ENERGY DATA PORTABILITY

Assessing Utility Performance and Preventing "Evil Nudges"

TABLE OF CONTENTS

MISSION:DATA
empowering energy savings

Mission:data Coalition is a national coalition of 35 energy innovative technology companies that empower consumers with access to their own energy usage data. Mission:data advocates for customer-friendly data portability policies throughout the country in order to deliver benefits to consumers and enable a vibrant market for energy management services.

EXECUTIVE SUMMARY

Electric and gas utilities have "nudged" consumers to save energy for many years. Pioneered by Opower (now Oracle), utilities have used the concept of "nudges" to induce certain consumer behaviors with peer comparisons, badges, smiley faces or other techniques. But nudging can be used to suppress certain behaviors as well, particularly those behaviors that go against the utility company's commercial or strategic interests. We define an "evil nudge" as any effort to frustrate customers' ability in online transactions to exercise their rights to use competing services, such as third party energy management services. The magnitude of an "evil nudge" is determined by the difference in elapsed time between two instances: First, where a customer takes an online action the utility wants (such as enrolling in automatic billing), and second, where a customer exercises his or her right to receive energy information services from a non-utility provider. The bigger the difference, the larger the evil nudge.

Initially begun in California, Green Button Connect My Data is now spreading nationwide, offering "data portability" to consumers who wish to take their energy usage information from utilities and transfer it to "third parties." However, the success of data portability mandates and true interoperability will be determined by the usability of the utility's website and the performance of its information technology (IT) systems. With anecdotes from energy entrepreneurs with direct experience working with utilities' Green Button Connect My Data systems, we present four common performance shortfalls: data delays, incorrect data, unplanned outages and poor conformance.

Identifying evil nudges and setting performance criteria for utilities' information technology (IT) systems are prerequisites to achieving data portability. Usability of utilities' websites should be evaluated with a panel of average consumers attempting to share their energy data with a non-utility entity. Next, regulators should hold utilities accountable for their IT systems by requiring performance metrics and public reporting. Only by testing and reporting on the start-to-finish user experience across multiple scenarios can regulators align the performance of the utility with the desired outcome: the meaningful exercise of consumer choice.

WHAT IS DATA PORTABILITY?

Data portability is the idea that consumers should have the capability to move one's data from corporations to other service providers with simplicity and interoperability. Originally used in computer science, portability initially meant the ability to move text or documents across different software platforms without any loss in content. For example, "PDF" is an acronym for "Portable Document Format," meaning PDFs can be viewed on all computer operating systems such as Windows, MacOS and Linux. A document that can only be viewed on Microsoft Windows computers is not considered "portable." Recently, data portability has been adopted by several countries as a policy goal to encourage competitive markets and to prevent formation of "data monopolies" in the information economy. For example, Europe's General Data Protection Regulation (GDPR) Article 20 establishes a "right to data portability":

> *"Controllers must make the data available in a structured, commonly used, machine-readable and interoperable format that allows the individual to transfer the data to another controller."*

In the context of utilities, data portability means the ability of consumers to transfer their energy usage data, account information and billing information to any third party service provider, such as a smartphone app, a demand response provider or a commercial building energy management system. Green Button Connect My Data is a technical standard that makes data portability a reality.

HOW DOES DATA PORTABILITY BENEFIT CONSUMERS?

Portability means consumers can access information services not offered by their utility. Many of these data-driven applications have been shown to reduce energy usage by 6%-18%.[1] For example, new services from the private sector include:

- Budgeting software to manage energy costs
- Demand response software that uses "gamification" and prizes to encourage residential load-shifting
- Tailored efficiency recommendations based on analyzing smart meter data
- Utility cost minimization services for commercial and industrial customers

But without true energy data portability across the country, consumers won't have access to these services.

BARRIERS TO DATA PORTABILITY: "EVIL" NUDGES

As popularized by Richard Thaler and Cass Sunstein, to *nudge* consumers in a certain direction is to subtly encourage them to make certain decisions over others. In "Nudge: Improving Decisions About Health, Wealth and Happiness," Thaler and Sunstein describe several examples, such as making workers' retirement contributions the default option upon hiring (rather than asking workers to opt in later). Consumers still have the right to choose, but the "choice architecture" is constructed in such a way that the default option leads to the best outcome, or choice, for the individual. Government, Thaler and Sunstein argue, can encourage healthy eating, energy conservation or other societal goals without mandates using what they termed "libertarian paternalism."

Electric and natural gas utilities "nudge" their customers all the time — for example, to encourage automatic bill payments instead of mailing checks. Anyone who has dialed an 800 number only to hear a recorded voice imploring you to "see our website for faster service" has experience with being nudged — in this case, to a lower-cost communications method for the utility.

Of course, nudging can be used to discourage as much as encourage. Investor-owned utilities have shareholders, of course, and there are customer behaviors that could cut into profits. Over time, utilities have taken actions to discourage those behaviors.

We define an "evil nudge" as any effort by utilities to impede customers' ability in online transactions to exercise their rights to use competing services. For example, increasing the number of required steps or the cognitive burden on the consumer to complete the process of sharing their data with a third party. Absent government interventions to compel utilities to behave differently, utilities will naturally impose burdens on customers who seek to do things that are not aligned with the utilities' interests.

Unfortunately, when it comes to sharing energy data with app makers, evil nudges are widespread

1 "Got Data? The Value of Energy Data Access to Consumers." Mission:data Coalition, January, 2016. http://www.missiondata.io/s/Got-Data-value-of-energy-data-access-to-consumers.pdf.

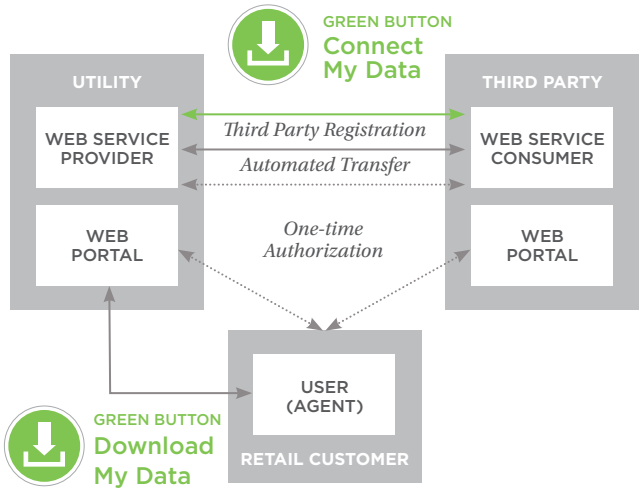
in utilities' websites and forms. Whether through bureaucratic incompetence, neglect or deliberate action, some utilities purport to offer data portability but, in practice, frustrate customers' desire to exercise their rights to data portability. Rather than a few breezy clicks of the mouse, the customer experience with utilities' websites can be more like a Kafkaesque labyrinth.

GREEN BUTTON CONNECT MY DATA SPREADS NATIONWIDE

WHAT IS GREEN BUTTON?

Green Button is a technical standard developed by industry for exchanging energy data to make it "portable." Green Button is formally known as the North American Energy Standards Board's (NAESB) REQ21, the Energy Services Provider Interface (ESPI). These terms are interchangeable.

As with other technical standards, the primary benefits of widespread adoption of Green Button are reduced transaction costs and the facilitation of commerce. For example, if every state had its own Wi-Fi standard (IEEE 802.11), travellers would need to buy different Wi-Fi communication cards for use in each state. Lack of consistency means that energy management firms experience higher transaction costs than if Green Button were universally deployed.



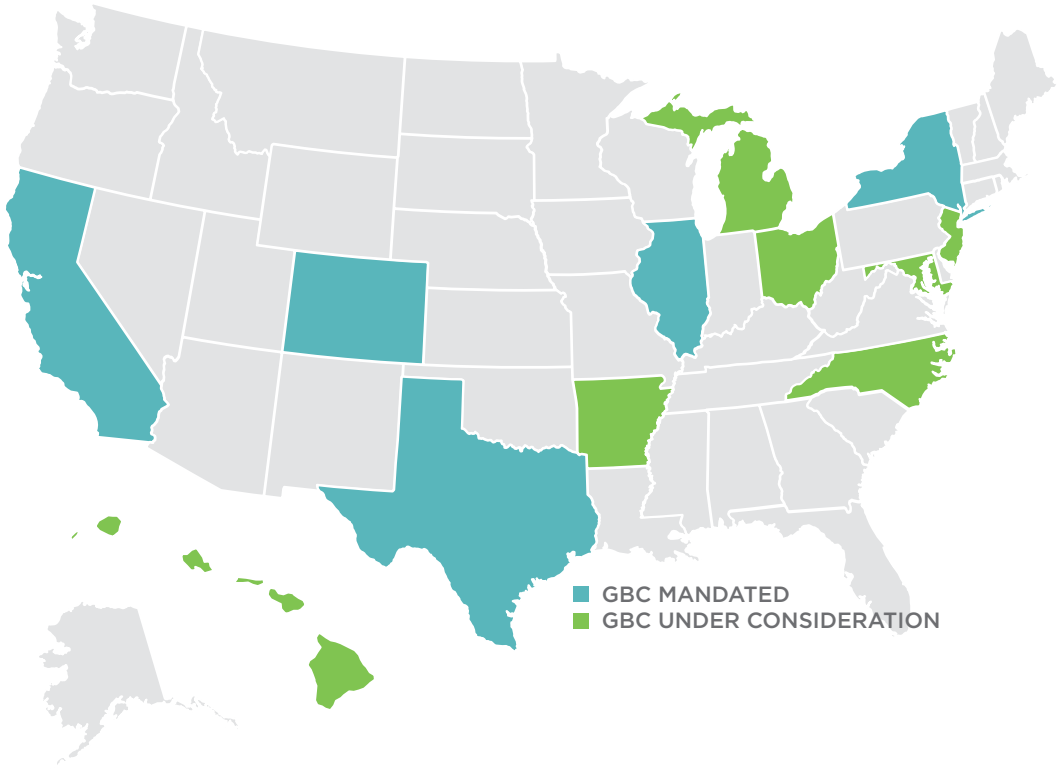
There are two flavors of Green Button. As the name suggests, Green Button DMD requires users to login to their online utility account and download a file manually. The file format is standardized using an XML (eXtensible Markup Language) and can be opened in spreadsheet programs such as Microsoft Excel or OpenOffice. Unfortunately, DMD has not been widely used by customers, primarily due to the friction introduced by the downloading-and-uploading process. Many of the best energy applications function in an ongoing capacity, making recommendations to the customer by email or text messages as usage increases. Asking customers to periodically upload a data file into a website to keep their energy app current presents a burden that nearly all attention-constrained customers will not bear.[2] As a result, most third parties do not consider DMD an adequate solution. In contrast, Green Button Connect My Data (GBC) is an automatic, ongoing transfer of usage data to a third party upon authorization by the customer. Initially, 12 to 48 months of historical usage, account and billing data are transferred from the utility to the third party. Thereafter, ongoing interval readings are transmitted.

GROWING ADOPTION

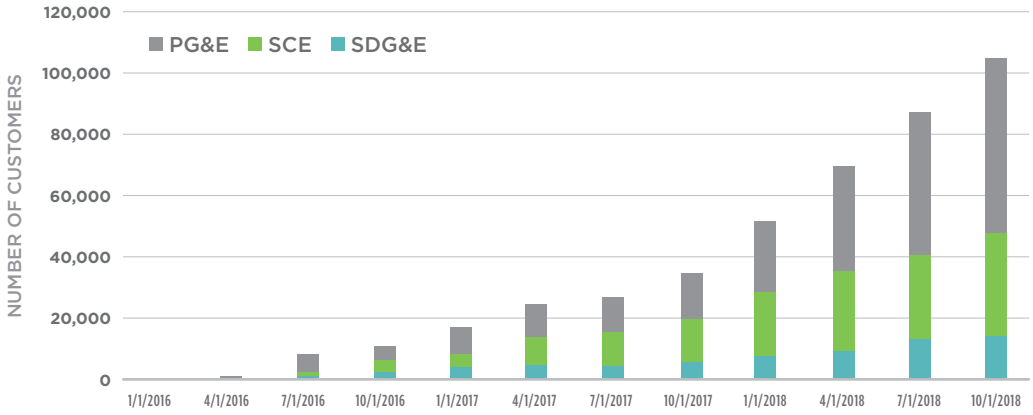
Several state policies across the U.S. support portability of energy data. In 2013, California became the first state to require its electric utilities to provide Green Button Connect My Data (GBC). After two and a half years of development and offering limited trials, GBC became widely available by Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E) in 2016. Since then, a growing number of state public utility commissions (PUCs) have ordered their utilities to support GBC.

2 See, e.g., "Green Button: One year Later." Edison Foundation's IEI Issue Brief, Sept 2012. http://www.edisonfoundation.net/iee/Documents/IEE_Green%20Button%20Report_Final.pdf.

GREEN BUTTON CONNECT MY DATA (GBC) ACROSS THE U.S.



	Utility	*Number of electric meters*	*Type*	*Status of GBC*
CALIFORNIA	Pacific Gas & Electric	5,070,987	Mandated	Implemented as of 2016
	Southern California Edison	5,024,164	Mandated	Implemented as of 2016
	San Diego Gas & Electric	1,408,733	Mandated	Implemented as of 2013
COLORADO	Xcel Energy	1,587,603	Mandated	Planned for 2020
ILLINOIS	Commonwealth Edison	4,157,200	Mandated	Implemented as of 2017
	Ameren Illinois	1,252,000	Mandated	Implemented as of early 2018
MICHIGAN	Consumers Energy	1,818,090	Voluntary	Planned in Q3 2019
NEW JERSEY	Rockland Electric	61,109	Voluntary	Implemented in Q2 2018
NEW YORK	Consolidated Edison	3,550,000	Mandated	Implemented in Q2 2018
	Orange & Rockland	226,000	Mandated	Implemented in Q2 2018
	New York State Electric & Gas	883,563	Mandated	Planned, pending AMI approval
	Rochester Gas & Electric	372,931	Mandated	Planned, pending AMI approval
	National Grid	1,885,000	Mandated	Planned, pending AMI approval
	PSEG Long Island	1,070,000	Voluntary	Planned in 2019
TEXAS	Oncor, CenterPoint, TNMP, AEP	7,374,271	Mandated	Planned GBC upgrade by Jan 2020
	Entergy Texas	477,000	Proposed	Date not specified
	Total	**36,218,651**		



Number of California customers using Green Button Connect to share data with demand response providers, by electric utility and by quarter, 2016-2018. Source: Quarterly compliance filings, CPUC A.14-06-001 et al.

RISING UTILIZATION BY CUSTOMERS

In states with GBC, many customers are choosing to share their utility data with service providers such as rooftop solar companies or energy management firms. In California, where GBC has been operating the longest, residential demand response (DR) has been a strong driver. DR providers obtain customer permission to access their energy information, which must be transmitted to the wholesale market operator (California Independent System Operator) for verification and settlement. In the past 36 months, over 100,000 households have enrolled in these services, demonstrating that GBC is a scalable solution to meet the needs of innovative distributed energy resource (DER) providers. In addition to the chart shown above, PG&E reports that 120,000 of its customers are using GBC for purposes other than demand response as of mid-2018. PG&E has over 100 third parties registered to receive data via GBC.

USER EXPERIENCES DESIGNED TO SUPPRESS

There is no question that the internet and smartphones have made certain tasks in modern life faster and more convenient. Only a few years ago, we used telephone books. Shopping required physically going to a store. Encyclopedias on library shelves provided answers to our questions, rather than the omniscient search bar on web browsers.

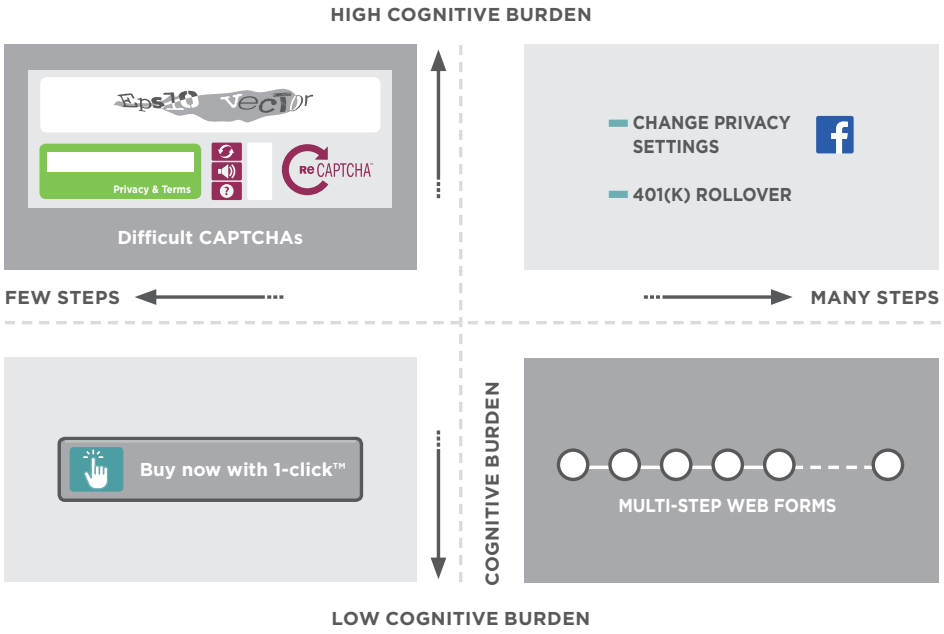
We forget how quickly our expectations for modern services have changed. For example, Millennials find it infuriating when businesses don't answer questions immediately via Twitter because making telephone calls and waiting on hold is intolerable. Rolling over a 401(k) retirement account feels like a nightmarish return to pre-internet barbarism due to the paper forms that need to be signed and mailed.

Not only have our expectations for services increased dramatically as a result of the internet and smartphones, but a massive "convenience industry" now commands billions of dollars across the economy. Some highlights of this industry include:

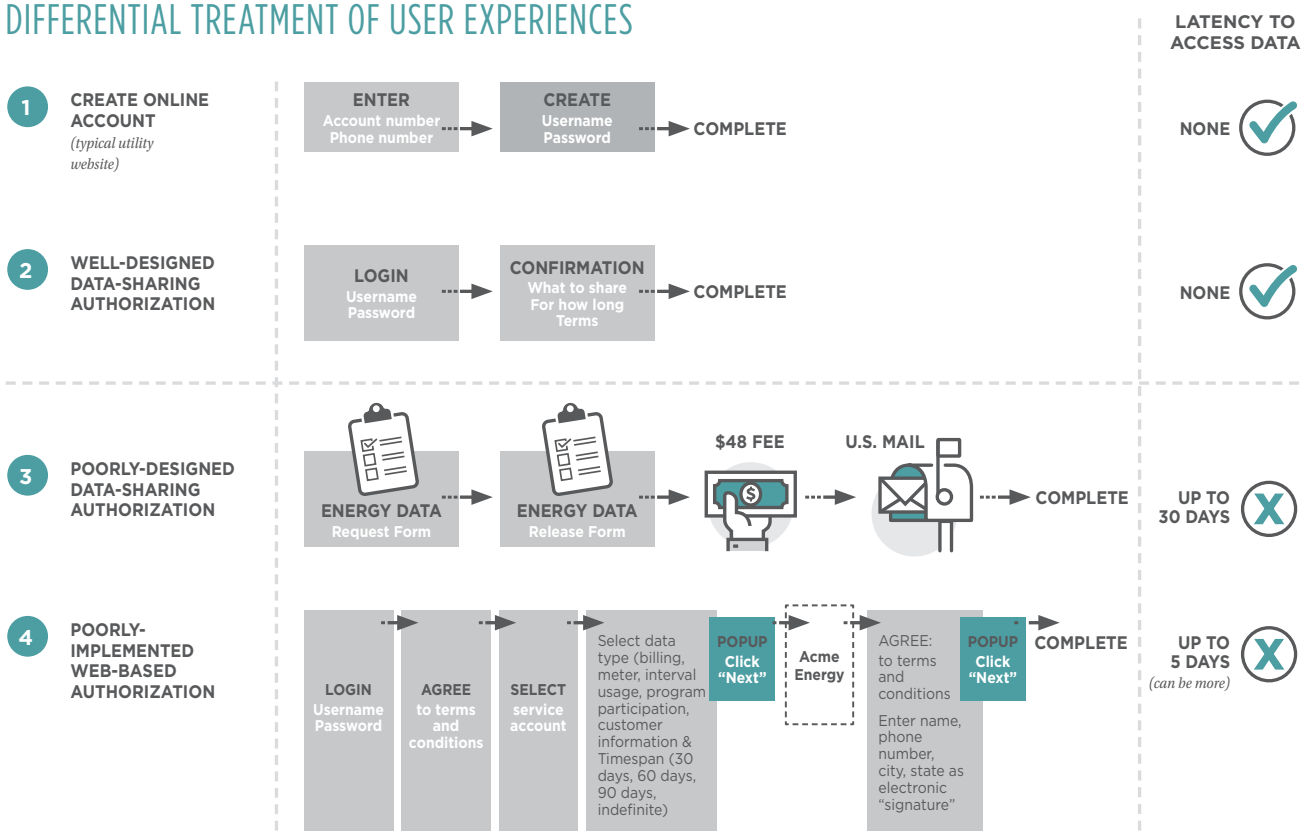
- Amazon's 1999 patent for "1-Click" ordering was among the company's most valuable, helping power the rise of the e-commerce giant to take $1 of every $2 Americans spend online. Two or three clicks resulted in fewer sales than one, so Amazon pioneered the practice of saving shipping and credit card information online to prevent the customer from re-entering such information for each purchase.
- Google's "traffic acquisition cost" was approximately $25 billion in 2018. The search giant spends this money across many players to make Google the default search engine on platforms such as the iPhone's Safari browser or Mozilla's Firefox. Only a small percentage of users bother to change the default search engine on their web browser.
- Accenture found that 95 percent of millennials say they'd switch energy providers altogether if their energy provider proves unable to provide a seamless experience.[3]

3 https://www.greentechmedia.com/articles/read/utilities-ignore-millennials-at-their-peril

USER EXPERIENCE TYPOLOGY



DIFFERENTIAL TREATMENT OF USER EXPERIENCES



(1) Utilities want customers to interact with the utility online, reducing call-center operating expenses, as shown in the relatively small number of required steps. (2) A utility's online experience to facilitate sharing one's energy data can be similarly streamlined, though it often isn't. (3) Paper forms for data sharing require significantly more effort from customers, as shown above using Duke Energy in North Carolina as an example. (4) A complex, multi-step online experience can be equally arduous, as shown above referencing Southern California Edison's GBC implementation as of 2018. Note that GBC, as a technical standard, is silent on user experience topics, so it is possible to have a poor UX while complying with the standard.

Against this backdrop of decreasing friction in customer interactions across industries, inconvenient, multi-step user interactions have become reserved for those things firms *don't* want their users to do: return purchased items, change privacy settings to minimize personal information shared, move retirement funds from one IRA to another. Many firms, including utilities, are required to provide services they don't wish to emphasize. The relative convenience of online user interactions is therefore reflective of a firm's priorities: the simplest-to-execute actions are those that increase revenues, decrease costs or provide strategic benefit.

By quantifying the time differential between a given customer transaction and a well-designed "reference" interaction, we can assess the magnitude of the "evil nudge": How badly does a utility want to discourage the customer's given behavior relative to the behaviors that the utility desires?

Differential treatment of user experiences (UX) can be separated into two characteristics: the number of steps required and cognitive burdens. Tasks requiring greater cognitive effort lead to increased time to complete a given process. Examples include complex forms where reading and comprehension are required to avoid selecting the wrong items in a list. A multi-step process with high cognitive requirements results in high user attrition rates. In one example specific to the electricity sector, a study by demand response provider EnergyHub found that 42% of customers solicited for a demand response program ultimately enrolled when the process was simplified, as compared with 3% when the enrollment process was arduous.[4]

User experience typology is shown in the four quadrants on page 8, with the number of steps on the x-axis and cognitive burden on the y-axis. Darker shading indicates a longer, more difficult user experience.

> *"Even our buddies at the utility said they couldn't get through their own authorization process successfully to try out our app!"*
>
> - MISSION:DATA MEMBER

> *"This is very poorly thought out...This is a horrible user experience."*[5]
>
> - ENTREPRENEUR

BUGS AND GLITCHES: THE PERFORMANCE OF UTILITY IT SYSTEMS

The operation of GBC by utilities requires successful information technology systems. When outages or glitches occur — as they inevitably do — third parties (such as energy management firms) don't get the information they need, resulting in several consequences. The first and most obvious consequence is confused or dissatisfied customers. For example, one demand response company experiences a large number of complaints from customers when utilities are delayed in transmitting data. These consumers expect to be compensated for their energy reduction. Waiting days or weeks — often an unpredictable, inconsistent delay from time to time — causes customer confusion and often leads to unenrollment.

TYPES OF PERFORMANCE PROBLEMS

Data Delays are when utilities fail to transmit customer energy information to third parties in a timely manner.

Incorrect Data are data sent to a third party that do not match what the customer sees on the utility's web portal.

Unplanned Outages are when parts (or the entirety) of a utility's GBC system goes offline, outside of a scheduled maintenance window.

Poor Conformance is when the utility's implementation does not conform to the Green Button Connect My Data standard.

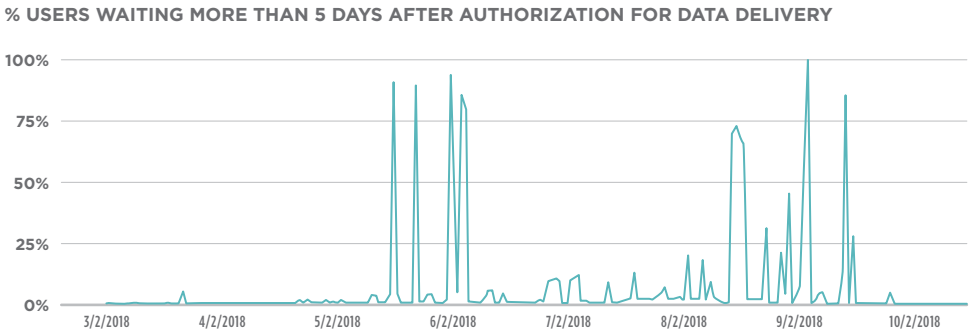
Second, business interruptions and uncertainty add costs to the third party. Technical support and software engineers from the third party need to be called in to troubleshoot problems and communicate with the utility. It is important to note that the resulting harms from IT system outages are asymmetric: The utility faces virtually no consequences in terms of lost revenue or dissatisfied

4 "Optimizing the demand response program enrollment process." EnergyHub, 2016. https://www.energyhub.com/optimizing-demand-response-enrollment.

5 Awesome Power, Public Utility Commission of Texas Project No. 42786. April 25, 2017. http://interchange.puc.texas.gov/Documents/42786_34_937368.PDF.

customers, but the third party suffers.

With some 17 million electric meters' data available via GBC today, many third parties have sufficient experience to assess how well these utilities' IT systems are performing. We have distinguished performance "glitches" into four general categories (see sidebar), each with their own unique set of impacts.



One firm experienced multiple delays in which nearly 100% of their customers' data was delayed by 5 days or more.

DATA DELAYS

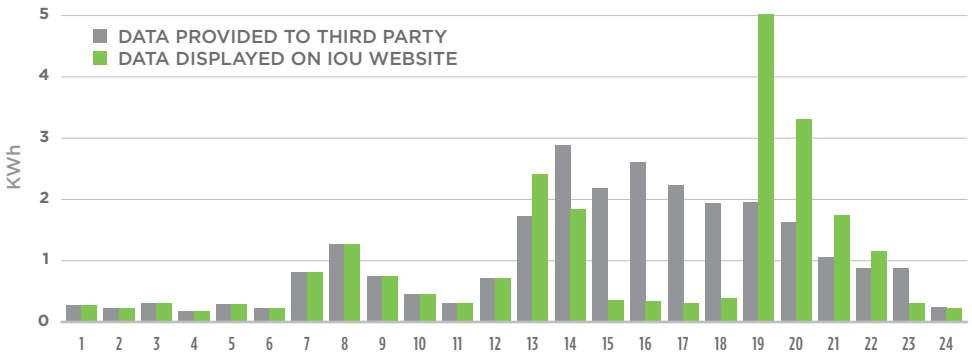
Many third parties have reported significant delays in receiving energy data. Delays can occur initially, after a customer clicks the final "submit" button to complete an authorization, or they can occur on an ongoing basis. Several app developers have reported that they were forced to entirely re-design their applications to accommodate data delays from utilities. For example, one firm built its software to inform facility managers of yesterday's energy usage data, but the firm had to re-build its user interface when it realized energy data was frequently delayed by multiple days. Delays were such a regular occurrence for one third party that it programmed its software application to tells its users upon completing the authorization: "We will notify you via email when data are received. This may take some time."

One third party monitored data delays from Southern California Edison (SCE) over several months. The graph below shows the percent of its customers in SCE's territory whose data was delayed more than five (5) days. For example, customer usage data from Sunday was sometimes delayed until Friday or later. Numerous "spikes" are noticeable, indicating that SCE's system was frequently delayed in transmitting data from virtually all of this customer set. Far from being predictable and robotic, the SCE system is inconsistent, creating challenges for third parties who must accommodate widely varying latencies in their products.

> *"We find that data is stale and updated irregularly. It can have a 3-day to 2-week lapse."*
>
> - ENTREPRENEUR

INCORRECT DATA

Sometimes utilities transmit incorrect energy usage data to third parties. This is a particularly vexing problem because the third party often has no way to know whether the data provided are correct or not. In the case cited below, from Southern California Edison, the third party compared the data received from the utility via GBC with what the customer sees on the utility's web portal. An hour-by-hour comparison showed numerous significant



In this example from demand response provider OhmConnect, a utility in California provided OhmConnect hourly readings via GBC that were different from what was displayed on the utility's web portal. "IOU" = investor-owned utility. Source: Comments of OhmConnect, Inc. on August 8, 2018 IEPR Commissioner Workshop on Demand Response. California Energy Commission Docket No. 17-IEPR-12, dated August 22, 2017.

discrepancies, creating challenges and headaches when settling a demand response transaction at the California Independent System Operator for monetary compensation. Other issues have been reported by third parties, such as null values (no reading) mistakenly represented as zeros.

UNPLANNED OUTAGES

Unplanned system outages can occur with any IT system, but they are particularly problematic for energy management companies because delivery of energy efficiency recommendations — a core value of a third party's service — is delayed to consumers. When analyzed quickly, timeseries energy data is more valuable because it alerts consumers or building owners to ongoing energy waste and immediate savings opportunities. Managing sporadic outages is therefore a challenging task for many entrepreneurs.

> *"Now that we are hitting it [the utility's servers] nightly, we just break it — a lot. It sucks. Unstable. Gets overloaded at the drop of hat."*
>
> - ENTREPRENEUR

From: ShareMyData <ShareMyDataMB@pge.com>

Subject: Share My Data Unplanned Outage Notification - Thursday October 25th

To: ShareMyData <ShareMyDataMB@pge.com>, sharemydata <sharemydata@pge.com>

PG&E is experiencing an unplanned network outage that is impacting Share My Data jobs. Users are unable to successfully make any API calls.

At this time, we are still assessing the issue and looking for a solution. A notification will be sent out when we have more information or the issue is resolved.

Should you have any questions or need for additional support, please feel free to contact us at sharemydata@pge.com.

Thanks,

Share My Data Team

Email notice of an unplanned outage from Pacific Gas & Electric. At least PG&E notifies third parties by email of outages (whether scheduled or unscheduled); many utilities provide no notice whatsoever.

THIRD PARTY COMMENTS ON THE PERFORMANCE OF SMART METER TEXAS

"...[T]he system for third party access is actually much worse, because frequently it just stops working entirely. Here is a list of such failures (we notified the PUC each time):

- **January 17th, 2017:** Third party agreement invites are not sending.
- **January 19th, 2017:** Third party agreement invites are not sending, resolved six hours later, but then the problem occurs again and is not fixed for three to four more hours.
- **January 24th, 2017:** Third party agreement invites are not sending. This problem continued, more or less, for two full days.
- **February 21st, 2017:** Third party agreement invites are sending, but they contain broken links that do not work. This problem continued for two full days.
- **March 1st, 2017:** SMT completely crashes for hours, and no one can log in.
- **March 14th, 2017:** SMT completely crashes again, and no one can log in.
- **March 20th, 2017:** Just like February 21st, third party agreement invites are sending with broken links (rendering them useless).
- **March 28th, 2017:** Registration of new users stops working completely.
- **March 30th, 2017:** SMT completely crashes for hours, and no one can log in.

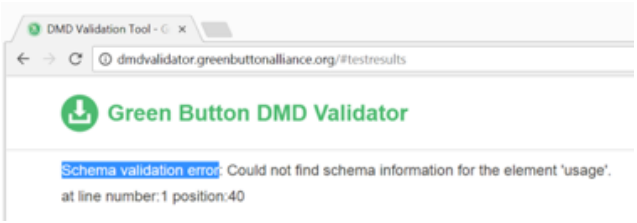
As is apparent, SMT crashes a lot, and the third party authorization process is very buggy."

An entrepreneur reports on Smart Meter Texas (SMT)'s operations in 2017. A subsequent settlement agreement, approved by the PUC, will improve the user experience and require greater uptime beginning in 2020. Source: Awesome Power.

POOR CONFORMANCE

Adhering to the GBC standard has been an ongoing challenge in several jurisdictions. While some elements of the standard allow a degree of flexibility, many are rigid. For example, the XML format for usage data is specified in great detail; it is either followed properly, or it isn't. Last year, Mission:data discovered that one major electric and gas utility was claiming to follow the Green Button standard for usage data, but in practice it had made its own custom version. Non-conformance makes interoperability impossible, requiring entrepreneurs to write customized software for each utility.

Usage data files can be validated for conformance by uploading samples to this website, managed by the nonprofit Green Button Alliance: dmdvalidator.greenbuttonalliance.org. It's easy for many utility customers to download their own Green Button



file and run a conformance test. Errors, such as a "schema validation error" as shown below, will result if the energy usage file does not conform to the standard.

> *"We have separate code for each California utility. Their implementations are totally different from one another."*
>
> - MISSION:DATA MEMBER

OTHER ISSUES

Beyond data delays, incorrect data, unplanned outages and poor conformance, there are other friction points that, if introduced by utilities, inhibit the successful operation of third party software applications. These include:

Registration and onboarding: Firms seeking to acquire customer data from a utility must register with the utility, exchange encryption keys for secure communication, and complete technical interoperability tests. Often times, utilities shortchange this process by not providing sufficient information or staff resources. In the case of San Diego Gas & Electric (SDG&E), entrepreneurs have told us there is a long queue to register with SDG&E's GBC system. **Two firms told us they have been waiting in line for over three years** and are unable to complete onboarding due to the utility's lack of readiness.

> *"We've been waiting in SDG&E's registration queue for over three years."*
>
> - MISSION:DATA MEMBER

Technical support: Questions concerning the operation of any IT system inevitably arise, but many utilities provide poor response times to even basic questions. In many cases, email is the only way to communicate with utility staff. One entrepreneur said, "The utility's lack of responsiveness to basic questions became a running joke among our development team. If they responded to an email within *three weeks*, we pretended to be impressed."

Documentation: Documentation is important for any IT system. However, some utilities offer only marketing brochures, and while others provide detailed documentation, such documentation can be incorrect or out-of date, leading to many vexing delays and trial-and-error attempts to fix problems. Good documentation is especially important in cases where utilities do not conform closely to the GBC standard. One entrepreneur wrote, "The API has a fairly involved 'onboarding process', and the documentation is badly out of date. In fact, a lot of the API documentation simply makes claims that aren't true."[6]

SOLUTIONS

When analyzing the many instances of utilities' poor IT performance, the question of intent frequently arises. Are utilities acting nefariously to prevent competitive services from succeeding, or are they merely inept? Many are inclined to cite the adage about human behavior, "Never ascribe to malice what can more easily be explained by incompetence." However, in the face of climate change and the need for immediate action to reduce our energy usage, we would argue that intentions are irrelevant. What matters most is the actual experience ultimately had by customers who want to share their data. Once usability and performance metrics are quantified, regulators can set standards for utilities and hold them accountable. Objective measurement of utility shortcomings is more important than speculation

6 Awesome Power.

about utilities' intent because measurement focuses regulators' attention on necessary reforms.

USABILITY STANDARDS: LEARNING FROM THERMOSTATS

Long before Nest modernized the public's vision of thermostats as elegant, energy-saving devices, the thermostat industry experienced a crisis. In 2008, EPA's EnergyStar found that homes with programmable thermostats were using more energy than those without, leading the federal agency to terminate its thermostat labeling program. Rebates for programmable thermostats were shelved in many parts of the country, hurting sales. The culprit — as anyone who has used a clunky 1980s or 1990s thermostat can attest — was their poor user interface. Many users could not set their thermostat's clock correctly, handcuffing the device's energy-saving features. 50% of thermostats observed were set to 'override,' or manual control, defeating the purpose of programmability.

Lawrence Berkeley National Laboratory scientist Dr. Alan Meier and his colleagues developed a usability test for thermostats, measuring how long it takes the average person to complete several tasks such as "set the correct time" or "program a weekly schedule."[7] The results showed significantly longer periods than expected. The findings had a significant impact on policy, particularly in California, where usability requirements became a prerequisite for energy efficiency rebates.

7 Alan Meier, Cecilia Aragon, Therese Peffer, Daniel Perry and Marco Pritoni. "Usability of residential thermostats: Preliminary investigations." *Building and Environment* 46 (2011) 1891-1898.

CONCLUSION AND FUTURE WORK

The time has come for regulators to institute usability requirements on utilities' GBC websites. As more and more customer service functions are completed online, it is critical that regulators do more than simply assert the rights of consumers to share their data. Regulators must specify usability and performance minimums associated with exercising those rights. Utilities may have sole discretion over their web portals in a general sense, but regulatory scrutiny is necessary in any area with clear anti-competitive implications. Sharing one's energy usage data with a company that assists you in buying less energy is certainly such a case.

Usability requirements will also ensure that consumers receive the benefits of advanced metering infrastructure (AMI). Ratepayers have paid billions for AMI investments over the years in states across America. One study by the Edison Foundation found that 33% to 66% of the total benefits of AMI are consumer benefits (as opposed to utility benefits, such as reduced costs of meter reading).[8] The value of smart meters to consumers will remain elusive unless regulators make third party conservation software accessible — not just in theory but also in practice. Evil nudges by utilities reduce the likelihood that consumers will take control of their energy data with the help of third parties.

IT system performance is also critical to data portability. Even if a customer successfully passes through a utility's "digital gauntlet" to make his or her data portable, a non-functional IT system prevents the consumer from realizing the benefits of advanced meters. Regulators should mandate performance requirements and public display of real-time operating metrics as mechanisms for utility accountability. For example, California recently required electric utilities to report Application Programming Interface (API) response times, website latencies and start-to-finish elapsed times of customer experiences on a publicly-available website.[9] Such reporting also provides critical information to regulators in examining the prudence of IT costs.

To be maximally useful, an objective usability test must be compared with a well-designed reference case. For example, if a panel of average consumers can complete an authorization on a utility's website within 30 seconds, then other utilities' websites should be compared against that benchmark. Most likely, a composite metric will be needed to summarize the average elapsed times across multiple tests: The consumer uses a desktop computer and a mobile device to grant an authorization; the consumer does and does not have an online account established at the utility; the consumer knows or does not know his or her utility account number. Only by testing and reporting on the start-to-finish user experience across multiple scenarios can regulators align the performance of the utility with the desired outcome: the meaningful exercise of consumer choice. Mission:data is designing a user experience metric to help jump-start its development.

The Internet age presents customers with a dazzling new array of products and services, including energy management. But utility customers will be prevented from accessing such services so long as electric and gas utilities are permitted to offer data portability "in name only." Enforcing true interoperability requires state regulators to develop greater technical expertise to ensure that utilities' digital platforms are high-performing and customer-centered.

MISSION:DATA
empowering energy savings

8 Ahmad Faruqui et al., July 2011. The Institute for Electrical Efficiency, The Edison Foundation. *The Costs and Benefits of Smart Meters for Residential Consumers*, p. 27.

9 California Public Utilities Commission. Resolution E-4868, August, 2017, p. 54-57. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M194/K746/194746364.PDF.