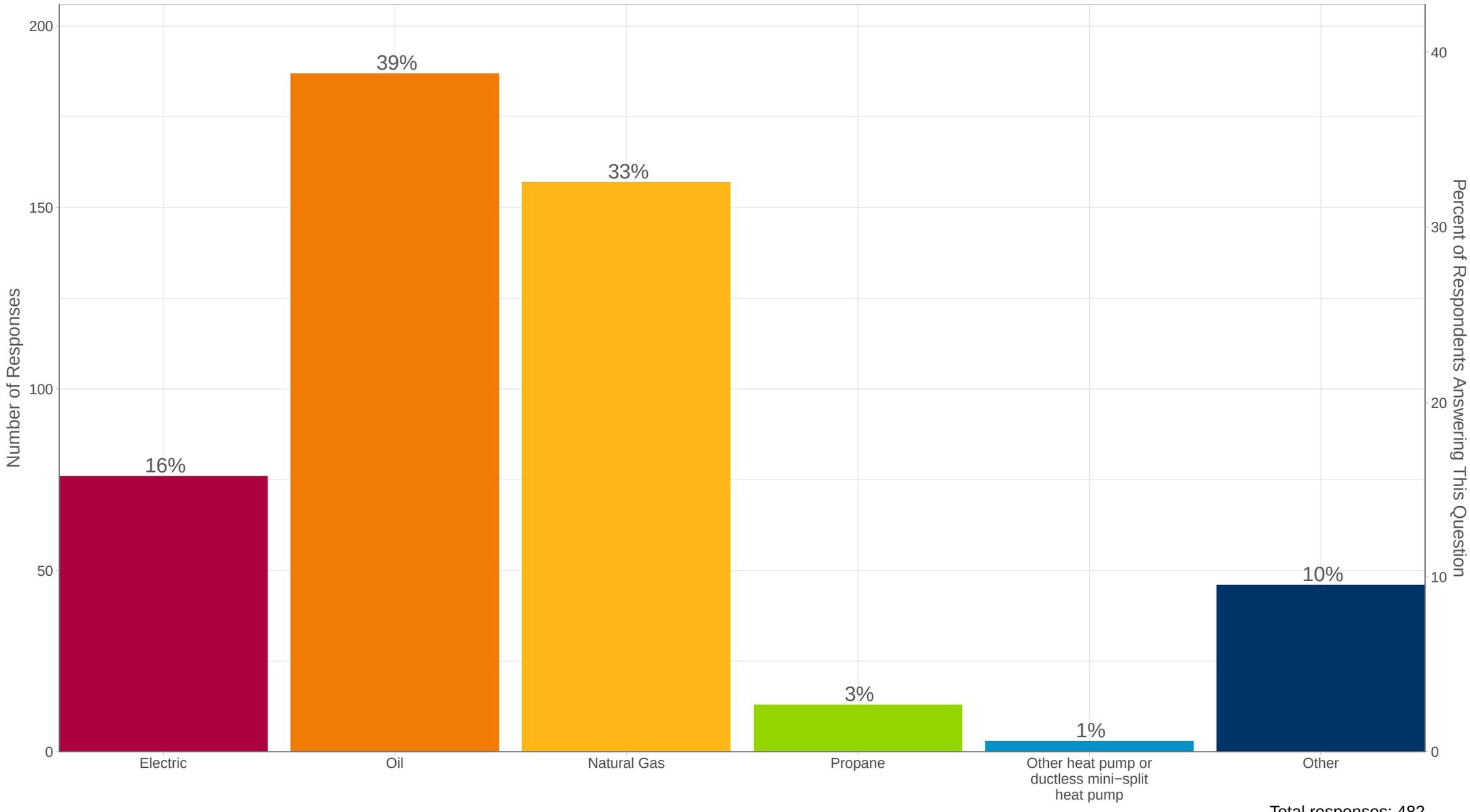
1.35 Question QB2: What was the primary system that heated the space before the ductless mini-split heat pump was installed?



Total responses: 482
Total respondents: 482
Source: Navigant Analysis

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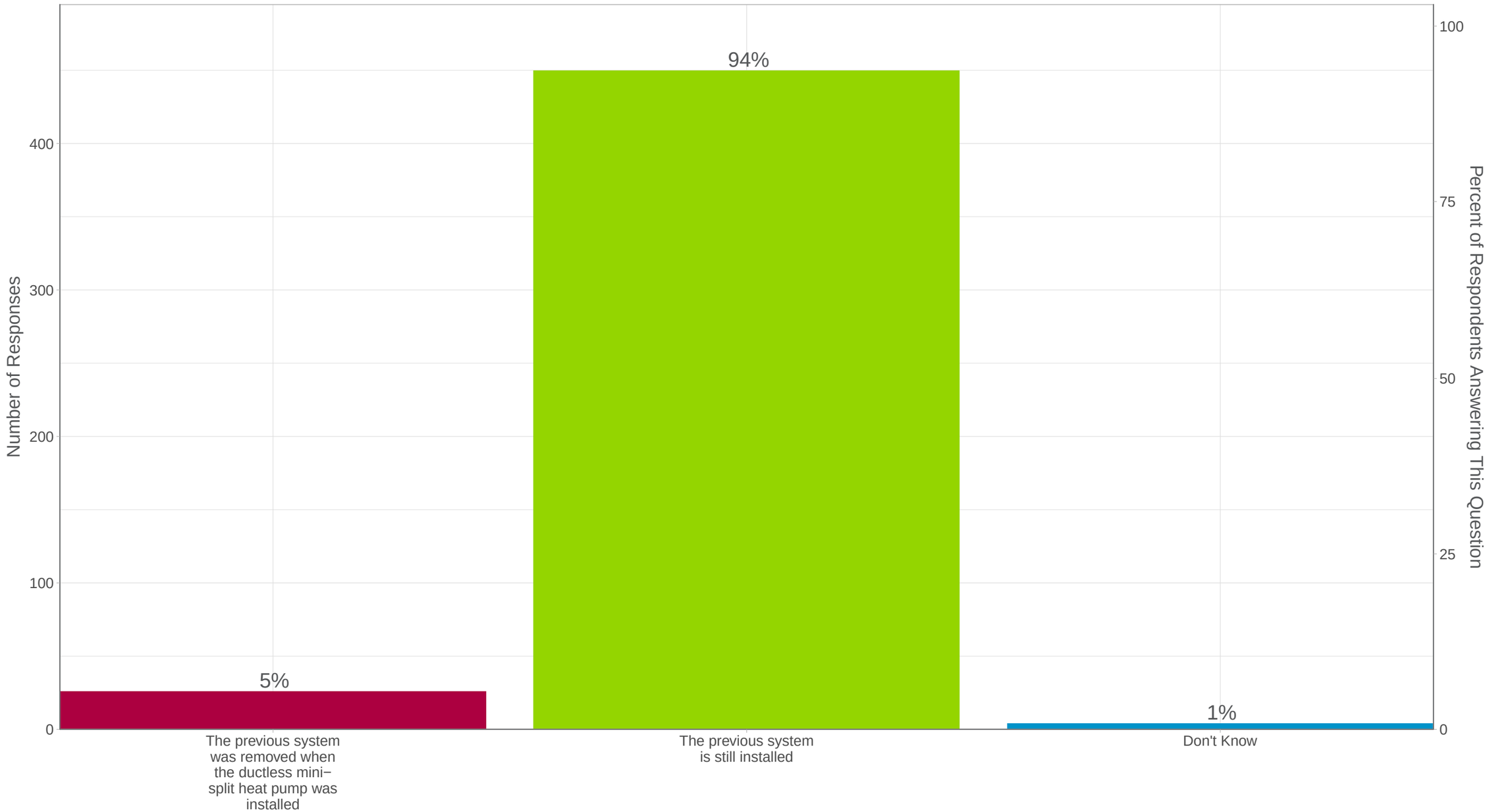
1.36 Question QB3: When the ductless mini-split heat pump was installed was the previous heating system serving the space removed or is it still installed?



Total responses: 480
Total respondents: 480
Source: Navigant Analysis

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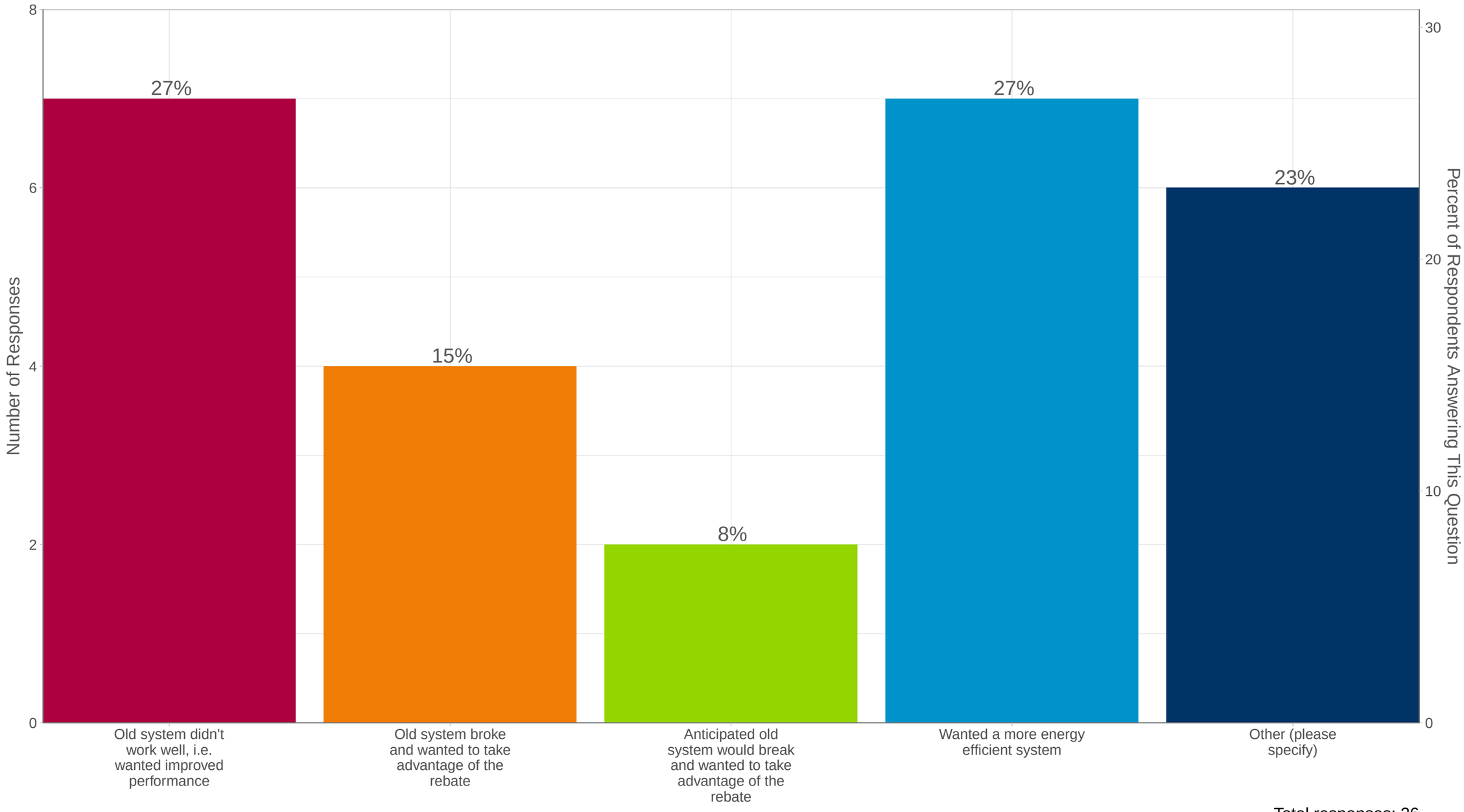
1.37 Question QB4: Why did you replace your existing heating system?



Total responses: 26
Total respondents: 26
Source: Navigant Analysis

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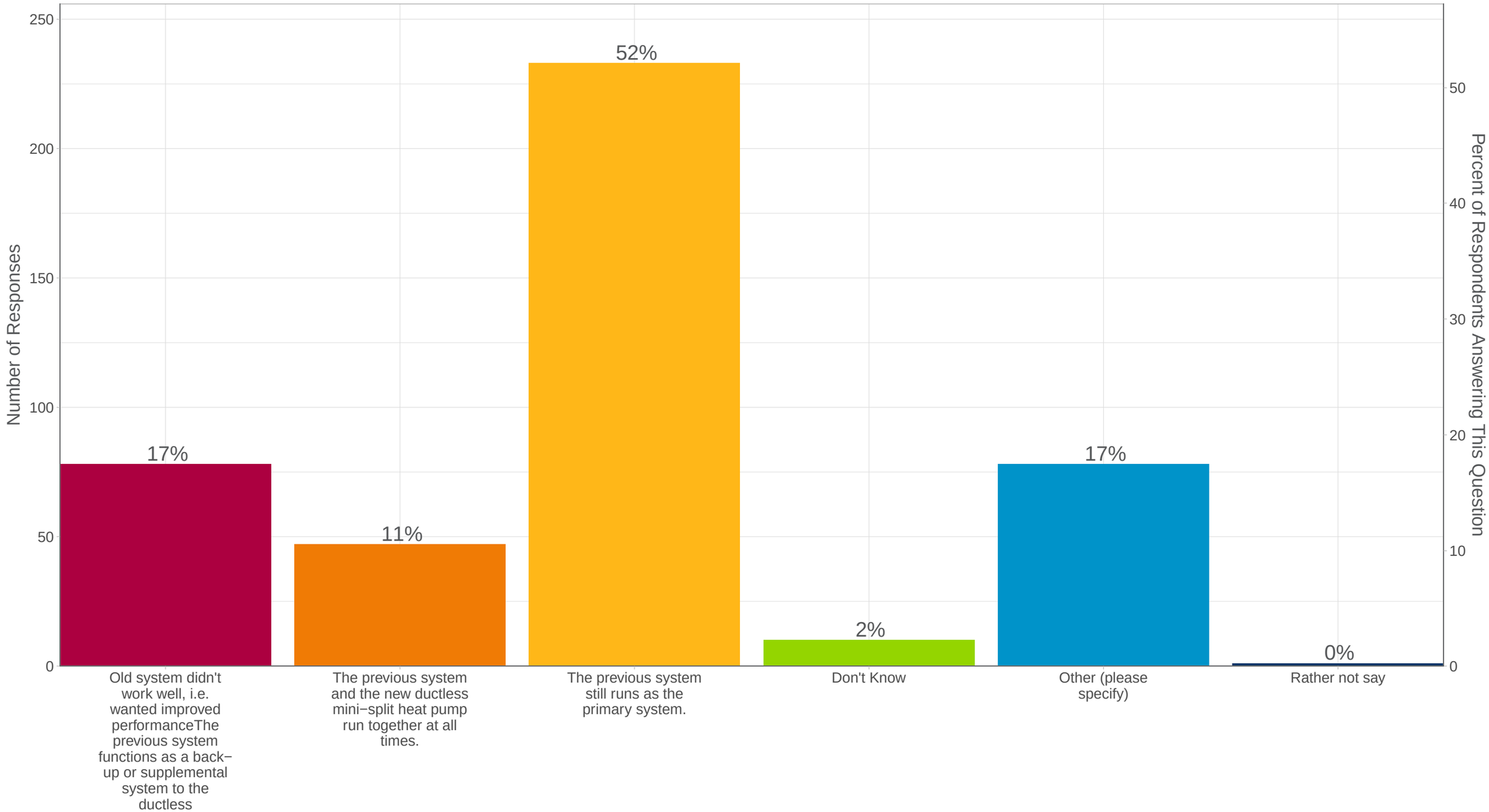
1.38 Question QB3b: How does the previous heating system function today with the ductless mini-split heat pump?



Total responses: 447
Total respondents: 447
Source: Navigant Analysis

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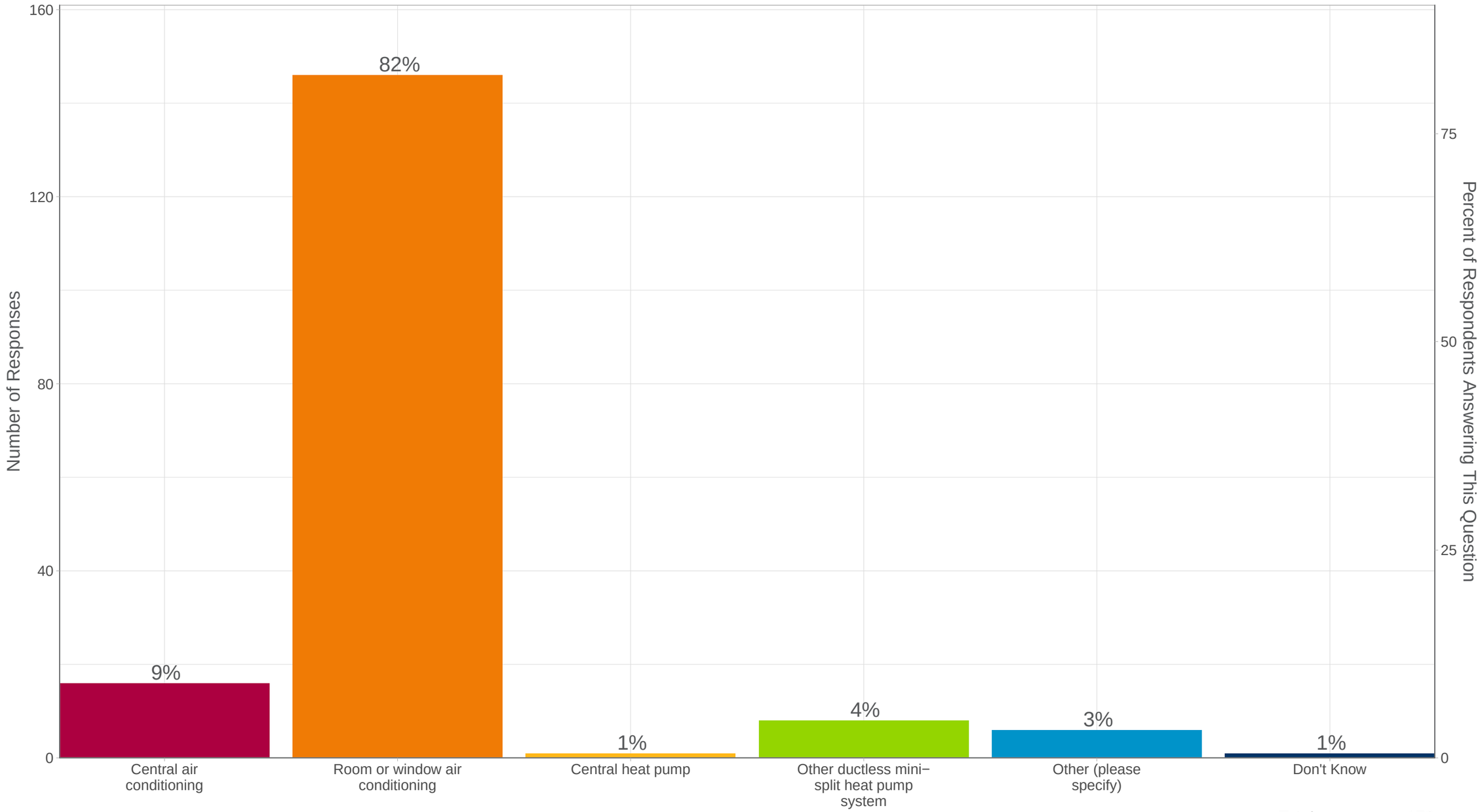
1.39 Question QB6: What was the primary system that cooled the space before the ductless mini-split heat pump was installed?



Total responses: 178
Total respondents: 178
Source: Navigant Analysis

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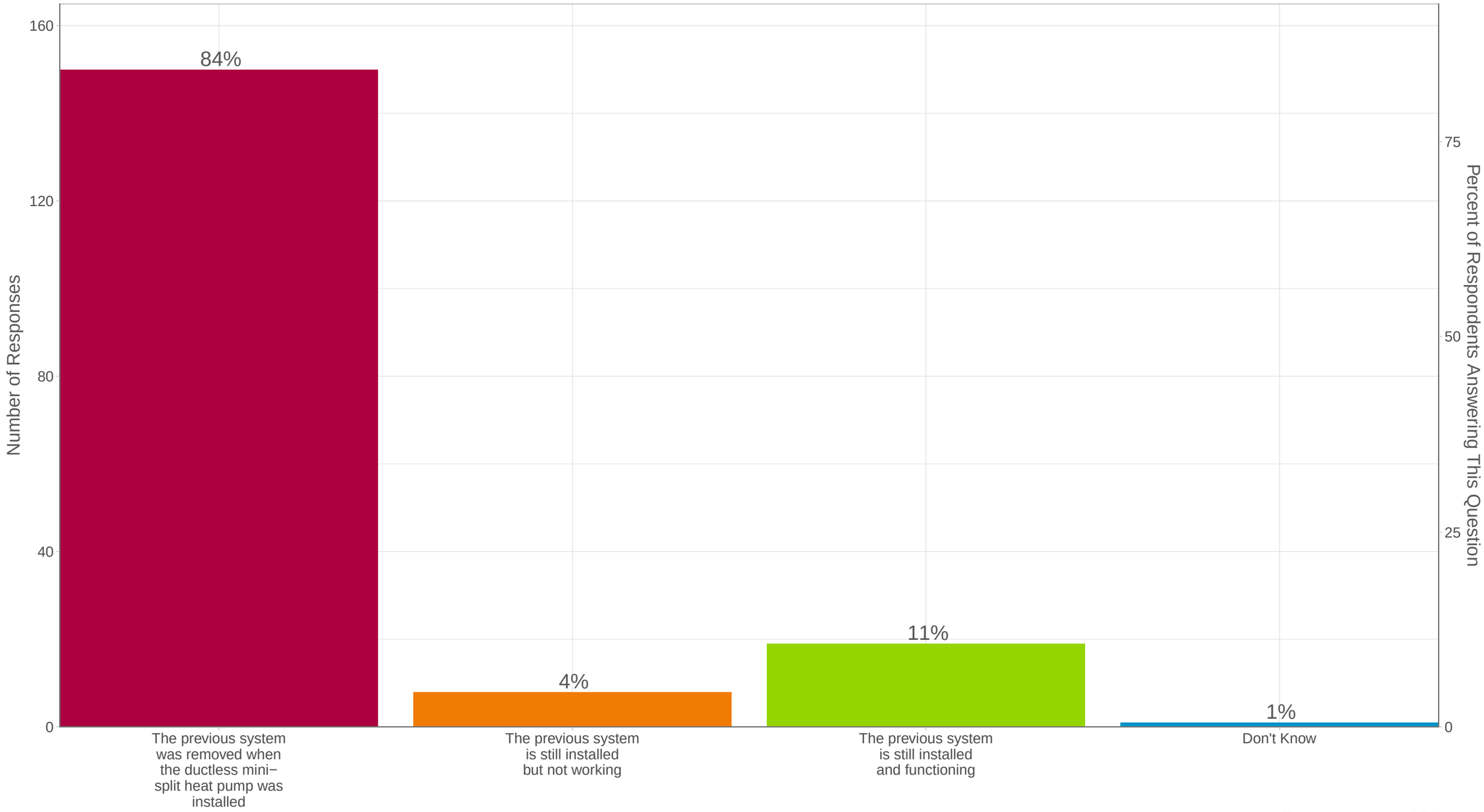
1.40 Question QB7a: When the ductless mini-split heat pump was installed was the previous cooling system serving the space removed or is it still installed?



Total responses: 178
Total respondents: 178
Source: Navigant Analysis

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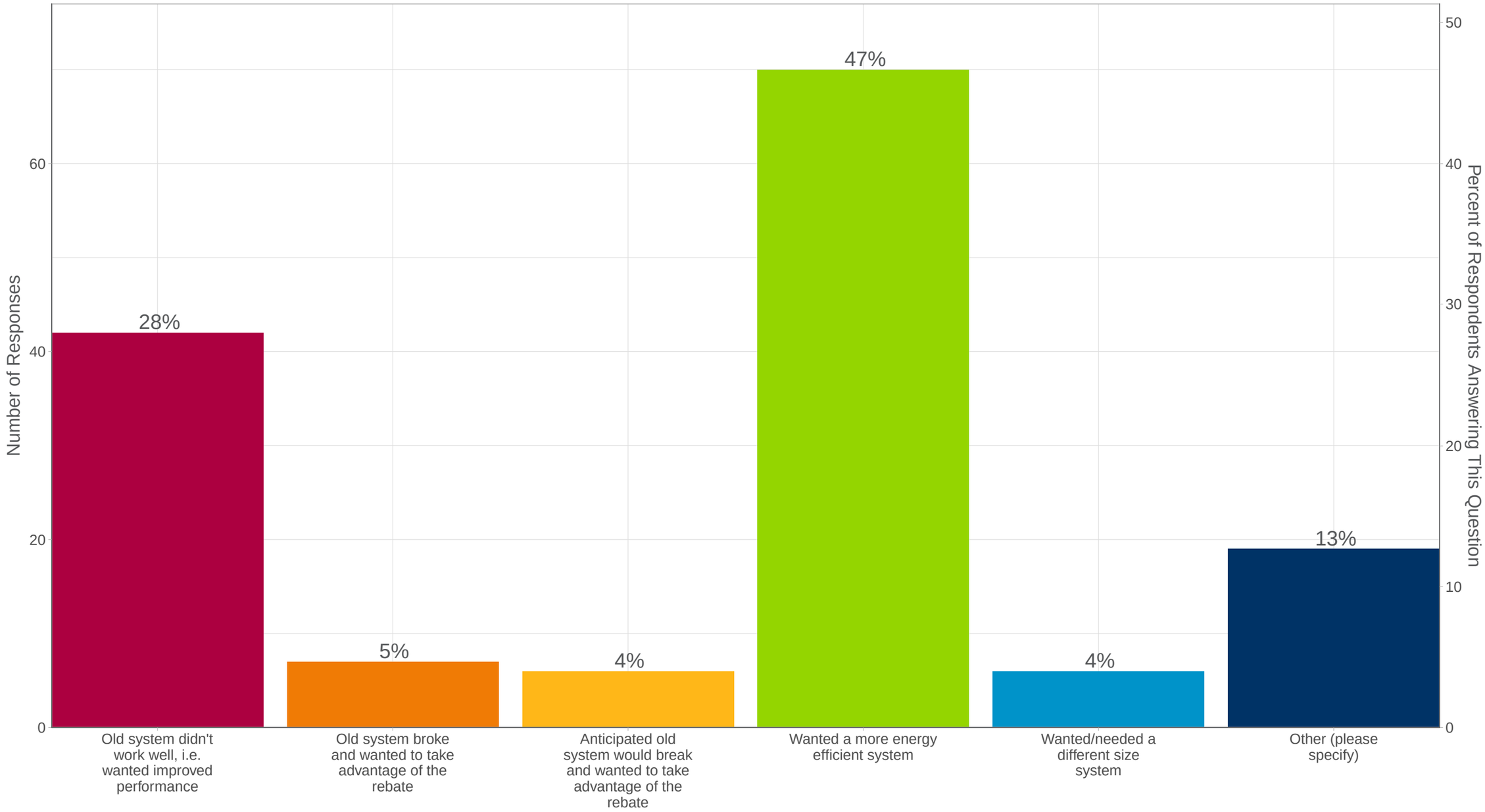
1.41 Question QB8: Why did you replace your existing cooling system?



Total responses: 150
Total respondents: 150
Source: Navigant Analysis

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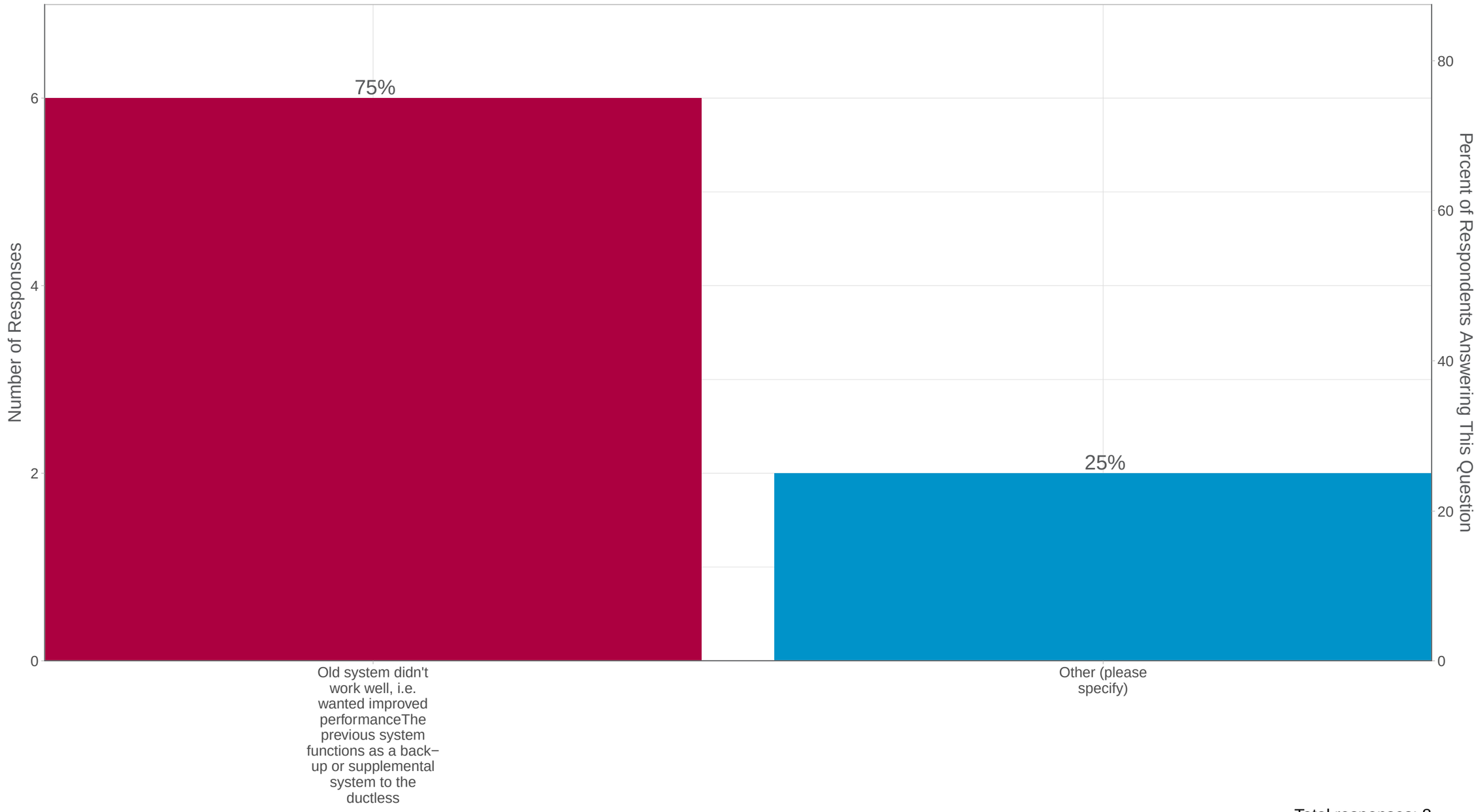
1.42 Question QB7b: How does the previous cooling system function today with the ductless mini-split heat pump?



Total responses: 8
Total respondents: 8
Source: Navigant Analysis

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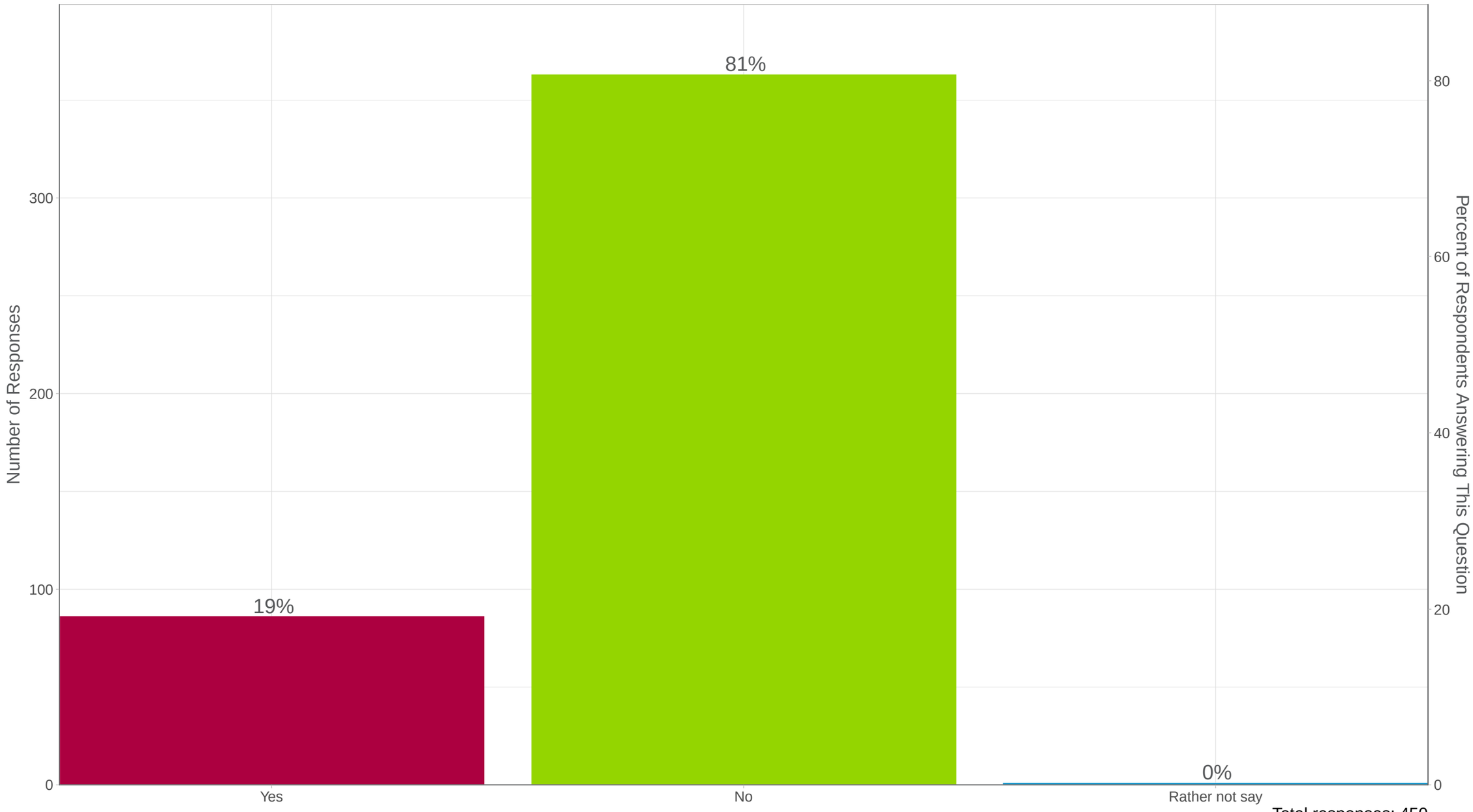
1.43 Question QB10a: Other than the ductless mini-split heat pump and the existing heating or cooling system, does another system provide heating or cooling to the space?



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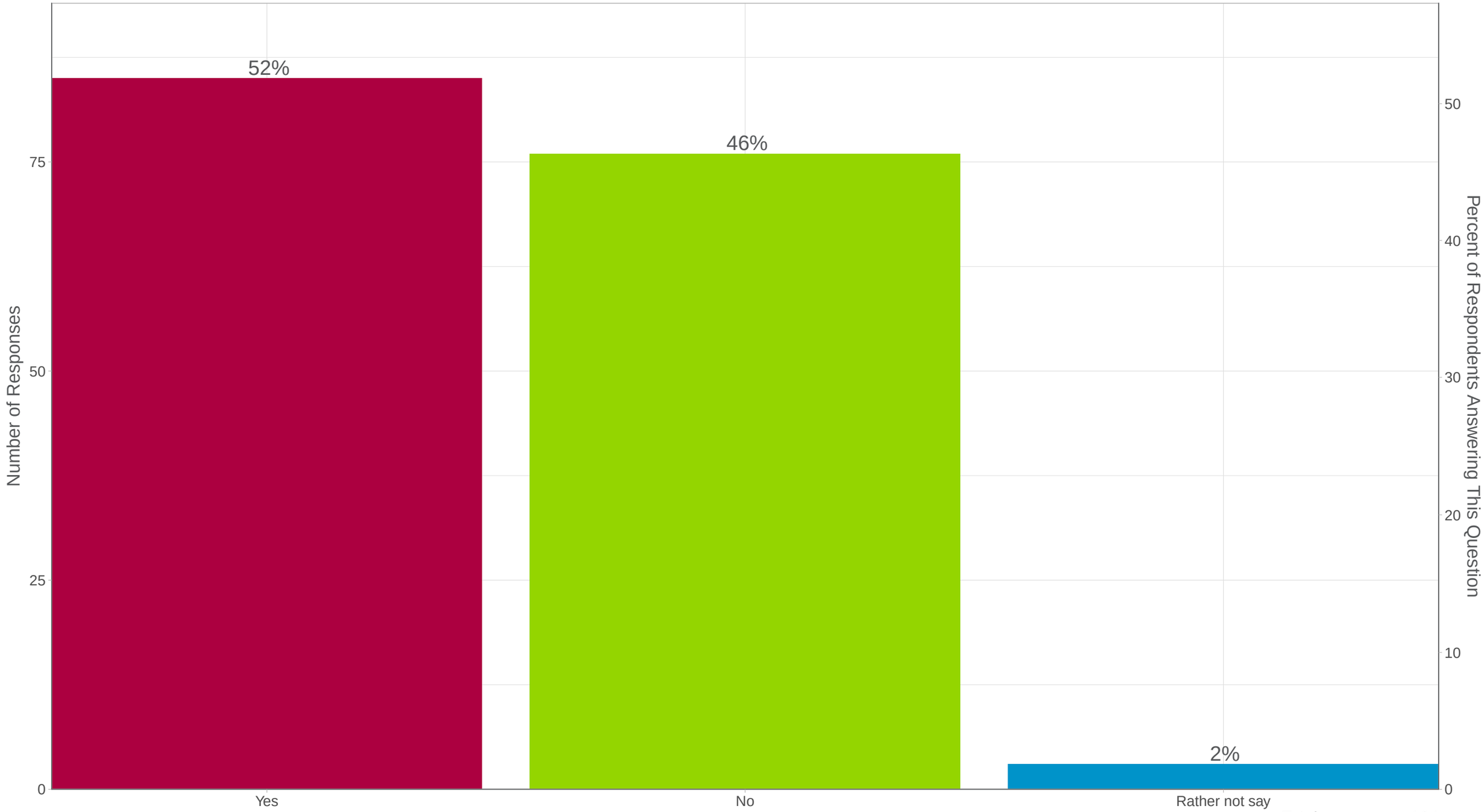
1.44 Question QB10b: Other than the ductless mini-split heat pump, does any other system provide heating or cooling to the space?



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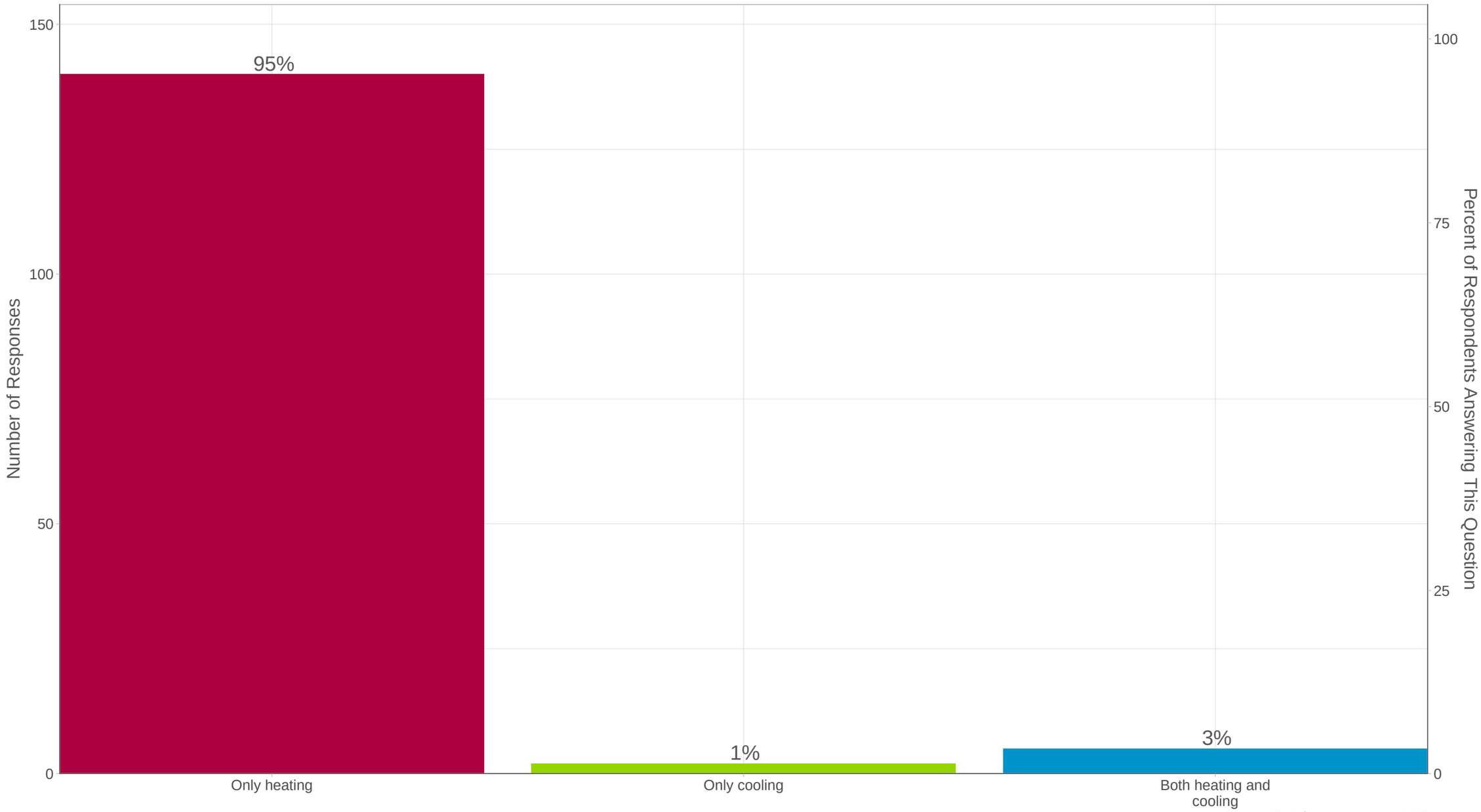
1.45 Question QB11: Does this "other" system you indicated provide heating or cooling?



Total responses: 147
Total respondents: 147
Source: Navigant Analysis

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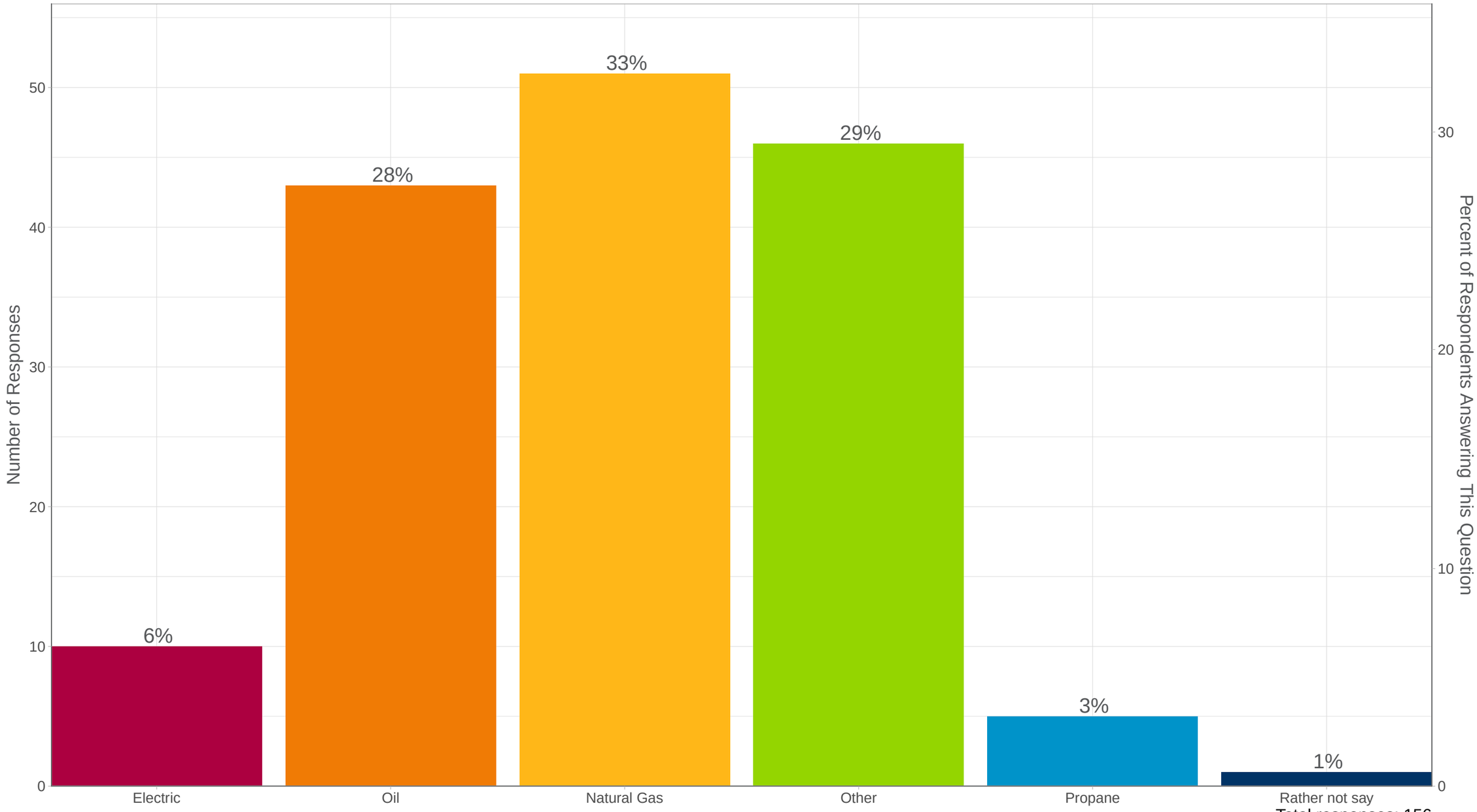
1.46 Question QB12a: What is the other heating system that provides heating?



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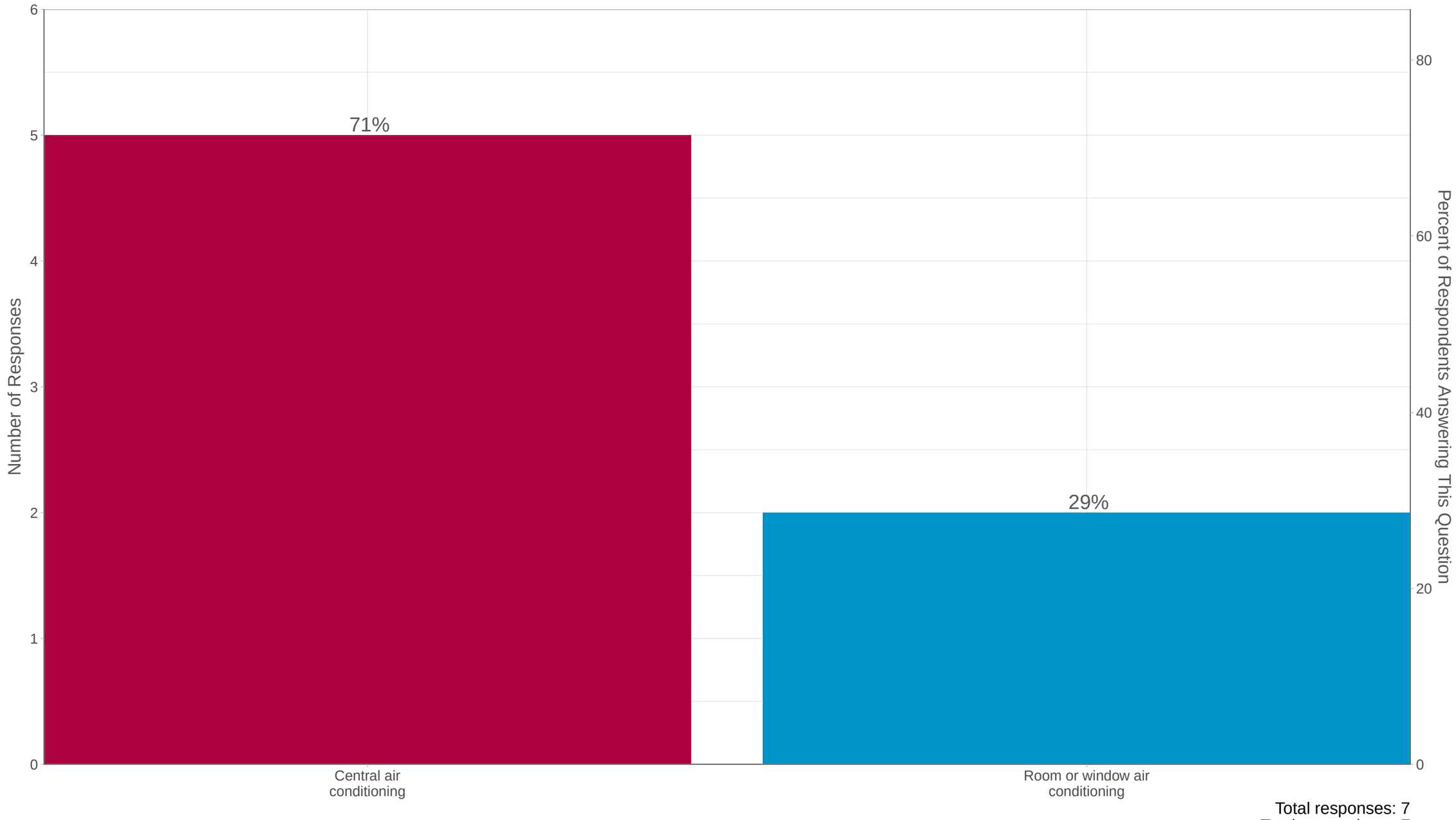
1.47 Question QB12b: What is the other cooling system that provides cooling?



Total responses: 7
Total respondents: 7
Source: Navigant Analysis

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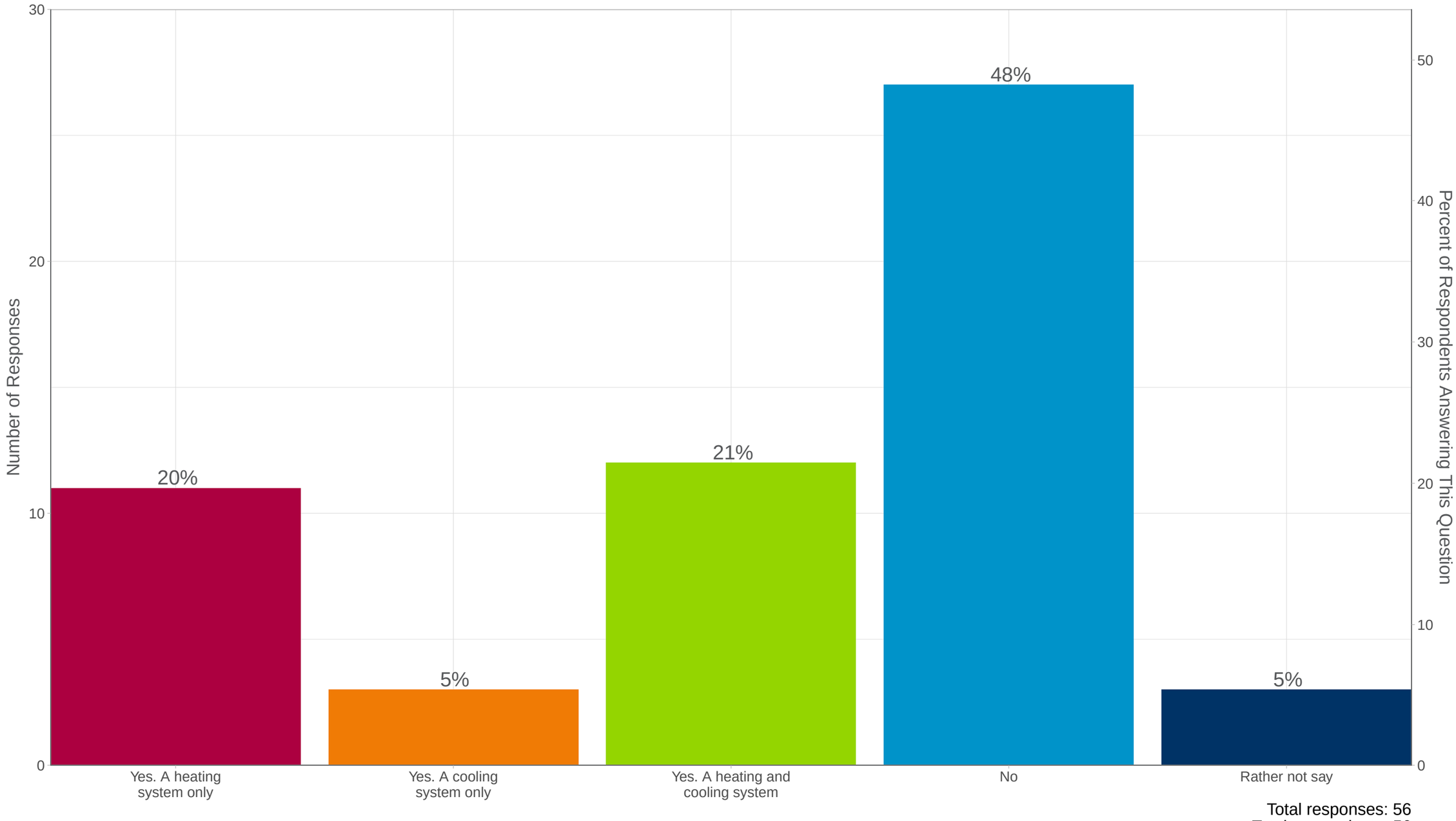
1.48 Question QB15: If you had not installed a ductless mini-split heat pump, would you have installed a different type of heating or cooling system?



Total responses: 56
Total respondents: 56
Source: Navigant Analysis

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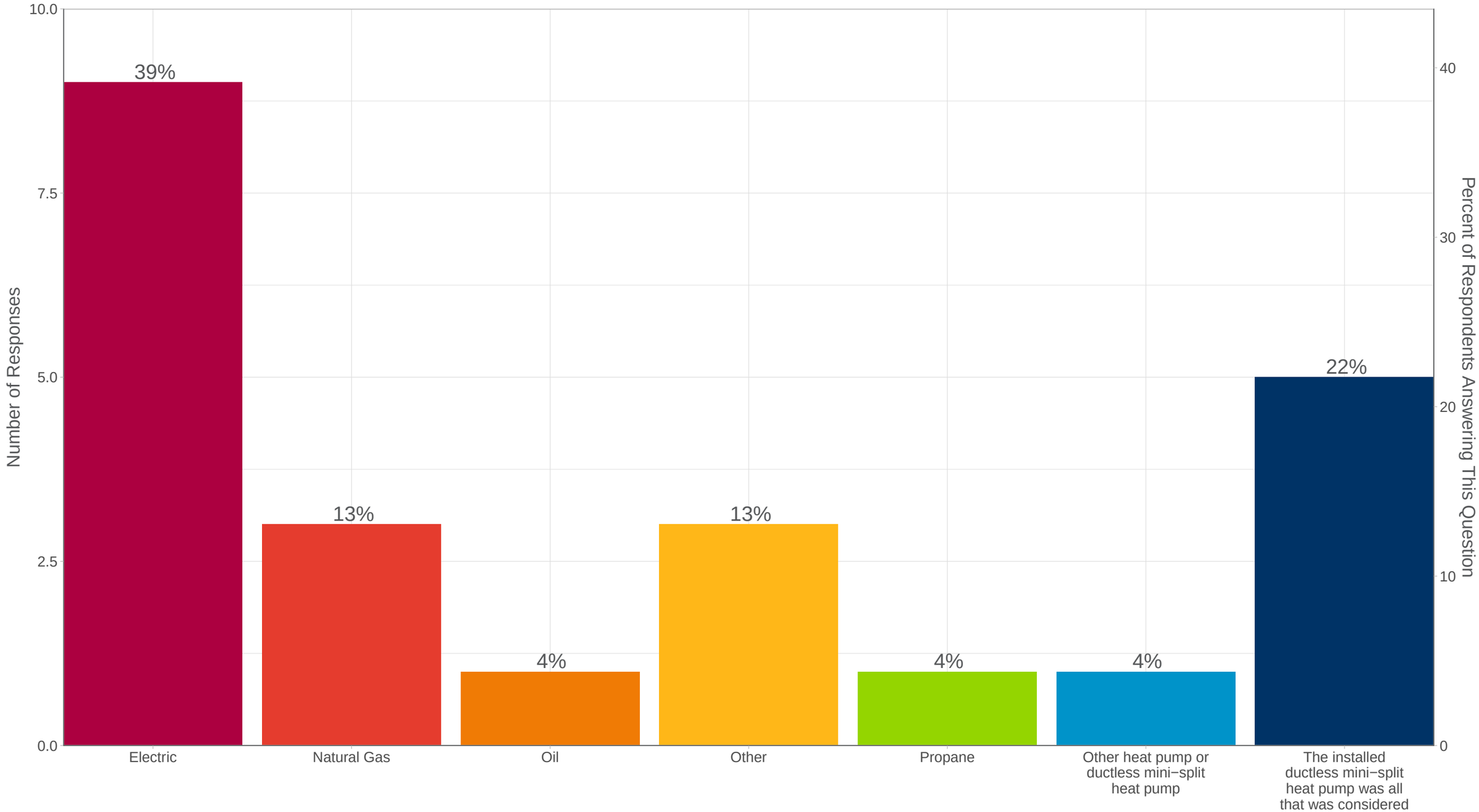
1.49 Question QB16a: What Heating System Would You Have Installed?



Total responses: 23
Total respondents: 23
Source: Navigant Analysis

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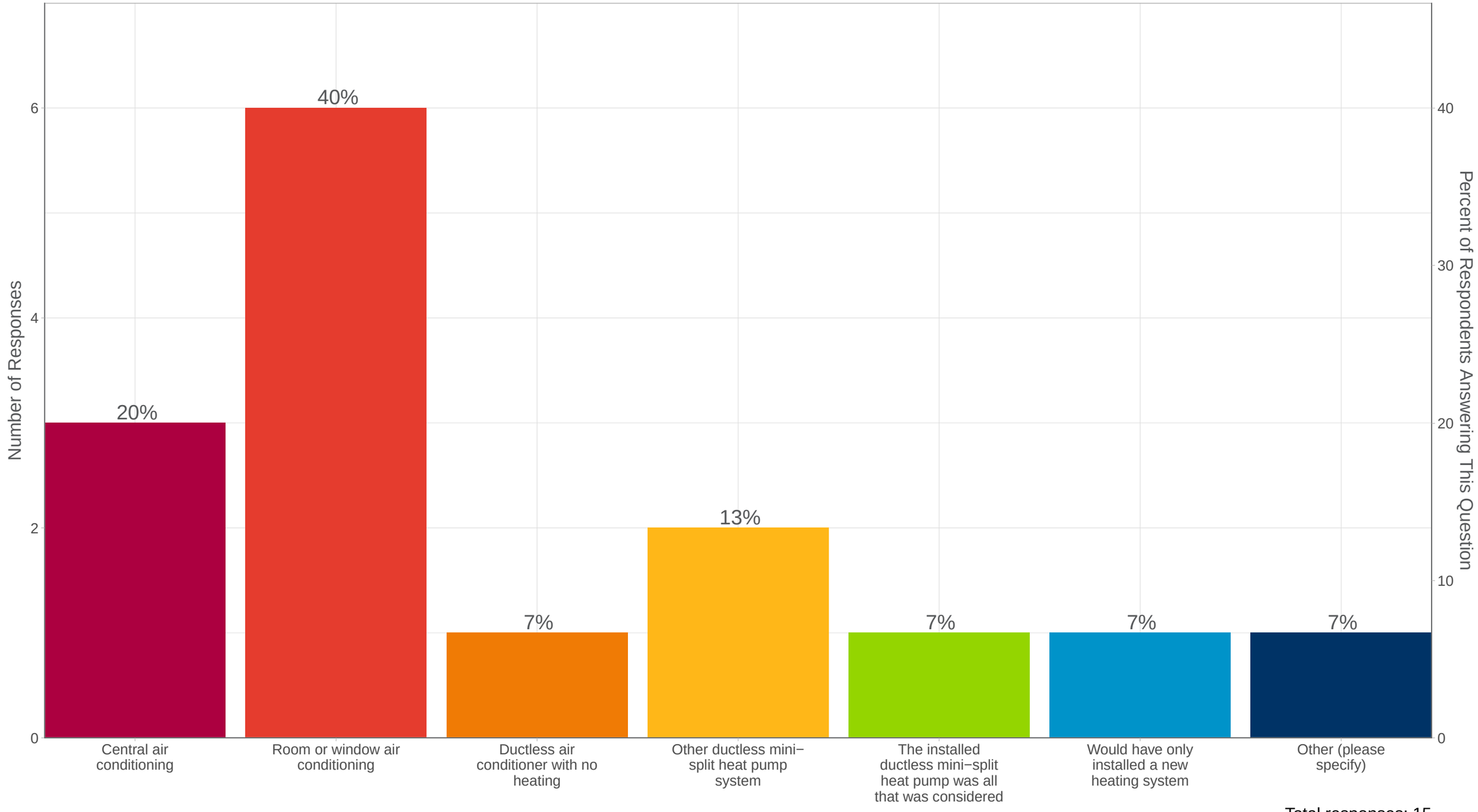
1.50 Question QB16b: If you had not installed a ductless mini-split heat pump in the space, what type of cooling system would you have most likely installed?



Total responses: 15
Total respondents: 15
Source: Navigant Analysis

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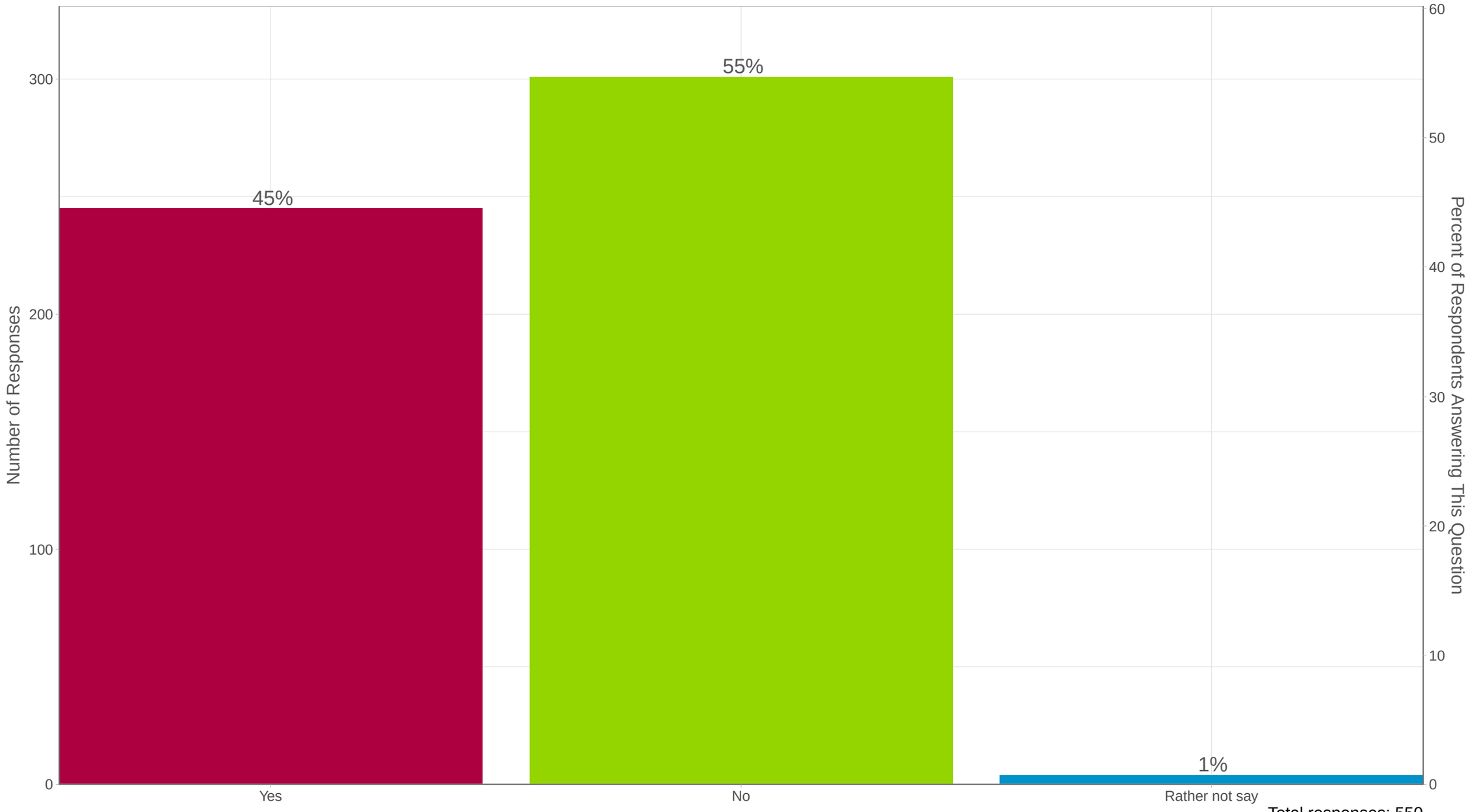
1.51 Question QB17: Other than the ductless mini-split heat pump, does any other system provide heating or cooling to the space?



Total responses: 550
Total respondents: 550
Source: Navigant Analysis

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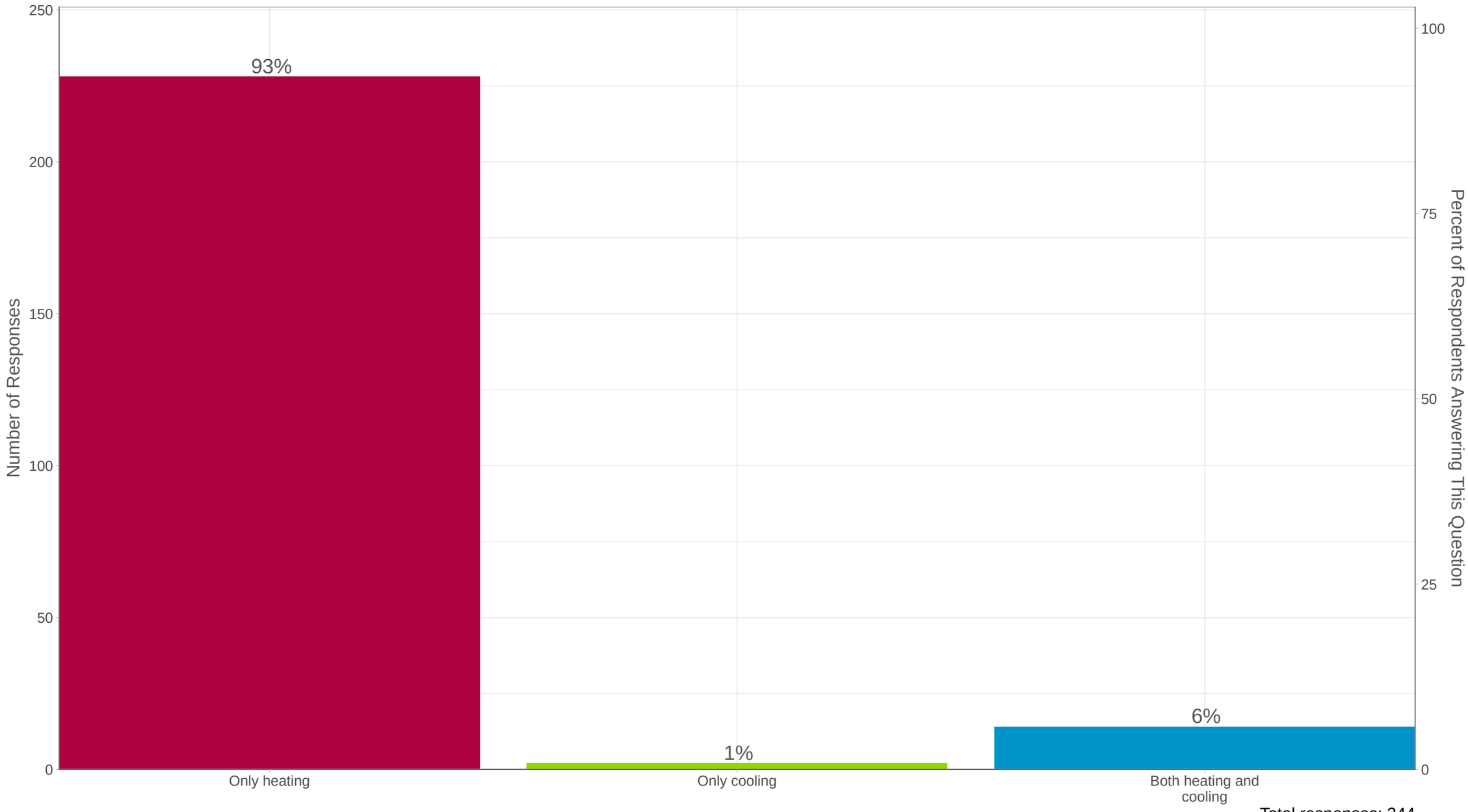
1.52 Question QB18: Does this "other" system you indicated provide heating or cooling?



Total responses: 244
Total respondents: 244
Source: Navigant Analysis

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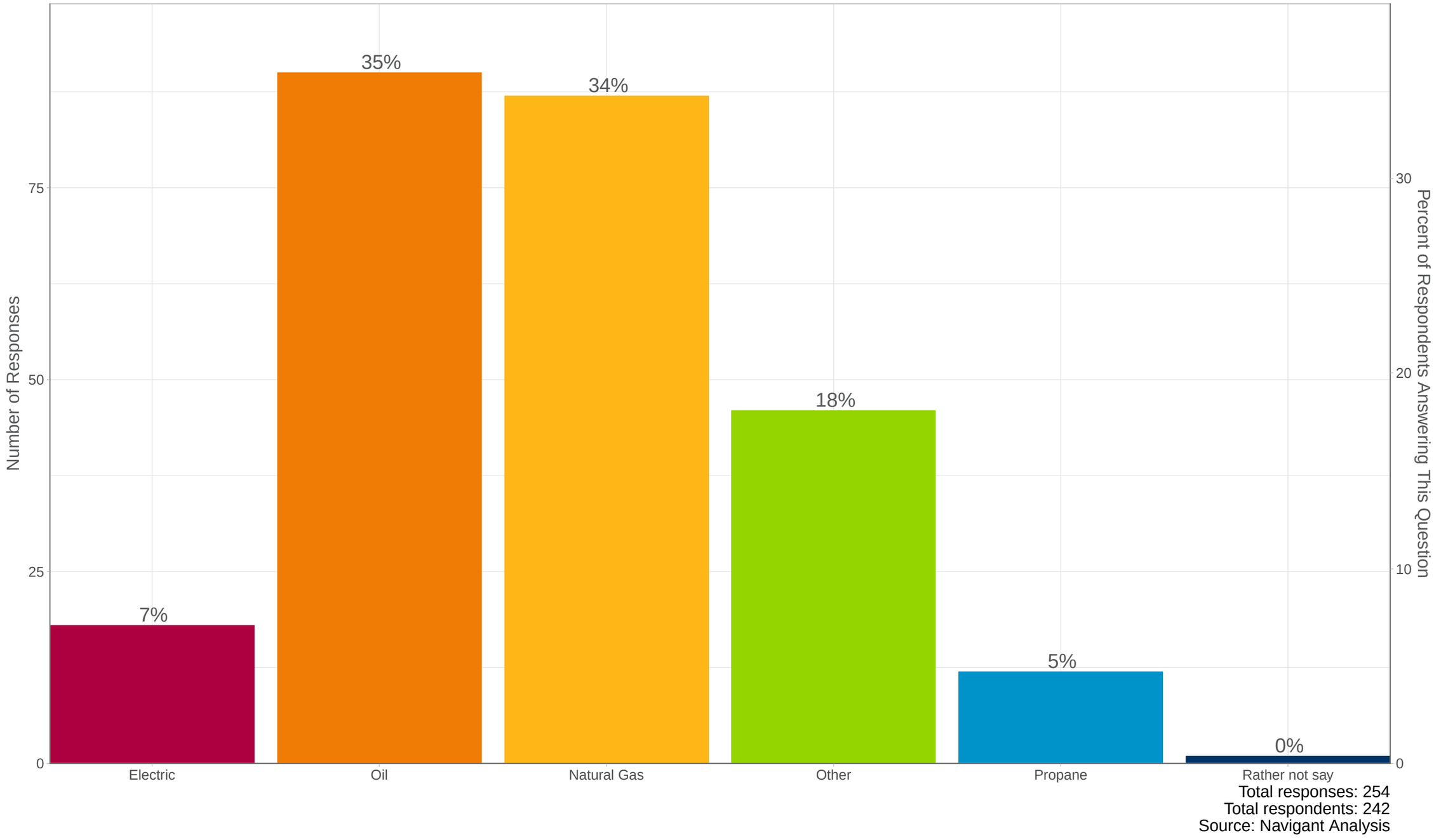
1.53 Question QB19a: What is the other heating system that provides heating?



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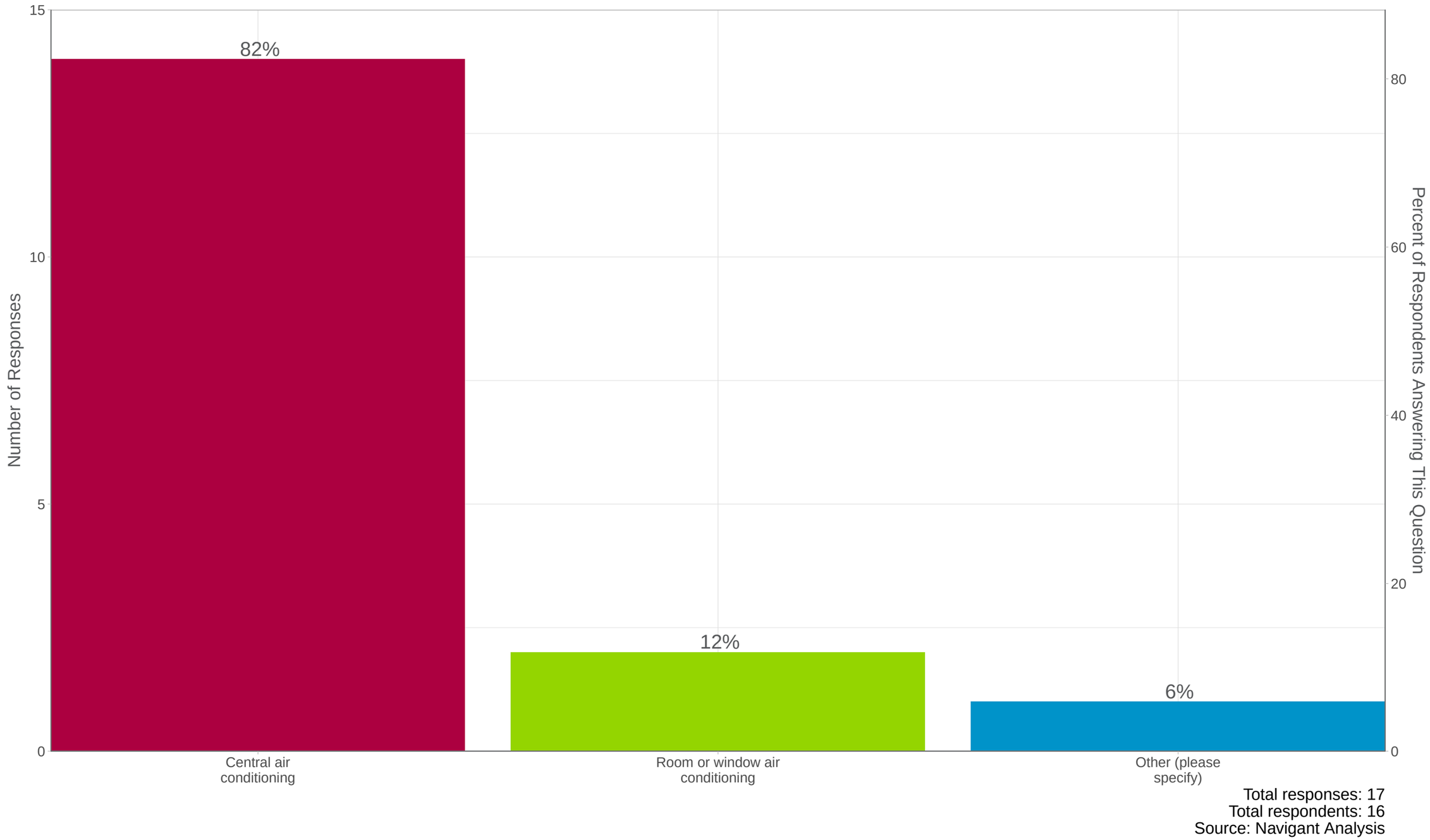
1.54 Question QB19b: What is the other cooling system that provides cooling?



Total responses: 17
Total respondents: 16
Source: Navigant Analysis

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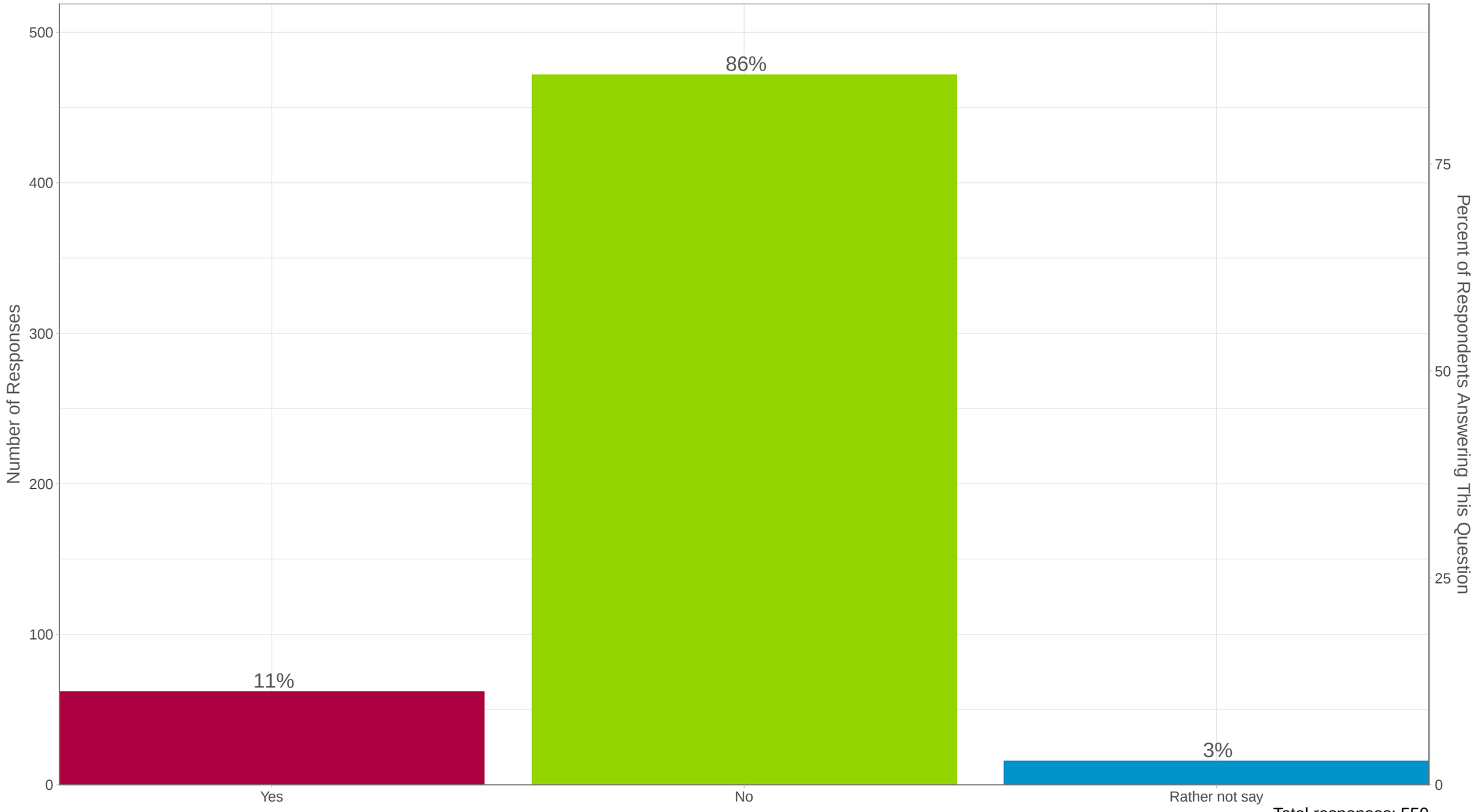
1.55 Question QB20a: If you had not installed a ductless mini-split heat pump, would you have installed a different heating system?



Total responses: 550
Total respondents: 550
Source: Navigant Analysis

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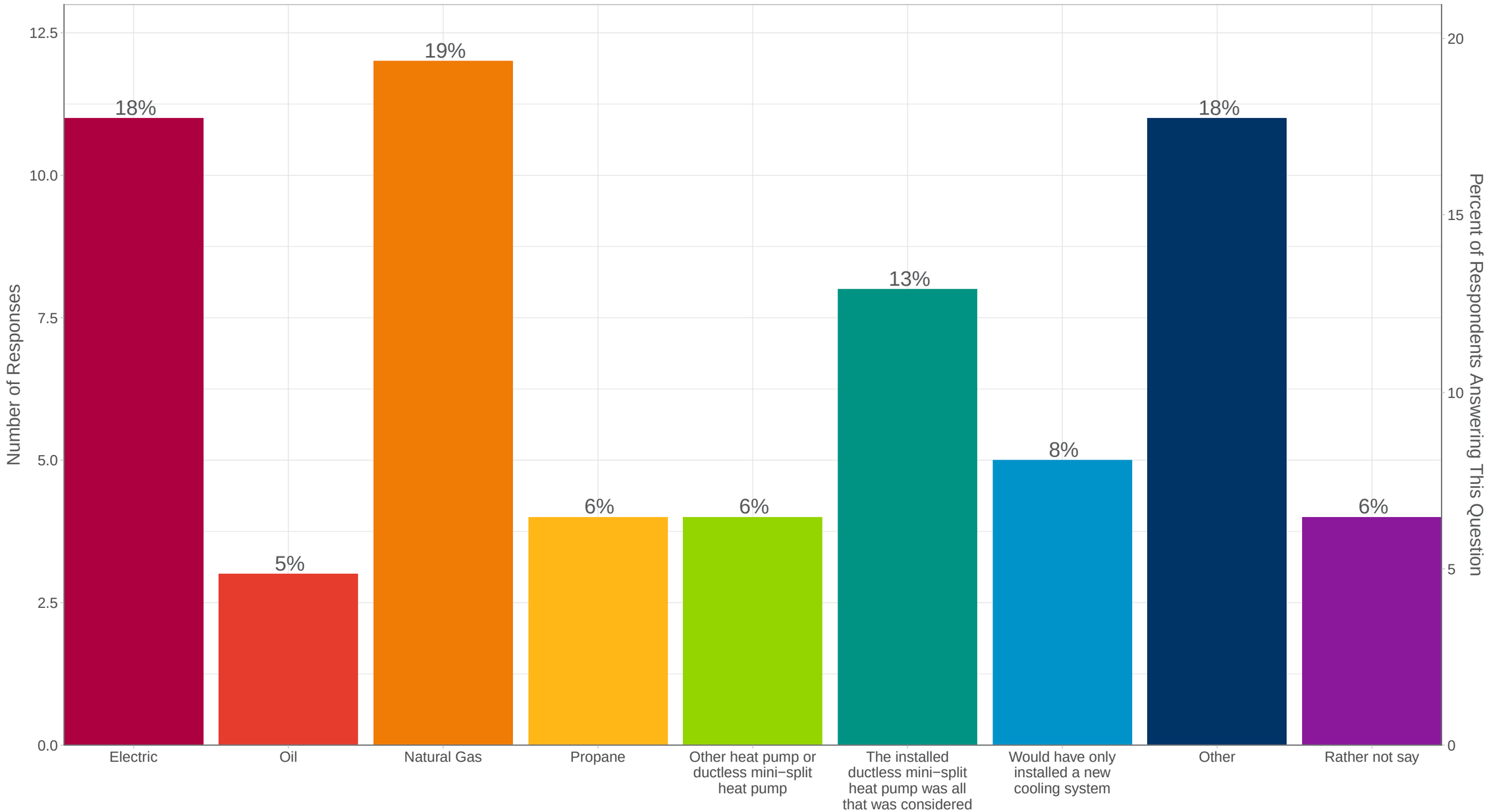
1.56 Question QB20b: What Heating System Would You Have Installed?



Total responses: 62
Total respondents: 62
Source: Navigant Analysis

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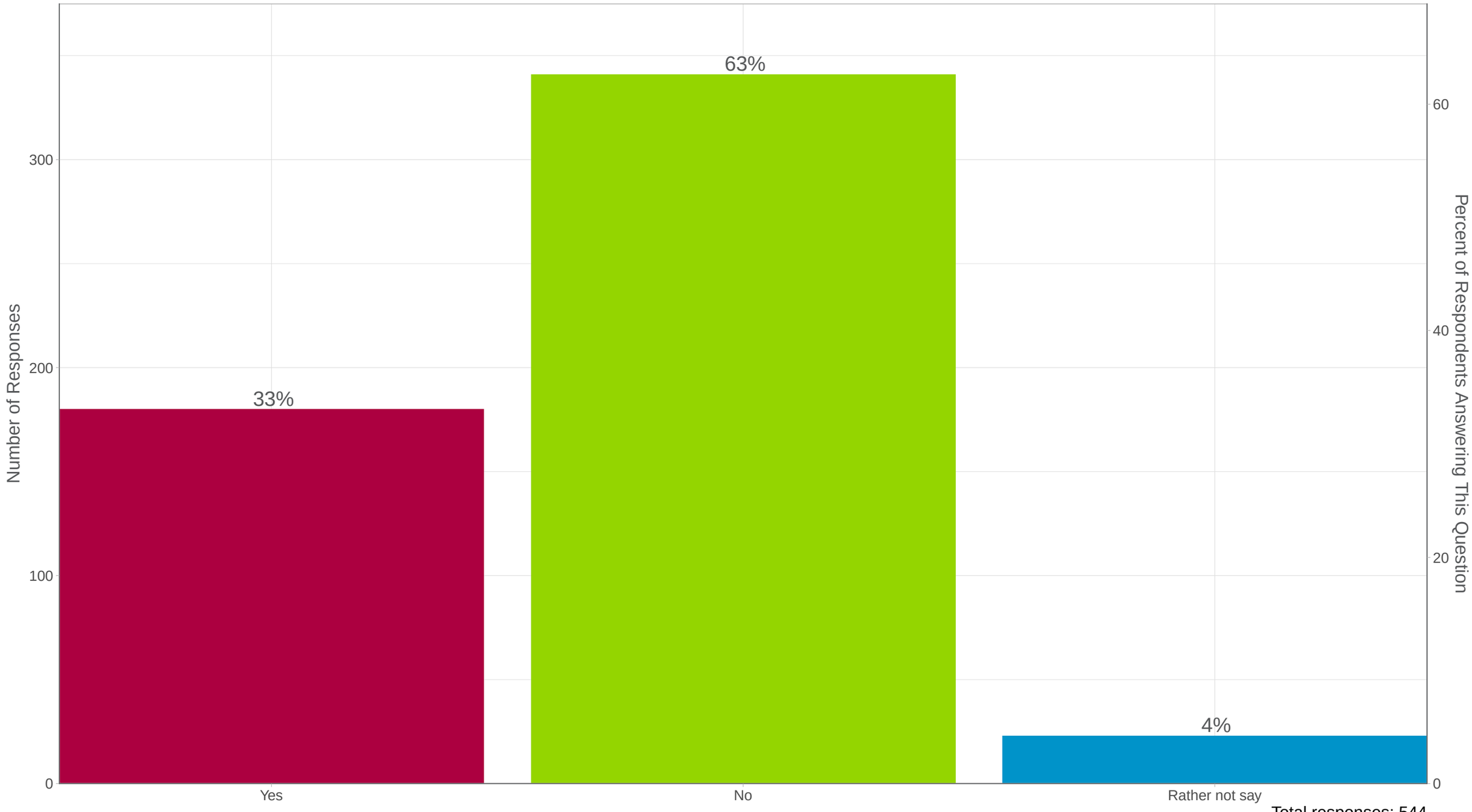
1.57 Question QB21a: If you had not installed a ductless mini-split heat pump, would you have installed a different cooling system?



Total responses: 544
Total respondents: 544
Source: Navigant Analysis

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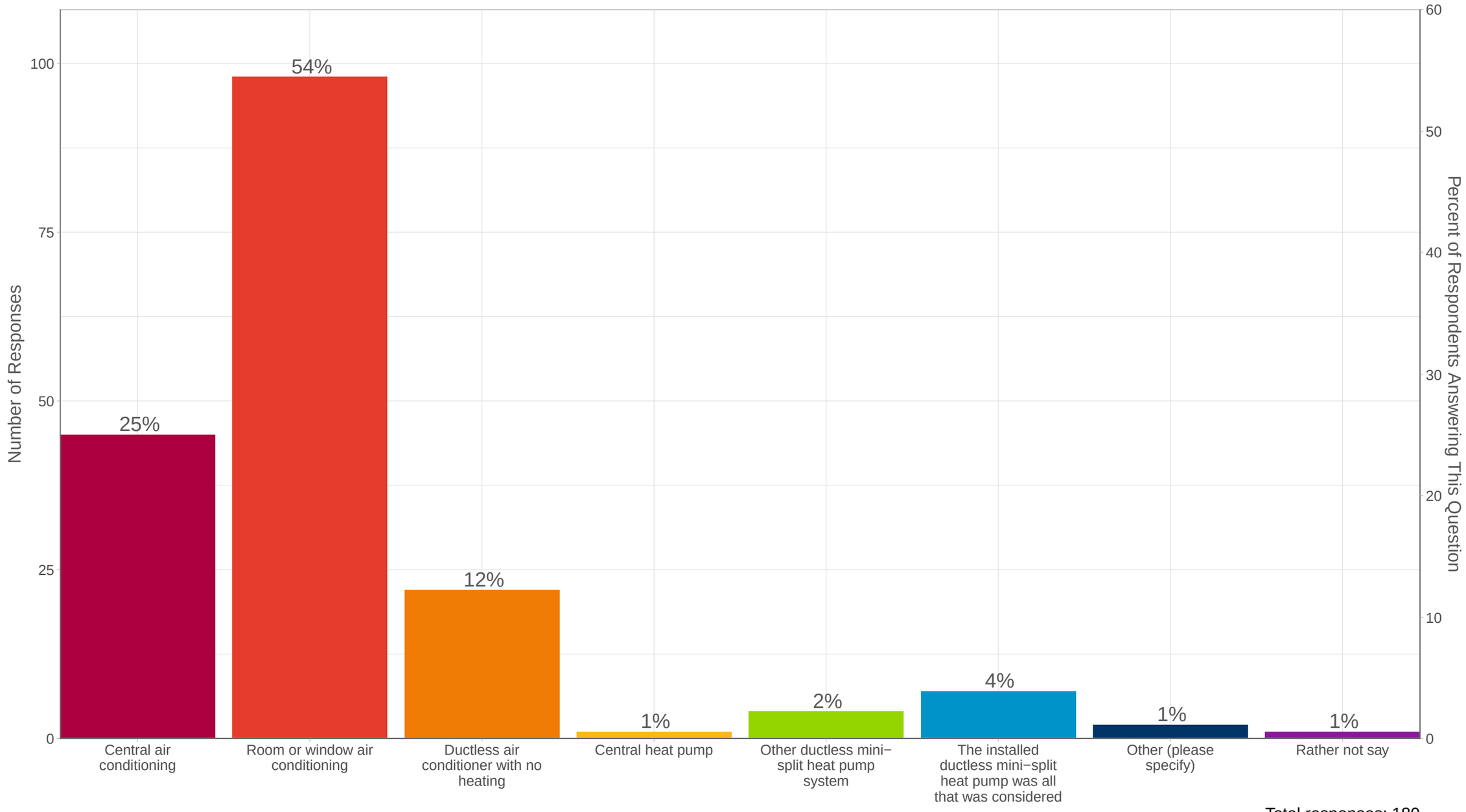
1.58 Question QB21b: What type of cooling system would you have most likely installed?



Total responses: 180
Total respondents: 180
Source: Navigant Analysis

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Ductless Mini-Split Heat Pump Survey (RES 29)

Open Ended Questions

Prepared for:

Prepared by:

NAVIGANT

2.1 Question Q1: Before we finish do you have any other feedback about the Mass Save Program or the rebate you received for your ductless mini-split heat pump? (Program)

(Results are representative, not comprehensive of those received)

- I love the Mass Save program
- Great program
- Thank you
- It was a great rebate and audit was impressive
- Mass Save is great. The Mass Save audit identified some missing (or inferior) insulation areas in the wall but missed some others. I wish they were more thorough in finding problem spots.
- The Mass Save Program is very useful to help homeowners get better energy efficient equipment at better cost. Very useful.
- Highly recommend this program to others. I installed an efficient cooling system at a reasonable price. System works very well so far.
- very difficult...paperwork got lost had to be resubmitted...a contractor wanted to do an inspection was totally inflexible on times to do it
- It would be helpful if you provided additional information to homeowners or other potential installers on the selection of an installer. We made the mistake of checking credentials for State licensing, and found that our contractor (YearRound Heating & Cooling, Hatfield) was licensed by the state. However, as we learned after the fact, even through he represented himself as an authorized installer, he never had any training by Fujitsu (or Mitsubishi), and it was very clear from his installation that there were significant limitations in his knowledge of how to install the Fujitsu systems. We are now faced with the need to re-position 2 of the indoor units that were installed only 3 feet above the floor, and to have additional exterior work done to keep nesting animals from chewing away at exposed tubing insulation.
- The program helped make the decision easier, caused us to tell others about it, and the program seemed well-run and our submission was processed very promptly Thank You!
- The program is excellent - every resident in MA should take advantage of it. I am extremely impressed and pleased with everyone involved. Thank you!!

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2.2 Question Q1: Before we finish do you have any other feedback about the Mass Save Program or the rebate you received for your ductless mini-split heat pump? (Rebate)

(Results are representative, not comprehensive of those received)

- Very prompt payment of rebates.
- First, I thought the rebate took WAY too long to receive. These days, things should simply not take 8-10 weeks. Second, while the MASS Save website stated that I'd be getting $500 in rebate, I actually only got $300, which was also, understandably disappointing.
- The rebate should probably be higher than $100/300 to help incentivize others.
- I understand that there was a larger rebate than the $300 that I received, but that I had to use a contractor on a specific list provided by the state and I did not know that prior to having the unit installed.
- There was a serious problem in processing my rebate. Well over 3 months. Many phone calls made and the problem was identified early yet never resolved. Only when I quit calling and took a chance with an email did the rebate process.
- I really appreciated the rebate we received. It helped make the DMSHP more affordable for us. It was still a large investment even with the rebate.
- Rebate should be more like $500, $100 is kind of low. These units are expensive.
- Rebates are sufficient and appreciated to help offset costs of home improvements that may not have made otherwise.
- I never received the proper rebate amount for the mini-split system. I installed one outside condenser and two indoor heads. The Rebate team could never read and interpret the contract or my clarifications - so they gave me a $300 rebate for one of the indoor heads. When trying to pursue the rebate for the second head, they said that a mistake was made and I should have received only $100 for the first head and, therefore, the $300 would cover the two heads. The certificate information I provided and the ratings on the Mass Save web site clearly stated that I should get $300 per unit. I tried to pursue but was 'shutdown' by every attempt I made. This rebate system is a fraud. The people would attempted to help were clearly instructed to not provide the proper rebate.
- I had two 18kW units installed. One had wall mount indoor, the 2nd had floor mount indoor. I got only $100 for the floor mount because the SEER was 1% different, AND yet, this unit so far produces better heat than the wall mount. Mass Save needs to recalibrate your rebate method!
- Mass Save rebate came quickly. Mass CEC rebate has yet to arrive.
- The online system is very clunky and fails often. It could use improvement. Phone support staff is excellent. I never received and explanation for the rebate we received. We installed 8 mini splits and only got $800 despite having 6 units that were eligible for the $300 rebate.

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2.3 Question Q2: Additionally, do you have any overall comments on the performance of your ductless mini-split heat pump that you would like to share? (System)

(Results are representative, not comprehensive of those received)

- Very much satisfied with a choice to go with ductless system. Will use in future if ever need a replacement of existing heating or cooling unit in main house.
- The system should come with a smart programmable thermostat beyond the included remote. The fact that I can't manage this system remotely to be more efficient is a loss.
- If possible, estimates should be given for operating costs of the system for both heating and cooling prior to any purchase. Also the drawbacks of using the system as the primary heat source should be made clear.
- I would like assistance in learning how to operate the heating portion of the ductless heat pump. I can't seem to get them working.
- I am in the process of contacting the contractor who installed the mini-split heat pump because even though I've turned off the heat pump system, it sounds like it's still running outside and our electric bill was very high still.
- The ductless system did not provide the savings compared to window units we were told it would. And it was very expensive to install
- we are getting more use from the mini-splits as a cooling system versus heating.
- I need to contact my installer to guide me in using the heat pumps along with my oil burning furnace for adequate warmth in the cold winter. I tried just using the heat pumps and was cold most of the time!
- If the instruction about how to operate the pump most efficiently can be provided on Mass save website, it will be even better.

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2.4 Question Q2: Additionally, do you have any overall comments on the performance of your ductless mini-split heat pump that you would like to share? (System Performance)

(Results are representative, not comprehensive of those received)

- It's too expensive to use electric. Would love a gas option.
- Love it. Room unusable before heat pump.
- The mini-split is making the master bedroom so comfortable summer and winter that I want to add units to heat and cool the other second story rooms that are inadequately heated and cooled at present.
- Love them. Wish had installed years earlier.
- The air conditioning works great. We've used the air purifier a couple of times and that works well also. we've only used the heat once or twice and it did take the chill off the room. We are not sure if we can use the unit when the temperature is below 30 - we are afraid of condensation freezing in the pipes or the unit. We will use it more for cooling in the spring and summer. We are still getting to know how to operate the units.
- It has performed better than expected.
- It is a good system but the bills are higher than I expected and the heating isn't as efficient in all rooms when the temp is below 15 degrees. Will need to supplement with other heat at those times.
- We don't heat with it. The units are high, so we don't know how to get the heat down to the lower part of the rooms.
- The performance for heating and cooling far surpassed my expectations. The heating capability was a pleasant bonus!
- I'm just not sure how to work The heating feature
- Up until this arctic freeze, we were happy with the mini-splits, but they do not seem to be able to handle this level of cold very well.
- I do not use it below 30 degrees because it was recommended by the contractor not to use it at such a low temperature.
- I installed it for cooling but have found myself using it for heating a lot more than I anticipated. I love it.
- I am shocked and dismayed at the cost. I was hoping to save money and it did the opposite. My electric bill has gone from $30/mo to $238/mo and I have solar on my house. This makes no sense, wish I had not spent the money on this

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