Response to Smart Metering Implementation Programme's Consultation on Privacy and Data Access

October 13, 2011

Smart Metering Implementation Programme – Roll Out Team
Department of Energy & Climate Change
3 Whitehall Place
London
SW1A 2AW

Opower, Inc. ("Opower"), a behavioural energy efficiency and smart grid software company, would like to thank the Department for Energy and Climate Change ("DECC") for the opportunity to comment on its Smart Metering Implementation Programme (the "Programme") consultation on data access and privacy that was released in August 2011.

Opower works with over 60 utilities in the United States, including 8 of the 10 largest, and with First Utility in the United Kingdom, to deliver energy savings to residential households.[1] Opower motivates customers to use less energy and save money on their monthly bills by providing customers with better information about their energy use and personalized energy savings advice.

This year Opower will deliver its personalized behavioural efficiency programme to over 10 million residential customers through mail, email, websites, smart phone applications, and text messages. Opower's programme consistently motivates customers to save an average of 1.5 – 3.5% on their energy bills.[2,3] Opower also increases the rate of participation in other efficiency programmes, such as home insulation rebate programmes, by as much as 60%.

The following comments and recommendations build on our response to the previous consultation in October 2010. We support DECC's goal of creating a robust and secure market for energy efficiency and delivering smart meter benefits to households in the UK.

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[1] See UK expansion press release here: http://opower.com/company/news-press/press_releases/28
[2] Allcott, Hunt, September 2011, "Energy Conservation and Social Norms," Journal of Public Economics, available at: http://opower.com/uploads/library/file/1/allcott_2011_jpubec_-_social_norms_and_energy_conservation.pdf
[3] Davis, Matt, May 2011, "Behavior and Energy Savings: Evidence from a Series of Experimental Interventions." Environmental Defense Fund, available at: http://opower.com/uploads/library/file/5/edf_behavior_and_energysavings.pdf

- **Suppliers should have access to daily and sub-daily energy usage data.** Access to residential energy usage data is essential for Opower to deliver energy savings and other services to households. Opower relies on its partnership with suppliers to access energy use data at monthly, daily and sub-daily intervals. Without access to such data, Opower will not be able to deliver its services in the UK. Opower can produce 1.5 – 3.5% average savings with monthly data. With daily and sub-daily data, however, Opower estimates an increase in effectiveness of over 50%, as more granular data enables more customization and targeted efficiency advice. Further, targeted efforts to reduce peak usage—enabled by daily and sub-daily data—can add another dimension to programme effectiveness, helping to alleviate capacity constraints and increasing reliability. See **Figure 4** for an estimate of these potential benefits in the UK.

- **Suppliers should be allowed to contract with vendors to deliver opt-out efficiency programmes. Both** Opt-in and prompted choice approaches to data access will significantly limit rates of participation in energy efficiency programs offered by Opower and other companies. Opower estimates (see **Figure 7**) that an opt-in programme design could result in a loss of over £1.3 billion in annual benefits compared to an opt-out program. Opower has been able to scale rapidly in the U.S. because it supplies its service by default to the customers of its utility partners. As discussed by the Behavioural Insights Team in their recent report on behaviour change and energy use, defaults are a powerful tool for improving participation rates.[4] A study in Germany found that enrolling customers by default into a green power-pricing programme increased participation from 1% (the overall participation rate in such programmes in Germany) to 94% – the difference between 10,600 and 1 million households participating.[5] By adopting an approach that allows for defaults, the magnitude of potential savings and proportion of households affected increase significantly. Without permitting default approaches, Opower questions whether DECC will be able to realize its ambitious energy efficiency goals.[6]

- **Energy efficiency should be a regulated duty**. The best way to maximize the energy efficiency potential of smart meters and protect consumer privacy is to make energy efficiency a regulated duty. There is already precedent for regulating utilities to achieve efficiency-related goals. For example, the Carbon Emissions Reduction Target ("CERT") is an existing regulated requirement imposed upon suppliers.[7] The Green Deal also has ambitious

[4] "Behaviour Change and Energy Use," June 2011, *Cabinet Office's Behavioural Insights Unit*, available here: http://www.cabinetoffice.gov.uk/sites/default/files/resources/behaviour-change-and-energy-use.pdf
[5] Pichert, Daniel, and Konstantinos Katsikopoulos, "Green Defaults: Information presentation and pro-environmental behaviour," October 2007, *Journal of Environmental Psychology*, available here: ftp://papers.econ.mpg.de/IMPRS/SumSchool2009/priv/Katsikopoulos/ABC%20Read%205.2.pdf
[6] Moxham, Ben and Gila Sacks, "Advisers' letter to David Cameron on energy and climate policies," 5 September 2011, *Daily Telegraph,* available here: http://www.telegraph.co.uk/earth/greenpolitics/8741779/Advisers-letter-to-David-Cameron-on-energy-and-climate-policies.html
[7] See, e.g., "Paving the way for a Green Deal," *Department for Energy and Climate Change*, June 2010, available here: http://www.decc.gov.uk/assets/decc/consultations/certextension/certextgovresponse.pdf

efficiency goals.[8] Smart meter data can be leveraged to provide additional efficiency benefits and make these other government programs more effective. For example, Opower can use this data to increase the participation rate in other efficiency programs, like home insulation, by 40-60 percent. The U.S. state of California recently issued comprehensive regulations on data access and privacy.[9] The California rules limit suppliers' use of smart meter data to a narrow category of "primary purposes," including billing, grid maintenance and energy efficiency. This was done in part to allay concerns that suppliers would sell data to third parties for purposes unrelated to energy efficiency. By making efficiency a regulated duty, DECC would allow suppliers and their contractors to deliver the full potential energy savings from smart meters while protecting consumer privacy.

Responses to select consultation questions[10]

Benefits of access to sub-daily data

1. Please submit any further evidence, such as surveys or consumer research, regarding privacy issues and smart metering. In particular, is there evidence available about the effects of the availability and aggregation levels of more granular data (for example daily)?
3. Are there any data uses, apart from those set out below, where the arrangements for access to data could have an impact on the benefits of the programme? How does this analysis differ for the gas market?
4. What types of energy services and energy advice could be provided by the market (by suppliers and / or ESCOs / potential new entrants) that require access to specific levels of data? What level of data granularity (frequency, time-lag) is needed to provide such services and what is the potential impact of these services in terms of percentage energy savings? Please provide empirical examples and explain the basis of any assumptions and distinguish between gas and electricity.

Each of the consultation questions above relate to the incremental benefits of more granular smart meter data. Behavioural energy efficiency companies encourage energy-saving behaviour change through analysis of energy usage information and other publicly available data. As the amount of data available increases, this data analysis becomes more insightful and targeted. Greater insight leads to greater savings. To give a sense of the type of information that can be gleaned from more granular data intervals, and the corresponding insights that can be derived from that information, it is useful to look at several examples.

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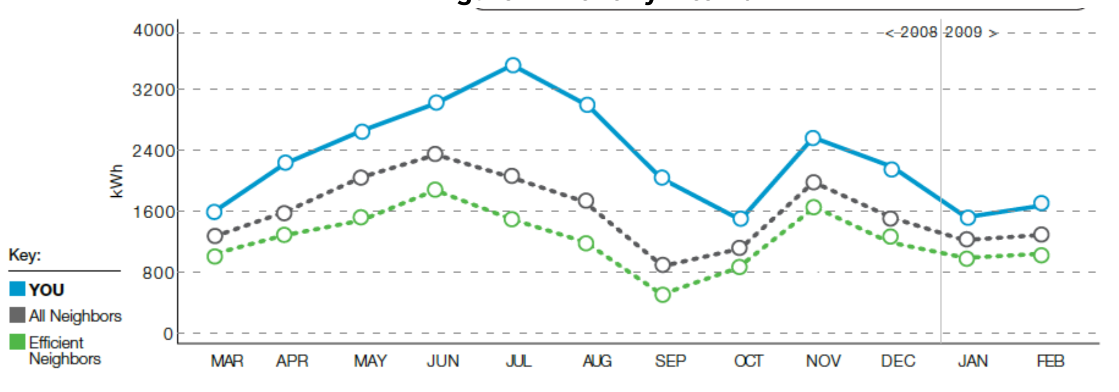
[8] See, e.g., "The Green Deal: A summary of the Government's proposals," 2010, *The Department of Energy and Climate Change*, available here: http://www.decc.gov.uk/assets/decc/legislation/energybill/1010-green-deal-summary-proposals.pdf
[9] California Public Utilities Commission, Decision 11-07-056, July 28, 2011, p. 151, available here: http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/140369.pdf
[10] Note: The question number corresponds to the actual number from the consultation document

Figure 1: Monthly interval



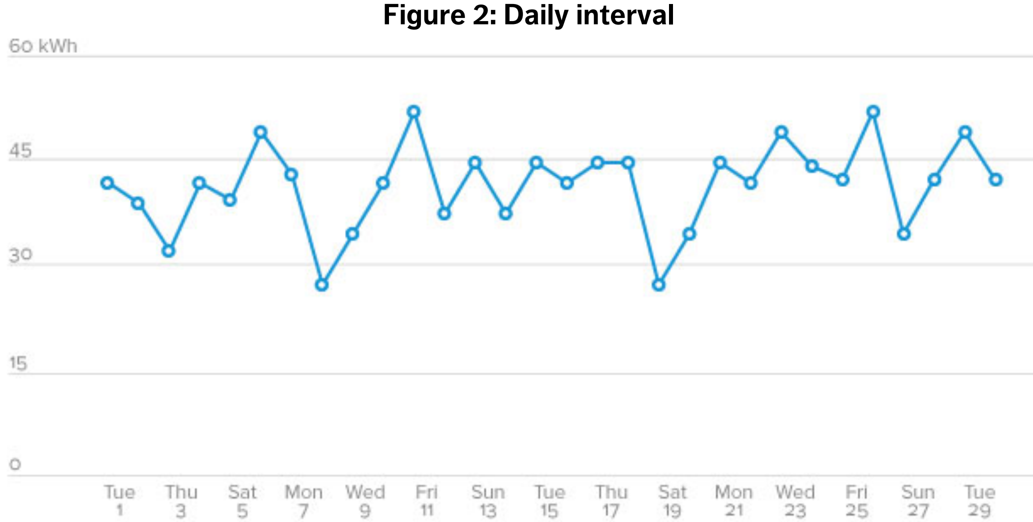
With monthly data, customers can see how their energy usage compares to their neighbours and how it varies over seasons.

Monthly intervals allow energy information companies to show the aggregate amount of energy used by a given household in a given month. While it is possible to make some hypotheses about energy use by comparing months (i.e. if use goes up during very hot or very cold months, this can likely be attributed to heating or cooling), it is impossible to determine the actual amount of monthly usage attributable to heating and cooling, or to any distinct aspect of energy use. With access only to monthly data, a behavioural efficiency program largely focuses on:

- providing an accurate peer comparison (i.e. comparative consumption),
- showing progress month-to-month, and
- presenting personalised advice based largely on parcel data (e.g. size and date of construction of the home), demographic data, and seasonal variation.

The majority of Opower's programs in the US have operated with monthly data. These programs have consistently delivered measurable energy savings of 1.5% - 3.5%.

Figure 2: Daily interval

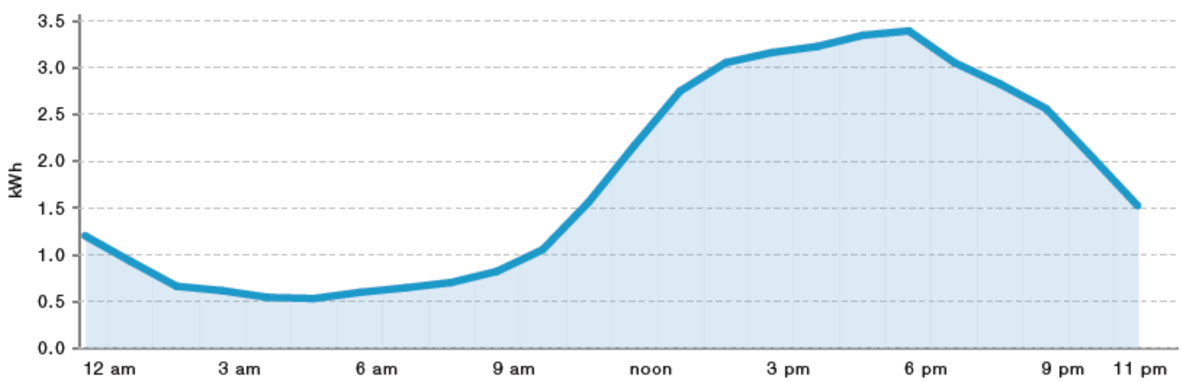


With daily meter reads, customers can receive high bill alerts and compare their weekday usage to their weekend usage.

At daily intervals, it is possible to disaggregate to some degree the amount of energy use dedicated to heating and cooling, and to offer consumers useful information about the ways they can save energy by modifying their behaviour (e.g. turning the thermostat down a few degrees when leaving the house for the day). Better insights can be developed as well, including by:

- building better profiles and tips by looking at weekday versus weekend usage,
- providing bill high bill alerts that let people know if they are on track for a particularly high bill at the end of the month; and,
- understanding how weather and behaviour are interacting.

Figure 3: 30-minute interval

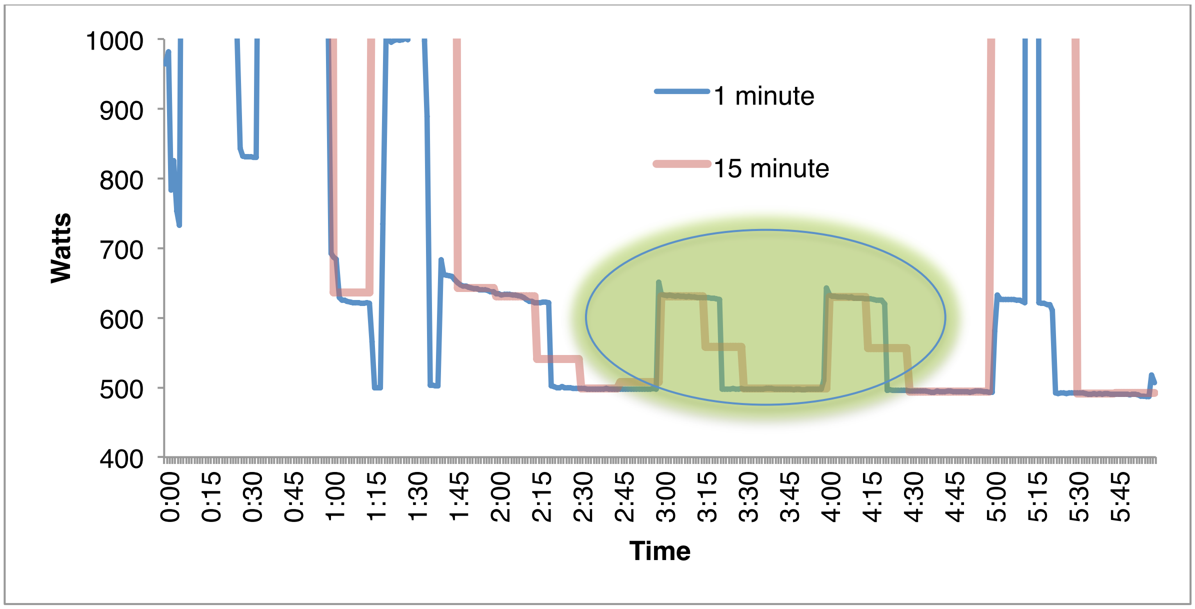


With thirty-minute intervals, customers can see how their energy usage changes over different periods of the day.

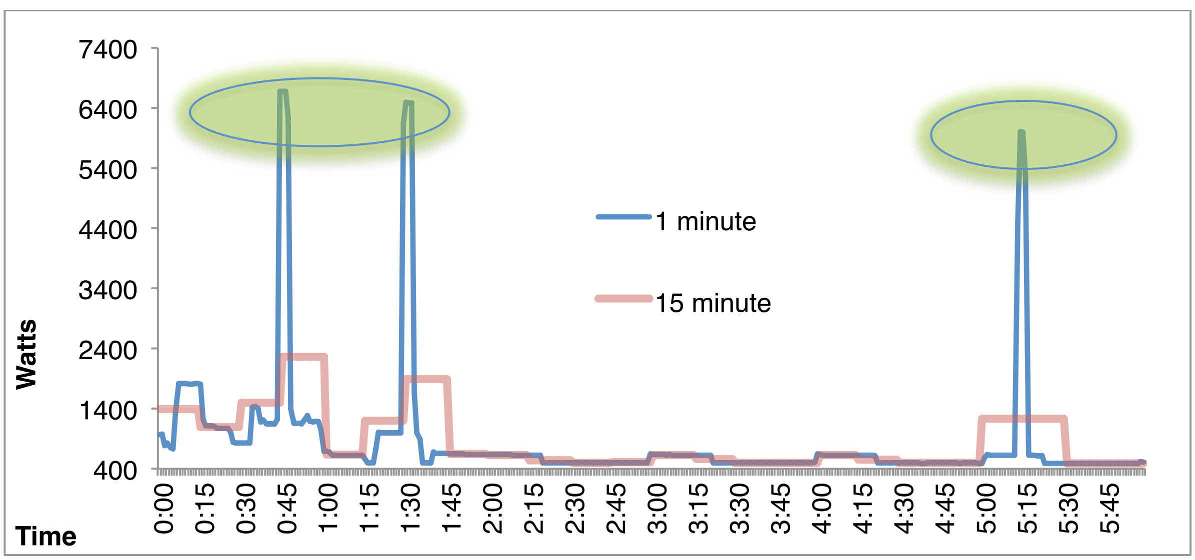
With smart meter data at a frequency of at least every 30-minute interval, behavioural efficiency programs can present customers with insights on the ways they use energy at different times of day, enabling them to adjust their usage and lessen strain on the grid during peak times. Interval data of at least this level of specificity is essential to offer truly dynamic pricing (i.e. critical peak pricing).[11] This level of data enables more accurate heating and cooling disaggregation and the construction of profiles identifying classes of usage. For most appliances, device disaggregation and identification is not possible with 30-minute data. In some cases a refrigerator, because of its regular and predictable cooling cycle, might be detectable at this interval. However, as described below, the refrigerator's load signature is much more reliably detectable at intervals of 15 minutes or less.

[11] For a discussion of dynamic pricing, see, e.g.: Faruqui, Ahmad, and Sanem Sergici, 14 June 2011 "Dynamic Pricing: Past, Present, and Future," *The Brattle Group*, available here: http://www.brattle.com/_documents/UploadLibrary/Upload956.pdf

Figures 4 and 5: 15-minute or less



With meter reads at 15 minutes or less, we begin to see patterns of appliance energy use. The fifteen-minute read (zoomed in above) shows the pattern a compressor cycle of a refrigerator.

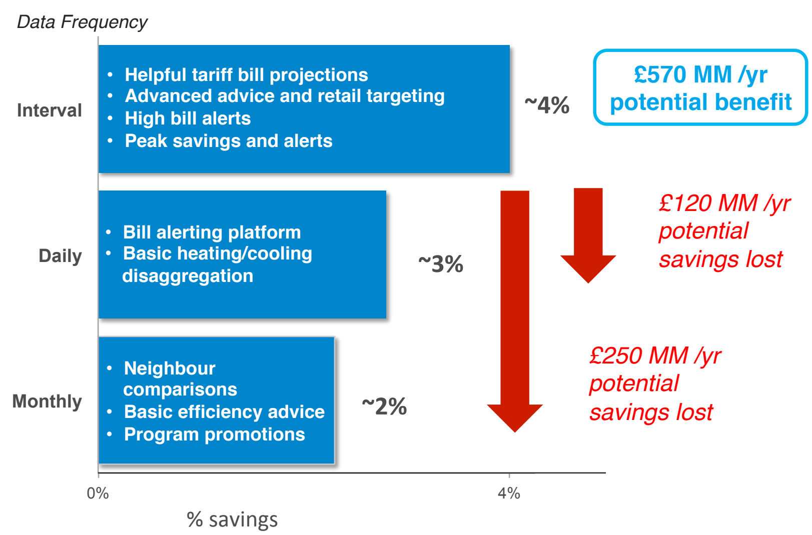


However, where energy usage shows three brief spikes (above) a water heater is turning on for a couple of minutes at a time – a pattern that is only apparent in the 1-minute data.

1515 N Courthouse Rd, 8th Floor, Arlington, VA 22201 USA +1 703 778 4544 opower.com @opower

For most appliances, device disaggregation and identification is not possible with 30-minute data. In some cases a refrigerator, because of its regular and predictable cooling cycle, might be detectable at this interval. However, **as demonstrated in Figures 4 and 5**, the refrigerator's load signature is much more reliably detectable at intervals of 15 minutes or less.

Figure 6: Less data means fewer benefits



At these levels of granularity it becomes possible to disaggregate many particular appliances based on algorithmic analysis of load signature such as a refrigerator or an electric hot water heater.

As Dr. Carrie Armel of Stanford University described in a recent presentation to the Silicon Valley Leadership Group, even greater insights and dramatic potential energy savings would be possible with more detailed data.[12] While device disaggregation is not currently possible with 30-minute interval data, such data nevertheless holds great potential for providing useful, actionable insights to consumers broadly and without additional infrastructure investment beyond the smart meter.

As illustrated in **Figure 6**, Opower estimates that the United Kingdom could lose £370 million annually in potential benefits if it only allows suppliers to access monthly as opposed to sub-daily data.

Benefits of opt-out programme design

2. To what extent would different rules for access to data between suppliers and third parties be expected to impact on the development of an energy services market (in terms of product and tariff innovation and/or entry to the energy market by third parties)? What are the particular data uses to which these concerns apply?
16. Are there any alternatives to a basic opt-in or opt-out approach to consumer choice such as some form of prompted choice? What are the practical and consumer protection considerations in relation to different options (for example when and how)? From a consumer perspective what alternative approaches and vehicles (for example letter, email, phone) to seek customer consent are there?
17. What evidence is there of likely take-up rates that could be achieved through different approaches to consumer choice?

[12] "The Value of Energy Sensors: Will it Be Realized?," delivered by Carrie Armel, Ph.D., Precourt Energy Efficiency Center, Stanford University, at the Silicon Valley Leadership Group's 2011 Energy Summit, June 2011.

These three consultation questions relate to data access. Access to household energy usage data is necessary for any behavioural energy efficiency provider to deliver energy savings. There are two potential models that allow efficiency providers to access this type of household data. One model allows third parties to access data by partnering directly with a supplier, while the other model allows third parties to partner directly with the customer.[13] While each model has its own benefits and drawbacks, Opower recommends that the government implement policies that allow *both* business models to thrive in the UK's energy efficiency markets.

Distinguishing between business models

In the supplier-processor model (i.e. Opower's model), data processors access customer energy usage data from the supplier. Data processors provide services in the energy supplier's name, and operate as extensions (or agents) of the supplier – much like a billing service provider. In this relationship, the privacy of customer data is protected in the contract between the supplier and data processor, and the data processor retains no rights to personally identifiable information after the services are completed. Further, data processors in this model cannot sell data to other third parties, but must use the data only for the explicit purposes outlined in the contract with the supplier, in the case of Opower to provide energy efficiency advice and services to customers.

Alternatively, in the direct-to-customer model, third parties obtain energy usage data directly from the customer. Because the customer expressly consents to providing this usage information, third parties are not bound by similar restrictions regarding the data's usage and can use the data for multiple purposes, including selling that data to other third parties for non-efficiency related purposes.

Figure 7: Comparison of data processors and third parties

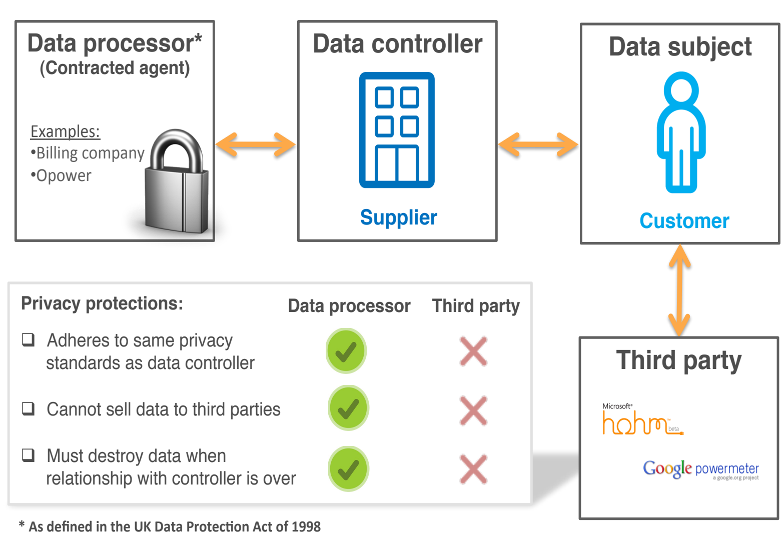


Figure 7 illustrates the difference between these two models.

Direct-to-customer model (Google Powermeter, Microsoft Hohm, etc.) – Under this model, a customer may choose to transfer data to a third-party platform so they may take advantage of the third-party's product. Customers interact with both the supplier to supply the energy usage data, and the third party for data analysis and

[13] The proposed central data and communications body ("DCC") in the UK could potentially create a third access point.

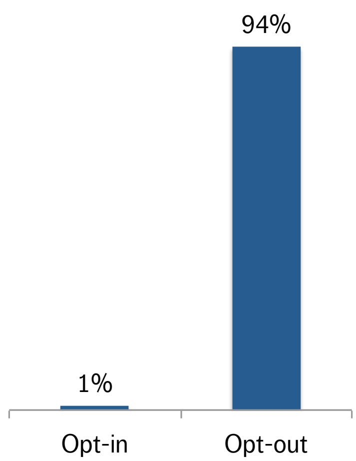
feedback.[14]

Supplier-processor model (Opower, billing services) – This model allows the supplier to contract with a vendor to use data to provide customer engagement or efficiency products. For customers, the relationship between the supplier and the vendor is seamless; the customer primarily sees output as a supplier service.

Benefits of the supplier-processor model and opt-out design

The supplier-processor model—as characterized by opt-out design, or defaults—is key to achieving rigorously measured behavioural energy efficiency at scale. A German study on green power pricing programmes demonstrates the dramatic value of opt-out design. These programmes allow customers to voluntarily pay more for their electricity. In return, they receive electricity that is generated from a larger share of renewables than other offerings. Similar to energy efficiency in the UK, increasing the production of renewable energy is a public policy goal for the German government. However, the average participation rate in these opt-in programmes was only 1%.

Figure 8: Opt-out lifts participation in German green power programs



Rather than mandate the use of renewables, a local German government came upon a more powerful solution – defaults. The town of Schönau implemented an opt-out green pricing programme with great success. 94% of customers remained in the programme months after they were enrolled.[15] As displayed in **Figure 8**, such defaults have a proven ability to greatly increase participation.

The Cabinet Office's Behavioural Insights Team has recognized this benefit in the context of pension schemes, and energy policy. [16,17] Changing pension schemes from opt-in to opt-out increased participation from 40% to 90% in the UK.[18] And in the context of energy policy, the UK Government changed its default settings for heating and lighting systems with the ambitious goal

[14] Google and Microsoft shut down Powermeter and Hohm earlier this year. Opower is unaware of any direct-to-consumer companies that have achieved verified behavioral energy savings at scale.

[15] Pichert, Daniel, and Konstantinos Katsikopoulos, "Green Defaults: Information presentation and pro-environmental behaviour," October 2007, *Journal of Environmental Psychology*, available here: ftp://papers.econ.mpg.de/IMPRS/SumSchool2009/priv/Katsikopoulos/ABC%20Read%205.2.pdf

[16] "Behaviour Change and Energy Use," June 2011, *Cabinet Office's Behavioural Insights Unit*, available here: http://www.cabinetoffice.gov.uk/sites/default/files/resources/behaviour-change-and-energy-use.pdf

[17] "Applying behavioural insight to health," 31 December 2010, *Cabinet Office and Behavioural Insights Team*, available here: https://update.cabinetoffice.gov.uk/sites/default/files/resources/403936_BehaviouralInsight_acc.pdf

[18] "Applying behavioural insight to health," p. 11

of realizing a reduction in emissions of 25% by 2015.[19]

Opower has effectively used defaults to engage over 85% of customers in US supplier service territories and has consistently seen an opt-out rate of less than 1%. With this high level of participation, the small behaviour changes that lead to Opower's average 1.5 – 3.5% savings result in a large aggregate impact. When projecting a relatively generous opt-in rate of 5% for a full UK deployment, Opower still estimates the UK would lose 15,000 GWh in energy and over £1.3 billion in bill savings over three years. **Figure 9** compares these estimated benefits of opt-out versus opt-in Opower programmes if fully deployed in the United Kingdom.

Figure 9: Benefits of opt-out for UK full deployment

Benefits of an OPOWER program:	Opt-out*	Opt-in**	Loss
❑ % of customers who take action	85%	< 5%	~80%
❑ Energy savings	> 20,900 GWh	< 5,900 GWh	~15,000 GWh
❑ Gross savings for customers	> £1,700m	< £350m	~1,350m
❑ Measurable and verifiable results	✓	✗	Transparency
❑ Savings across each customer class	✓	✗	Equality

* Assumptions include deployment to 21.3m UK households over 3 years and access to sub-interval data
** Assumptions include averages of 5% of customers opting in and 10% savings rate for 21.3m UK households over 3 years

Opt-out design is necessary for rigorous measurement and verification of energy savings

Strong evaluation, measurement, and verification ("EM&V") are in the interest of both the Government and the taxpayers, who shoulder the cost of these programmes. With rigorous EM&V in place, DECC can be sure households are receiving the benefits of the programmes for which they are paying. DECC may want to work with suppliers more broadly to identify the best methods for reporting energy savings from smart meter enabled efficiency services.

Opt-out structure is necessary for establishing unbiased experimental design, including randomization, statistically equivalent control and treatment groups, and ex-*post* measurement. Experimental design is key to rigorous EM&V of programme savings.

Specifically, opt-out design allows for the creation of treatment and control groups that are demographically equivalent so that the effect of a programme on the treatment group's energy usage can be measured with statistical confidence. By contrast, an opt-in programme would be difficult to measure with certainty. Although there are a variety of statistical techniques one can use to match participants with non-participants based on observable characteristics – such as housing, demographic, and census data – none of these methods address differences in unobservable characteristics like attitudes and beliefs. While a "matched" comparison group may appear to be similar to the treatment group, it is likely that undetected biases will render the

[19] "Behaviour change and Energy Use," p. 28

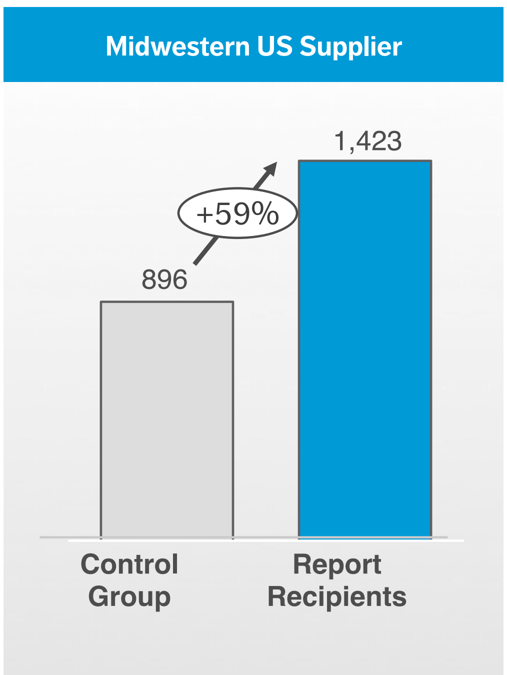
measured savings invalid. This is especially true in the case of opt-in programmes: the act itself of opting-in signals a difference from those who did not opt in. In the world of surveys, this is known as survey responder (or selection) bias.

Opt-out programme design avoids these issues by assigning customers to the participant and non-participant groups at random. This randomization procedure ensures that unobservable characteristics are balanced between the participant and non-participant groups. As a result, one can draw a causal, unbiased inference about the impact of the programme.

Opt-out design increases participation in other programmes

Opt-out behavioural energy efficiency programs have also proven the ability to lift participation in other efficiency programs. Opt-out design does this in two ways. First, opt-out allows a behavioural efficiency provider to access more households that could potentially participate in other efficiency programs. Second, opt-out allows for these providers to access more data, which is used to develop highly personalised messaging.

Figure 10: Opower lifts other programmes



The result is a more tailored marketing channel that successfully encourages both behaviour change and increased participation in other efficiency programs. **Figure 10** displays results from a recent deployment with a Midwestern US supplier in which Opower increased participation by 59% in a refrigerator-recycling programme. As with each deployment, Opower was able to rigorously measure this increase in participation by using a randomized-controlled trial.

The ability to lift programme participation is especially important as the UK rolls out the Green Deal. With more detailed data, Opower can further personalise this advice, which will result in increased participation in Green Deal programmes. In this way, Opower's access to granular data can support DECC's policy objectives for both the Smart Metering Implementation Programme and the Green Deal.

Prompted choice is sub-optimal

Prompted choice compels customers to make a decision on whether to participate in a program. These programs tend to result in participation rates that fall somewhere between opt-in and opt-out programs, but have many of the shortcomings of opt-in programs. First, prompted choice will reduce participation compared to opt-out programs. The Cabinet Office's Behavioural Insights

Team report on health care cited an example in which prompted choice design for pension schemes resulted in 70% participation, as opposed to 40% with opt-in design and 90% for opt-out.[20] Separate studies exploring prompted choice in the context of organ donations have found much lower participation. In Texas, only 20% of people opted in to an organ donation program when presented with a prompted choice. With such low participation, this system was deemed a failure and replaced.[21] In the case of a behavioural energy efficiency program, still lower participation levels would be expected. Energy efficiency programs start from a much lower baseline of participation than something pension—or even organ donation—schemes.

Second, prompted choice poses the same challenges for evaluation, measurement, and verification as opt-in design. Rigorous EM&V of behavioural efficiency requires experimental design characterized by *ex-post* measurement. To the extent that prompted choice does not allow for proper randomization of control and treatment groups, this will increase propensity for selection bias, which will reduce the internal validity of impact analysis.

Thus, if DECC wants to maximize the consumer benefits of smart meters, create a policy environment that permits rigorous measurement and verification of results, and preserve consumer choice, then opt-out remains the optimal policy approach.

Vulnerable customers

12. How could smart metering data be used to identify and protect vulnerable consumers? Should such activity be considered a regulated duty and are any licence changes needed to create particular duties on suppliers in this area?

Unlike most energy efficiency programmes, behavioural programs have a proven ability to deliver savings for all types of customers – including the vulnerable. When allowed access to smart metering data, a data processor can combine this data with other publicly available demographic, postal, and household-related data to identify vulnerable customers and provide them with personalized behavioural messaging. Because vulnerable customers tend to spend a larger proportion of their income on energy, these efficiency-related benefits can have a greater relative impact for these priority groups. **Figure 11** demonstrates the above-average energy savings that Opower has achieved across low-income and elderly households within a Northern California supplier's service territory.

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[20] Applying behavioural insight to health," 31 December 2010, *Cabinet Office and Behavioural Insights Team*, available here: https://update.cabinetoffice.gov.uk/sites/default/files/resources/403936_BehaviouralInsight_acc.pdf

[21] Wellesley, Hugo, 2011, "A nudge in the right direction for organ donation – but is it enough?" *BMJ*, available here: http://www.bmj.com/content/343/bmj.d5726.extract

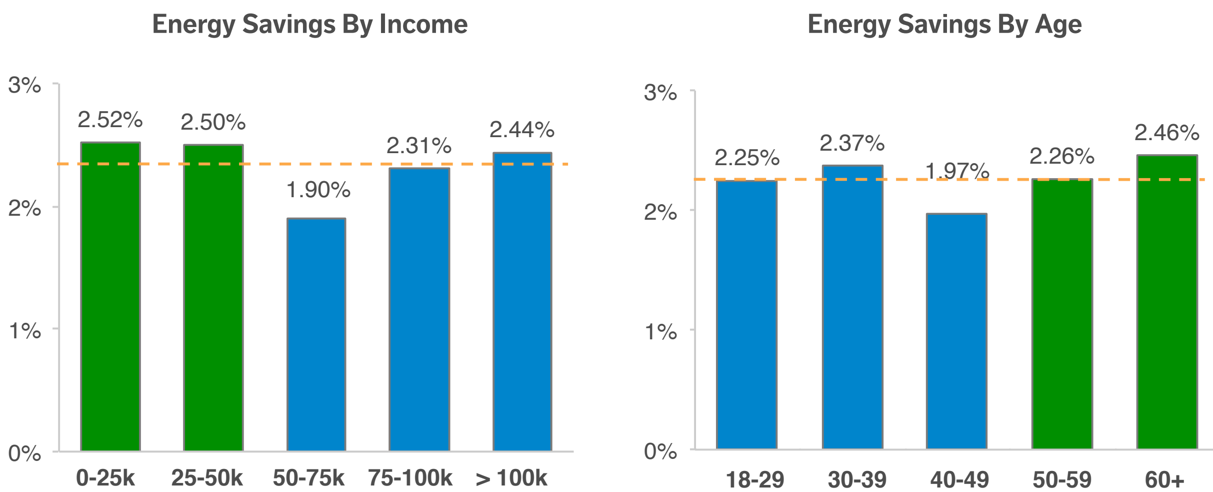

Figure 11: Opower results are consistent across income level and age

Behavioural efficiency programmes benefit the vulnerable in at least two other ways. First, they can help mitigate excessive comfort taking that can result when efficiency improvements are installed. With tailored messaging, vulnerable customers receive information that helps them save energy regardless of their circumstance. These actions help them avoid the comfort taking that may otherwise occur. This effect is confirmed by the program's results. Because results are measured *ex post*, these 2.5% savings are net of any comfort taking.

Second, behavioural programs not only help households find new efficient technologies and behaviours that save them energy and money, but also understand how to use existing technologies efficiently. By educating *all* customers on how best to take advantage of smart meters, behavioural programs lock in the benefits of the smart metering rollout.

Efficiency should be a regulated duty

DECC has emphasized priority and super priority groups in other energy-related policies in an effort to protect the most vulnerable. Most notably, CERT requires 40% of carbon reductions to come from measures installed in priority group households, and another 10% come from the super priority group.[22] The Smart Metering Implementation Programme should similarly emphasize these priority groups by including policies that will enable behavioural energy efficiency programmes to reach these vulnerable customers. By identifying the provision of

[22] See, e.g., "Paving the way for a Green Deal," *Department for Energy and Climate Change*, June 2010, available here: http://www.decc.gov.uk/assets/decc/consultations/certextension/certextgovresponse.pdf

energy efficiency as a regulated duty, DECC can ensure these priority groups benefit from the smart metering deployment.

Best practice is evolving to include efficiency as a regulated duty

In the United States, California has recently enacted both legislation and a comprehensive regime of regulation governing data access and privacy of smart meter data. California has adopted as its starting point a similar principle to the one articulated by DECC in the Smart Metering Implementation Programme: Suppliers of energy are prohibited from using, storing or sharing personally identifiable smart meter energy use data except for certain "primary purposes" or with the consent of the customer. In California, "primary purposes" are defined as those that:

(i) provide or bill for electrical power or gas;
(ii) provide for system, grid, or operational needs;
(iii) provide services as required by state or federal law or as specifically authorized by an order of the Commission, or;
(iv) plan, implement, or evaluate demand response, energy management, or energy efficiency programmes under contract with an electrical corporation, under contract with the Commission, or as part of a Commission authorized programme conducted by a governmental entity under the supervision of the Commission.[23]

California includes efficiency among the "primary purposes" for which suppliers may use smart meter data, which allows these suppliers to share it with data processors that are subject to appropriate privacy safeguards. By making this determination, the California Public Utilities Commission recognized the judgment of the California State Legislature that efficiency is a crucial public policy goal and a major underlying benefit of smart meter implementation. Further, it recognized the vital role that suppliers can and should play in promoting energy efficiency.

Smart metering rollout is an opportunity to lock in the benefits of efficiency

DECC has expressed a strong policy interest in promoting energy efficiency. Smart meters alone do not provide customers with particular benefits beyond accurate and timely billing.[24] Rather,

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[23] California Public Utilities Commission, Decision 11-07-056, July 28, 2011, p. 151, available here: http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/140369.pdf
[24] *See, e.g.*, "Smart Metering Implementation Programme: Response to Prospectus Consultation, Supporting Document 1 of 5 on Data Access and Privacy," March, 2011, *Department of Energy and Climate Change,* Appendix 3, p. 36 ("delivering the benefits of smart metering depends on consumers changing their energy consumption behaviour"), available here: http://www.decc.gov.uk/assets/decc/Consultations/smart-meter-imp-prospectus/1477-data-access-privacy.pdf; "Preparations for the roll-out of smart meters," June 30, 2011,

smart meters are the precondition for a range of potential energy savings, including energy conservation, informed investment in energy-efficient appliances and automation, and load management to shave demand during peak times. Customers save money only when, in response to useful information derived from the smart meter, they change their energy use behaviour. DECC acknowledged this fact in its Response to Prospectus Consultation, noting that "delivering the benefits of smart metering depends on consumers changing their energy consumption behaviour," and that these benefits "depend on the take up of energy efficiency advice and actions by consumers."[25]

DECC recognizes that "if the benefits of smart meters are to be realized, it is essential that consumers understand why they are receiving a smart meter and how to make best use of the new technology, including how to use it to help increase energy efficiency and optimize energy use."[26] One of the hard-won lessons of smart meter rollouts in the United States has been that the goal of customer education and engagement cannot be accomplished in a single visit, seminar or piece of correspondence. Rather, educating customers about smart meters—and the value these meters represent—is a continuous process.

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National Audit Office (noting "uncertainty over consumer benefits" from Smart Meter implementation), available here: http://www.nao.org.uk/publications/1012/smart_meters.aspx

[25] "Response to Prospectus Consultation, Supporting Document on Data Access and Privacy," p. 36.

[26] *Id.* p. 19