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Do consumers know their **electricity** use? Answers from big data

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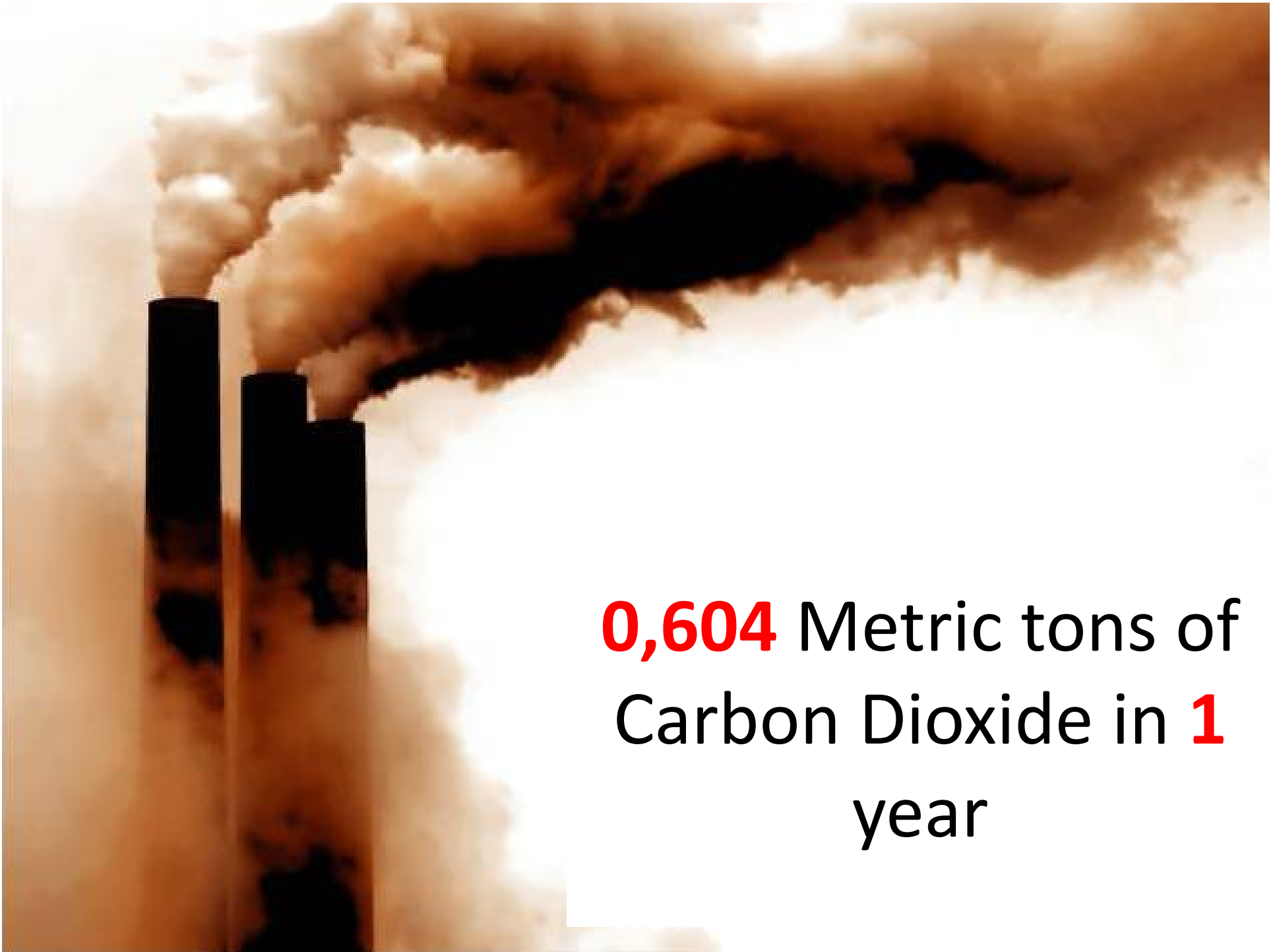
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Background

- CO₂ emissions must be drastically reduced in next **50 years** (IPCC, 2014)
- **Behaviour change** can reduce **20%** of CO₂ from household electricity use (Dietz et al, 2009)
- To change behaviour, it might be important for people to know how much electricity is used by different appliances



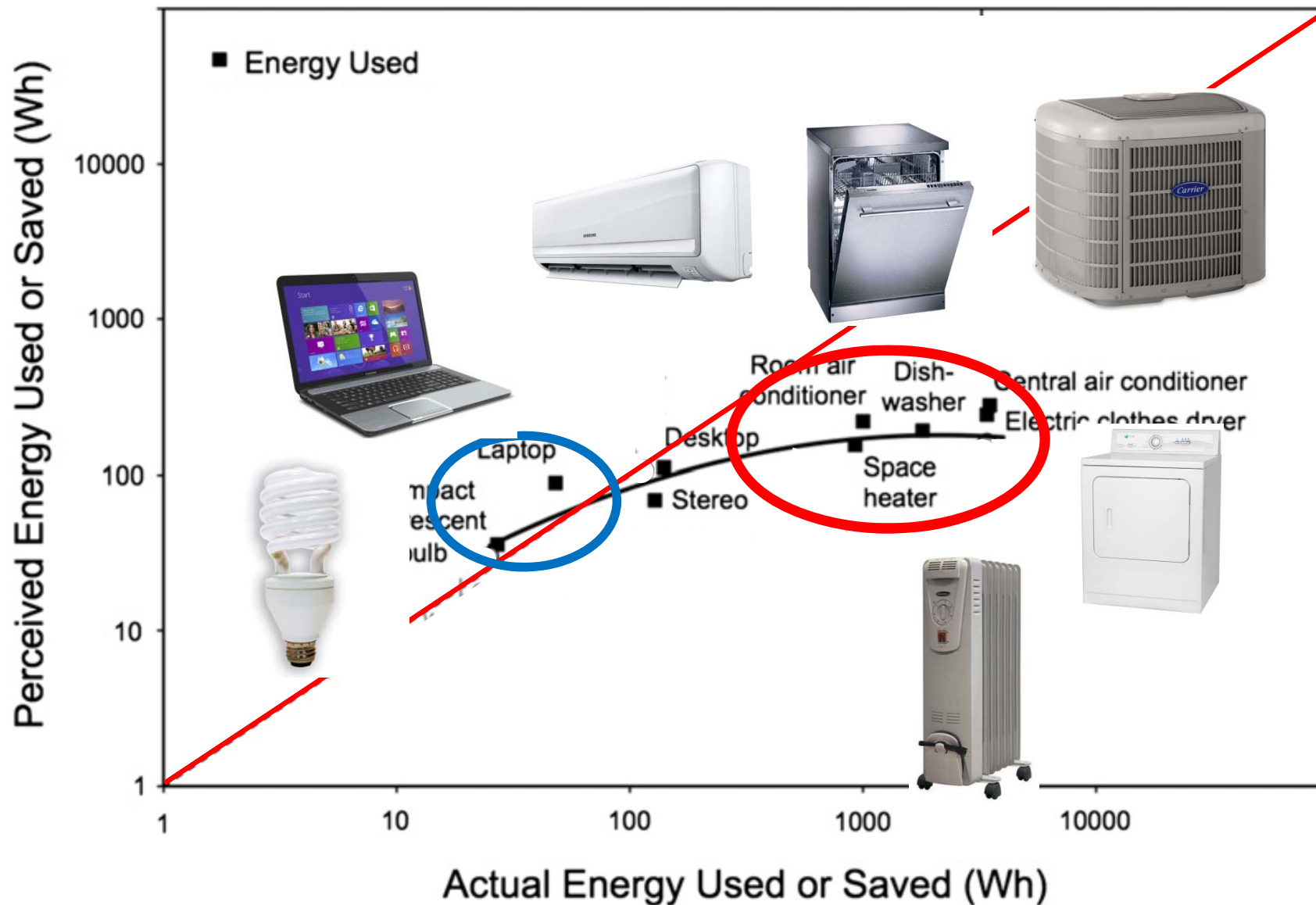


0,604 Metric tons of
Carbon Dioxide in **1**
year

Why perceptions matter?

- More informed and better decisions regarding energy use and potential savings
- Better design of energy-related technologies and services
- Support for energy companies to reduce the high usage in the peak periods
- Provide insights for understanding decision-making in energy context

Do people know energy use of appliances?



Attari et al. (2010)

Limitations of Attari et al. study

1. Estimated energy use for avg household
 - **We have *actual* electricity for each household**
2. Participants judged 'energy use' of appliances
 - **Our participants estimated *kWh* or \$ for each appliance**

Research Questions

1. Do people know how much energy is used by their appliances?
2. Are estimates better in Kwh or \$?
3. Do participants know how much electricity they used compared to:
 - ... their Pecan Street community?
 - ... the average US household?

Pecan Street Community

- Pecan Street (Austin, TX) is a research organisation
- 'Big data' track energy use from test community of 700 households



Method




- **Data collection:**
 1. **Perceived electricity use (in Kwh or \$)** estimated in online survey
 2. **Actual electricity use** measured in 1-hour intervals for 3 summer
- **Appliances:** AC, refrigerator, dryer, washing machine, dishwasher and oven
- **Participants (N=118):**
 - more than 85% white
 - predominately households with 2 or more occupants
 - 80% with at least a college degree
 - 70% with income higher than \$75.000 per year

kWh Group: Example question

How many kilowatt hours do you think are used to run the following appliances in your house - as you typically would - over the course of **an entire summer month**?

You can indicate how many kilowatt hours each appliance uses by sliding the bar to the right (more kilowatt hours) or to the left (less kilowatt hours).

If you do not have such a appliance in your home, please click on the not applicable option!




	kilowatt hours used in one summer month											Not Applicable
	0	100	200	300	400	500	600	700	800	900	1000	
 Refrigerator												<input type="checkbox"/>
 Washing Machine												<input type="checkbox"/>
 Dishwasher												<input type="checkbox"/>

\$ Group: Example question

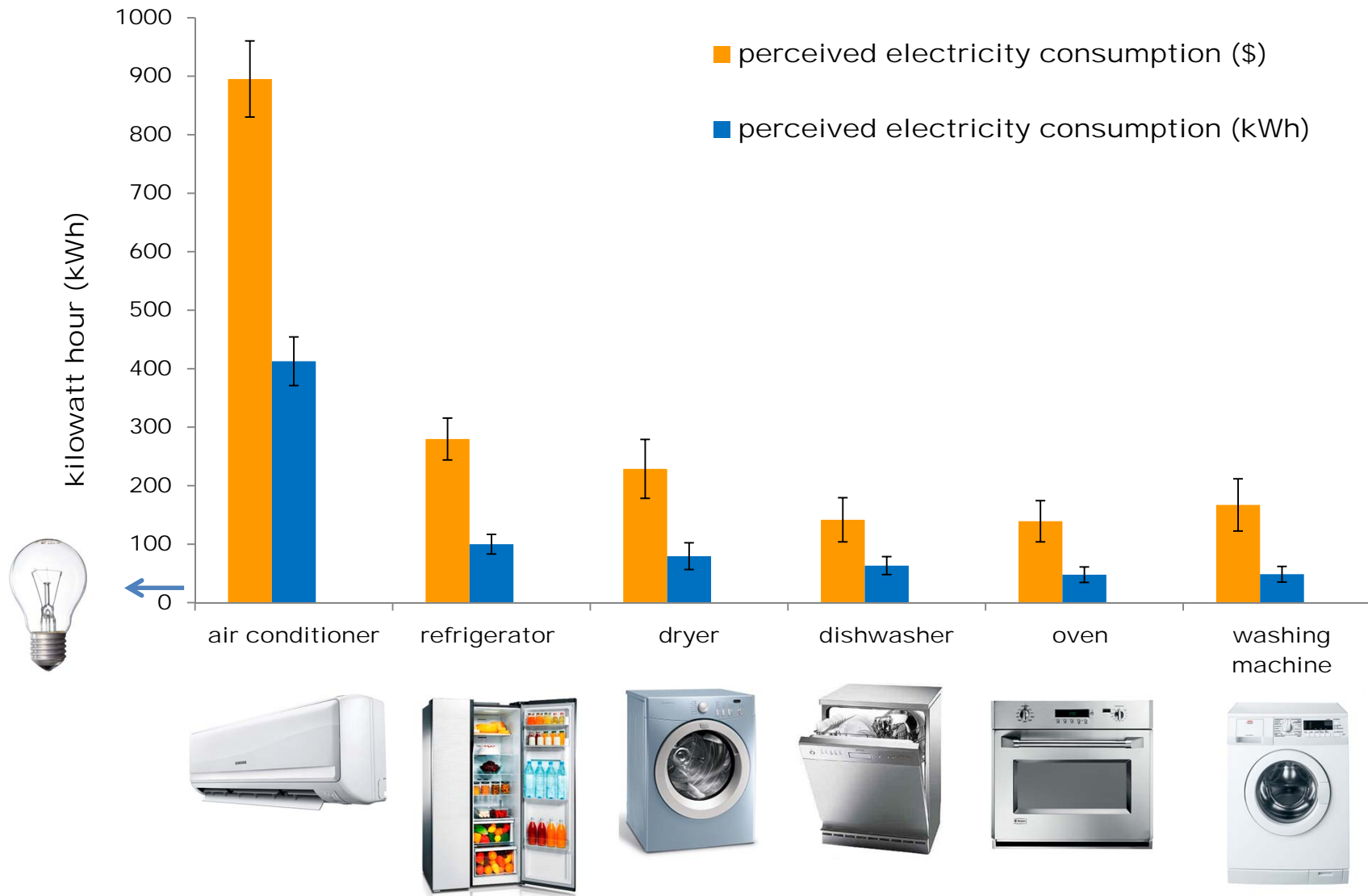
How much do you think it costs to run the following appliances in your house - as you typically would - over the course of **an entire summer month**?

You can indicate how much it costs you to use each appliance by sliding the bar to the right (costs more dollars) or to the left (costs less dollars).

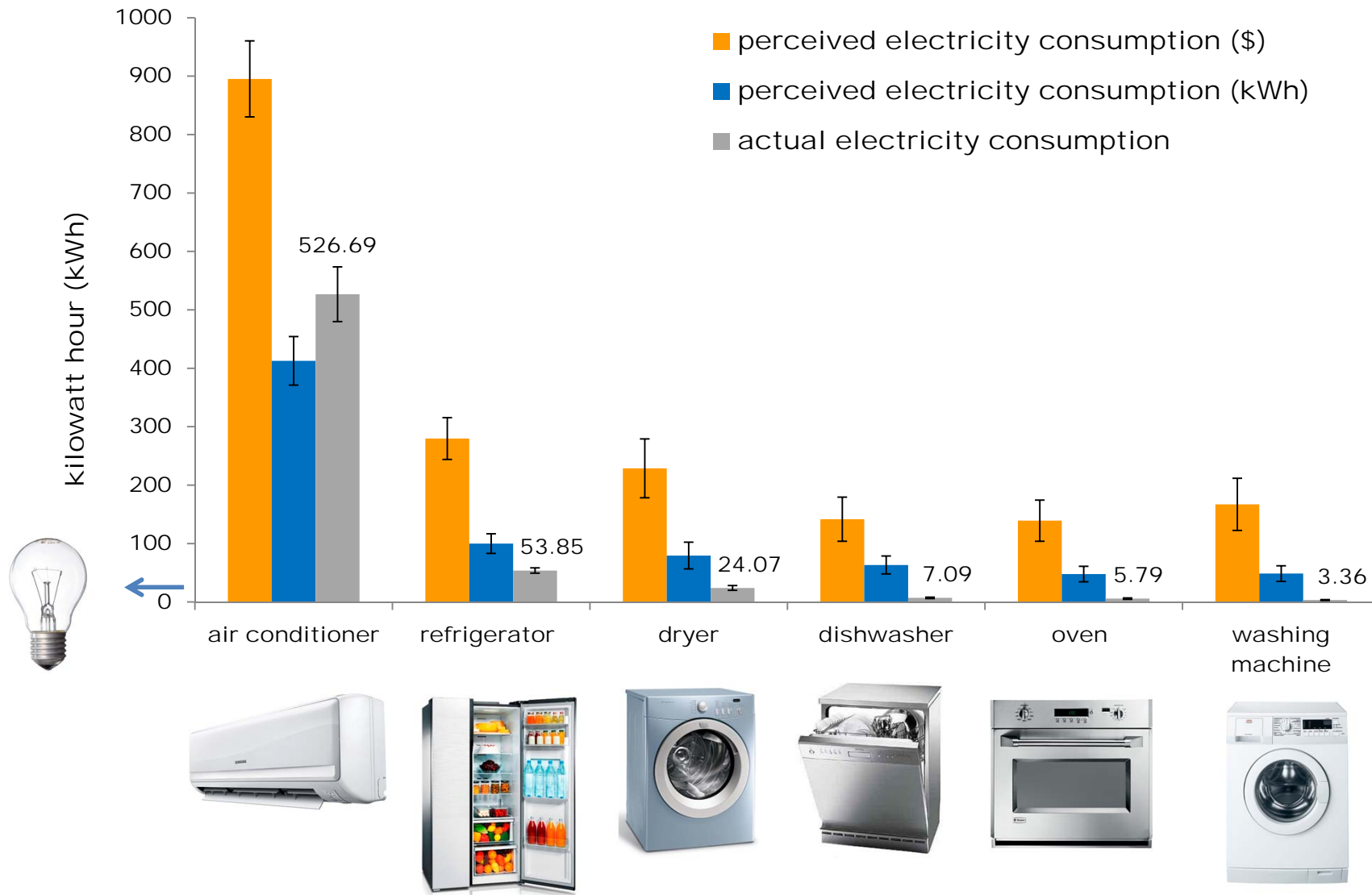
If you do not have such a appliance in your home, please click on the not applicable option!

	cost (in \$) for one summer month											Not Applicable
	0	10	20	30	40	50	60	70	80	90	100	
 Electric Dryer												<input type="checkbox"/>
 Dishwasher												<input type="checkbox"/>
 Air Conditioner												<input type="checkbox"/>

Estimated use



Estimated use (vs. actual use)



Conclusion 1 & 2

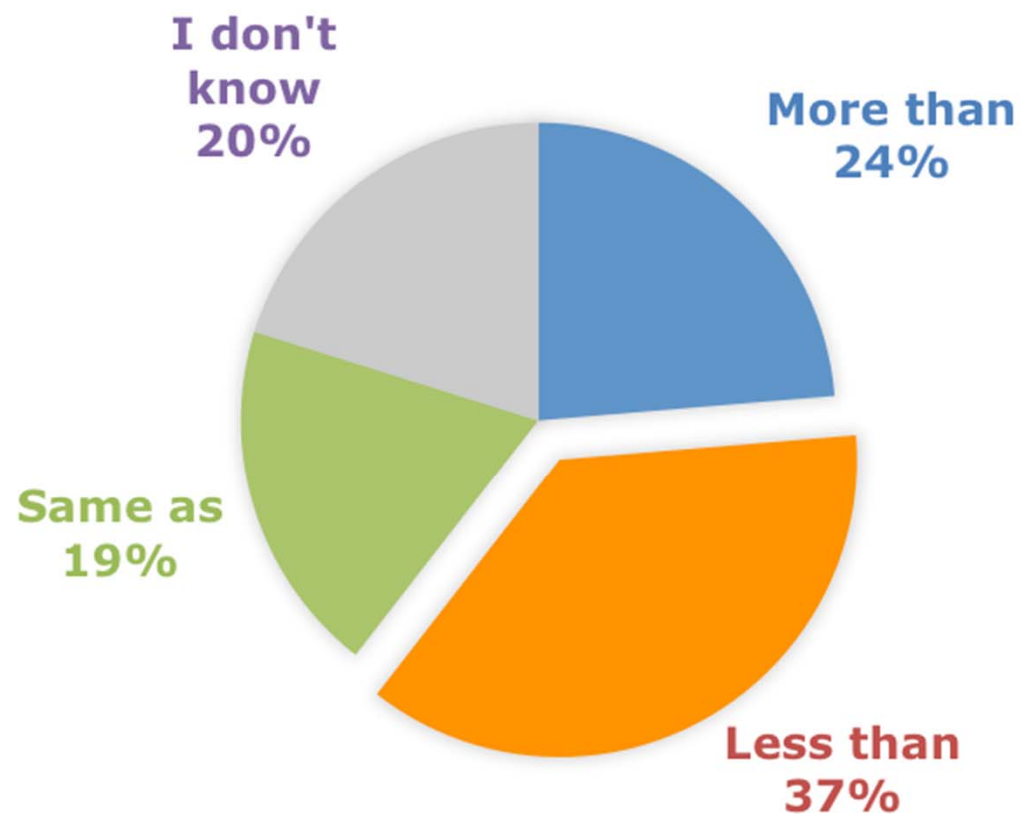
1. People do have misperceptions about how much electricity their appliances are using
 - Even when we assessed their actual use (rather than estimated average use; Attari et al., 2010)
2. Estimates in \$ were less accurate than those in kWh
 - \$ may evoke memories of high prices (Bruine de Bruin et al., 2011)

Example question: Neighbours

Overall, do you think that your household consumes more or less electricity than the average household in the Pecan Street Project community?

- My house consumes more than the Pecan Street Project community average house
- My house consumes less than the Pecan Street Project community average house
- My house consumes about the same as the Pecan Street Project community average house
- I don't know

PERCEPTIONS OF HOUSEHOLD ENERGY USE IN COMPARISON TO PECAN STREET COMMUNITY

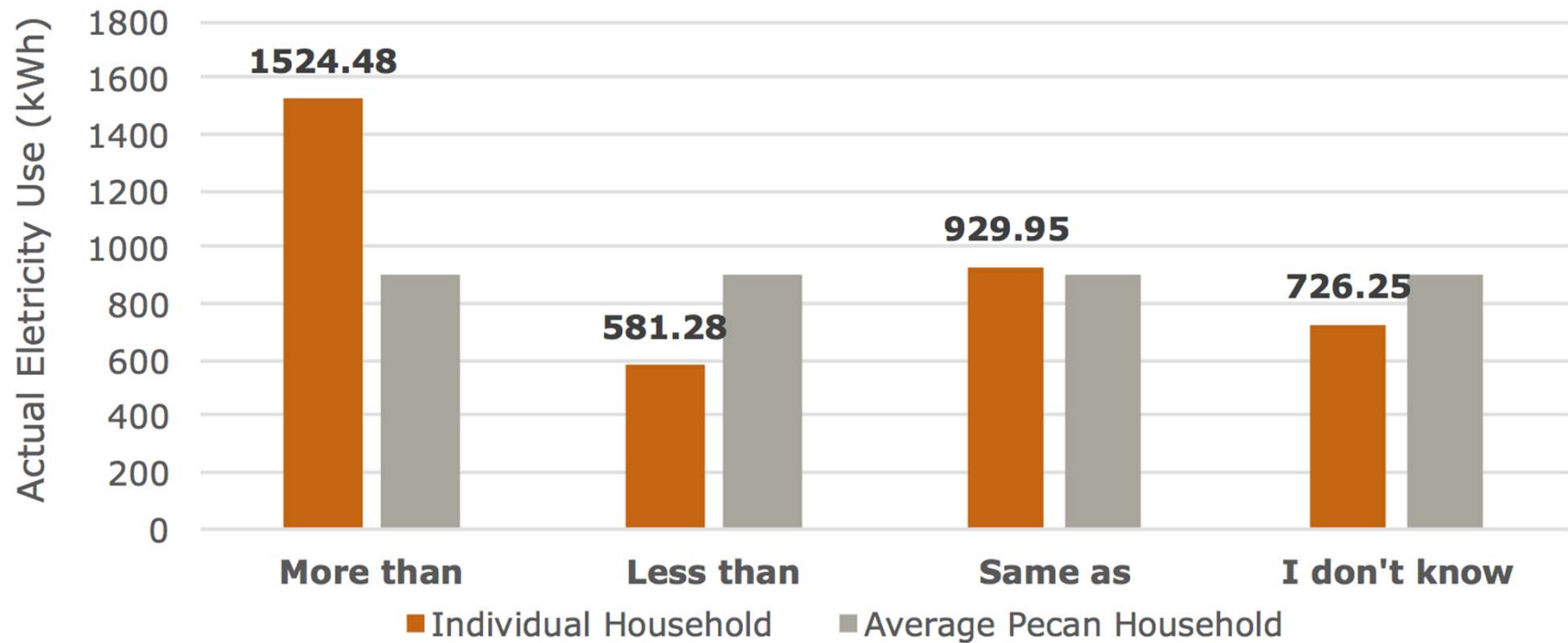




VS



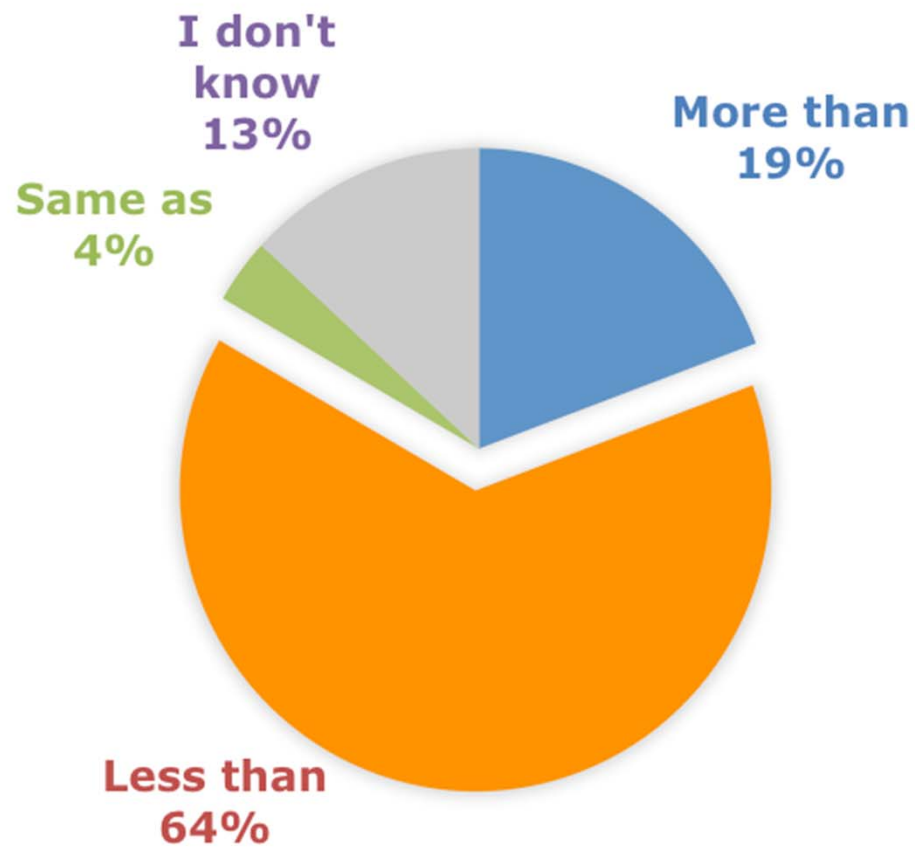
Percieved and actual household eletricity use in comparsion to **Pecan Street Community**



Example question: Average Home

- Overall, do you think that your household consumes more or less electricity than the average household in the United States?
 - My household consumes more than the U.S. average household
 - My household consumes less than the U.S. average household
 - My household consumes about the same as the U.S. average household
 - I don't know

PERCEPTIONS OF HOUSEHOLD ENERGY USE IN COMPARISON TO AVERAGE US. HOUSEHOLD

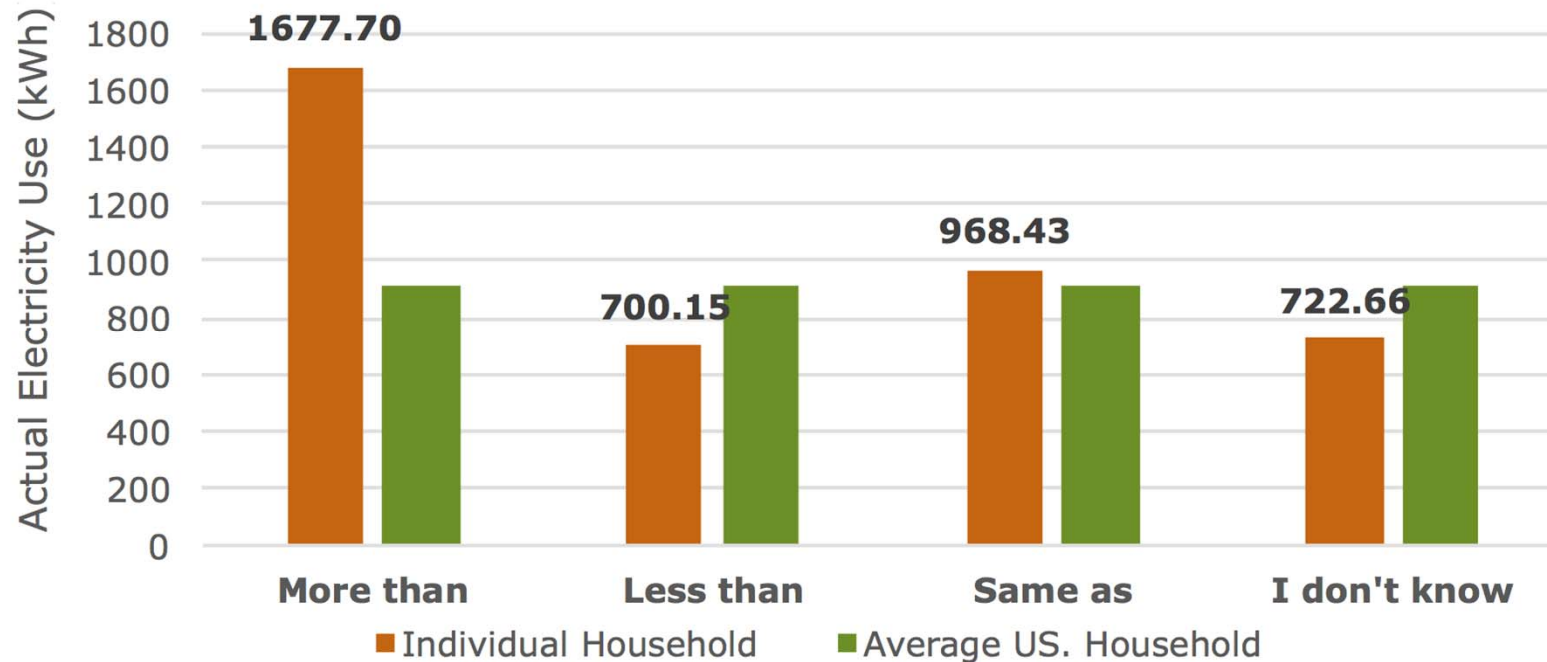




VS



Percieved and actual household eletricity use in comparsion to **Average US. Household**



Conclusion 3

- Consumers' perceptions of their relative household electricity use are quite accurate for both Pecan Street Community and average US. household
- Consumers who think they use more do indeed use much more
- How can we motivate those consumers to use less?

Limitations and next steps

- Limitations
 - Pecan Street Community sample
 - Focus on use during summer months
- Follow-up experiments
 - Can we improve people's estimates of how much electricity is used by their appliances?
 - Do improved estimates of electricity use lead to behaviour change (and reduced CO2 emissions)?

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