

CONSERVATION AT PACIFIC GAS AND ELECTRIC (PORTLAND, OREGON)

Tests of a kitchen-mounted device (RECS) developed by Ontario Hydro Research Labs that indicates momentary and cumulative consumption of electricity on individual circuits.

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Toronto
1994

1. The sample

The 35 households of the project were individually interviewed by phone. This took place in the month of February, 1994. 16 RECS and 19 Power Sentry households took part in the survey.

The RECS homes are more likely to have kids and the PS homes are more likely to have seniors present.

The PS homes are more likely to have occupants present 24 hours a day (11 of 18 households) as compared to the RECS (5 of 16 households). Thus daytime setbacks are easier to implement for the RECS homes.

In fact, somewhat more RECS homes own setback thermostats.

Frequency Distribution for Setback own
Split By: RECS or P.S.

	Total Count	RECS Count	P.S. Count
yes	9	6	3
no	25	10	15
Total	34	16	18

These setback thermostats are considered easy to use by 7 of the 9 homes.

Frequency Distribution for Setback easy
Split By: RECS or P.S.

	Total Count	RECS Count	P.S. Count
yes	7	5	2
no	2	1	1
Total	9	6	3

On the other hand, of the 9 homes with setback thermostats, only one PS home and 4 RECS homes actually use their setback thermostats.

Frequency Distribution for Setback used
Split By: RECS or P.S.

	Total Count	RECS Count	P.S. Count
yes	5	4	1
no	4	2	2
Total	9	6	3

Of the 34 households answering this question, all have some electric heat and it is the major source in all but 6 homes...

Frequency Distribution for Electr ht
Split By: RECS or P.S.

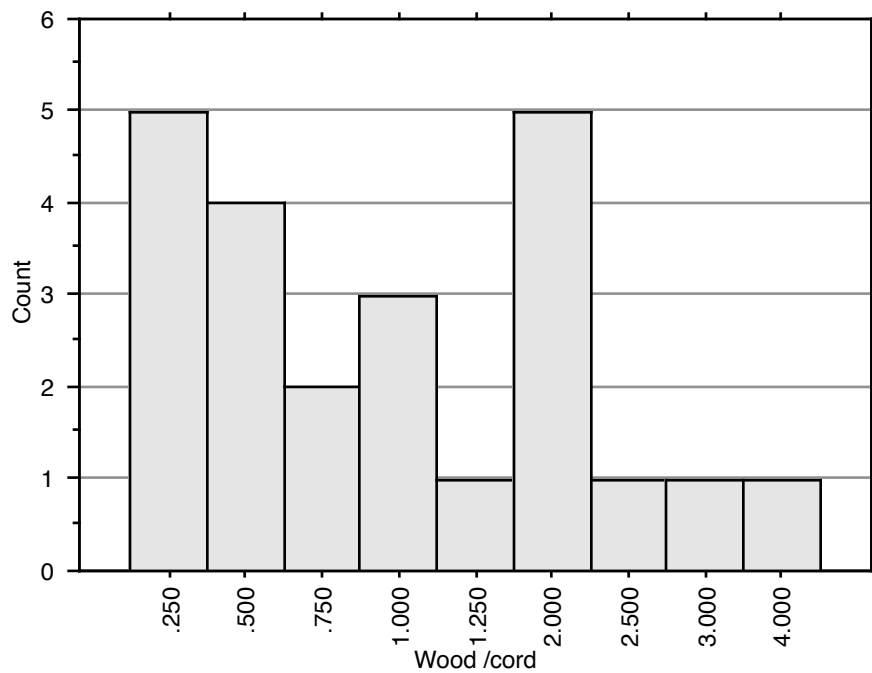
	Total Count	RECS Count	P.S. Count
major heat	28	12	16
minor heat	6	4	2
Total	34	16	18

Wood (including pellets) as fuel was also common, especially among RECS homes...

**Frequency Distribution for Wood ht
Split By: RECS or P.S.**

	Total Count	RECS Count	P.S. Count
none	11	3	8
minor	15	9	6
major	8	4	4
Total	34	16	18

Of the 23 homes burning wood, some 12 homes used one or more cords of wood. RECS homes averaged 1.14 cords and PS homes 1.38 cords.



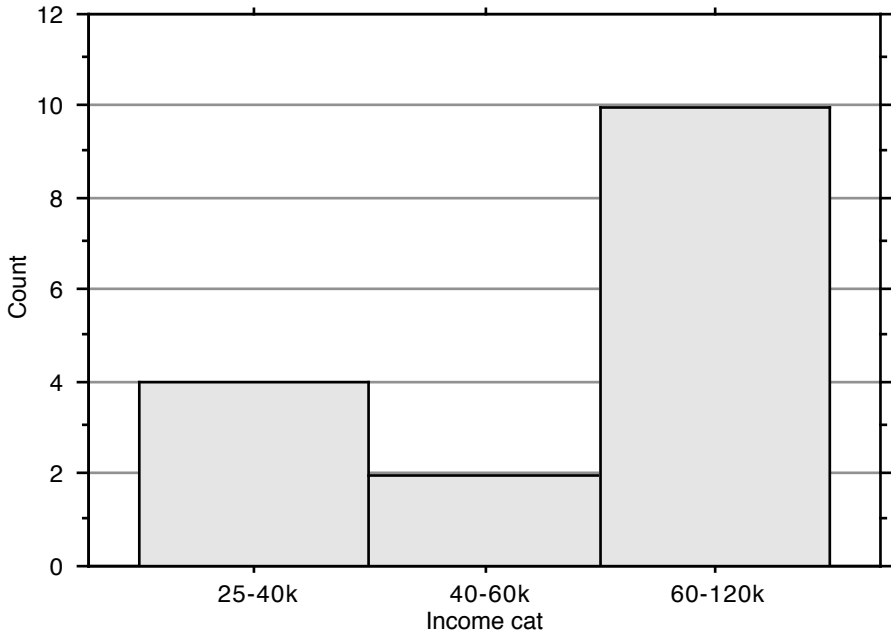
No other heating fuel was recorded.

For the most part, the sample considers itself active or very active in conservation. This may or may not be similar to the reactions of a random sample of people in Portland.

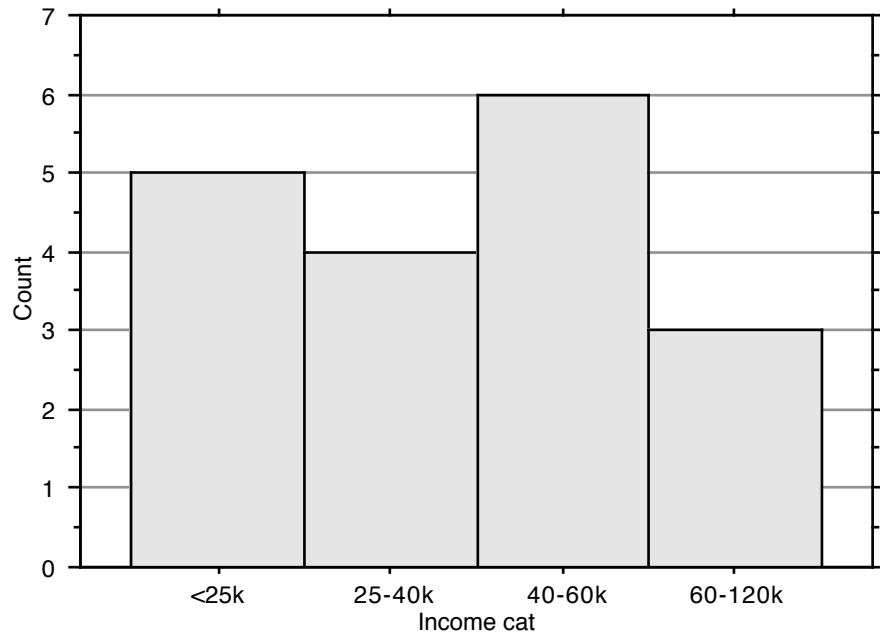
Frequency Distribution for Conservator
Split By: RECS or P.S.

	Total Count	RECS Count	P.S. Count
some nt active	3	1	2
neutral	6	3	3
some active	19	11	8
very active	6	1	5
Total	34	16	18

The household income claimed by RECS families is substantially larger than that claimed by PS families. For RECS families, the average is about \$71,000 with 10 of 16 families claiming income over \$60,000...



The income for PS families averages \$43,000 with 3 of 18 families claiming income over \$60,000...



2. Attitudes and knowledge about electricity

Somewhat more of the RECS homes had a “commodity-like” attitude towards electricity. When asked...

Do you ever think about the use of electricity in your home the way you might think about the consumption of gasoline in your car? Like, “This refrigerator uses 14 pieces of electricity a week?”

63% RECS owners answered *yes* as compared to 53% of PS owner, as shown in the following table.

Percents of Column Totals for Elect Pieces, RECS or P.S.

	RECS	P.S.	Totals
yes	62.5	52.6	57.1
no	37.5	47.4	42.9
Totals	100	100	100

In addition, “since the time the [device] was installed,” the RECS device has been much more successful in helping customers to “think of electricity as a substance or product,” as shown by the following table.

Percents of Row Totals for RECS or P.S., Substance

	no more	somewhat more	much more	Totals
RECS	6.2	81.2	12.5	100
P.S.	33.3	61.1	5.6	100
Totals	20.6	70.6	8.8	100

This claimed awareness is also matched by their greater knowledge of the consumption of their refrigerator. It should be remembered that only the RECS customers get information specifically about the consumption behavior of their refrigerator. About 38% of RECS homes had a reasonable estimate for refrigerator consumption as compared to 11% for PS homes. Indeed, all of the RECS respondents who offered good estimates did so because they remembered their estimate from viewing the RECS device. It may further be

concluded that few people in the population at large (except RECS users) really know what their refrigerator consumes.

Percents of Row Totals for RECS or P.S., Fridge consum2

	can't guess	guess	memory	Totals
RECS	62.5	0	37.5	100
P.S.	88.9	11.1	0	100
Totals	76.5	5.9	17.6	100

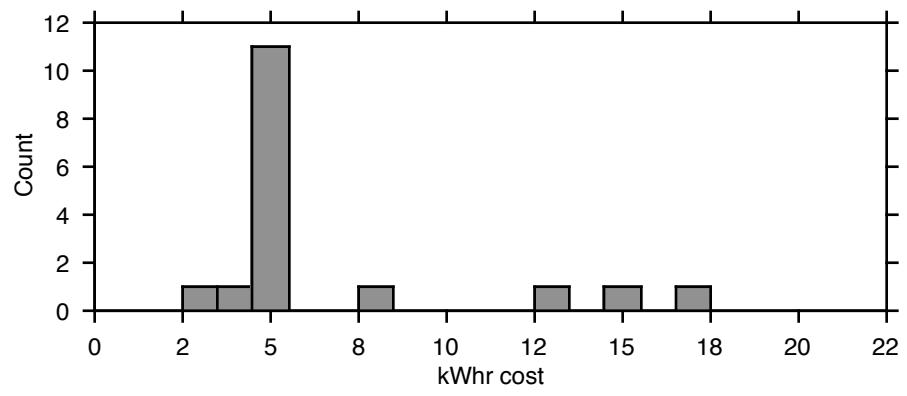
Data to be presented later shows the refrigerator is the least favored circuit in the RECS display. In light of this fact, refrigerator knowledge probably underestimates the benefits of having a RECS display present.

The sample were asked if they know what a kiloWatt hour is? Most offered some definition but few provided a full definition. RECS home owners were a bit better informed.

Did the groups know what a kiloWatt hour costs? Both groups had median and modes right on 5¢... which is the correct answer. But the arithmetic averages of the groups were a penny or two high. RECS users, averaging 6.3¢ were more accurate than PS users at 7.2¢. It can be assumed that those who offered

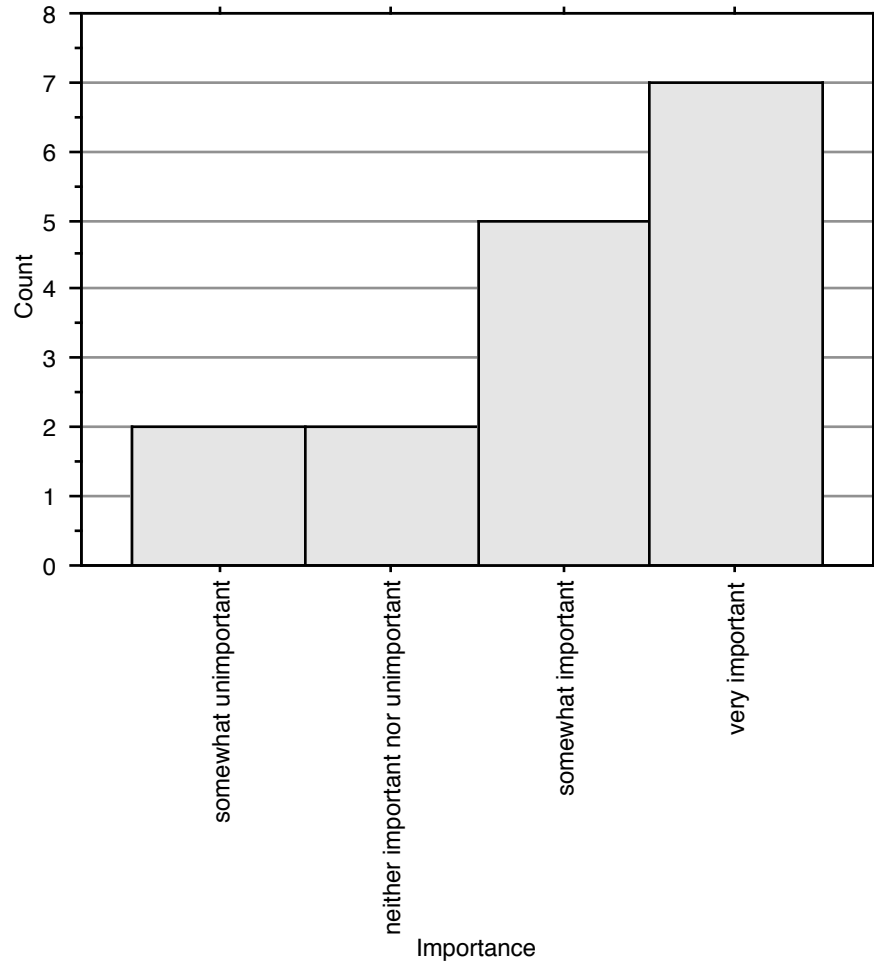
	kWhr cost, Total	kWhr cost, RECS	kWhr cost, P.S.
Mean	6.8	6.3	7.2
Std. Dev.	4.1	3.4	4.9
Count	17	9	8
Minimum	3	4	3
Maximum	17	15	17
# Missing	18	7	11
Median	5	5	5
Mode	5	5	5

The distribution of price estimates was somewhat broad, but 5¢ seems to be a favorite number.

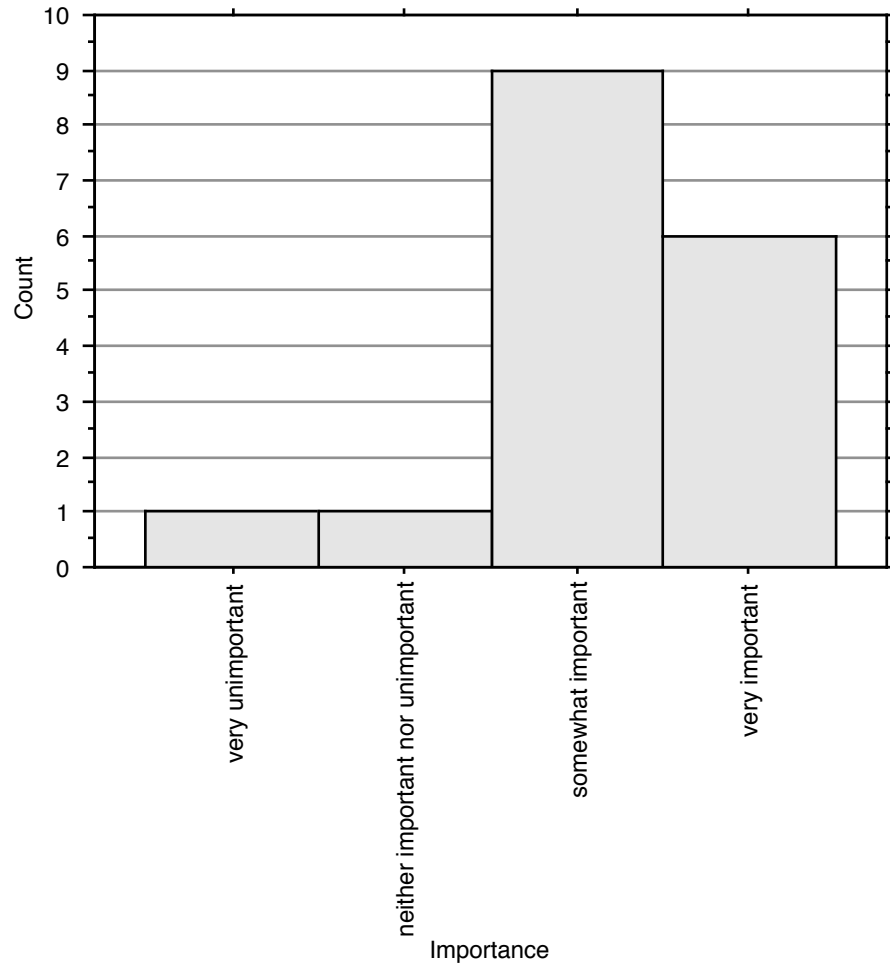


3. Reactions to the consumption meters

Respondents thought it was important to have devices such as RECS and PS in their homes. 12 of 18 RECS homes felt that way.



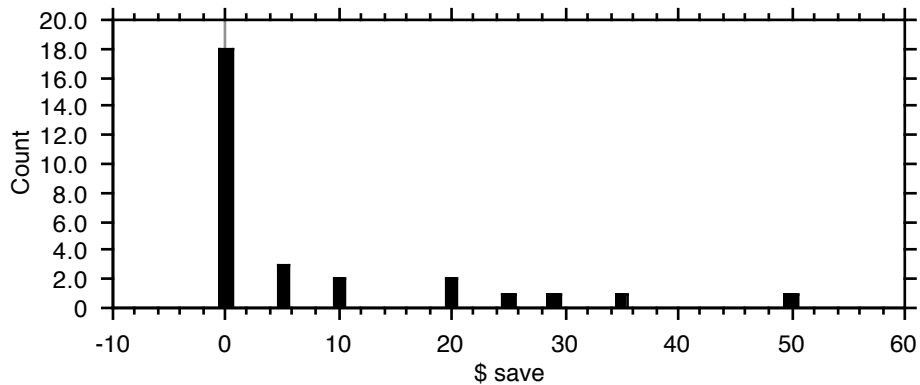
PS homes were *more* favorable, with 15 of 17 households rating it as somewhat or very important.



As a result of having the devices in their homes, respondents felt they saved...

- \$7.90 a month for RECS homes, and
- \$6.80 a month for PS homes.

The arithmetic averages are somewhat deceptive. Less than half of each group thought there weren't any savings at all. On the other hand, one RECS customer thought savings were \$50 a month. Overall in this small sample, the distribution of estimates appears to be quite similar in the two device groups, with RECS averaging a bit higher.



The number of bigger and smaller savings estimates were about the same in the two groups.

It should be noted that about 5 out of the 19 PS respondents didn't offer an estimate for savings. It would be conjecture to say whether they would have raised or lowered the average if they were forced to guess. However, it can be concluded that they did not feel well enough informed to offer a guess.

	Mean	Minimum	Maximum	# Missing	Median	Mode
\$ save, Total	7.4	0	50	6	0	0
\$ save, RECS	7.9	0	50	1	0	0
\$ save, P.S.	6.8	0	35	5	0	0

9 of 34 households began to use more wood for heating since the devices were installed. Roughly as many RECS as PS homes took this direction.

Averaging households, roughly 80% of the adults present in a household look at the device, and about 90% of the kids.

Participants look at the RECS about 45 times a months and the PS about 36 times a month.

Descriptive Statistics
Split By: RECS or P.S.

	Mean	Std. Dev.	Std. Error	Count	Minimum	Maximum	# Missing
Ck frq/mon, Total	40.3	28.8	4.9	34	1	112	1
Ck frq/mon, RECS	45.4	27.7	6.9	16	1	112	0
Ck frq/mon, P.S.	35.8	29.7	7	18	8	100	1

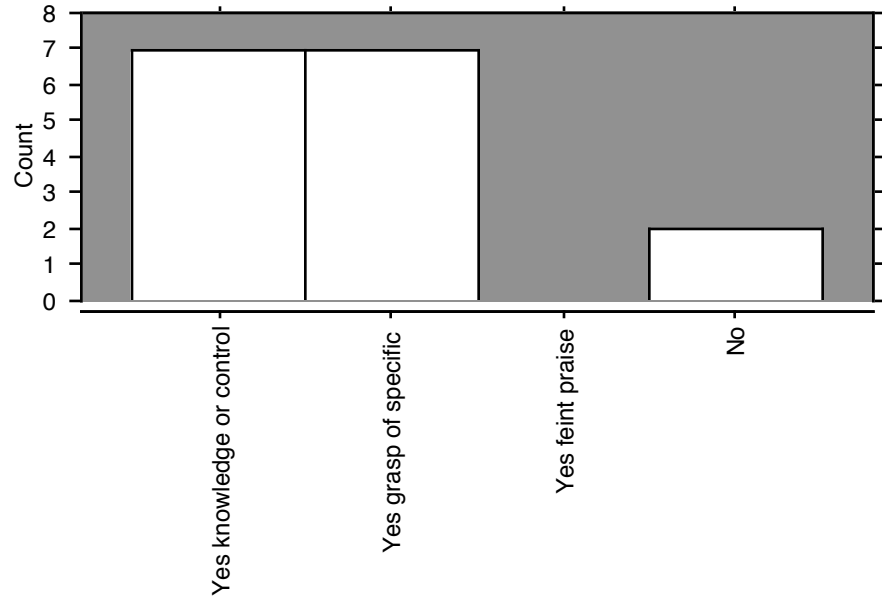
After the first month of use, roughly equal numbers of RECS users decline, increase, and stay the same in the frequency with which they look at the device. For PS users, the pattern is somewhat different. Almost half the group increase the frequency of their attentions. One interpretation is that the PS displays require a period of learning before they become meaningful. The PS users may reach the same level of use as the RECS users (a) as time passes or (b) if the challenge of learning to use the device were less.

Percents of Row Totals for RECS or P.S., Ck trend

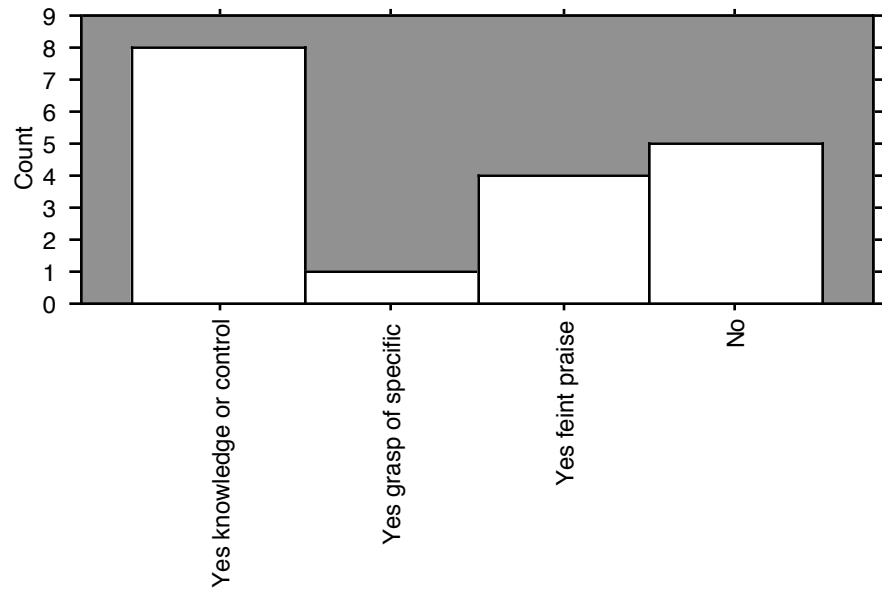
	less	same	more	Totals
RECS	37.5	37.5	25	100
P.S.	27.8	27.8	44.4	100
Totals	32.4	32.4	35.3	100

Respondents were asked if they had learned anything as a result of the installation of a device in their home. Users acknowledge learning something about *general* energy control and for the RECS group, some specifics as well. Overall, the RECS was slightly more productive in providing new lessons to users and did not as frequently offer nothing better than “feint praise.”

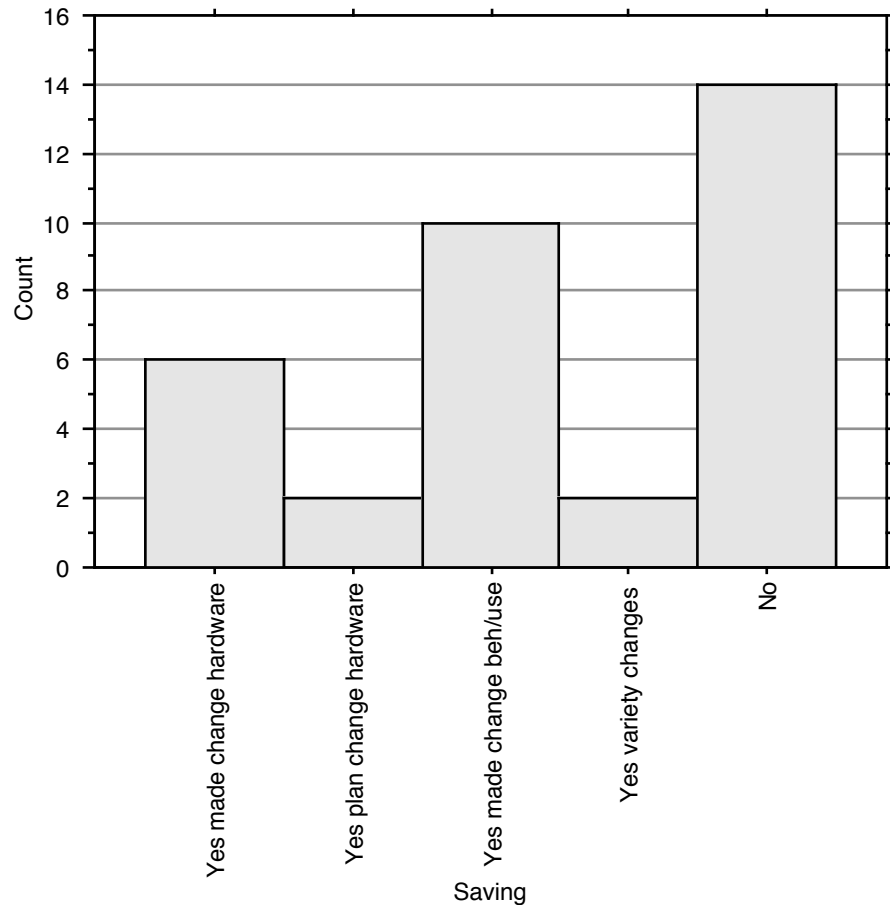
The RECS group...



The PS group...

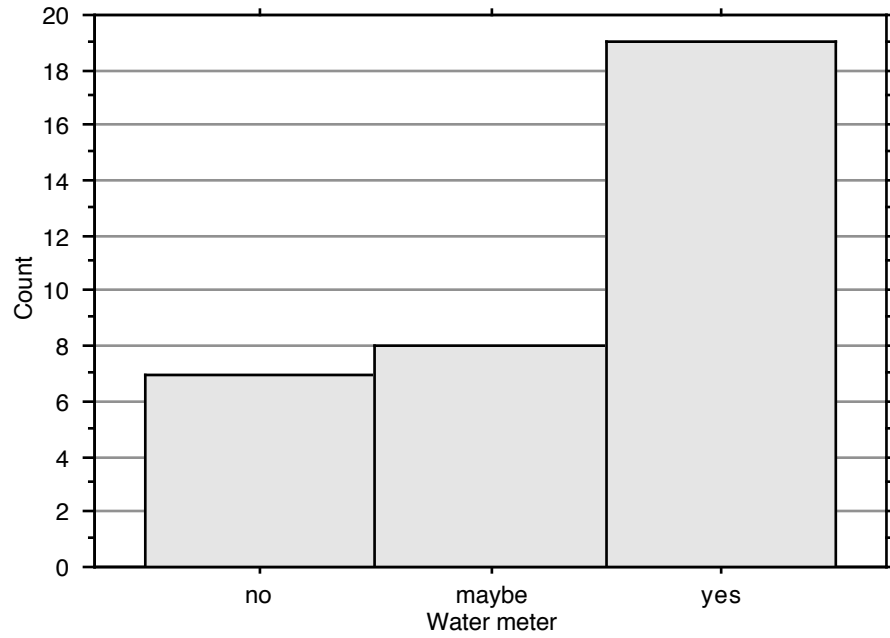


Given new information from their devices, what efforts at conservation were made by the householders as a result of the devices? The following chart shows about half the sample made no physical or lifestyle changes at all. 30% of the group changed behavior or usage and 20% made a physical change to their homes. The RECS and PS groups did not appreciably differ in savings changes.



Only a few households had any reason to think that consumption had increased in any way. These again did not differ between the two device homes.

It is also possible to judge the value placed on an electricity conservation device by indirect questioning. Do the PGE households in this study feel that a *water* consumption meter similar to the RECS or PS would be useful? As shown in the follow chart, they generally *would* like such a meter. The two device sub-groups did not appreciably differ.



About a third of the RECS households have turned the screen brightness way down or turned the monitor off at some time.

4. Reactions to RECS

4.1. Main screens

There are three main screens to RECS...

1. present cost per hour— a digital “speedometer” for the consumption of the whole house at that moment in time in terms of dollars,
2. present usage in kilowatts — a digital “speedometer” for the consumption of the whole house at that moment in time in terms of power. and
3. present usage of each circuit — a bar chart showing usage in each main circuit.

Customers were asked if they found felt they understood each of these displays. All respondents said they found each of the three understandable, an impressive outcome... assuming some truth to their assessment!

Customers were asked if they found each of these displays useful. For the present cost, one customer said *no*, for the present usage in kilowatts, 10 said *no*, and for the series of individual bars for each circuit, 3 said *no*.

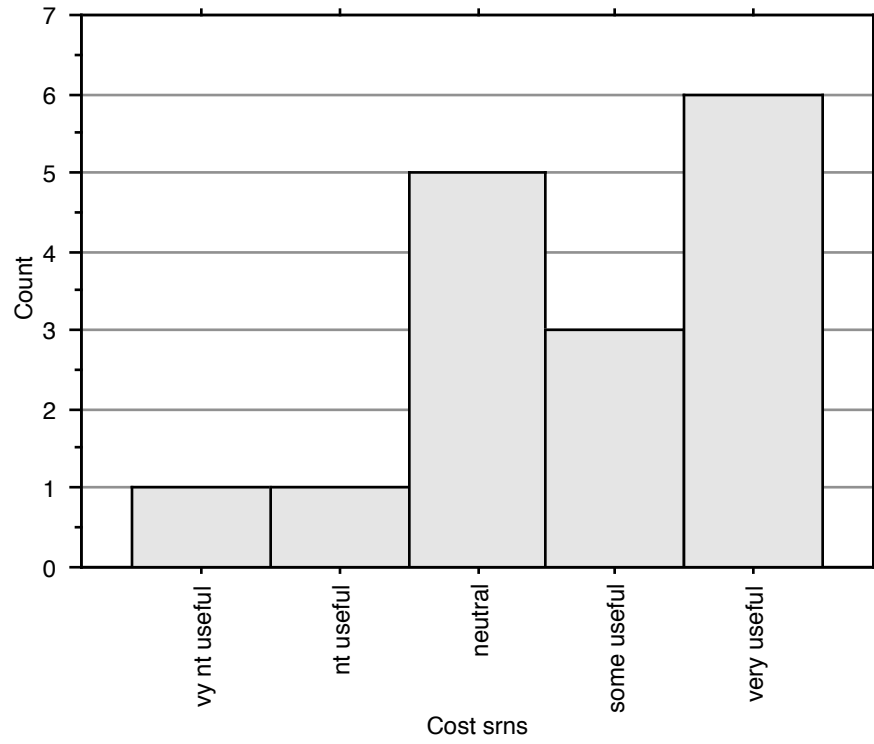
How often do people look at each of these screens? Paralleling the perception of usefulness mentioned in the previous paragraph, the median number of times a month people look at the displays are...

- present cost per hour: 60 times a month,
- present usage in kilowatts: 4 times a month, and
- present usage each circuit: 30 times a month.

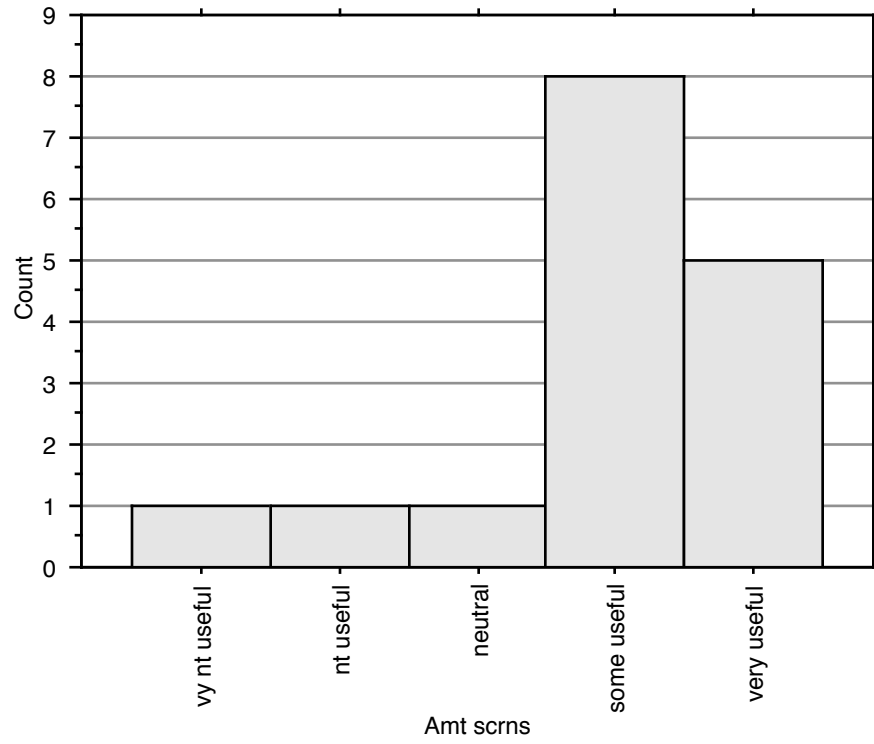
The reasons given for finding these three main screens individually useful are found in the appendix.

The RECS offers over a dozen screen displays in total. These may be generically divided into three categories (1) cost over a certain period of time, (2) amount of electricity being used, and (3) cumulative (or total) cost displays.

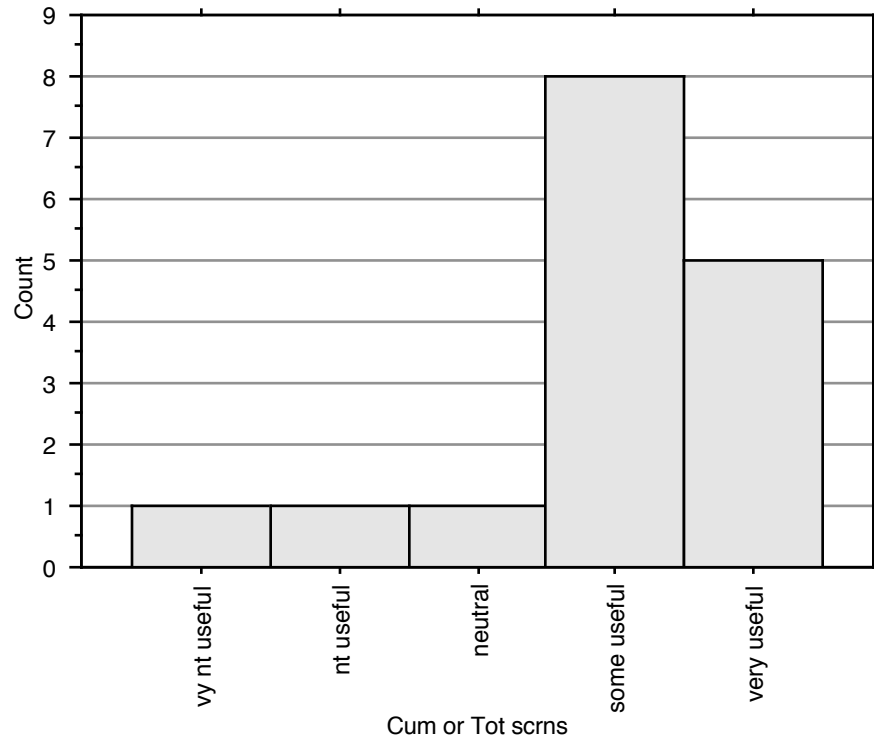
The cost-over-a-period displays are well-liked for usefulness as shown in the chart below.



The amount of electricity being used screens are even better liked for usefulness, as shown in the chart below.



The cumulative (or total) cost screens are also better liked as shown in the chart below.



4.2. Specific circuits

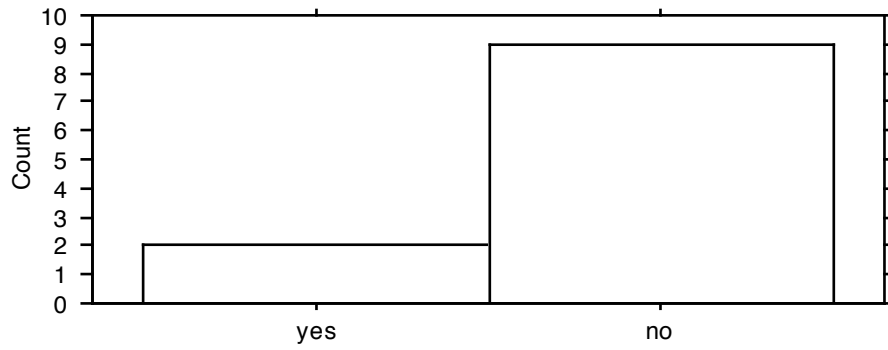
There are 7 circuits tapped by the RECS sensors. In addition, two more displays show (1) total consumption and (2) an “Other” consumption figure representing the difference (or remainder) between total consumption minus the sum of the specific circuits.

Which circuits do householders feel are important? Respondents were asked, “which circuits you find the most important.” Answers were recorded as yes or no.

Refrigerator: no one thought this circuit was important

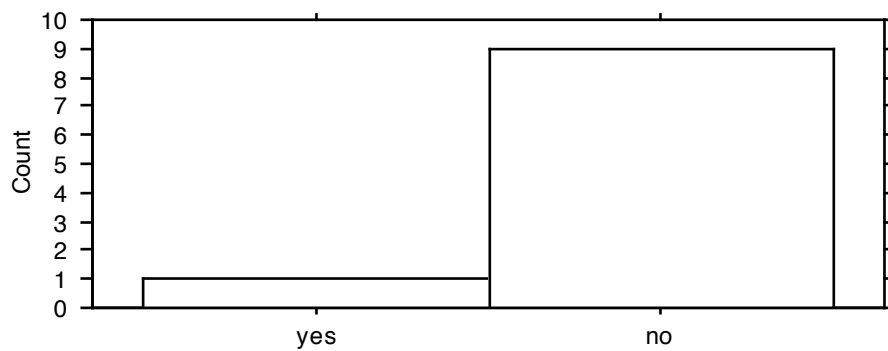
Dishwasher: about 20% of RECS respondents thought this was important.

	Percent
yes	18.2
no	81.8
Total	100



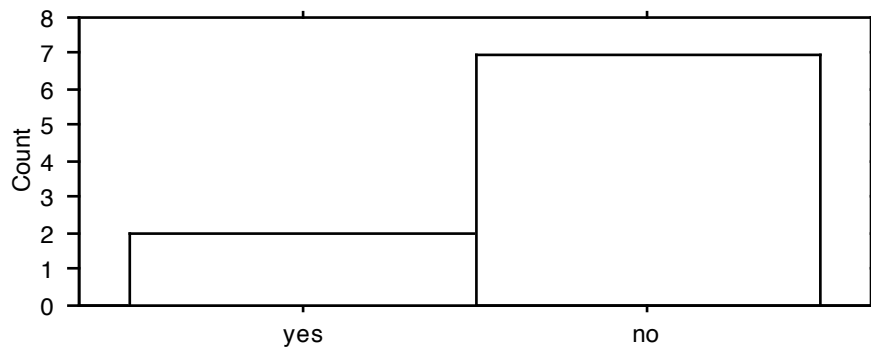
Washer: this was deemed important by 10%.

	Percent
yes	10
no	90
Total	100



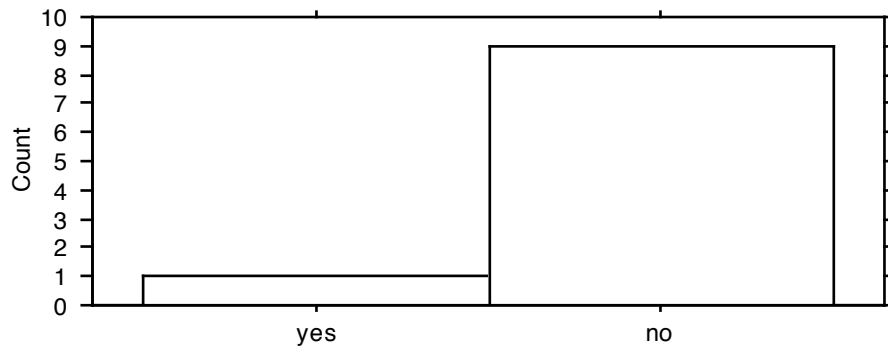
Dryer: one in five people thought the dryer was important. This validates the good sense of the RECS customers in as much as the dryer consumes far more electricity than the washer.

	Percent
yes	22.2
no	77.8
Total	100



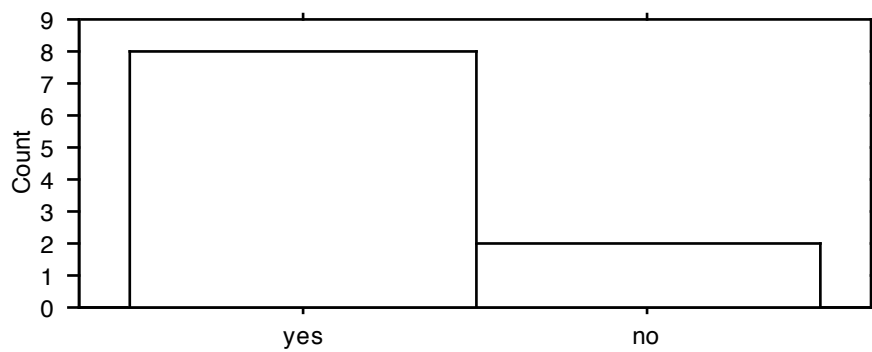
Stove: oddly, the stove consumption was of interest to only 10% of customers despite being a major drain. This may indicate a low level of interest in conservation for devices whose functions are deemed essential and unalterable.

	Percent
yes	10
no	90
Total	100



Hot water: consumption matters to 80% of the RECS sample. Despite being essential and possibly unalterable, hot water use seems to be viewed as an element which *can* be controlled.

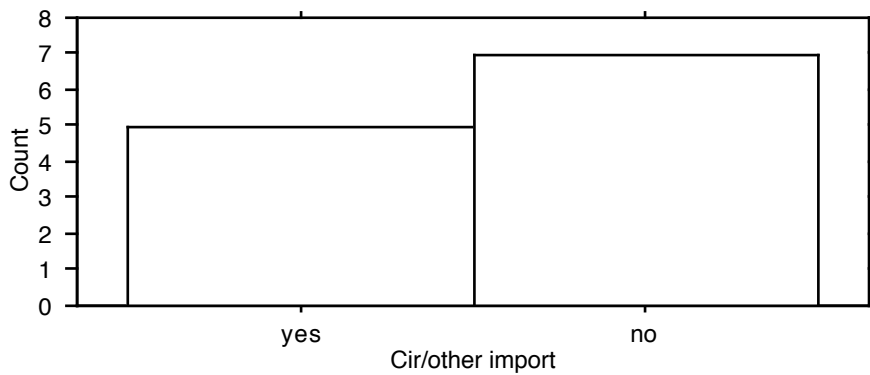
	Percent
yes	80
no	20
Total	100



Electric heat: 100% said "important."

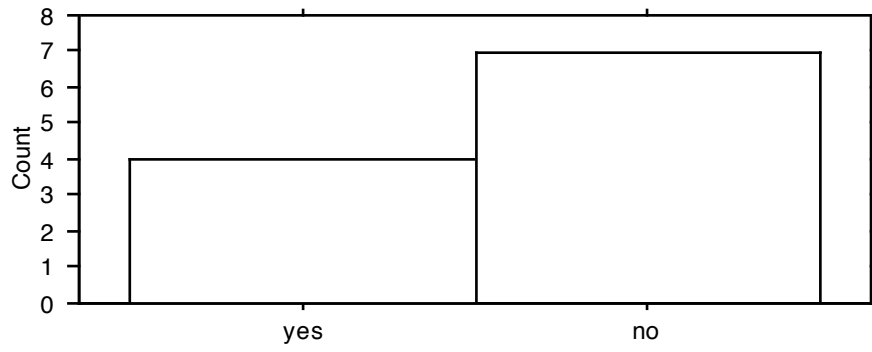
"Other": while not providing specific to guide conservation behavior, customers seem genuinely interested in the catch-all category. This is puzzling.

	Percent
yes	41.7
no	58.3
Total	100



Total: total consumption is available on other RECS screens yet it seems to be of strong interest vis a vis the individual circuits bar charts.

Percent	
yes	36.4
no	63.6
Total	100



5. Reactions to Power Sentry

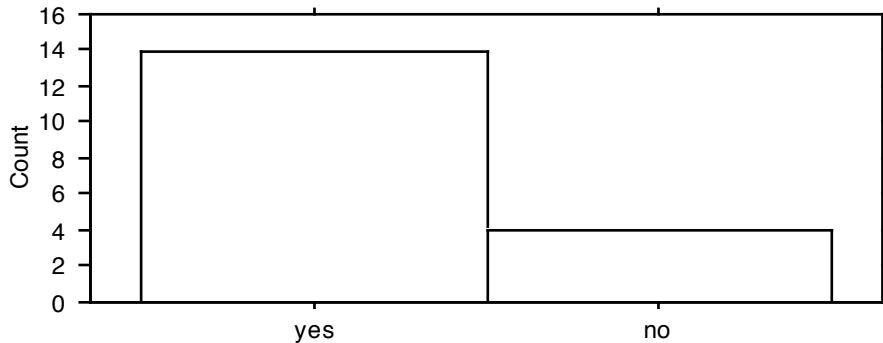
5.1. Importance

The PS device has 7 displays. PS customers were asked for the importance of each display as a yes-no answer and *how often* they looked at each display.

The *importance* opinions are presented below with frequency results in the next section.

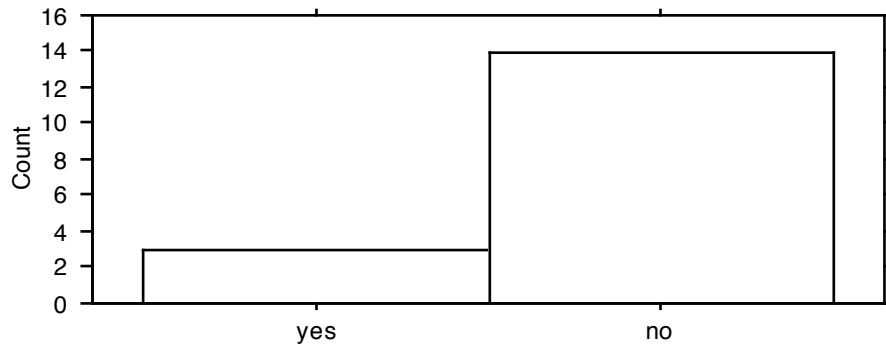
CUR This billing period so far... CUR and NOW are the only displays with appreciable consumer interest. This attitudinal data shown here agree with the behavioral data (on frequency of viewing) in the next section.

	Percent
yes	77.8
no	22.2
Total	100



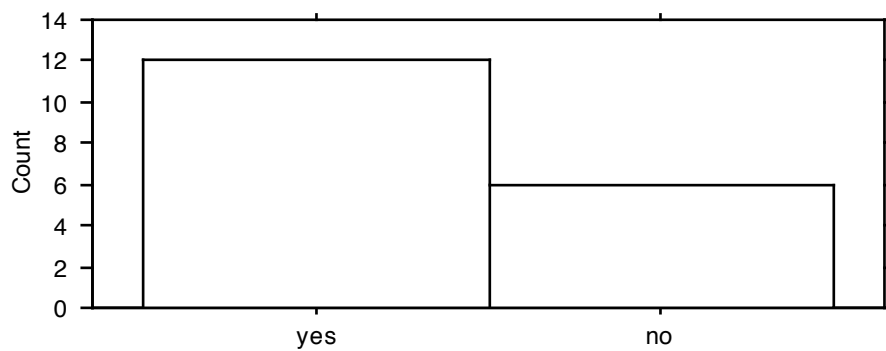
PRJ This billing period to end

	Percent
yes	17.6
no	82.4
Total	100



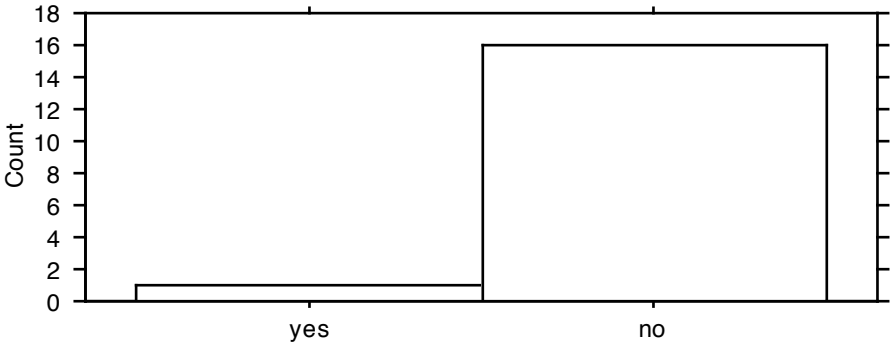
NOW Usage right now

	Percent
yes	66.7
no	33.3
Total	100



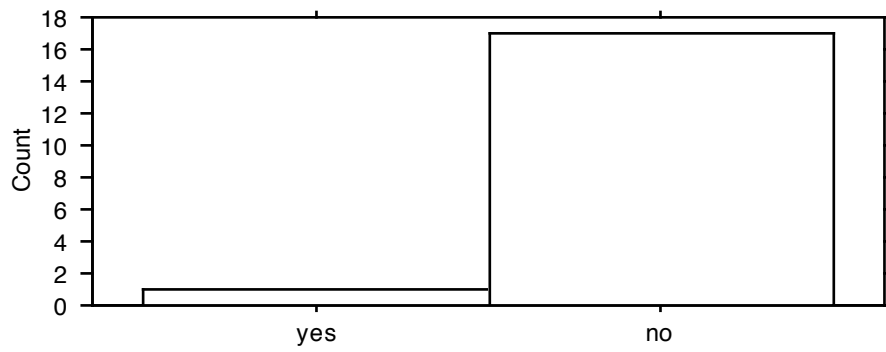
DIF Diff of this hr to last hr

	Percent
yes	5.9
no	94.1
Total	100



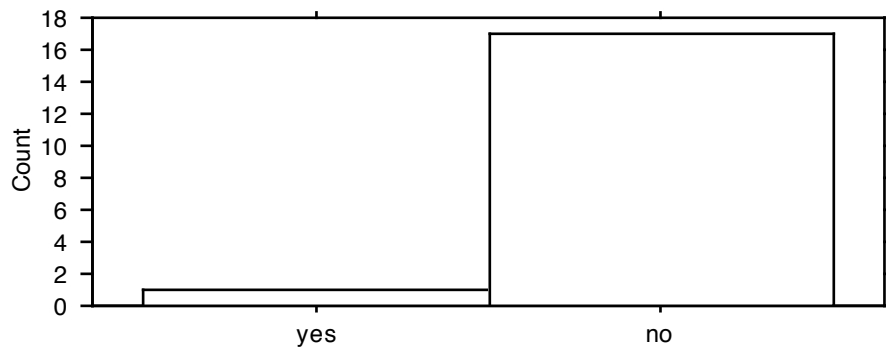
BUD Budgeted and actual use

	Percent
yes	5.6
no	94.4
Total	100



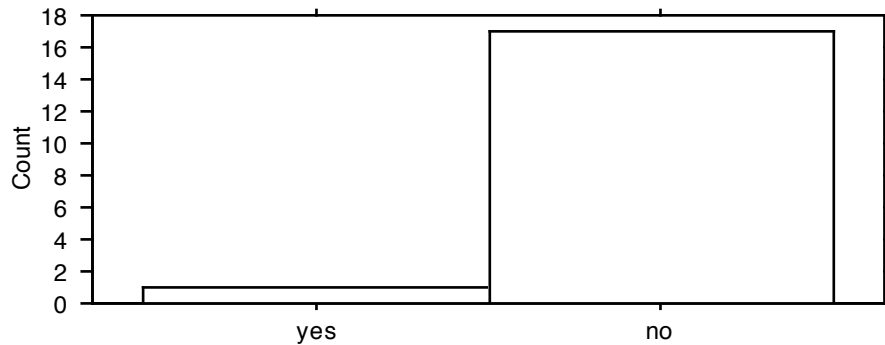
LST Last billing period

	Percent
yes	5.6
no	94.4
Total	100



RATE Cost of a kWhr

	Percent
yes	5.6
no	94.4
Total	100



5.2. Frequency of viewing

How often did people look at each scale?

These figures are somewhat misleading because the interviewers did not pressure customers to address all the questions on each of the displays. For example, 11 respondents view LST an average of 3.7 times a month (medium exposure is zero times); but it can be assumed that the 8 “silent” PS customers — those who did not answer this question — used it only infrequently or never.

The “median” score is the one which half the sample exceed and half the sample are below. The “mode” is the most popular score and typically is close to the median. The “mean” is the familiar arithmetic average. Because even a single very high score (such as “60 times a month”) can distort the mean, *the median* is considered the best indicator of the central tendency of a sample on variables such as are discussed in this section.

As with many aspects of human life, variability is the norm. For the PS, there is somebody who has no or little interest in a given screen. But equally, there is somebody who will look at each screen one of the screens 12 times a month.

Like the RECS, the screen showing present consumption for the month so far, CUR, is the one holding the most interest. With a range from 2 to 60 times a month, the median experience is 12 and the arithmetic mean is 19.8 times a month, or roughly twice every three days. Please see the table below.

Also like the popular RECS automatic default screen, current usage, NOW, is the second highest in frequency although there are many more missing answers. The NOW median is also 12 and the mean is close to CUR at 19.7 times a month.

All other screens were viewed *far* less often. Interest varied between 2 and 7 times a month.

	Mean	Std. Dev.	Count	Minimum	Maximum	Median	Mode
CUR/Month	19.8	18.8	16	2	60	12	•
PRJ/Month	7	8.6	13	0	30	4	•
NOW/Month	19.7	20.3	12	0	60	12	12
DIF/Month	5.8	10.4	10	0	32	1.5	0
BUD/Month	3.7	4.4	11	0	12	2	•
LST/Month	2.3	3.7	11	0	12	0	0
RATE/Month	4.4	8.8	11	0	30	1	0