# Privacy Perceptions of Energy Data: A U.S. Consumer Study[1]

**Jason Dedrick and Angela U. Ramnarine-Rieks**

**Syracuse University, School of Information Studies**

Stimulus funding provided by the American Recovery and Reinvestment Act of 2009 (ARRA) assisted in the acceleration of smart meter deployment (58.5 million installed) among electrical utilities in the United Sates. The capture of energy use data at near real time intervals by smart meters enables automation of services, management of grid operations, and better matching of supply to demand. Potential consequences from these activities raises privacy concerns among consumers that should be addressed by utilities and regulators.

With this in mind, the following study was conducted across four U.S. cities with different levels of smart meter integration. The objective is to identify consumers' perceptions of privacy concerns raised by the deployment of smart meters. It asks the following questions:

- How do consumers perceive privacy risks when presented with information about possible smart meter data collection and use?
- How do utility companies currently protect data privacy and how well do their policies and practices correspond to the privacy concerns of consumers?

This paper focuses on the first question. Two focus groups (8-10 participants) were done in each of the following metropolitan areas:

- Syracuse, New York- no smart meter installation
- Detroit, Michigan– installation of smart meter ongoing by utilities
- Houston, Texas– smart meters installed in most homes
- San Jose, California- smart meters installed in most homes

A cross-section of consumer demographics and experience with smart meters was represented by 76 participants (See Table 1).

[1] The study is supported by the U.S. National Science Foundation (SES-1447589) and the Alfred P. Sloan Foundation.

**Table 1. Participant demographics**

| | # of Participants | | # of participants | | # of participants |
|---|---|---|---|---|---|
| **Home Ownership** | | **Education** | | **Employment** | |
| Own | 70 | High school | 9 | Full-time | 52 |
| Rent | 6 | Some college | 10 | Homemaker | 9 |
| **Age** | | 2 yr degree | 13 | Part-time | 3 |
| 18-33 | 11 | College graduate | 31 | Retired | 10 |
| 34-45 | 29 | Post graduate | 13 | Unemployed | 2 |
| 46-59 | 24 | **Income** | | **Smart meter** | |
| 60+ | 12 | <$50K | 7 | Don't know | 7 |
| **Gender** | | $50-75K | 33 | No | 27 |
| Male | 38 | $76-100K | 20 | Yes | 42 |
| Female | 38 | $101-125K | 6 | | |
| | | >$125K | 10 | | |

Scenarios were used to assist in illuminating potential issues. Participants interacted with four scenarios—the first two, plus two of the following three:

1. Video overview of smart grid by the Department of Energy https://www.youtube.com/watch?v=JwRTpWZReJk
2. Video advertisement for Bidgely, a home energy management service used by utilities. https://www.youtube.com/watch?v=Clc012Ss9LU
3. News story from Forbes business magazine describing home hacking via a vulnerable home electronic system http://www.forbes.com/sites/kashmirhill/2013/07/26/smart-homes-hack/#5eda5c9946a5

4. Researcher-developed scenario in which police search a home based on information received from the utility about high electrical usage, leading to suspected marijuana growing.
5. Researcher-developed scenario where a homeowner receives targeted advertisement from third parties about energy cost savings after subscribing to their utility's energy saving program

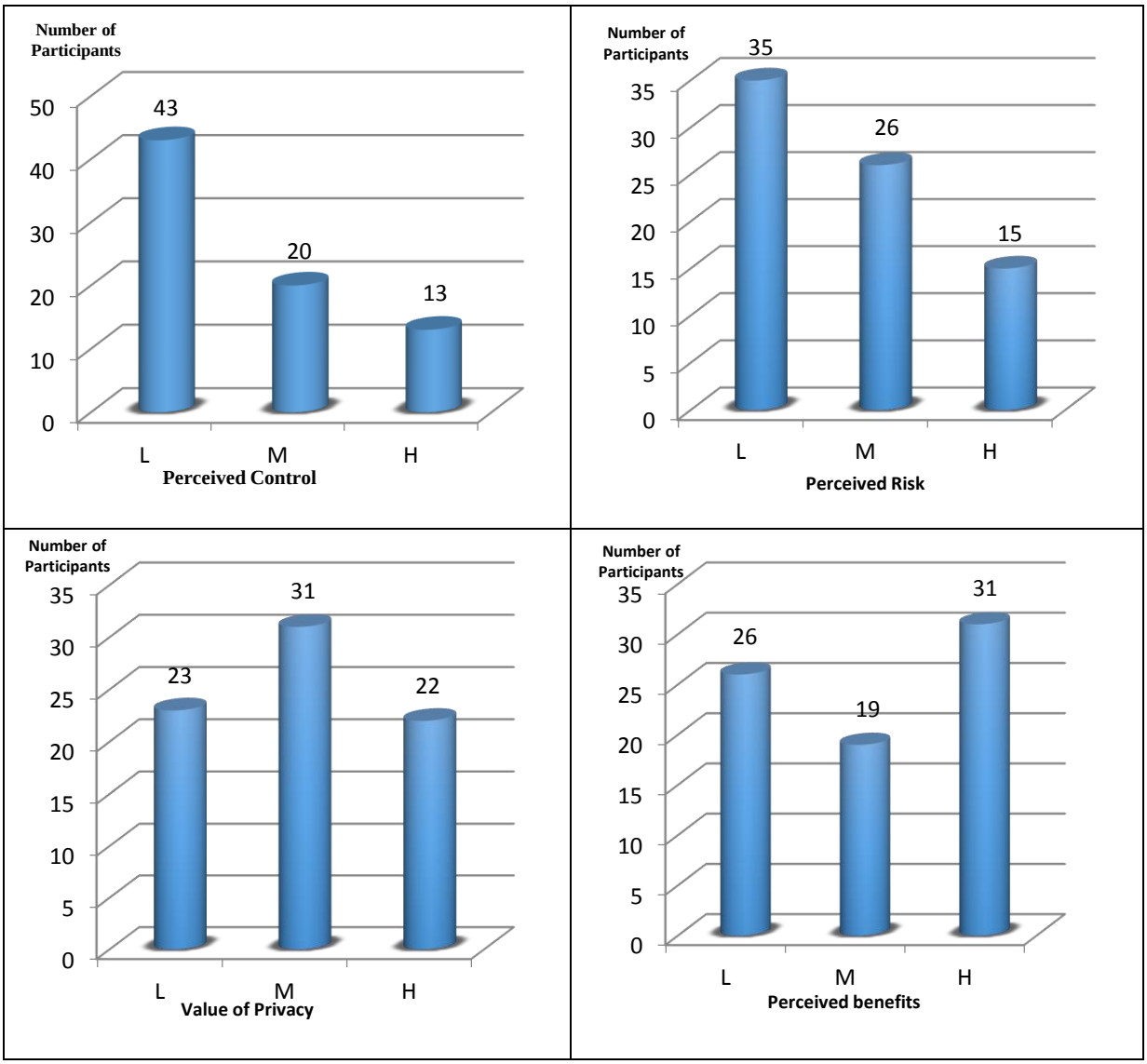
Transcripts of the focus groups were reviewed open coded by two researchers and salient privacy perceptions were organized to characterize views of data privacy. Those identified are: perceived control; perceived risk; value of privacy; and perceived benefits. Table 2 summarizes the meaning of these illustrating them with responses

**Table 2. Consumer perceptions of privacy**

| Perceptions | Definition | Examples of high and low |
|---|---|---|
| Perceived control | Power to control access to personal data and protect oneself from intrusions. | High:" Most things are safe if you have passwords."<br>Low: "If guys are really good they can hack into anything" |
| Perceived risk | Belief about the potential harm from a loss of privacy and likelihood of occurrence | High: ""There are crazy killers and pedophiles out there…"<br>Low: "This is the future." |
| Value of privacy | Importance placed on protecting one's privacy | High: "I don't want my neighbor knowing the amount of energy…"<br>Low: "I don't have anything to hide. They can access all my data." |
| Perceived benefits | Realized benefits customer see as fair exchange from access to their data | High: "I would love to know which devices in my home pull the most energy."<br>Low: "I'm from an older generation where you turn off lights when you leave a room." |

Based on focus groups responses, participants were ranked as low, medium or high on the four perceptions. Figures 1 illustrates of our rankings which were similar across the four locations.

**Figure 1 Rankings of Consumer Perceptions**




Participants perceive a low level control over access to their data or how it is used. Twice as many participants feel that the risk of privacy loss is low than see it as high, even after reviewing scenarios where it was compromised. One explanation is people believe their privacy is already invaded and the additional threat from smart meters is not very high. Value of privacy was evenly split between low and high, with some saying "I've got nothing to hide" [1] while others were concerned about "Big Brother". Perceived benefits were split closely between low and

high. This was influenced by high electrical bills (hence, the potential savings), time spent monitoring energy use, and comfort with using technology to manage their lives.

Preliminary results illustrate the tradeoff between the perceived benefits and perceived risks which will shape the overall attitude towards data collection by utilities. Higher perceived benefits and lower perceived risk result in more favorable attitudes and willingness to participate in energy management programs. Attitudes will be moderated by their perceived control over the data and the value placed on privacy. Higher perceived control will moderate concerns over potential privacy and security risks. Those who value privacy will be cautious towards data collection, sharing and use and demand greater privacy protection from utilities and other third parties.

Utilities efforts should attempt to provide clear, understandable communications on potential benefits to consumers, such as better management of their energy use and resultant savings, as well as how the data is used by utilities and third parties to improve services. Preliminary interviews with utility representatives stress the importance of crafting consumer friendly communications and implementation of opt-in or opt-out policies with steps taken to protect customer data from unauthorized access.

BIBLIOGRAPHY

1. Solove, Daniel J. "I've got nothing to hide and other misunderstandings of privacy." *San Diego L. Rev.* 44 (2007): 745.