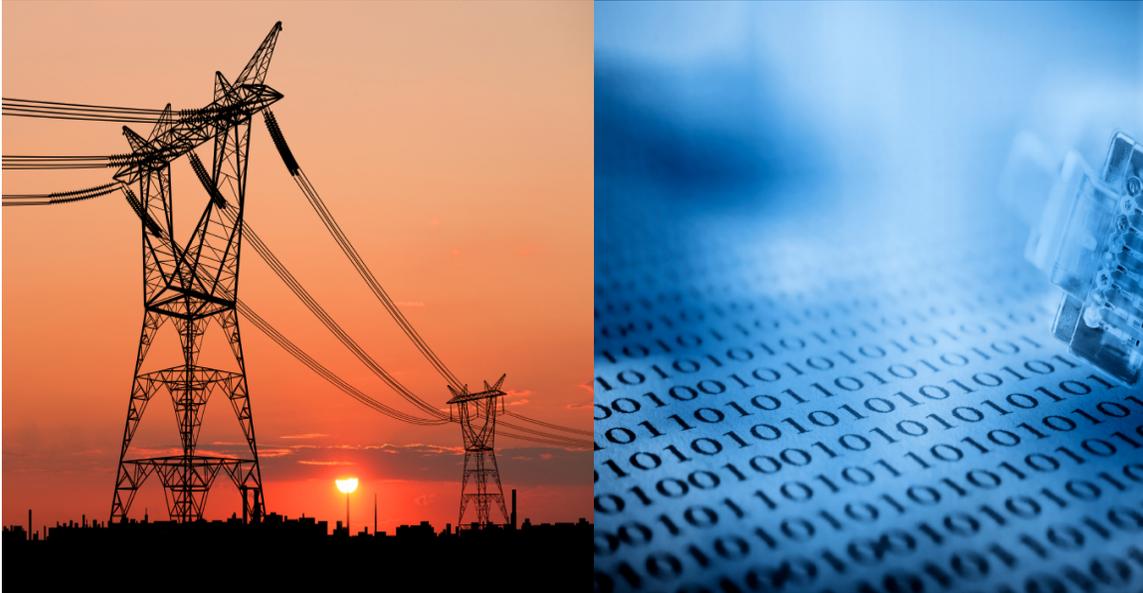


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## Perceptions about Privacy on the Smart Grid

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**Sponsored by AT&T**

Independently Conducted by Ponemon Institute LLC

November 2010

# Perceptions about Privacy on the Smart Grid

Presented by Ponemon Institute  
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## Part 1. Introduction

Ponemon Institute and AT&T are pleased to present the findings of a study on how consumers perceive the impact of the smart grid on the privacy of their energy consumption information. For purposes of this study, we have defined the smart grid as an advanced electricity transmission and distribution network or “grid” that utilizes digital information and control technology to improve reliability, security and efficiency. The smart grid uses a smart meter attached or linked to homes and buildings. Smart meters use real-time sensors to provide information on power consumption and price.

The smart grid will enable financial, informational, as well as “electrical” transactions among consumers, grid assets and other authorized users. Proponents of the smart grid say that it will give consumers more control over their energy resources, integrate all types and sizes of electrical generation and storage systems to support a “plug-and-play” level of convenience, increase efficiency, anticipate and respond to system disturbances and operate resiliently against attacks and natural disasters.<sup>1</sup> On the other hand, privacy advocates are concerned about the potential privacy risks of the smart grid.<sup>2</sup>

According to a report by NIST on the privacy impacts and risks throughout the entire smart grid structure, the ability to access, analyze and respond to much more precise and detailed data from all levels of the electric grid is critical to the major benefits of the smart grid. The collection of smart meter data raises potential surveillance possibilities posing physical, financial and reputational risks. More data, and more detailed data, may be collected, generated and aggregated through smart grid operations than previously collected through monthly meter readings and distribution grid operations.<sup>3</sup>

Our sampling frame involved 25,698 adult-aged individuals in the U.S. Initially this consumer study surveyed 1,218 individuals. To ensure we had knowledgeable respondents, we began the survey with three screening questions designed to test their understanding of the smart grid. Our reduced sample of 509 individuals included only those deemed to be knowledgeable about the smart grid.<sup>4</sup>

## Part 2. Executive Summary

Overall, consumers are equally split about the affect the smart grid will have on the privacy of their energy consumption records. Thirty-nine percent of respondents believe the smart grid will diminish their privacy. Twenty-four percent of respondents are unsure as to the impact and 37 believe it will not impact or improve their privacy. Of particular note is that as professed knowledge about the smart grid increases, so too does the concern regarding privacy. There is a noticeable shift from the “no impact on privacy” to the “diminishes privacy” category. Thus, utilities

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<sup>1</sup> See “What Is the Smart Grid?” by Joe Miller, SmartGridNews.com, April 17, 2009.

<sup>2</sup> A recent article revealed growing public concerns about high-tech utility meters, as evidenced by consumer complaints against the electric utility provider on such issues as increased utility bills, health concerns about radio transmissions from wireless devices, and privacy fears. See “High-Tech Utility Meters Spark a Fight” by Rebecca Smith, Wall Street Journal, September 10, 2010.

<sup>3</sup> See National Institute of Standards & Technology (NIST) Draft Report on Smart Grid Cyber Security Strategy and Requirements, February 2010.

<sup>4</sup> Our sampling frame was built from national census data using scientific methods. This allows us to extrapolate sample results to the general population of adult-aged consumers located in the United States.

implementing smart grid capabilities should be aware of the need to reassure consumers that their privacy will be protected. Other key takeaways from this report include the following:

- Based on the perceptions of respondents, there appears to be an opportunity for consumer education. A significant percentage of consumers in our study (85 percent) do not appear to have received or absorbed information about the installation and benefits of smart meters. Only 15 percent of respondents say they received information regarding new capabilities about the smart grid and what to expect.
- In the respondents' ranking of their privacy concerns, energy usage information fell about in the middle of the range—above online search information but below health and financial information. Respondents also have varying degrees of willingness to entrust their energy usage information to different entities, trusting utilities and telecom companies more and the federal government and ISPs less.
- Consumers associate targeted data collection/retention, vigilant security and customer authorization for release of sensitive information as key strategies for building trust. Furthermore, the practical step of de-identifying information significantly reduces consumer concerns. The proportion of respondents concerned about the release of their information is almost cut in half (from 58 percent to 32 percent) when information is de-identified before release.

### Part 3. Key findings

We believe four themes emerged from the findings of the study:

**First**, many consumers do not understand what the smart grid is. Less than half (42 percent) of consumers interested in participating in our study were able to complete the survey. Fifty-eight percent did not have sufficient knowledge about the smart grid.

**Second**, consumers were not provided, did not recall receiving information or did not absorb the material about the installation of a smart meter and the benefits of the smart grid. Power companies probably recognize the need for good communication and should consider that consumers may not be assimilating the information, even if it is provided.

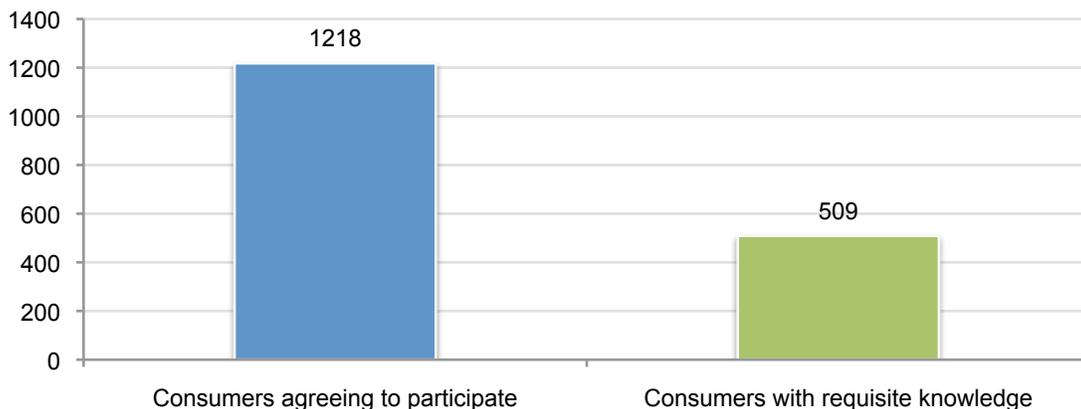
**Third**, consumers in our study who claim to have the best understanding of the smart grid are the most concerned about the smart grid’s impact on their privacy. The major concern appears to be how the collection of personal information will threaten their personal safety and reveal personal details about their lifestyle. Coupled with the prior finding, the value of utilities educating consumers and addressing privacy issues head on cannot be over-emphasized. If the utility does not address this need, consumers will potentially rely upon other sources that may not provide complete or accurate information.

**Fourth**, trust is possible. Consumers in our study believe security, authorization for release and de-identification allow them to feel more secure about the privacy of their energy consumption. Nevertheless, personal safety issues—whether real or imagined—worry many respondents and need to be addressed in communications about the smart grid.

#### Consumers are in the dark.

Many respondents are in the dark about what the smart grid is and how it will affect the privacy of their energy consumption records. As reported in Bar Chart 1, the pre-screened sample revealed that 42 percent of the 1,218 individuals who agreed to participate in the study do have the requisite knowledge and understanding about the smart grid to be able to complete the survey. Hence, these respondents were excluded from the pool of survey respondents.

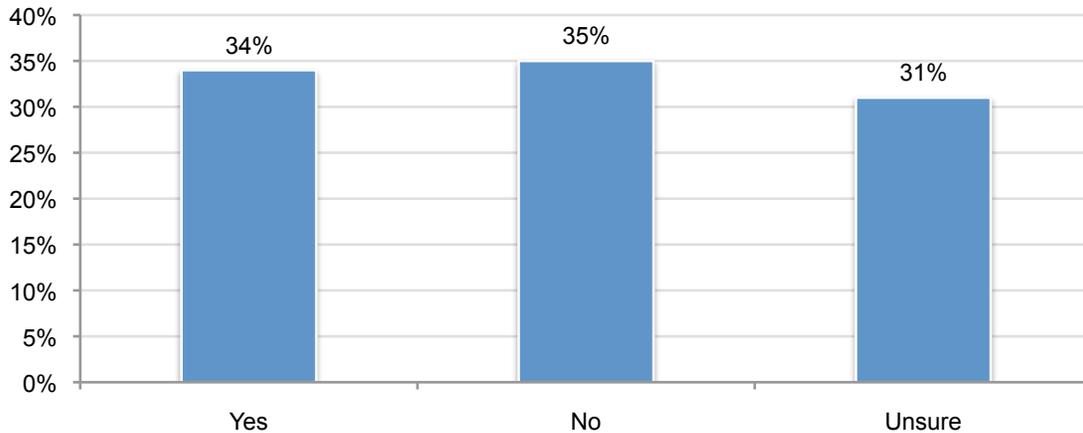
**Bar Chart 1: Sample of consumers before and after screening criteria**



Among our qualified group of respondents, substantial confusion exists as to whether their residences are currently equipped with a smart meter. Bar Chart 2 shows 34 percent of respondents say a smart meter was installed on their home or building. Thirty-one percent of

respondents say they are unsure about whether or not a smart meter was installed on their home or building. Thirty-five percent say they do not have a smart meter on their home or building.

**Bar Chart 2: Was a smart meter installed on your home or building?**

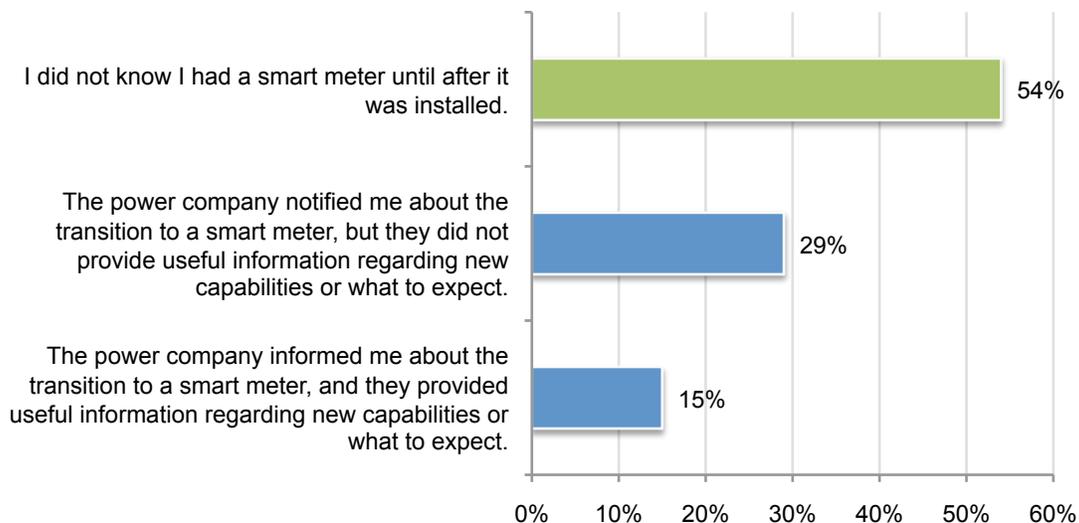


**Power companies should consider how they might communicate more effectively with consumers and generate enthusiasm for the smart grid.**

Respondents claim that in most instances, power companies installing smart meters on homes or buildings did not communicate important information about the transition to the smart grid. As shown in Bar Chart 3, of the 34 percent of respondents who say they have a smart meter on their home or building, 54 percent did not know they had a smart meter until after it was installed.

Another 29 percent of respondents say the power company notified them but they did not provide useful information. Only 15 percent say the power company informed them about the transition to a smart meter and provided useful information regarding its capabilities and what to expect (“other” was two percent and is not shown on the chart).

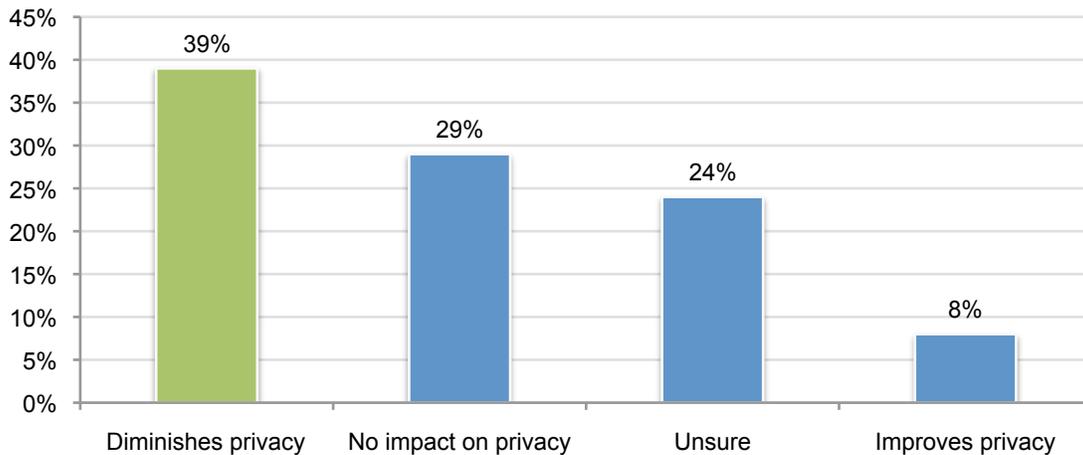
**Bar Chart 3: Experiences during the installation of the smart meter**



The perceived lack of information as described above, suggests power companies should re-examine how they communicate implementation of smart grid technologies to their customers. Such communications are an opportunity to persuade customers about the possible benefits of the smart grid and address concerns about the privacy of their energy consumption records.

Consumers are roughly split over the question of whether the smart grid will diminish the privacy of their energy usage information. According to Bar Chart 4, 39 percent believe the privacy of their billing and energy use information will actually be diminished as a result of the smart grid. However, 29 percent believe there will be no impact on privacy, and eight percent believe it will actually improve their privacy. Finally, 24 percent of respondents are unsure about the privacy impact.

**Bar Chart 4: How the smart grid affects the privacy of billing and energy use records**



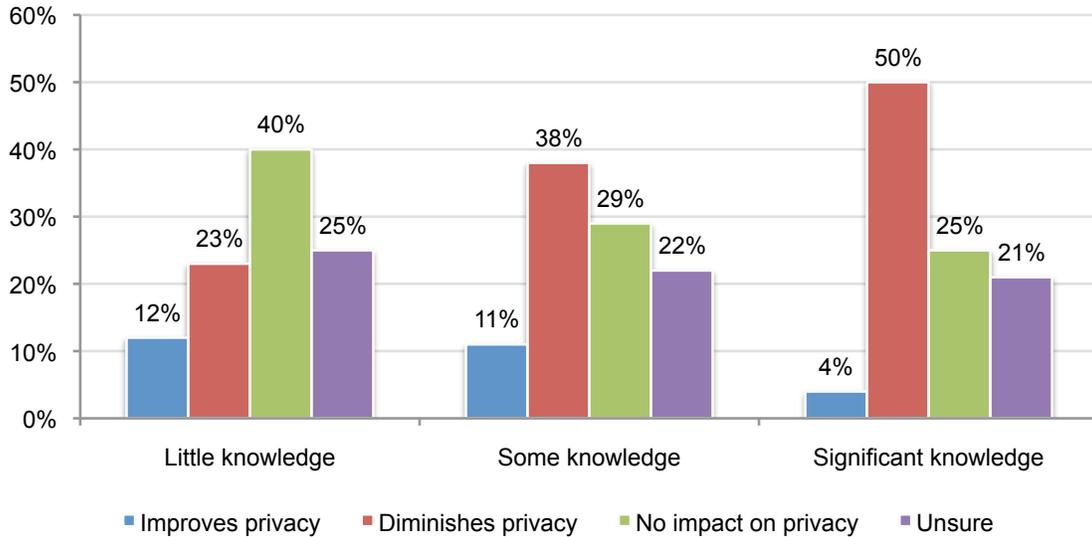
**Knowledge about the smart grid causes privacy concerns to surge.**

Bar Chart 5 reports how respondents’ knowledge about the smart grid affects their perceptions of privacy. As shown, 50 percent of respondents who say they have significant knowledge about the smart grid believe it will diminish their privacy.

In contrast, only 23 percent of those with little knowledge report concerns about the diminishment of their privacy and 40 percent of this group believe the smart grid will have no impact on their privacy. Only 25 percent of respondents with significant knowledge believe the smart grid will not impact their privacy.

**Bar Chart 5: Perceptions about privacy and knowledge level about the smart grid**

Each bar shows the percentage of respondents who believe the smart grid will improve, diminish, have no impact or are unsure how the smart grid affects their privacy

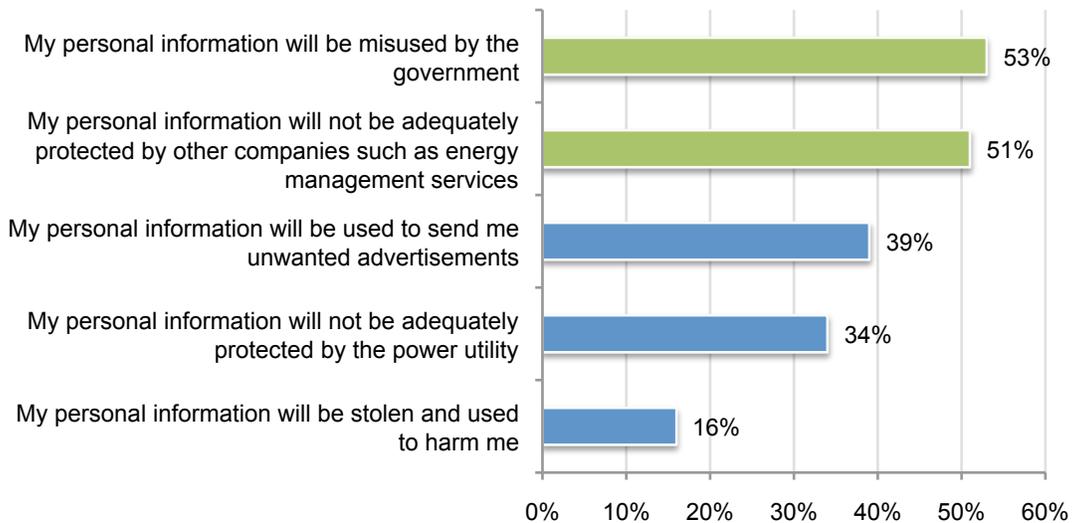


The privacy concerns triggered by the smart grid are varied. As noted in Bar Chart 6, respondents' most frequently voiced concerns about their personal information is misuse by the government (53 percent) or third-party companies such as energy management services (51 percent) will not adequately protect their personal information.

A smaller percentage (34 percent) of respondents worry about the protection of their personal information by power utilities. Only 16 percent of respondents believe their personal information will be stolen and ultimately result in harms to them or their households

**Bar Chart 6: Why respondents are concerned about privacy**

Each bar expresses the frequency of various privacy concerns related to the smart grid



It seems the consumers in our study have more trust in their local power utility than government or third parties such as energy management services. This finding could be possibly attributed to the fact that consumers may not understand the involvement of government or energy management services in the smart grid and as a result may not understand how these

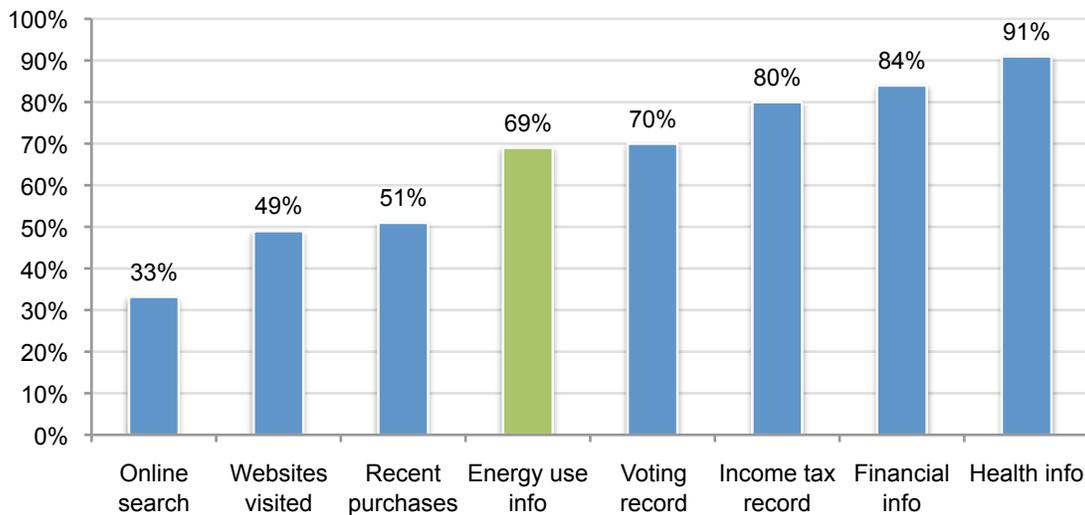
organizations would use their personal information. Thus, it seems third parties have an even greater level of distrust to overcome.

Respondents rank the importance of the confidentiality of energy use information in the middle of the range of the different types of sensitive information they were asked to rank in the survey. As shown in Bar Chart 7, 69 percent of respondents believe the confidentiality of their energy use information is very important or important.

In comparison, the confidentiality of recent purchases, websites visited, and online searchers are considered less important (51 percent, 49 percent, and 43 percent, respectively). Health information, financial information, and income tax records are considered the most confidential (91 percent, 84 percent, and 80 percent, respectively).

**Bar Chart 7: How consumers rate the importance of the confidentiality of certain types of personal information**

Each bar expresses the combined important and very important response



Media articles and other reports have discussed the possibility that detailed information about homeowners' energy consumption could be used to deduce if the home is occupied or other sensitive patterns of behavior. Whether or not this can or will be possible has raised concerns among consumers.

According to Table 1, respondents worry about the following information that potentially could be revealed through the smart grid: when the home is occupied and unoccupied, when occupants are awake and asleep and how much appliances are used (80 percent); consumption record (78 percent); current amount due on the account (70 percent) and status of open balance (69 percent). Of least concern is information about the individual responsible for the account (25 percent) and the electric utility supplying the account (26 percent).

Table 1. The following table contains personal information potentially available through the smart grid. Each percent expresses the level of concern of respondents.	Combined very concerned & concerned	Combined not concerned & some concern
When the home is occupied and unoccupied, when occupants are awake and asleep, how much appliances are used	80%	20%
Consumption record	78%	22%
Current amount due on the account	70%	30%
Status of open balance	69%	31%
The nature or type of appliances used in the household	67%	33%
Presence of a home network or appliances and computers	64%	36%
Method of paying bill, including credit card or bank account details	62%	38%
Number of people living in a household	59%	41%
Presence of on-site generation such as solar panels	42%	58%
Location where service is being taken	39%	61%
Unique identifier for the account	36%	64%
Data comparing household usage to an aggregated neighborhood stats	32%	68%
Identify the electricity utility supplying the account	26%	74%
Individual (name) responsible for the account	25%	75%

Respondents seem to be most worried about how the smart grid's collection of personal information will threaten their personal safety and reveal personal details about their lifestyle. Of less concern are more service-oriented information such as location of service, person responsible for the account, and the utility supplying the account.

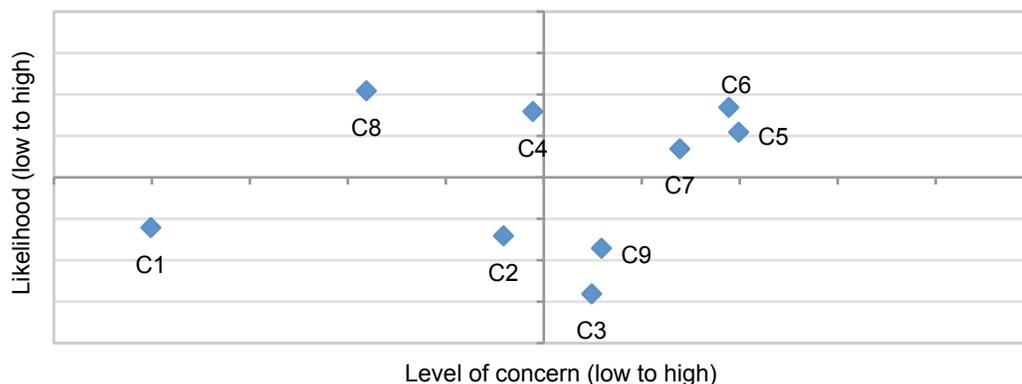
### Consumers' perceptions of nine privacy scenarios

To assess respondents' concern, we developed a two-step approach that allows us to compute a privacy severity score for nine separate scenarios as summarized in Table 2. For each scenario, we asked respondents to rate the likelihood of occurrence and their corresponding level of concern. A higher level of severity occurs when respondents see the likelihood as high and the level of concern as high.

Table 2. Nine smart grid privacy scenarios cited by experts and the calculation of the severity multiplier	High Likelihood	High Concern	Severity multiplier
C1. Your billing and energy use information is stolen and used to steal your identity.	21%	56%	12%
C2. Access to your energy use records reveals specific times and locations of electricity use in areas of your home and also indicate the types of activities and/or appliances used.	57%	54%	31%
C3. Specific smart appliances communicate with your smart meter. This information is used by manufacturers for warranties and insurers for claims.	66%	40%	26%
C4. Specific smart appliances such as your home thermostat are controlled directly by the power utility to conserve energy consumption.	60%	84%	50%
C5. Access to live energy use data reveals in real time where you are in the residence and what you are doing.	81%	79%	64%
C6. Malicious use of your smart meter data leads to a number of problems such as targeted home invasions.	80%	85%	68%
C7. Combinations of meter data, analyzed for one purpose, reveal unexpected information about you or others in your home.	75%	75%	56%
C8. Smart meter data reveals activities or uses that utility companies may then subsequently decide are inappropriate or should not be allowed.	43%	89%	38%
C9. With meter data being stored in many locations and accessed by many different entities, your record of energy consumption is inaccurately modified.	67%	51%	34%

Graph 1 plots the severity of nine privacy scenarios according to its position in the following two-by-two matrix based on likelihood of occurrence and level of concern. With respect to concerns about privacy, the most severe outcomes appear in the upper right quadrant. As seen, most severe is the malicious use of the smart meter (C6), access to live energy use data (C5), and dangerous combinations of meter data use (C7).

**Graph 1: Plot of nine scenarios by likelihood and level of concern**  
Each point C1 to C9 represents the corresponding scenario listed in Table 2 (above)



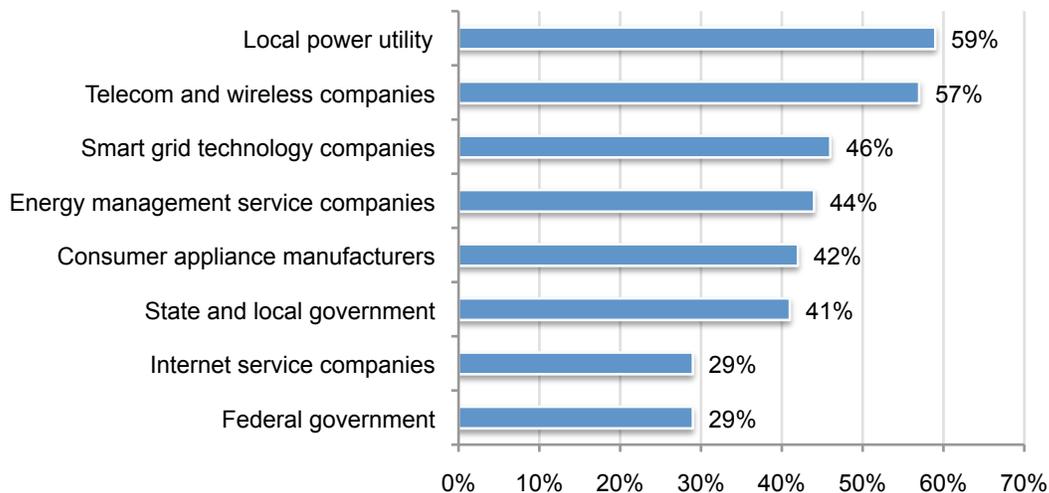
## Trust is possible

Consumers in our study seem to trust certain entities more than others with their energy usage information. Bar Chart 9 shows organizations most trusted to have access to billing and energy use records are the local power utility (59 percent) and telecom and wireless companies (57 percent).

Least trusted are the federal government and Internet service companies (both 29 percent). This finding is similar to the finding about privacy concerns shown in Bar Chart 6. That is, consumers in our study seem to have more trust in the local power utility than the federal government. Again, this perception may be due to their understanding of how the local utility uses personal information.

### Bar Chart 9: Who do respondents trust with their billing and energy use records?

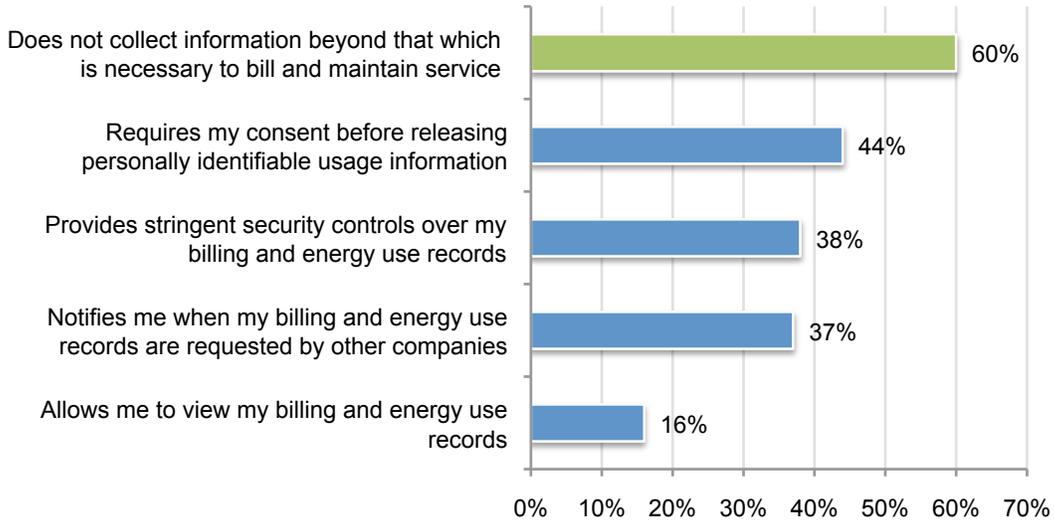
Each bar expresses the organizations that respondents trust to have access to personal information.



Consumers see varying levels of value in different strategies for protecting energy usage information. According to Bar Chart 10, consumers in our study believe the best way to protect the privacy of their billing and energy use records is to not collect information beyond that which is necessary to bill and maintain service (60 percent) and to require consumers' consent before releasing personally identifiable use information (44 percent).

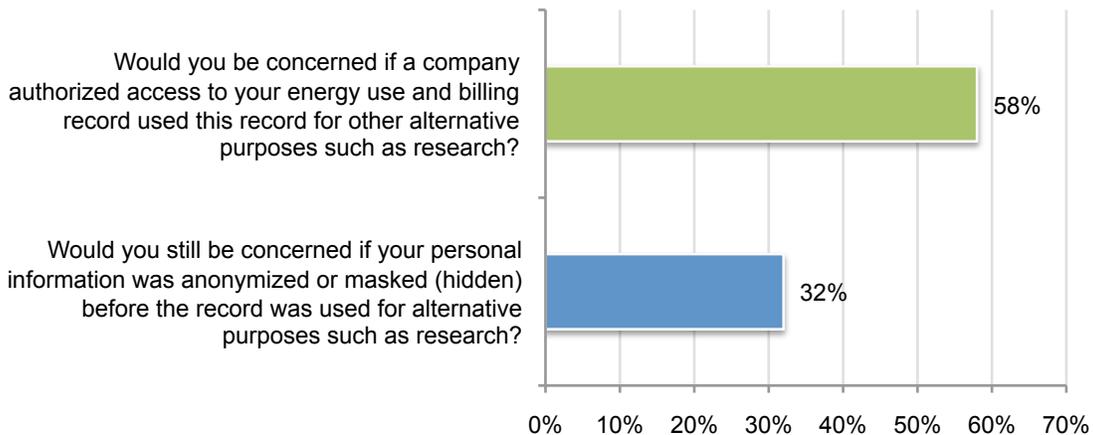
Of least interest, according to 16 percent of respondents, is the ability to view their billing and energy use records. This could be attributed to the fact that this information is available in their monthly bills.

**Bar Chart 10: Most important to protecting the privacy of billing and energy use records**  
 Each bar records the percent of respondents who see a given feature as important to their privacy



De-identification methods reduce respondents concerns about the use of personal information collected on the smart grid. As noted in Bar Chart 11, while 58 percent of respondents express concern about sharing their personal information with various companies for secondary uses, only 32 percent of respondents would still be concerned if their personal information was anonymized or masked before their records were used for alternative purposes.

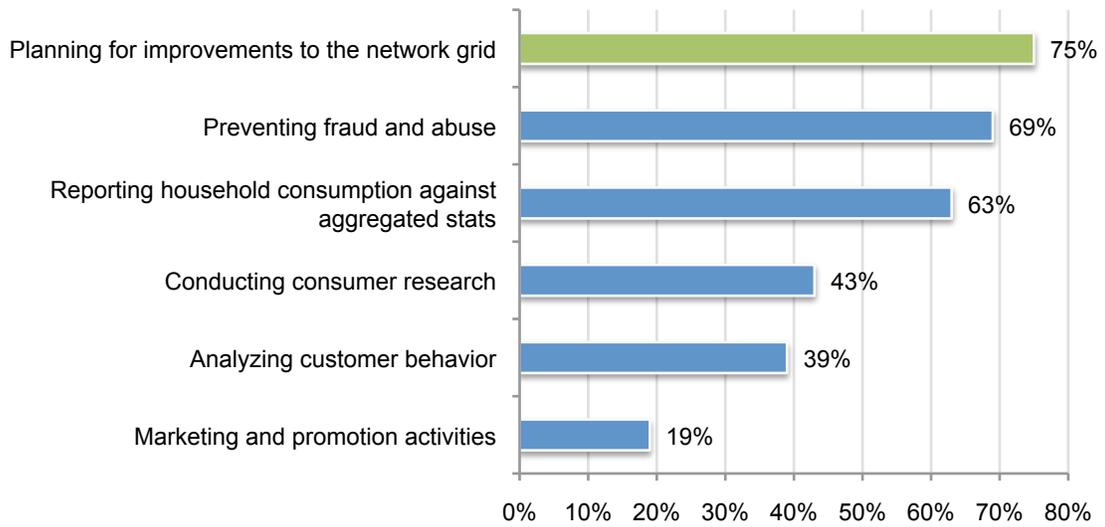
**Bar Chart 11: Concern about sharing and secondary use of billing and energy use records**  
 Each bar records the yes response to the presented question



Bar Chart 12 shows the most acceptable uses of respondents' private records under the condition that personal information is de-identified are: planning for improvements to the network grid (75 percent), preventing fraud and abuse (69 percent) and reporting household consumption against aggregated stats (63 percent). Least acceptable are marketing and promotion activities (19 percent).

### Bar Chart 12: Acceptable uses of private energy use records

Each bar records the respondents' believe under the condition that their personal data is de-identified



#### Part 4. Methods

Table 3 reports our sample response using a web and telephone interview collection method. Our sampling frame was a representative list of 25,698 individuals more than 17 years of age. As reported, 1,218 adult-aged individuals across the nation took part in the survey. This represents a 4.7 percent response rate. All respondents were asked to complete three screening questions to assess their level of knowledge about the smart grid. This resulted in a final sample after screening criteria of 509 individuals.

Respondents were paid nominal compensation for participating. All interview data was collected over a four-week period ending in July 2010. Additional survey analysis and respondent debriefings were conducted through August 2010. On average, 90 percent of respondents completed all questions within 18 minutes.

Table 3. Sample response	Freq	Pct%
Total sampling frame	25,698	100.0%
Survey returns and bounce-back	2,063	8.0%
Total returns	1,389	5.4%
Rejected surveys	171	0.7%
Final sample	1,218	4.7%
Final sample after screening criteria	509	2.0%

Table 4 reports the employment status of all respondents. As can be seen, a majority of respondents are employed.

Table 4. Respondents' present employment status	Pct%
Full time employee	51%
Part time employee	10%
Business owner	7%
Retired	10%
Student	8%
Active military	3%
Unemployed	11%
Total	100%

Table 5 reports the self-reported annual household income. The majority of respondents (52%) say they have an annual income at or below \$60,000.

Table 5. What best describes your household's annual total income?	Pct%
Less than \$20,000	13%
\$20,001 to \$40,000	16%
\$40,001 to \$60,000	23%
\$60,001 to \$80,000	16%
\$80,001 to \$100,000	14%
\$100,000 to \$150,000	10%
\$150,001 to \$200,000	5%
\$200,001 to \$300,000	2%
More than \$300,000	1%
Total	100%

Approximately, 52 percent of respondents are female and 48 percent male. Table 6 reports the highest level of attained education for respondents. As can be seen, a majority of respondents report having attended a college, university or vocational program.

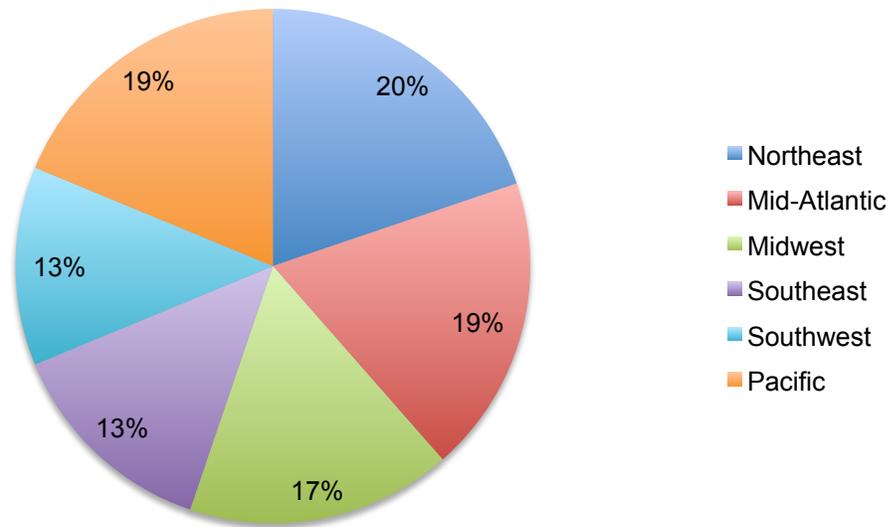
Table 6. What is your highest level of education attained?	Pct%
High school	22%
Vocational	21%
Attended, University or College	25%
Graduate, University or College	26%
Post graduate	5%
Doctorate	1%
Total	100%

Table 7 shows the age range of respondents. A majority of respondents say they are at or below 45 years of age. Fifty-five percent say they are head of their households.

Table 7. Respondents' age range	Pct%
18 to 25	16%
26 to 35	21%
36 to 45	19%
46 to 55	18%
56 to 65	11%
66 to 75	10%
75+	3%
Total	100%

Pie Chart 1 provides the geographic distribution of our sample. In total, individuals from 43 states are represented in this research.

**Pie Chart 1: U.S. regional distribution of respondents**



## Part 5. Caveats & Conclusion

There are inherent limitations to survey research that need to be considered carefully before inferences are drawn from the findings. The following items are specific limitations that are germane to most telephone surveys.

- **Non-response bias:** The current findings are based on a sample of survey returns. We contacted a representative sample of individuals, resulting in a large number of usable returned responses. Despite non-response tests, it is always possible that individuals who did not participate are substantially different in terms of underlying beliefs from those who completed the telephone interview.
- **Sampling-frame bias:** The accuracy is based on contact information and the degree to which the list is representative of individuals who are adult-aged Americans. We also acknowledge that the results may be biased by external events such as media coverage. We also acknowledge bias caused by compensating subjects to complete the telephone interview. Finally, because we used a telephone collection method, it is possible that other collection methods would result in a different pattern of findings.
- **Self-reported results:** The quality of survey research is based on the integrity of confidential responses received from subjects. While certain checks and balances can be incorporated into the survey process, there is always the possibility that a subject did not provide a truthful response.

### Concluding Thoughts

The jury is still out on consumers' perceptions about the impact of the smart grid on their privacy. This presents an excellent opportunity for organizations in the smart grid domain to create awareness about its benefits and address consumers' worries about privacy and personal security. The following issues, as revealed in the findings of the study, seem to be the most salient for future discussions and research about privacy and the smart grid:

- Respondents believe the acceptable uses of privacy energy records focus on improving the grid and preventing fraud and abuse.
- De-identification of personal information seems to reduce privacy concerns.
- Respondents seem to trust their local power utilities and telecom and wireless companies with the information collected about their household energy usage.
- Respondents prefer that information collected about their energy usage does not go beyond that which is necessary to bill and maintain service.
- Power companies and smart grid companies should create a communications strategy that addresses privacy and personal safety concerns.
- Personal safety and revelations about respondents' lifestyle are of greater concerns than fears about identity theft.

## Appendix 1: Survey Responses

Fieldwork completed on July 31, 2010

Sample response	Freq	Pct%
Total sampling frame	25698	100.0%
Survey returns and bounce-back	2063	8.0%
Total returns	1389	5.4%
Rejected surveys	171	0.7%
Final sample	1218	4.7%

Q1a. Please describe your level of knowledge about the smart grid?	Freq	Pct%
No knowledge [Stop]	283	23%
Little knowledge	249	20%
Some knowledge	451	37%
Significant knowledge	235	19%
Total	1218	100%

Q1b. Does the description provided above <b>match</b> your understanding of what the smart grid is?	Freq	Pct%
Yes, it matches my understanding perfectly	107	11%
Yes, it closely matches my understanding	195	21%
Yes, it is an approximate match to my understanding	394	42%
No, the description is different than what I believe the smart grid to be (Stop)	200	21%
No, I had no previous understanding about the smart grid (Stop)	39	4%
Total	935	100%

Q1c. Are you responsible for paying all or part of your household utility bill?	Freq	Pct%
Yes	509	73%
No (Stop)	187	27%
Total	696	100%

Reduced sample after screening questions	509
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Q2a. Do you have a smart meter installed on your home or building?	Pct%
Yes	34%
No [Go to Q3]	35%
Unsure	31%
Total	100%

Q2b. What best describes your installation of the smart meter on your home or building?	Pct%
Overall, a positive experience	30%
Overall, a negative experience	15%
Overall, a net neutral experience	55%
Total	100%

Q2c. Please select the statement that best describes your experience about installation.	Pct%
I did not know I had a smart meter until after it was installed.	54%
The power company notified me about the transition to a smart meter, but they did not provide useful information regarding new capabilities or what to expect.	29%
The power company informed me about the transition to a smart meter, and they provided useful information regarding new capabilities or what to expect.	15%
Other (please specify)	2%
Total	100%

Q2d. Please select the statement that best describes your energy use billing experience after installation.	Pct%
I did not experience unexpected changes in my utility bill after the smart meter was installed.	50%
My utility bill increased above expectations after the smart meter was installed.	11%
My utility bill decreased below expectations after the smart meter was installed.	9%
Unsure	30%
Total	100%

Q3. Please rank what you believe to be the most important features of the smart grid from 6 = the most important feature to 1 = the least important feature.	Average Rank	Order
Enable consumers to take advantage of new energy sources such as solar and wind.	4.2	2
Provide consumers with cost savings on their energy consumption.	5.7	1
Reduce the frequency and duration of power outages.	1.7	5
Provide consumers with more options to manage power consumption.	3.3	3
Increase the security of our nation's electricity grid.	1.5	6
Permit comparison of your energy consumption to households similar to yours.	2.8	4

Q4a. In your opinion, how does the smart grid affect the privacy of your billing and energy use records?	Pct%
Improves the privacy of my billing and energy use records	8%
Diminishes the privacy of my billing and energy use records [Go to Q4b]	39%
No impact on the privacy of my billing and energy use records	29%
Unsure	24%
Total	100%

Q4b. Why do you believe the smart grid <b>diminishes</b> the privacy of your billing and energy use records? Please select the top <u>two</u> reasons of greatest concern to you.	Pct%
My personal information will not be adequately protected by the power utility	34%
My personal information will be used to send me unwanted advertisements	39%
My personal information will not be adequately protected by other companies such as energy management services	51%
My personal information will be misused by the government	53%
My personal information will be stolen and used to harm me	16%
Other (please specify)	2%
Total	195%

Q5. How much do you trust the following organizations authorized to access to your billing and energy use records? Please rate eight organizations in terms of your level of trust for safeguarding the privacy of your billing and energy record, where 1 = highly trusted, 2 = trusted, 3 = not trusted, and 4 = distrusted.	Highly trusted	Trusted
Federal government such as the Department of Energy	13%	16%
State and local government	20%	21%
Your local power utility	29%	30%
Internet service companies such as Google, Microsoft and others	12%	17%
Companies that provide energy management services	20%	24%
Companies that manufacture consumer appliances connected to the grid	19%	23%
Companies that manufacture smart grid technologies such as the smart meter	21%	25%
Telecom and wireless companies that connect your smart meter to the electricity provider	27%	30%
Average	20%	23%

Q6. What do you see as the most important features in protecting the privacy of your billing and energy use records? Please select the top <u>two</u> privacy practices that are most important to you.	Pct%
Does not collect information beyond that which is necessary to bill and maintain service	60%
Allows me to view my billing and energy use records	16%
Notifies me when my billing and energy use records are requested by other companies	37%
Requires my consent before releasing personally identifiable usage information	44%
Provides stringent security controls over my billing and energy use records	38%
Total	195%

Q7. The following table contains personal information potentially available through the smart grid. Please rate each data type according to your level of concern about privacy, where 1 = not concerned, 2 = some concern, 3 = concerned, 4 = very concerned.	Very concerned	Concerned
Party responsible for the account	10%	15%
Location where service is being taken	15%	24%
Unique identifier for the account	13%	23%
Consumption record	36%	42%
Current amount due on the account	30%	40%
Status of open balance	30%	39%
Presence of a home network or appliances and computers	29%	35%
Number of people living in a household	26%	33%
When the home is occupied and unoccupied, when occupants are awake and asleep, how much various appliances are used	48%	32%
The nature or type of appliances used in the household	31%	36%
Presence of on-site generation such as solar panels	19%	23%
Identify the electricity utility supplying the account	12%	14%
Method of paying bill, including credit card or bank account details	31%	31%
Data comparing household usage to an aggregated list of other households in the neighborhood	15%	17%
Average	25%	29%

Q8. How important is the confidentiality of the following types of personal information? Please rate each type of personal information according to importance, where 1 = very important, 2 = important, 3 = not important and 4 = irrelevant.	Very important	Important
Energy use information	34%	35%
Health information	69%	22%
Financial and credit card information	67%	17%
Websites recently visited	25%	24%
Purchases recently made	26%	25%
Income tax record	62%	18%
Online search history	18%	15%
Voting record	32%	37%
Average	42%	24%

Q9a. Would you be concerned if a company authorized to access to your energy use and billing record used this record for other alternative purposes such as research?	Pct%
Yes, very concerned	23%
Yes, somewhat concerned	35%
Unsure	12%
No	30%
Total	100%

Q9b. Would you still be concerned if your personal information was anonymized or masked (hidden) before the record was used for alternative purposes such as research?	Pct%
Yes	32%
No	40%
Unsure	28%
Total	100%

Q10. Assuming that you cannot be associated with detailed energy use (i.e., the personally identifiable information is de-identified), what are some of the <b>acceptable uses</b> of data contained in your energy use record? Please select all that apply.	Pct%
Analyzing customer behavior	39%
Marketing and promotion activities	19%
Reporting household consumption against aggregated average consumption or benchmarks	63%
Preventing fraud and abuse	69%
Planning for improvements to the network grid	75%
Conducting consumer research	43%
Total	308%

Q11. Following are privacy concerns cited by experts. How likely do you believe it is that the following events could happen to you and your household as a result of the smart grid? Please rate each item in terms of likelihood, where 1 = very likely, 2 = likely, 3 = not likely and 4 = never.	Very likely	Likely
Your billing and energy use information is stolen and used to steal your identity.	8%	13%
Access to your energy use records reveals specific times and locations of electricity use in areas of your home and also indicate the types of activities and/or appliances used.	28%	29%
Specific smart appliances communicate with your smart meter. This information is used by manufacturers for warranties and insurers for claims.	28%	38%
Specific smart appliances such as your home thermostat are controlled directly by the power utility to conserve energy consumption.	24%	36%
Access to live energy use data reveals in real time where you are in the residence and what you are doing,	35%	46%
Malicious use of your smart meter data leads to a number of problems such as targeted home invasions.	35%	45%
Combinations of meter data, analyzed for one purpose, reveal unexpected information about your or others living in your home.	34%	41%
Smart meter data reveals activities or uses that utility companies may then subsequently decide are inappropriate or should not be allowed.	12%	31%
With meter data being stored in many locations and accessed by many different entities, your record of energy consumption is inaccurately modified.	32%	35%

Q12. How concerned would you be if each one of the following situations happened to you and your household? Please rate each situations from 1 = not concerned, 2 = some concern, 3 = concerned and 4 = very concerned.	Very concerned	Concerned
Your billing and energy use information is stolen and used to steal your identity.	25%	31%
Access to your energy use records reveals specific times and locations of electricity use in areas of your home and also indicate the types of activities and/or appliances used.	25%	29%
Specific smart appliances communicate with your smart meter. This information is used by manufacturers for warranties and insurers for claims.	21%	19%
Specific smart appliances such as your home thermostat are controlled directly by the power utility to conserve energy consumption.	44%	40%
Access to live energy use data reveals in real time where you are in the residence and what you are doing,	40%	39%
Malicious use of your smart meter data leads to a number of problems such as targeted home invasions.	44%	41%
Combinations of meter data, analyzed for one purpose, reveal unexpected information about your or others living in your home.	38%	37%
Smart meter data reveals activities or uses that utility companies may then subsequently decide are inappropriate or should not be allowed.	45%	44%
With meter data being stored in many locations and accessed by many different entities, your record of energy consumption is inaccurately modified.	25%	26%

**Demographics:** Following are variables that will be used to analyze results. Please check the most appropriate response to each demographic item listed below.

D1. What is your present Internet and email usage per day:	Pct%
Less than 1 hour	9%
1 to 2 hours	31%
3 to 5 hours	25%
6 to 8 hours	16%
More than 8 hours	19%
Total	100%

D2. What is your present employment status?	Pct%
Full time employee	51%
Part time employee	10%
Business owner	7%
Retired	10%
Student	8%
Active military	3%
Unemployed	11%
Total	100%

D3. What best describes your household's annual total income?	Pct%
Less than \$20,000	13%
\$20,001 to \$40,000	16%
\$40,001 to \$60,000	23%
\$60,001 to \$80,000	16%
\$80,001 to \$100,000	14%
\$100,000 to \$150,000	10%
\$150,001 to \$200,000	5%
\$200,001 to \$300,000	2%
More than \$300,000	1%
Total	100%

D4. What is your highest level of education attained?	Pct%
High school	22%
Vocational	21%
Attended, University or College	25%
Graduate, University or College	26%
Post graduate	5%
Doctorate	1%
Total	100%

D5. Please check your age range?	Pct%
18 to 25	16%
26 to 35	21%
36 to 45	19%
46 to 55	18%
56 to 65	11%
66 to 75	10%
75+	3%
Total	100%

D6. Please check gender:	Pct%
Female	52%
Male	48%
Total	100%

D7. Do you own or use a smart phone that connects to the Internet?	Pct%
Yes	34%
No	66%
Total	100%

D8. Are you head of the household?	Pct%
Yes	55%
No	45%
Total	100%

D9. Approximate location in the United States	Pct%
Northeast	20%
Mid-Atlantic	19%
Midwest	17%
Southeast	14%
Southwest	13%
Pacific	19%
Total	100%

Please contact [research@ponemon.org](mailto:research@ponemon.org) or call us at 800.877.3118 if you have any questions.

## Ponemon Institute

*Advancing Responsible Information Management*

Ponemon Institute is dedicated to independent research and education that advances responsible information and privacy management practices within business and government. Our mission is to conduct high quality, empirical studies on critical issues affecting the management and security of sensitive information about people and organizations.

As a member of the **Council of American Survey Research Organizations (CASRO)**, we uphold strict data confidentiality, privacy and ethical research standards. We do not collect any personally identifiable information from individuals (or company identifiable information in our business research). Furthermore, we have strict quality standards to ensure that subjects are not asked extraneous, irrelevant or improper questions.