May 5, 2022

Via Electronic Filing

Pennsylvania Public Utility Commission
Attention: Secretary Rosemary Chiavetta
400 North Street
Harrisburg, PA 17102

Re: Docket No. M-2021-3029018, Questions Related to the Commission's Investigation into Conservation Service Provider (CSP) and Other Third Party Access to Electric Distribution Company Customer Data

Dear Secretary Chiavetta:

Mission:data Coalition ("Mission:data") hereby provides these comments in response to the Pennsylvania Public Utility Commission's ("Commission") February 19, 2022 Notice in the *Pennsylvania Bulletin* (the "Notice") regarding Conservation Service Provider ("CSP") and other third party access to customer data held by Electric Distribution Companies ("EDCs"). Mission:data submits these comments in accordance with 52 Pa. Code §1.12.

By way of background, Mission:data is a non-profit coalition of technology companies delivering data-enabled energy management services and solutions. Mission:data's objective is to enable customer-friendly, nationally-consistent, zero-marginal-cost data exchange so that consumers can economically manage their utility bills by accessing new digital services, such as smartphone "apps" that help manage energy usage. With approximately 30 firms representing over $1.0 billion in sales, our member companies provide the most advanced software solutions for energy efficiency, demand response and other distributed energy resources ("DERs") in the residential, commercial and industrial sectors. Mission:data has worked in 15 states and the

District Columbia to promote standards-based energy data portability. Currently, over 36 million electric meters nationwide are under a mandate from state utility regulators to make energy data accessible via the Green Button Connect My Data ("GBC") standard to non-licensed third parties at the direction of the customer.

In the comments below, Mission:data's aim is to make the Commission aware of the lessons learned from other jurisdictions and how Pennsylvania can help derive maximum value from its investment in advanced metering infrastructure ("AMI"). First, Mission:data addresses the questions put forth in the Notice. Next, we include several attached reports that provide further information and case studies about the successful implementation of energy data portability in other jurisdictions.

1. Electric Distribution Company (EDC) Smart Meter Customer Data Access by CSPs and Other Third Parties Technical Concerns

a. Is it possible to develop a path in which certain CSPs or other third parties are granted authorization to access EDC smart meter customer data electronically in a secure manner?

Yes, absolutely. Experience in other states, and in other industries, leads us to conclude without reservation that there is a viable and trusted pathway by which Pennsylvania consumers can direct their electric distribution companies ("EDCs") to electronically and securely share their data with third parties. Data portability is a global movement across multiple industries, including the energy sector, that seeks to empower consumers to access data-driven services that are not available from incumbent providers. The ultimate aim of data portability is to increase competition and prevent the formation of "data monopolies" that artificially reduce the choices available to consumers. For example, in banking, many countries are moving to adopt Open Banking standards which allow consumers to easily move or "port" their data from one financial institution to another. The secure, permission-based exchange of financial data allows consumers to shop for lower interest rate loans or credit cards, or to access new services such as smartphone apps that assess their overall financial health by accessing data about checking accounts, mortgage accounts, auto loans, etc. held in otherwise siloed institutions. Similarly, in healthcare, Congress passed the *21st Century Cures Act* that requires health providers to make health data

easily accessible to patients. Health data portability allows patients to send their health records electronically to specialists or other providers in order to get second opinions or shop for cheaper services, including prescription drugs. In social media, Apple, Google, Facebook, Twitter and other services have created the Data Transfer Project so that consumers can easily and securely move their photos and contacts between competing digital services, allowing consumers to shop for new homes for their online data. All of the data portability efforts mentioned above – including that for energy data, as further explained below – use secure, internet-based standards such as Transport Layer Security ("TLS") for encryption and Open Authorization ("OAuth") for customer consent. These standards have been used for years to put consumers in charge of their own personal information and to securely access new online services. Paypal, for example, transacts billions of dollars every day around the world using TLS and OAuth standards.

GBC is a secure and feasible solution. GBC was created in 2011-2012 by the National Institutes of Standards and Technology and the Smart Grid Interoperability Panel with input from utilities, regulators and third parties. The GBC standard defines both the file format of customer energy data (including usage data, billing data, account information, etc.) as well as the communication protocol. The Green Button Alliance is a non-profit organization that provides testing and certification services so that regulators can be confident that utilities are adhering to the standard, thereby ensuring security, proper functionality and interoperability among utilities and across jurisdictions.

GBC is distinguished from Electronic Data Interchange ("EDI"), the system used by licensed retailers to transact usage and billing information with EDCs, in numerous respects. GBC uses modern, internet-based standards such as XML, whereas EDI was developed many decades ago, before the internet was widespread. Any files transmitted via GBC will adhere to the same format and structure regardless of the utility, making it easier for software tools to operate across the country, helping bring innovative new services to consumers. In contrast, EDI is far less standardized and structured, meaning that the same EDI client software used by a third party to interact with Pennsylvania utilities cannot be used in other states without significant modification. In addition, GBC's use of modern internet standards mean that GBC supports secure, web-based authorization from customers, whereas EDI does not. This means that the security of EDI is dependent upon oversight and regulation of the Commission over licensed EGSs – particularly with regard to customer consent, which EGSs must retain on file subject to

audit. GBC, in contrast, has built-in technological safeguards that ensure that customers grant their consent to the EDC directly, without having to rely on a trusted relationship with the third party. For all of these reasons, Mission:data believes that GBC is a secure and feasible solution. (Note that Mission:data supports the continued use of EDI in Pennsylvania in order to support licensed EGSs; however, because of EDI's shortfalls described above, we believe GBC should be operated *in parallel* with EDI in Pennsylvania.)

b. Can the web portals available to electric generation suppliers be utilized for this access, or is an alternate pathway necessary?

An alternate path is necessary. The web portals available to EGSs today do not allow customers to easily grant their consent through the platform. Thus, trust is established via regulation of EGSs and is not "baked in" to the existing website itself. For example, an EGS can access a customer's data via the EDC's web portals specifically made for EGSs by entering the customer's account number. Such requests are immediately honored because the EGSs must retain proof of customer consent and the EGSs will suffer penalties or license revocation if the customer's consent proves to be fraudulent. This approach works for EGSs today given the regulatory structure, but it is increasingly out of step with the modern internet and would not be appropriate for non-licensed technology companies that manage DERs today. The best practice for three-party online interactions today (i.e., the customer, the EDC, and the third party) is to leverage OAuth so that customers log in to the EDC's website and directly instruct the EDC – also known as the "data custodian" – to share their information. Not only is this approach more secure, but it is widespread across the internet, and many consumers are familiar with online authorizations that use OAuth.

c. Do individual EDCs already maintain an alternative method of data access for CSPs and other third parties? If yes, please explain your system for this access.

The current method by which most unlicensed third parties collect their customers' energy data in Pennsylvania is by asking for the customer's username and password to the EDC's bill-pay website. The third party then logs in as the customer and accesses the information required, such as energy usage history, bill history, and other information. This practice is known as

"credential sharing." It is important to first understand why credential-sharing is so prevalent today. The main reason is that most utilities nationwide, including Pennsylvania EDCs, have given third parties no other alternative for quickly, easily, and electronically accessing their customers' information. For years, many customers and third parties have asked EDCs across the country to provide electronic, standardized, permission-based data portability – but many of these calls have not been answered. For example, Walmart, the world's largest retailer with sales in excess of $500 billion per year, recently asked the Michigan Public Service Commission to require utilities to provide GBC because "without this capability, data retrieval becomes an inefficient, time-consuming process that requires Walmart to download data usage information on a store-by-store basis."

Whether the EDCs are aware of it or not, the bill-pay web portals currently provided by the EDCs are the best, quickest and most authoritative source of information for third parties about their customers' energy usage and costs. Demand for easy access to energy data is rising as corporations increasingly report their enterprise-wide energy usage and costs to investors on Wall Street and consumers are increasingly interest in cost-saving DERs. Mission:data therefore believes it is necessary and appropriate for Pennsylvania to consider GBC because the EDCs' existing web portals were not designed with these applications in mind.

d. <u>How are CSPs provided customer data when performing services under ACT 129?</u>

Mission:data believes that individual CSPs operating in Pennsylvania are best positioned to answer this question.

e. <u>What technical limitations currently prevent EDCs from providing smart meter data electronically to CSPs or other third parties?</u>

Based on Mission:data's experience in other jurisdictions, there are no technical limitations that prevent EDCs from providing smart meter data – or any other types of customer data, such as billing information – to CSPs or other third parties. At least five (5) states covering over 36 million electric meters nationwide have mandated that their utilities offer GBC (see our attached reports for more detail). While Mission:data recognizes that there are costs to implementing

GBC – just as there are costs to implement any software system – there are no insurmountable technical limitations.

f. Aside from CSPs, what other third party entities should be considered for potential access?

Mission:data strongly believes that ***any*** entity – not just CSPs – should have the opportunity to receive customer data electronically, pursuant to the eligibility criteria we outline in the question below. In order to support innovation and customer choice, it is paramount that the Commission not discriminate against certain types of entities that may be able to receive customer energy data. This is for two reasons: First, the Commission does not restrict the types of entities to which a customer may share his or her paper bill or electronic bill today. Imposing such restrictions now solely on the basis of entity type would be inconsistent with long-standing tradition of customers having the freedom to share their personal information with any entity they wish. Second, the Commission should welcome the presence of new third parties – including energy management companies, non-profits, university researchers, and others – because innovative new solutions help build Pennsylvania's digital economy while cost-effectively helping consumers manage their bills. The advent of mobile devices and inexpensive computing power in the cloud has made it possible to instantly analyze smart meter data and provide customers with detailed recommendations. See the example below.

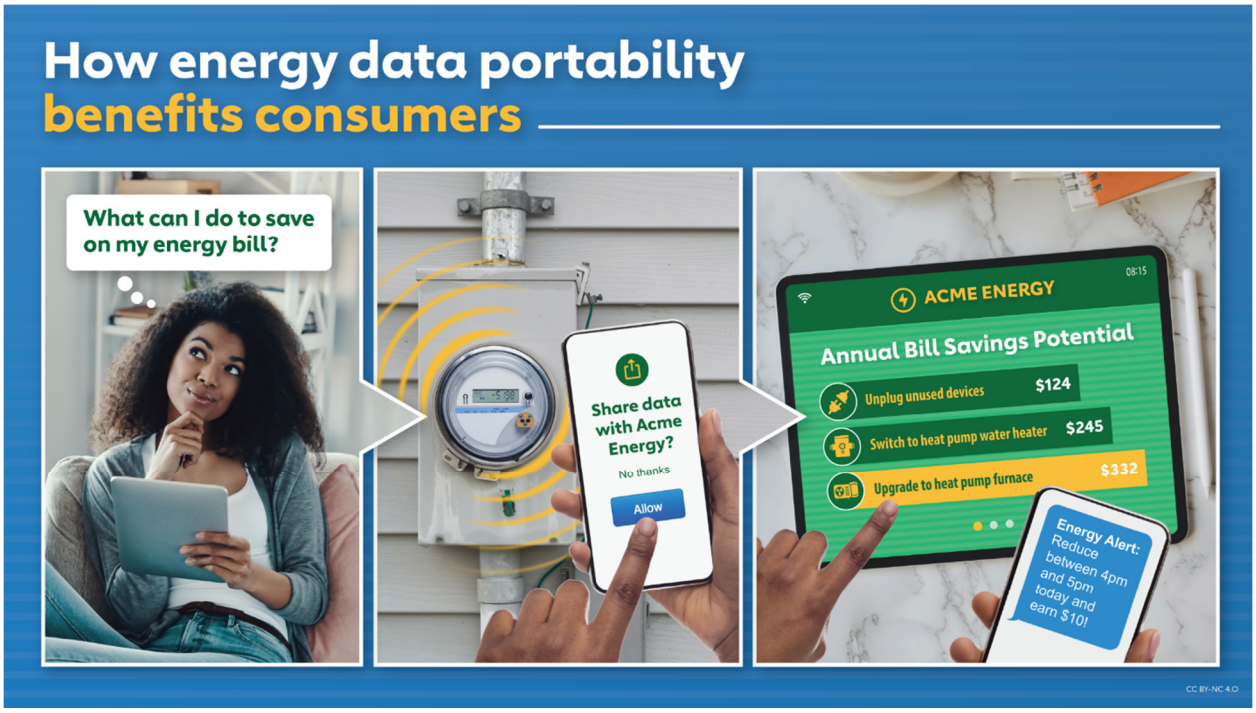

Figure 1: Diagram showing how energy data portability gives choices to consumers about how they use energy.

g. What criteria should the EDCs utilize to determine eligibility for CSPs and other third parties? Should there be different standards and/or different levels of access to data for different types of CSPs and other third parties?

For access to customer energy usage, billing and account information, Pennsylvania should follow in the footsteps of other jurisdictions on this question. Mission:data believes that the Commission, not EDCs, should establish the eligibility criteria for third parties as follows:

(1) Provision of contact information;

(2) Demonstrate the ability to interoperate with the system, provided that the EDC provides reasonable technical support;

(3) Agreement to privacy terms, namely the DataGuard privacy standard developed by the United States Department of Energy[1]; and

(4) Not be on the Commission's list of "banned" or prohibited third parties.

[1] https://www.smartgrid.gov/data_guard.html

These eligibility requirements are modeled after rules adopted in California, which underwent a comprehensive proceeding on this topic in 2012-2013.[2] Just as in Pennsylvania, the California Commission does not have clear jurisdictional authority over third parties, and so the requirements above are narrowly tailored to leverage the Commission's authority over the utilities. The Commission may not be able to levy a fine against a third party, but it can order its regulated utilities to cease data transmission.[3] Similar rules have been adopted in New Hampshire and Texas and are being actively considered in Arkansas, Maryland, North Carolina and Ohio.

As for different levels of access, Mission:data does not believe "tiers" of access are warranted at this time. Customers should be able to share their usage data, billing information and account information with any entity they wish without arbitrary thresholds applied to third parties. Mission:data understands that aggregated or anonymized usage data may warrant a more inclusive tier for the general public at some point in the future– particularly if the data are sufficiently protected or anonymized so as to avoid re-identification of the individual, thus rendering restrictions entirely unnecessary in such cases. Nevertheless, Mission:data believes that the highest priority of the Commission in the present docket should be to first establish the rules under which third parties may access individual – not aggregated – customer data with permission because that is much more likely to result in near-term value to consumers in the form of bill savings.

h. Should the EDCs require financial security instruments, such as bonds, to help protect data confidentiality? If yes, are rules required to implement these financial security requirements? Also, if yes, should there be different security thresholds required for different types of CSPs and other third parties? If no financial security should be required, please explain why not.

[2] California Public Utilities Commission. Decision D.13-09-025, September 23, 2013 at 2. Available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K191/77191980.PDF.

[3] In addition, the Commission can make referrals to the state attorney general and the Federal Trade Commission in order to investigate privacy violations and deceptive business practices.

No. There are three reasons why Mission:data does not believe that financial security instruments are warranted or necessary at this time. First, as a practical matter, the Commission does not have authority over unregulated third parties. If the Commission were to assert such authority, it would most likely lose in court; the resulting period of uncertainty while the matter was pending before state courts would be highly detrimental to the development of an energy management market in Pennsylvania, depriving customers of energy-saving benefits.

Second, no other state has, to our knowledge, required a financial security instrument of third parties (as separate from licensed retail suppliers) as a condition of receiving customer energy data. If the Commission were to impose financial requirements such as surety bonds, in spite of its limited authority, it would erect a significant barrier to participation in the energy management market in Pennsylvania relative to other states. Many firms, particularly smaller and innovative ones, would simply choose not do business in Pennsylvania and would opt to serve customers elsewhere.

Third, financial requirements would incentivize credential-sharing, reducing the utilization of GBC as more and more traffic would go to the EDCs' bill-pay web portals, where no financial requirements apply. The long-term effects of credential-sharing are hard to predict, but it could result in increased traffic loads on the EDCs' web portals as well as website service interruptions in cases where EDCs feel that online access needs to be curtailed to certain customers in order to maintain the security or availability of its web portal to all customers. Whatever the outcome, it is generally considered poor "cybersecurity hygiene" for EDCs to not know the identity of their website users. Eliminating the incentives to credential-sharing should be an important outcome of the present docket.

i. <u>What types of tools should be required to ensure that CSPs and other third parties accessing utility systems have access to help features, such as online trouble ticket systems or technical documentation, to enhance their customer experience? What other features may be necessary?</u>

Mission:data strongly supports the idea that EDCs should be required to operate a state-wide trouble ticket system. Not only is a trouble ticket system an industry standard, but it would serve as an important accountability tool for the Commission to ensure that ratepayer funds spent

on GBC are being incurred prudently because the Commission could access the type, severity, and resolution times of each technical issue raised. It would also be inefficient and imprudent for the EDCs to operate a GBC platform ***without*** simultaneously offering a trouble-ticket system due to the potential volume of requests that must be efficiently managed. Mission:data notes that Smart Meter Texas offers a single, state-wide trouble ticket system for third parties, of which there are over 150 in Texas alone. In addition, we recommend that the Commission adopt a Service Level Agreement ("SLA") in the form shown in Attachment 1 and report on continuously-updated system performance metrics as set forth in Attachment 2. The SLA, which is also standard in the software industry, includes reasonable and measurable targets for system availability. If the EDCs are unable to meet the targets, then metrics reported can form the basis for cost disallowance in a future proceeding.

j. <u>How should costs incurred for this purpose be recovered?</u>

Mission:data believes that costs for implementing our recommendations should be recovered from all ratepayers. There are three key reasons for this position. First, it should be the policy of Pennsylvania to encourage, rather than disincentivize, data-sharing because of the bill-savings benefits that can result. Monopoly utilities are not known for being particularly innovative, and many utilities are rationally discouraged from helping their customers manage their energy usage due to their incentive structures. This is despite the fact that huge amounts of the $430 billion spent per year on electricity nationwide is wasted. For example, the United States Environmental Protection Agency estimates that 30% of energy used in commercial buildings nationwide is waste. Making it more difficult for consumers to access energy-saving services by charging a fee simply to transmit their data to entities that can help reduce their monthly bills would lead to further market distortions and the uneconomic allocation of resources.

Second, standardized, electronic provision of information is an essential part of basic utility service in the 21st century. As more and more consumers use smartphones, home energy management systems and the "internet of things," modern consumers demand that utilities meet their digital expectations, including the ability to easily transfer their information to other services. By way of analogy, consider the development of utility bill-pay web portals approximately 25 years ago. At the time, broadband penetration rates were low but growing quickly, and the number of customers accessing EDC web portals in the late 1990s was small.

Nevertheless, utilities and regulators across the country did not charge customers individually for the use of these web portals because they wanted to encourage their use. The motivations behind socializing the costs of what at the time was a novel digital technology were a desire to improve information availability, reduce bill arrearages, cut costs from mailing and processing paper checks, etc. Today, utilization rates of bill-pay web portals vary across the country; whatever the percentage, it is fair to say that far less than 100% of customers take advantage of them. And yet neither regulators nor utilities would ever dream of charging customers individually to access the utilities' customer web portals. Similarly, a strong public interest – namely, increasing access to cost-effective energy management and encouraging competition in the digital energy marketplace – is served by socializing the costs of implementing data portability across all ratepayers.

Third, implementing data portability for all entity types is required by Act 129. Act 129 requires EDCs to, with customer consent, "make available direct meter access and electronic access to customer meter data to third parties, including electric generation suppliers and providers of conservation and load management services."[4] The statute does not limit the provision of meter data to *only* EGSs and providers of conservation and load management services; rather, it lists those entities merely as examples. For many years, the Commission has narrowly construed Act 129 to apply only to licensed entities, a point that the Commission itself recognized in 2016 ("As stated in our Sept. 15 Final Order, we reserve the right to revisit third party access at a future point in time").[5] Currently, Mission:data understands that licensed entities pay nothing on a per-transaction basis to access customer data via EDI.. The fact that electronic data accessibility is currently limited to licensed entities is merely one of habit, as the Commission has never made a determination that unlicensed third parties are ineligible to receive customer data.[6] Now that the Commission is revisiting this issue, and given the many digital developments with regard to data portability both in other jurisdictions and in other industries over the past few years, it would be wise for the Commission to give full force to existing statute by making all third parties eligible to receive customer data at no cost.

[4] 66 Pa. C.S. § 2807(f) (3).

[5] Proceeding No. M-2009-2092655. Final Order, adopted June 30, 2016 at 11.

[6] *Id.*

2. EDC Smart Meter Data Access by CSPs and Other Third Parties Legal Concerns:

a. What legal limitations currently prevent EDCs from providing smart meter customer data electronically to CSPs or other third parties?

Mission:data does not believe there are any legal limitations. We note that it is commonplace today for utilities to process data-sharing requests via forms such as "letters of authorization" and to transmit customer data in spreadsheets via email to customer-authorized third parties. The only difference with the proposed GBC platform from current practice is that it makes the process easier and more standardized, and with less manual effort on the part of the utility and the customer (for example, there would be no hard copy signatures exchanged). Nonetheless, in our experience, utilities are exceptionally risk-averse and afraid of the possibility, however distant or remote, of an aggrieved customer suing the utility for the acts of a third party that obtains customer data electronically, even if the utility was in no way responsible for the harm. The potential harm to the utility from this situation is both reputational as well as financial, particularly if the Commission disallows, or might disallow, costs associated with its legal defense from such a suit.

The solution to this problem is simple: The Commission should immunize EDCs (and gas utilities) from liability as a result of the acts of a customer-authorized third party. So long as the EDC receives a valid customer consent and transmits the data requested in encrypted form to the third party, the utility should not be liable for any downstream uses or misuses of customer data that is outside of their control. This is a critical point because, absent this liability waiver, utilities will, by their risk-averse nature, feel compelled to become the "policemen" of third parties, undermining the freedom with which innovative energy management companies can operate. We note that other states, such as California and Colorado, have made the same determination and do not hold utilities liable for the acts of third parties once a customer has authorized the release of his or her information.

b. How do EDCs protect their data when it is provided to CSPs performing services under Act 129 to ensure it is not abused? Can this method be extended to other CSPs or other third parties not under contract to perform Act 129 services for the EDC?

Mission:data does not know the details of the terms and conditions by which EDCs require CSPs to handle customer data. Nonetheless, Mission:data strongly recommends that the Commission

require a uniform tariff across the EDCs to define the privacy standards which third parties must follow. Specifically, Mission:data requests that the Commission adopt the DataGuard privacy standard, as described above, in the EDCs' tariffs. Among other provisions, DataGuard requires that third parties maintain a cybersecurity risk management program, including a comprehensive data breach response program for the identification, mitigation and resolution of any incident that causes or results in the breach of customer data security. Mission:data notes that other states such as California and Illinois have used a tariff approach, and others, such as Maryland and Washington, D.C., are actively the same.

c. Could the EDCs utilize contracts to protect the confidentiality of the data? If yes, what limitations currently exist that prevent the utilities from implementing these contracts?

For the reasons stated above, Mission:data believes that a tariff – specifically, a uniform, state-wide tariff – is a superior instrument to a contract. Moreover, it is important that the Commission approve ***all*** of the terms between EDCs and third parties. It would be inappropriate for EDCs to impose new terms or conditions without Commission oversight due to the risk of EDCs exploiting their monopoly position over customer data to impose unfair or coercive contract terms.

Finally, an important parallel between data access tariffs and interconnection tariffs must be mentioned because it helps clarify jurisdictional questions. While the Commission does not have jurisdiction over third parties, its authority to require third party adherence to the DataGuard privacy standard is analogous to prohibiting customers from interconnecting electrical equipment to the distribution grid that does not meet certain technical requirements. No one would claim that interconnection tariffs are legally invalid because the Commission requires customers to act a certain way with regard to customer-owned electrical equipment and the Commission does not have clear jurisdictional authority over ***customer*** behavior. Similarly, while the Commission does not have authority over third party behavior, it can, as part of its authority over regulated utilities, require that third parties connecting to the utilities' data-sharing platforms adhere to certain terms in order to ensure the safe operation of the data-sharing platform for the benefit of Pennsylvania consumers.

d. Would the EDCs need to include any provisions created in these proceedings in a tariff in order to apply them to CSPs and other third parties? What other terms of use should be included?

For the reasons stated above, yes, Mission:data strongly recommends that standardized tariffs be approved for all Pennsylvania electric and gas utilities. Mission:data believes that the Service Level Agreement referenced in Attachment 1 should also be incorporated into the tariff.

We note that a tariff should provide important due process protections for third parties. It would be inappropriate, unfair, and anti-competitive for EDCs to unilaterally terminate a third party's electronic access to their customers' data. Business interruptions caused by unsupervised terminations by EDCs would be fatal to many energy management companies. As a result, the Commission should establish a process by which complaints or allegations of misconduct can be reviewed by the Commission prior to any action being taken regarding termination. Mission:data strongly recommends California's due process provisions on this topic due to their simplicity and fairness.[7]

e. How should a CSP or other third party obtain customer consent for access to data from EDC systems? Would the EDC determine if a CSP or other third party has obtained the proper customer authorization before customer data is provided? If yes, how? If no, please explain why not.

The question appears to conflate two distinct scenarios. The first scenario is when a licensed entity, such as a CSP or EGS, requests customer data from an EDC. In the case of the utilities' EDI systems, the CSP or EGS does not need to prevent proof of customer consent to the EDC; rather, because the requester is a licensed entity, the EDC *assumes* that the CSP or EGS has obtained consent pursuant to regulations. The licensed entity is subject to audit and may have its license revoked if, in fact, it does not have the proper customer consent.

The second scenario is when an unlicensed third party wishes to receive customer data. According to the GBC standard, it is the customer, not the third party, that provides consent to the EDC. This ensures a higher level of privacy and security because the customer is in direct contact with the utility, meaning that the utility does not need to "trust" the third party's claim

[7] See California Public Utilities Commission. Decision D.13-09-025, September 23, 2013. Available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K191/77191980.PDF.

that a consent is genuine. One key advantage of the GBC approach is that utilities do not need to "police" third parties regarding their consent practices.

f. How would the EDC be notified when a customer grants consent for a CSP or other third party to access its' EDC-maintained customer data?

Per our response to (e) above, in the case of unlicensed third parties, the EDC does not need to be "notified" of a customer consent because the EDC receives customer consent directly. In other words, there is no separate "notice" process. If the customer does not grant their consent to the EDC, then no data are transmitted.

g. How should a customer withdraw previously granted consent for CSP or other third party access to the EDC's data? How would the EDC be notified of this withdrawal of consent?

For unlicensed third parties, customers should be able to withdraw consent the same way the consent was offered in the first place: via the utility's bill-pay website or by telephone to the utility.

h. How would the EDCs monitor data access to determine if a CSP or other third party becomes a "bad actor" by violating its agreements (failing to maintain data confidentiality, pulling data for a customer without proper authorization, etc.)? What processes could be used to remove access and prevent misuse?

Mission:data strongly opposes putting EDCs in the role of "policemen" with regard to third party behavior. We base our opposition in several factors: First, because utilities should not be liable for a third party's misbehavior, as described above; and second, because enforcement of third parties is not a responsibility the utilities want or should have. Mission:data has recommended that the EDCs' tariffs include the eligibility criteria described above, including the requirement that third parties agree to the DataGuard standard, which is enforceable by state attorneys general and the Federal Trade Commission.

i. For third parties that serve as both a Distributed Energy Resource Aggregator under FERC Order 22227 and a CSP, what limitations on the use of data should be placed on them to prevent unauthorized use between roles?

This issue is handled elegantly by DataGuard. Simply put, third parties cannot use any customer data for a purpose that is not agreed to by the customer. If the customer has not authorized a given use or if the authorization language provided by the third party is deceptive or misleading, then enforcement falls to the state attorney general and the Federal Trade Commission.

j. Should a utility be held accountable for the improper or illegal acts of a customer-authorized CSP or other third party?

Absolutely not; please see our response above.

k. What action, if any, can the Commission take against CSPs and other third parties that misuse their access to customer data or the data itself? Please cite to any statutes or regulations that support your answer.

Using the Commission's authority over EDCs, the Commission should order an EDC to terminate access to a third party if the Commission determines that the third party has demonstrated a pattern or practice of breaching the DataGuard privacy standard.

3. Utility Usage Data and Meter Access

a. What customer data should the utility share with CSPs and other third parties? Should different types of CSPs and other third parties have different access to customer data?

Mission:data strongly believes that EDCs and gas utilities should be required to share, with customer permission, a complete dataset that includes (i) at least 48 months of historic energy usage information, (ii) ongoing usage information, (iii) billing information including bill line items and the customer's applicable rate (in cases where the customer is not purchasing the energy commodity from a competitive supplier), and (iv) account information, such as account numbers and information necessary to assess eligibility for, or participation in, demand management or renewable energy programs. Failure to provide the complete dataset described will could result in third parties falling back on credential-sharing, which undermines the

purpose of the present docket. In order to help the Commission understand the full scope of specific types of data that should be provided electronically, Mission:data provides Attachment 3, which has in large measure been adopted in California, New Hampshire and the District of Columbia.

b. What types of data should the EDCs withhold from CSPs and other third parties? Do the EDCs' current systems allow for this data to be restricted?

One of the federal government's Fair Information Practices is the principle of data minimization. In practice, this means that third parties should only be given the minimum information necessary to achieve a customer-authorized purpose. A best practice is for the Commission to explicitly define "unshareable data." At the outset, unshareable data should include bank account numbers, social security numbers, and credit/debit card numbers. Energy management companies do not need such information to render their services, and even if they did, they can ask the customer directly for this information.

c. In what format should the data be given? Should the data from each EDC be in an identical format (similar to the Electronic Data Exchange Working Group web portal data)? What other technical standards should be applied to the data?

Yes, it should be identical across all utilities. GBC implementations by the EDCs (and gas utilities) should be proven to be identical by achieving independent certification by the Green Button Alliance. By way of example, Wifi and Bluetooth devices are known to be interoperable because of testing and certification processes; similarly, in order to ensure maximum interoperability both within Pennsylvania and among other jurisdictions, the Commission should require periodic certification.

d. Should aggregated data (i.e.—benchmarking or geographic data) be made available? Should aggregated data be available to a wider array of CSPs and other third parties?

Mission:data recommends that aggregated data should be considered by the Commission only *after* individual customer data (with consent) is established.

e. Should the Commission establish standard protocols and communication mediums for providing direct access to usage information from the meter to the Home Area Network? If so, what should those be?

While Mission:data would love to see the Commission establish new and improved communication requirements for direct meter data access, the reality is that this matter has been settled by the EDCs when they purchased AMI in the first place. In our experience, any significant changes to the communication mediums would require replacement of the meters – an expensive proposition. Nonetheless, there are several measures the Commission should require that any utility with advanced meters capable of a Home Area Network, either using Zigbee Smart Energy Profile or IEEE2030.5 over Wifi. First, EDCs should be required to provide a self-service web portal and mobile application by which customers can connect any HAN-compliant device of their choosing. This is known as "bring your own device" or "BYOD." Second, EDCs should be prohibited from imposing pre-screening requirements, device testing, fees, or other requirements on device makers, as further described below.

f. Should CSPs and other third parties be provided *direct access to the meter*? What policies or regulations should this Commission promulgate to ensure that these CSPs and other third parties are provided timely access under reasonable terms and conditions to the EDC's customer metering facilities?

Yes, customers should be able to connect *any* device of their choosing to their meter in order to receive direct, real-time energy readings. The Commission should prohibit utilities from imposing pre-screening requirements, device testing, fees, or other requirements on device makers. With cable communications, customers may attach any DOCSIS-compliant modem to their cable service to receive service – in other words, customers need not rent a modem from their cable provider, and doing so is unnecessarily costly. Similarly, customers should not be required to rent HAN devices from utilities. Achieving cost reductions from market competition in HAN equipment requires neutrality from utilities.

g. What communications, software or hardware can facilitate this direct access to the meter for customers and their approved CSPs and other third parties, and should the Commission establish requirements and or standards to facilitate this access?

In a few years' time, Pennsylvania utilities will seek to replace their aging smart meters with new ones. Since the time that AMI was first deployed, the available technologies have changed significantly. For example, new advanced meters come with "edge computing" technology and Wifi. Mission:data strongly urges the Commission to consider these new technologies in a separate, dedicated docket prior to EDCs beginning replacement. A thoughtful examination of the opportunities – and anti-competitive risks – posed by these new metering technologies is critical, and Mission:data believes that should begin after the other topics in the present docket have been addressed.

h. What electronic access to customer meter data do CSPs, other third parties, and EGSs need from EDCs, that they currently do not have? Provide specific examples where these entities do not have such access currently, and provide examples, if available, of electronic transactions that can be adopted to facilitate access.

See Attachment 3 for a list of data types sought by advanced energy management companies. Attachment 3 was developed over many months by considering many disparate examples of DERs including rooftop solar, property management applications, bill and cost analysis for commercial or multifamily properties, smartphone apps for residential energy management, etc. We note that the same data types are also needed for environmental, social and governance ("ESG") reporting obligations of publicly-traded firms. The biggest barrier to accessing all of these data today is technological consistency. As mentioned previously, many third parties use credential-sharing to access their customers' information, but this is not ideal for the reasons described.

4. Home Area Network (HAN) Protocols

a. Should there be interconnectivity between the smart meter and other equipment in the home? If so, how much? [read capability vs. two-way communication]

Yes. Such access should be read-only, as read-only functionality is the only feature most energy management companies need at this time, and adding write capability implications a cybersecurity risk that would need to be mitigated. For many years, Zigbee-based HANs have worked well in states such as California, Nevada, Illinois and Vermont. In Pennsylvania,

Mission:data understands that FirstEnergy, PPL Electric and Duquesne Light Company offer HAN connectivity (although some device pairing processes are more customer-friendly than others). However, PECO does not, despite having purchased and installed HAN-capable smart meters.

b. Can CSP or other third party equipment installed in a customer's home interact with the HAN or the smart meters?

Yes. HAN devices installed by the customer can acquire real-time meter readings, enabling devices in the home to intelligently manage their consumption or send alerts to the resident.

c. Do CSPs or other third parties that have installed equipment in a customer's home still need access to customer data from the EDC?

Yes, it is entirely conceivable that a third party with some form of real-time access to usage data would still need access to other types of customer data held by the EDC. Not only is installing a separate, customer-owned meter expensive, but settlement at PJM often requires data from the utility meter. There is also billing history and account information which is extremely important for holistic energy management services. In other words, kWh data alone is insufficient.

5. Automatic Control

a. How can smart meters "effectively support" automatic control of a customer's electricity consumption by customers, utilities, and the customer's CSPs or other third parties?

Mission:data does not believe it is necessary for smart meters to support automatic control of any device in the home. We understand that virtually all smart meters installed thus far in Pennsylvania are not capable of such functionality. When such capabilities are poised to be added – as meters are replaced, probably in the next 4-5 years – we recommend that the Commission re-assess this topic in the future.

Questions (b) through (d): Mission:data strongly recommends that stakeholder workshops be held to further discuss these topics.

6. Additional Concerns

a. Please address any additional questions or raise any additional concerns you have regarding CSP or other third party access to EDC customer data systems.

No response.

7. Centralization is the Key to Unlocking Efficiencies

Finally, Mission:data strongly recommends that the Commission require EDCs and gas distribution companies to provide a single, unified "API of APIs" across Pennsylvania, working in coordination with each other and with similar efforts in Northeastern states. What this means is that, from the third party's perspective, they would access a single API endpoint regardless of where the customer is located across the Commonwealth. There are significant benefits to be gained from this approach, which has been used successfully in Texas since 2013 and is currently underway in New Hampshire and New York; Maine is actively considering a similar approach. First and foremost, a centralized API means that customer data is harmonized across a single data model. This results in significantly more choice for consumers because they can access the same software-based energy management service in Erie as they could in Philadelphia. As other Northeast states follow this approach, Pennsylvania can benefit from its entrepreneurs being able to grow their businesses and easily "export" their digital energy management services to other states in the region. Conversely, new innovations developed in New Hampshire and New York could be offered to consumers in Pennsylvania, increasing the choices that are available to ratepayers. From the third party's perspective, there is a significant cost to the ongoing maintenance and support associated with a single API. As an example, if Pennsylvania were to have a single API instead of four (4) APIs, then third parties' costs to operate would be reduced by 75%.

An example diagram from New Hampshire is below, which shows how the Granite State's three electric utilities will "funnel" their data to third parties through a single, "virtual" API, once customers have granted their consent via the individual utility's existing customer web portals. Note that natural gas data is also provided in New Hampshire's approach.

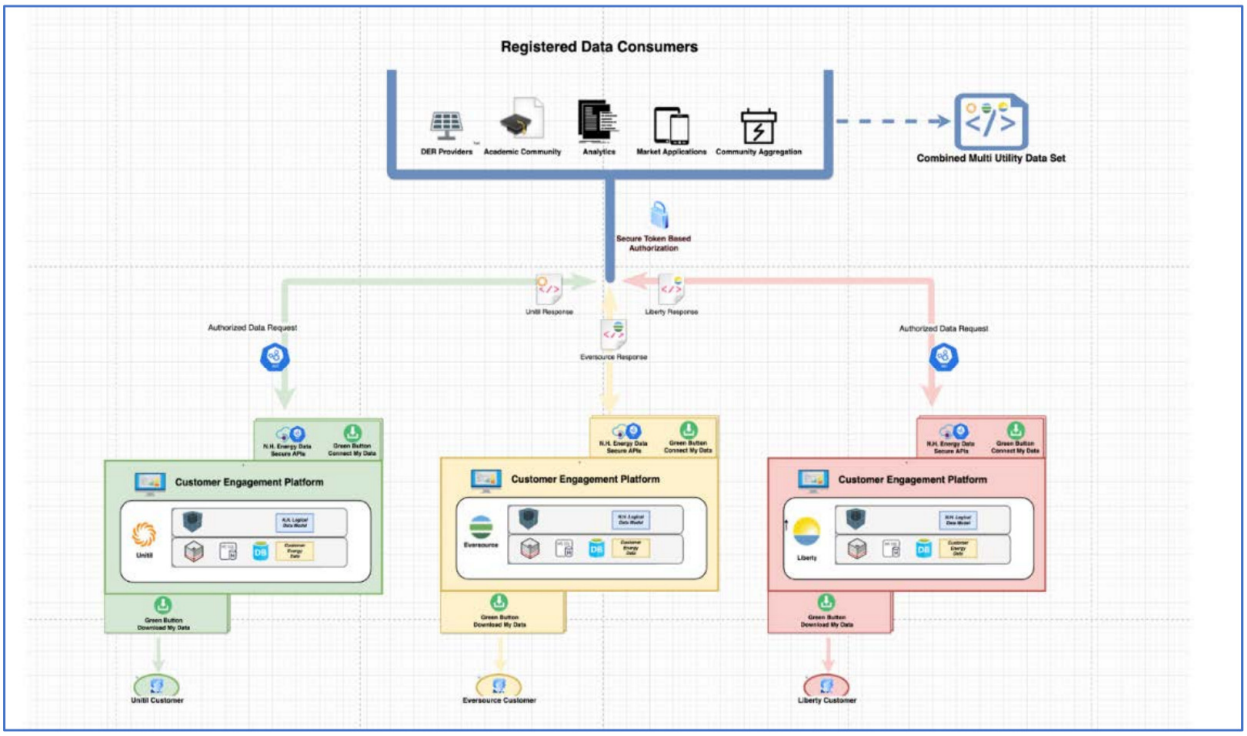

Figure 2: New Hampshire's "virtual" single API design for electricity and natural gas data.

Mission:data encourages the Commission to carefully consider lessons learned from the jurisdictions mentioned. Not only have other Northeast states found significant value in a centralized API, but they have found new cost efficiencies through "virtualization." While Texas opted to host all of the utilities' meter information in a centralized location in a series of decisions approximately ten years ago, the New Hampshire and New York models are simpler and more cost-efficient by opting against redundant data storage in a centralized locale. New Hampshire and New York are developing a "virtual" single API that, in turn, accesses the information from the underlying utility's existing Customer Information Systems, billing systems, meter data management systems, etc. This approach reduces the costs and complexities associated with maintaining and "synching" disparate data storage mechanisms.

8. Conclusion

Thank you for the opportunity to provide comments. Mission:data appreciates the work of the Commission and Staff and looks forward to further participation in this proceeding.

May 5, 2021

Respectfully submitted,

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SERVICE LEVEL AGREEMENT ("SLA")

1. Performance of System Operation

All utilities, including electric distribution companies and natural gas distribution companies regulated by the Commission, shall meet the performance requirement specified below with regard to each of the following elements of the Green Button Connect My Data platform (the "Platform"):

a. Customer-facing authentication and authorization web pages and processes
b. Customer data records delivered to third parties via Application Programming Interface ("API")
c. Customer data records delivered to third parties outside of an API

Uptime Requirement: The utility shall ensure that availability of the Platform on each of the above dimensions exceeds 99.8% uptime. Uptime is calculated on a calendar month basis as the number of minutes the Platform is available for use and operating correctly without a Severity Level 1 or Severity Level 2 occurrence (defined below) divided by the total number of minutes, excluding scheduled maintenance windows (defined below).

Accuracy Requirement: The utility shall ensure that accurate customer data records are delivered at least 99.8% of the time, as calculated on a calendar month basis.

2. Scheduled Maintenance Windows

Scheduled maintenance windows shall not exceed 30 hours per year, as calculated by the announced duration from start time to finish time. To be considered a scheduled maintenance window, the utility shall provide at least fourteen (14) days advance notice to all third parties and post a public notice on the utility's website, describing the start date and time and end date and time. Failure to provide this advanced notice means that the maintenance period will accrue downtime.

3. Issue resolution

Severity Classification	Acknowledgment time	Updates	Resolution time
Level 1. Critical function is not available or operating in a materially degraded manner	Same business day	Every 1 business day	1 business day
Level 2. Critical function is not available or operating in a materially degraded manner, but a workaround exists	1 business day	Every 1 business day	4 business days
Level 3. Non-critical function is not available or operating in a materially degraded manner	2 business days	Once per week	5 business days

"Acknowledgment" means the utility communicates to the third party that the issue is understood by the utility and the utility has commenced remediation efforts.

"Business day" means Monday through Friday excluding state and federal holidays.

"Critical function" includes, but is not limited to, customers completing authorizations without errors, delivery of the correct data in a timely manner without errors, and delivery of all other obligations as specified in applicable Commission orders.

"Updates" means email or telephone communication with affected third parties.

4. Penalties

Failure to meet the uptime and accuracy requirements in any calendar month shall result in penalties. According to the table below, penalties are assessed by eliminating the presumption of prudence for the percent of the total amount of Platform funding for which the utility seeks cost recovery in its next general rate case.

Uptime & Accuracy	Penalty
Above 99.8%	No penalty
99.0% - 99.8%	5.0%
97.0% - 99.0%	10.0%
95.0% - 97.0%	20.0%
Below 95.0%	50.0%

5. Limitations

This SLA shall not impose any penalties upon utilities from poor performance caused by the following:

a. Force majeure events outside the control of the utility, including natural disaster, war, acts of terrorism, riots, government action, or a network or device failure external to utility data centers;

b. Delays, latencies or errors directly caused by a utility's advanced metering infrastructure ("AMI") communications network

Performance Metrics

The Commission should require reporting of Green Button Connect My Data platform performance metrics on a publicly-available website, updated daily or continuously, including at a minimum the following:

1. Uptime
    a. Percent availability of the application programming interfaces ("APIs") measured as operational time without returning errors and delivering the data requested
    b. Percent availability of the customer-facing authentication and authorization web pages operating without errors
    c. Number of minutes the platform has failed to meet the uptime and accuracy provisions of the Service Level Agreement ("SLA")
2. Errors (searchable time periods)
    a. Inventory of errors generated describing date, time, error type, whether the error affected customer web pages or third party data requests via API, and a brief description
3. Response times (searchable time periods)
    a. API response times in milliseconds (synchronous and asynchronous), including mean, median, count of responses greater than 90 seconds, percent of responses greater than 90 seconds
    b. Web page response times in milliseconds, including mean, median, 90th percentile load time, etc.
    c. Time elapsed from the moment an authenticated customer clicks the final "authorize" button and the moment the requested data payload is available to the third party
4. Funnel statistics (searchable time periods)
    a. Duration and percent of users that complete the flow from start page through authentication to authorization, by device type or screen size

5. Usage Statistics
    a. Total Authorizations completed (daily)
        i. One-time authorizations
        ii. Ongoing authorizations
    b. Number of views per page (daily)
    c. Number of unique user views per page (daily)
6. Third Party Onboarding
    a. Time to complete third party administrative onboarding
    b. Time to complete third party technical onboarding
    c. Number of third parties in various stages of onboarding
7. Trouble Ticket Issues Tracking
    a. Number and type of issues submitted by third parties by severity
    b. Mean and max acknowledgment time
    c. Mean and max resolution time
    d. Number of issues outstanding that have exceeded the SLA acknowledgment time, with a description of the issue
    e. Number of issues outstanding that have exceeded the SLA resolution time, with a description of the issue

Field	Green Button Location	Enumerated/Allowed Values	Example
Account Number	Retail Customer Schema > CustomerAccount		1089999
Premise			
Customer Name			Bob Smith
Customer Email Address			smith@mail.com
Customer Phone		Home / Mobile / Business	
Account Address	Retail Customer Schema > ServiceLocation	This should be multiple addresses: Contact and Service.	123 Main Street Salem NH 03079
Customer Rate Code			D1 Res
Meter Number	Retail Customer Schema > ServiceLocation > Usage Point		234433
Meter Reading Previous		Register Read End KWH or KW at end of cycle "meter reading previous'	345878
Meter Reading Current		Register Read End KWH or KW at end of cycle "meter reading current'	345878
Overall Consumption Last Period	UsageSummary > OverallConsumptionLastPeriod		809
Overall Consumption This Period	UsageSummary > CurrentBillPeriodOverAllConsumption		784
Billing Period	UsageSummary > BillingPeriod > Duration and Start		
Commodity	UsageSummary > Commodity	Gas or Electric	"E"
Bill Amount	UsageSummary > Amount	Current bill total	106.5100
Balance Forward?			
Customer Charge	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)		17.00
Delivery Charge	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)	ItemKind 2: Energy Delivery Fee	0.0233
Stranded Cost Charge	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)		0.0432
System Benefit Charge	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)		0.00456
Consumption Tax	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)	ItemKind 5: Tax	0.00005
Energy Service Charge Fixed	UsageSummary > CostAdditionalDetailLastPeriod (bill line item collection)		0.0823
Quality of Reading	UsageSummary > QualityofReading	0 - Valid 7 - manually edited 8 - estimated using reference day 9 - estimated using linear interpolation 10 - questionable 11 - derived 12 - projected (forecast) 13 - mixed 14 - raw 15 - normalized for weather 16 - other 17 - validated 18 - verified 19 - revenue-quality	valid
Service Supplier Kind	Retail Customer Schema > Service Supplier > Supplier Kind	Utility, Retailer, Other, LSE, MDMA, MSP	retailer
Service Supplier ID	Retail Customer Schema > Service Supplier > SupplierID		
Service Supplier Effective Date	Retail Customer Schema > Service Supplier > EffectiveDate		
Service Supplier Name	Retail Customer Schema > Service Supplier > Name		
Peak Demand (for current bill period)	UsageSummary > PeakDemand		
Interval Reading Start Date and Time	MeterReading > IntervalBlock > IntervalReading > TimePeriod		
Interval Reading Value	MeterReading > IntervalBlock > IntervalReading > Value		
Interval Duration	MeterReading > IntervalBlock > IntervalReading > TimePeriod > Duration		
Interval Reading Quality	MeterReading > IntervalBlock > IntervalReading > ReadingQuality	Valid, Manually Edited, Estimated Using Reference Day, Estimated Using Linear Interpolation, Questionable, Derived, Projected, Mixed, Raw, Normalized for Weather, Other, Validated, Verified, Revenue-Quality	
TOU	MeterReading > IntervalBlock > IntervalReading > TOU	TOU bucket for interval period	
Demand Response Program	RetailCustomerSchema > DemandResponseProgram		
Energy Efficiency Programs	RetailCustomerSchema > ProgramDateIDMappings	collection of all customer EE programs	
Time Configuration	RetailCustomerSchema > TimeConfiguration	time info (i.e. daylight savings)	
Interval Reading Direction	MeterReading > IntervalBlock > IntervalReading > Direction		
Tariff Profile	UsageSummary > TariffProfile		

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.

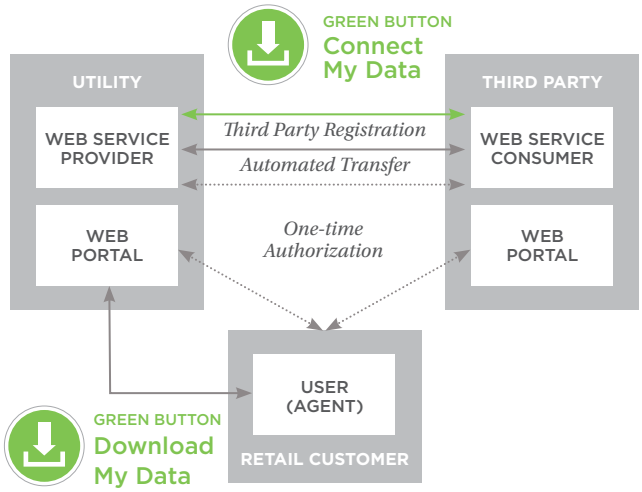
in utilities' websites and forms. Whether through bureaucratic incompetence, neglect or deliberate action, some utilities purport to offer data portability but, in practice, frustrate customers' desire to exercise their rights to data portability. Rather than a few breezy clicks of the mouse, the customer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



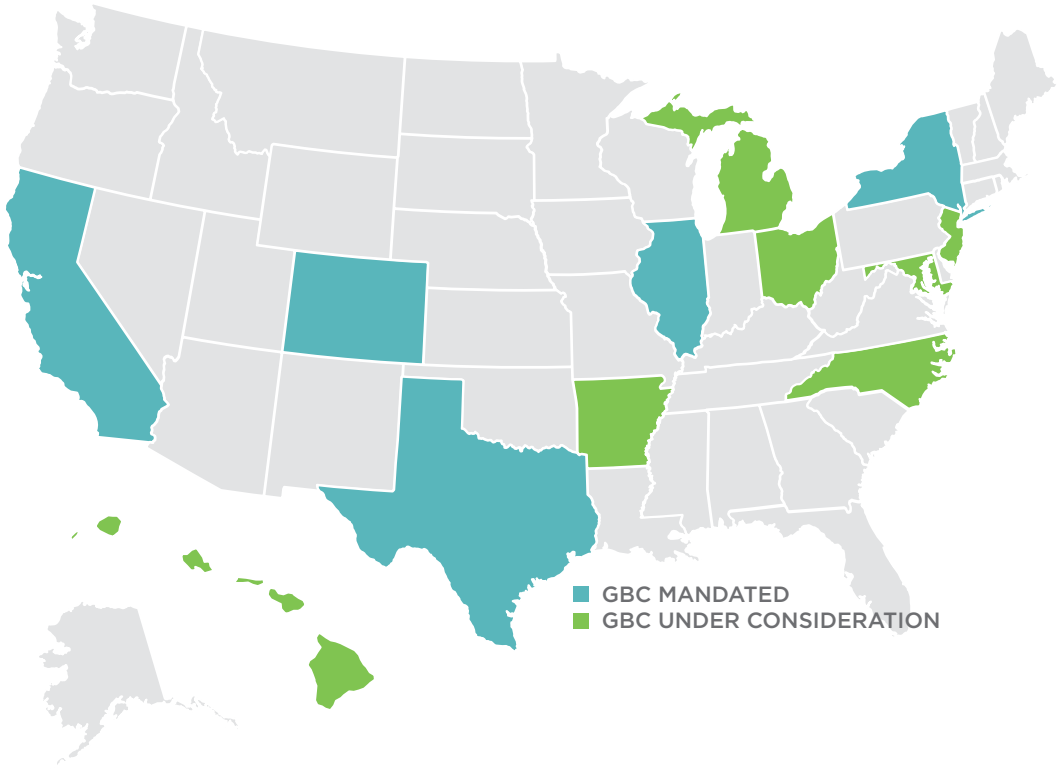
There are two flavors of Green Button. As the name suggests, Green Button DMD requires users to login to their online utility account and download a file manually. The file format is standardized using an XML (eXtensible Markup Language) and can be opened in spreadsheet programs such as Microsoft Excel 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

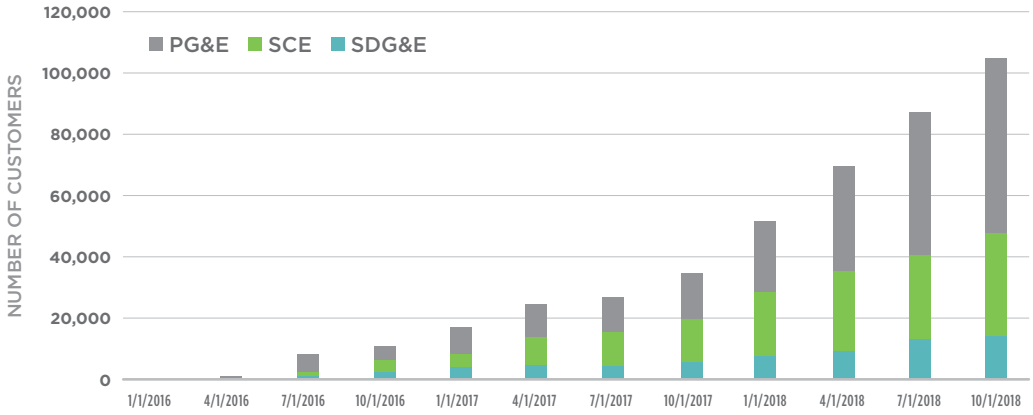
Several state policies across the U.S. support portability of energy data. In 2013, California became the first state to require its electric utilities to provide Green Button Connect My Data (GBC). After two and a half years of development and offering limited trials, GBC became widely available by 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.

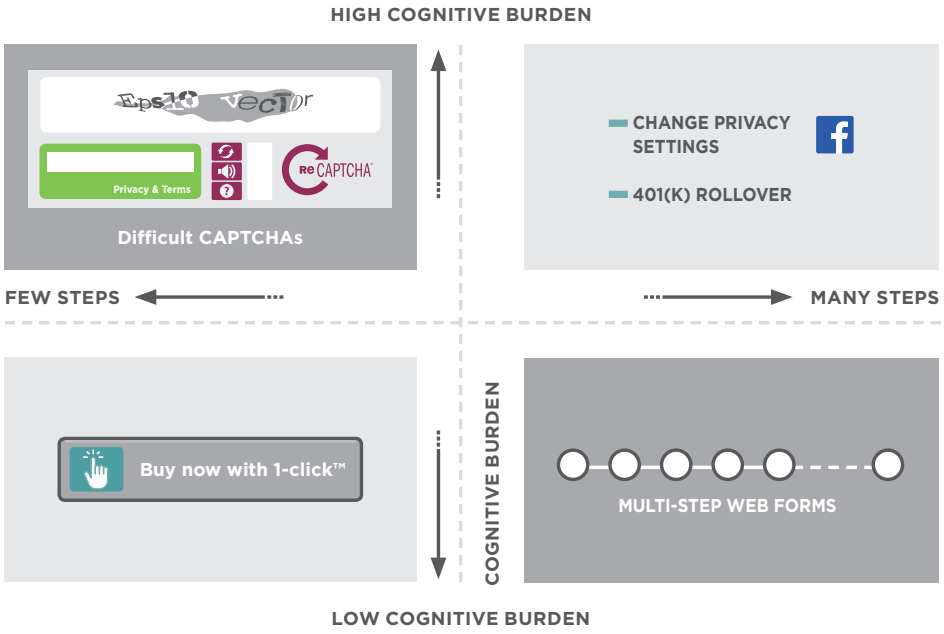
We forget how quickly our expectations for modern services have changed. For example, Millennials find it infuriating when businesses don't answer questions immediately via Twitter because making telephone calls and waiting on hold is intolerable. Rolling over a 401(k) retirement account feels like a 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:

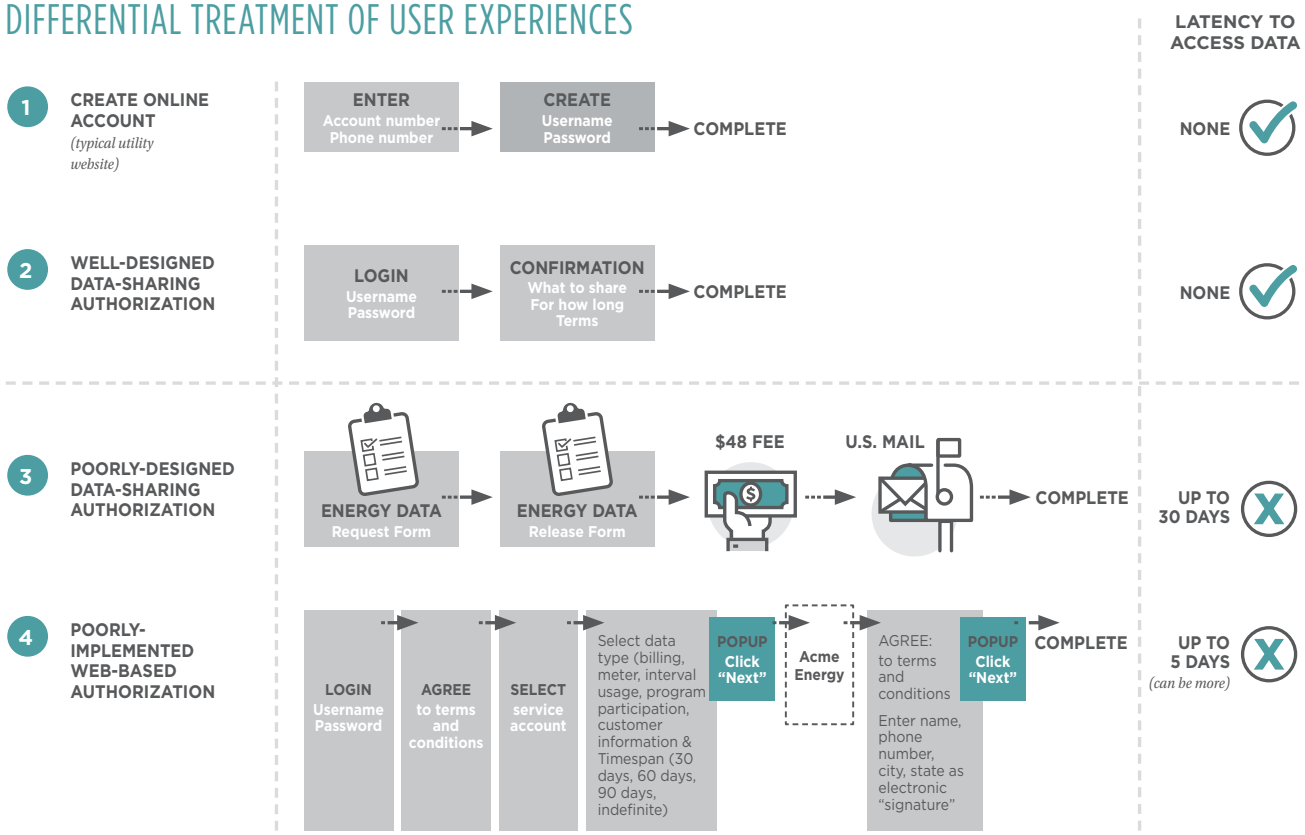
- Amazon's 1999 patent for "1-Click" ordering was among the company's most valuable, helping power the rise of the e-commerce giant to take $1 of every $2 Americans spend online. Two or three clicks resulted in fewer sales than one, so Amazon pioneered the practice of saving shipping and credit card 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.

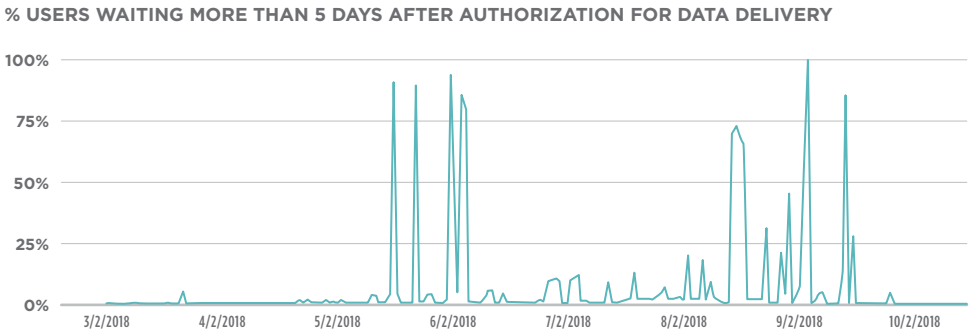
Second, business interruptions and uncertainty add costs to the third party. Technical support and software engineers from the third party need to be called in to troubleshoot problems and communicate with the utility. It is important to note that the resulting harms from IT system outages are asymmetric: 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

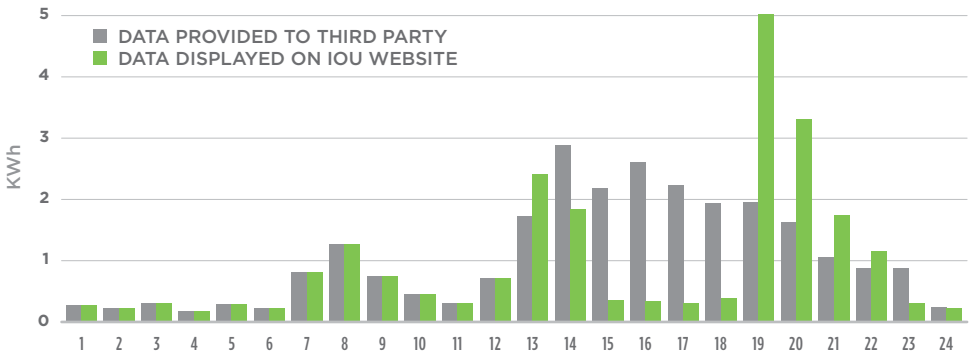
Many third parties have reported significant delays in receiving energy data. Delays can occur initially, after a customer clicks the final "submit" button to complete an authorization, or they can occur on an ongoing basis. Several app developers have reported that they were forced to entirely re-design 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.

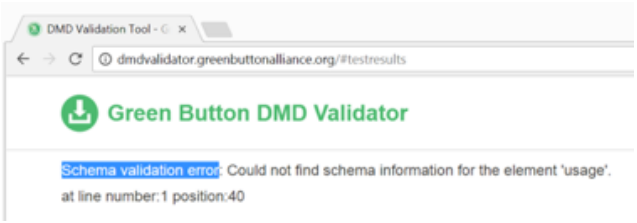
As is apparent, SMT crashes a lot, and the third party authorization process is very buggy."

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.

DIGITAL PLATFORM REGULATION OF ELECTRIC UTILITIES

MISSION:DATA
empowering energy savings

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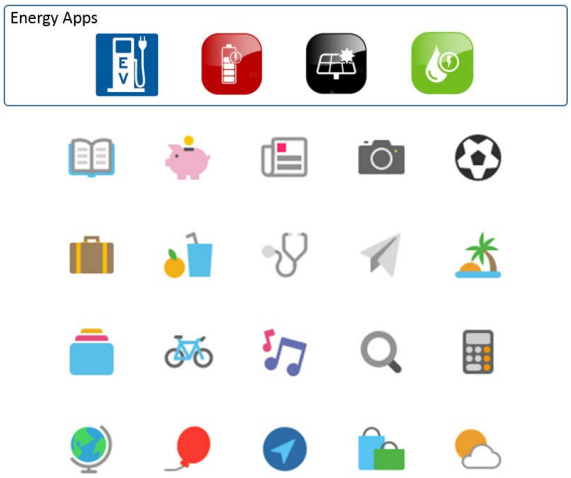
MISSION:DATA
empowering energy savings

Mission:data Coalition is a national coalition of 30 innovative energy technology companies that empower consumers with access to their own energy 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

New smart meter "App Stores" provide fertile ground for energy innovation. But they also present new opportunities for electric utilities to hinder competition and impede their distributed energy competitors.

Monopoly electric utilities increasingly provide digital services such as data portability to distributed energy resources (DERs), but government regulation of these monopolies has not adapted to the digital age. Unfortunately, rate regulation alone is ill-equipped to face modern challenges posed by the digitization of the power sector. DERs provided by non-incumbents have digital interactions with utilities, such as gathering real-time or historic electric usage data, billing information, etc. and provide demand reduction services back to the utility. New smart meters from major manufacturers such as Itron and Landis+Gyr feature on-board computers that create tremendous opportunity for innovative DERs that would benefit customers, but they also create opportunities for utilities to abuse their market power by exploiting asymmetries of information and discriminating against DER providers by limiting access, withholding information or imposing onerous terms of use. This report analyzes the new competitive landscape of electricity-related services through the lens of digital platform regulation. Just as the U.S. Congress and countries around the world are grappling with how to regulate the tech giants' "app stores" such as Apple's, state public utility regulators must familiarize themselves with abuses that are coming to the electricity sector (such as crippling, discriminatory terms and conditions, and snooping) and then craft pro-consumer policies to address them such as non-discrimination mandates, prohibitions on self-dealing, and establishing fair terms for digital interconnection. Modern utility regulators must go beyond prudence review to restrain utilities' anti-competitive activities.



UTILITIES' DIGITAL PLATFORMS NEED OVERSIGHT

The modern power grid is becoming increasingly decentralized, decarbonized and digitized. Industry and state utility regulators are beginning to grapple with those first two trends — decentralization and decarbonization. But relatively little attention has been paid to the third trend: digitization. The objectives of this paper are to (1) demonstrate the need for digital platform regulation, particularly as it relates to utilities' anti-competitive conduct that harms distributed energy resources (DERs), and to (2) propose policy solutions in the form of fair competition principles to guide regulators as the electricity system enters a new era.

State utility regulators are unprepared to oversee the increasing volume and variety of digital interactions that occur between DERs and utilities. DER aggregators of demand response, energy efficiency, smart electric vehicle (EV) charging, and various non-wires alternatives (NWAs) must communicate electronically with a monopoly distribution electric utility. DER aggregators interact with utilities' information technology (IT) systems for various purposes, such as gathering and analyzing customer energy usage information, acquiring information necessary for a customer to participate in a wholesale market, or receiving control signals from the utility to alter load. However, utilities are not traditionally skilled at managing IT systems, and DER aggregators have experienced failures on the part of utilities to provide certain

data in a timely and reliable manner.[1] Furthermore, many utilities view DERs as a competitive threat, and utilities' IT systems therefore represent a likely venue in which utilities can stifle DERs' business prospects with complex, opaque and highly technical processes. State regulators have long recognized the need for oversight of interconnection rules governing the attachment of solar photovoltaics to the distribution grid in order to establish fair terms between regulated and non-regulated entities. However, no state regulator has established comprehensive interconnection rules for digital interactions. There is a substantial risk that utilities will act discretely to hobble, undermine, or "slow-walk" their digital interactions with third party DERs in an anti-competitive fashion. As a result, it will be very difficult to decentralize and decarbonize the power sector (while maintaining low energy costs) if monopoly utilities are not held accountable for open and transparent operation of the online systems that are necessary for DERs to flourish. Put another way, many state utility regulators were already struggling to hold utilities accountable and maintain a level playing field in an analog world. A digital world presents even greater challenges.

While we acknowledge that some utility-owned DERs are useful and necessary, in order to meet the need for rapid emissions reductions in the face of climate change, the digital playing field must be leveled between *all* DERs and utilities. Our assumption in this paper is that behind-the-meter innovation will only occur at the speed necessary to address climate change if non-utility DERs (i.e., DERs owned or controlled by customers and/or customer-selected third parties) are permitted to proliferate. And as non-utility DERs grow, certain digital interactions with the utility become necessary, as exhibited during the recent California heat wave when third party demand response providers were called upon by utilities to manage peak demand and avoid blackouts.[2] DERs often require electronic access to customer usage data and certain information about customer accounts held by the utility in order to operate. It is these digital interactions between co-equal market participants — utilities and third party DERs — where regulatory oversight is necessary to ensure a level playing field.

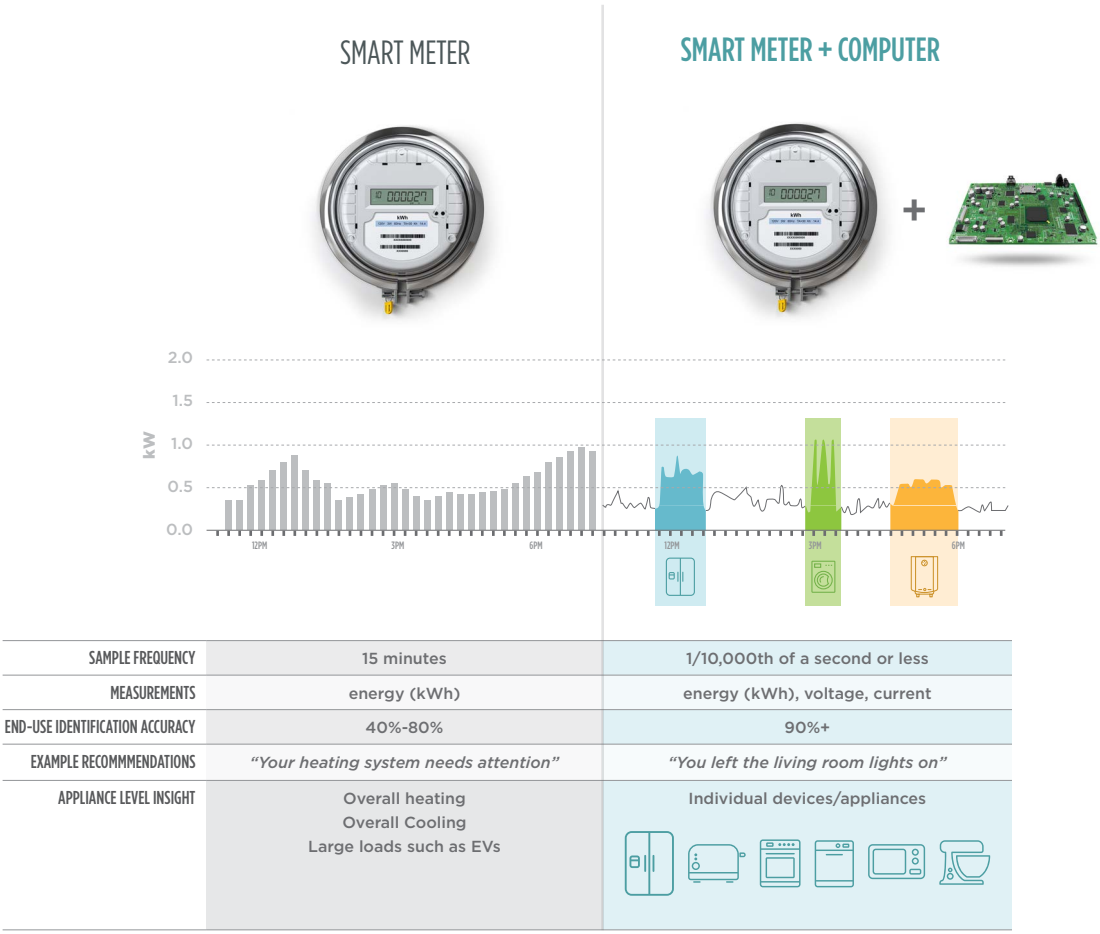
State public utility commissions have no choice but to become digital platform regulators in order to be effective in the 21st century. Utilities have many IT systems whose interactions with DERs must be overseen. The first major digital platform to come about has been Green Button Connect (GBC). Used in five (5) states today covering 36 million electric meters, GBC electronically provides customer-authorized DERs with energy usage and billing information necessary for DERs to function. Unfortunately, these platforms have not always worked reliably (or sometimes haven't worked at all), as we have written about previously.[3]

Recent technological developments besides GBC cry out for oversight of digital platforms. The latest is a new generation of smart meters that contain on-board computers. These computers allow software "apps" to be loaded on the meter. Apps could, for example, analyze electricity usage at high frequencies and disaggregate consumption by appliance or device. The ability to load an app onto a meter at zero marginal cost and receive accurate disaggregations of energy usage is potentially game-changing for DERs, who could better understand each household and more accurately target their customers with cost-effective efficiency recommendations. For this new "App Store" on advanced meters to benefit customers and to maximize its carbon-reducing potential, state regulators must force utilities to make these computing advancements accessible to third parties. Regulators must move beyond cost-of-service regulation by adopting pro-competition principles and developing enforcement mechanisms tailored to digital interactions.

1 See, e.g., *Complaint of OhmConnect, Inc. Against Southern California Edison Company for Data Failures.* California Public Utilities Commission, Docket No. C1903005. Filed March 8, 2019.

2 https://www.greentechmedia.com/articles/read/western-heat-wave-tests-californias-clean-grid-transition

3 See *Energy Data Portability: Assessing Utility Performance and Preventing 'Evil Nudges.'* Mission:data Coalition, January, 2019. Available at http://www.missiondata.io/reports/.



SAMPLE FREQUENCY	15 minutes	1/10,000th of a second or less
MEASUREMENTS	energy (kWh)	energy (kWh), voltage, current
END-USE IDENTIFICATION ACCURACY	40%-80%	90%+
EXAMPLE RECOMMMENDATIONS	*"Your heating system needs attention"*	*"You left the living room lights on"*
APPLIANCE LEVEL INSIGHT	Overall heating Overall Cooling Large loads such as EVs	Individual devices/appliances

HOW UTILITIES CAN DISCRIMINATE AGAINST DERS

App Stores on smartphones have seen discrimination and anti-competitive activities in the past, as we discuss below. Utilities are poised to similarly hinder competition by virtue of their control over meter-based app stores. Examples of potential abuses include:

Prohibiting Apps from Duplicating Utility-Provided Functions. Suppose a software company makes an app that sends you text message alerts when you approach a budgeted amount for your monthly electric bill. This would be valuable to many customers, but many utilities already offer "high bill alerts" via text message. Utilities eager to maintain their direct customer relationship could ban similar apps in order to retain "ownership" of the customer. In the past, Apple has banned podcast apps that would have competed with Apple's native podcasts app and music apps that would have duplicated some of iOS's built-in music functions.

> Consumers will download apps that compete with pre-installed apps only when there is a noted quality difference, and even then, lower-quality pre-installed apps will still enjoy an advantage over third-party apps.
>
> **- U.S. House of Representatives Antitrust Subcommittee Report (p. 352)**

Privileging the Utility's Pre-Installed Apps With Better User Experiences. Your electric meter could come pre-installed with apps for energy disaggregation and bill alerts, courtesy of the utility. However, the utility could make it difficult or complex for customers to consent to the installation of a third party app that provides similar capabilities. Pre-installed apps involve less "friction" of user experience because they can be used immediately without completing a consent process or waiting for the app to be loaded. This pitfall

could be remedied by (1) banning pre-installation of apps by the utility and (2) requiring all apps, whether utility- or third party-made, to follow the same customer consent process.

Utility-Friendly App Makers Receive Better Treatment. App makers that are friendlier to the utility's business model could receive faster approvals; have terms and conditions selectively waived; or have reduced fees or commission percentages. A firm providing, say, behind-the-meter battery storage that reduces the utility's capital investment (and thus earnings) would be a prime target for "back-burner" treatment, whereas an app beneficial to the utility could be welcomed with a red carpet. When Uber was in violation of Apple's terms, Apple's CEO telephoned Uber's CEO and amicably resolved the disagreement. Smaller firms than Uber, however, would have simply seen their app banned from the App Store without an opportunity to appeal. Utilities must be agnostic when it comes to which services their customers choose. Size, political influence or business model should not influence how an app maker is treated by a utility.

Crippling Hardware Features to Third Party Apps Such as Voltage or Current Measurement. A utility could allow its own apps to access voltage or current information while providing inferior power data to third party apps. Voltage and current measurement permits even greater accuracy with load disaggregation; certain "signatures" seen in voltage and current fluctuations are traceable to certain loads, such as motors or compressors, in a way that power data (measured in watt-hours) cannot discern. Platform operators can reserve superior information for themselves via private APIs. According to the U.S. House of Representatives Antitrust Subcommittee Report, "Apple is permitted to use the private APIs on iOS devices, but third-party developers are not" (p. 353).

EXISTING REGULATORY APPROACHES ARE INADEQUATE

Today, the primary tool of utility regulation is disallowing costs from inclusion in rates. Utilities must prove to their regulator that they have "prudently" incurred costs, meaning that those costs were necessary to deliver safe and reliable electric service. One could argue that the threat of cost disallowance is sufficient to compel a utility to operate its IT platforms in such a way that is open to DERs, pro-competitive, and maximally beneficial to customers. But there are several reasons why the threat of cost disallowance is by itself inadequate to ensure positive outcomes for digital platforms that serve DERs and customers:

1. **Disallowance is costly for regulators to prove**. Utilities can exploit information asymmetry to frustrate regulators' efforts to get information about the performance of IT platforms and App Stores. And since utilities' legal costs are paid by ratepayers, they can out-maneuver and outlast state regulators. Utilities can even appeal disallowances in court, further straining regulators' resources. As a result, disallowances are rare, diminishing their coercive force.[4]

2. **Time lags between prudence reviews.** Often, several years elapse from the time a utility's IT platform fails and the punishment (i.e. cost disallowance) is meted out (if punishment occurs at all). In contrast, in a competitive market, the failure of an IT platform results in immediate financial consequences in the form of reduced users, lowered revenue, and contractual penalties. A delayed feedback loop in conventional prudence reviews is not only a departure from norms in a competitive market, but it is ill-suited to IT systems that can change rapidly. For example, a perfectly functional IT platform can become inoperable within seconds.

3. **Lack of clear performance metrics.** Whereas the prudence of a power plant investment can be evaluated in part by its capacity utilization rate (0%-100%), there is no comparably simple, widely-used metric for an IT platform. "Uptime" or IT system availability can be manipulated by, for example, claiming uptime despite the presence of severe bugs. Moreover, it is difficult to predict the expected utilization of an IT platform by DERs outside of regulators' and the utility's control, frustrating the setting of appropriate utilization targets.

Performance-based regulation (PBR) is one possible mechanism for correcting these shortfalls. However, for PBR to be successful, regulators must educate themselves about the desirable outcomes for utilities as digital platform operators,

4 David Littell, Jessica Shipley and Megan O'Reilly. *Protecting Customers from Utility Information System and Technology (IS/IT) Failures: How performance-based regulation can mimic the competitive environment.* Regulatory Assistance Project. September, 2019. https://www.raponline.org/wp-content/uploads/2019/09/rap_littell_shipley_oreilly_performance_regulation_information_technology_2019_september.pdf

as well as *un*desirable outcomes to be avoided. We propose several performance metrics and tools for regulators that will be necessary to oversee digital platforms, whether or not PBR is applied. But first, we must understand lessons learned regarding the market power wielded by digital platform operators in other industries, most importantly App Stores on smartphones.

LESSONS LEARNED FROM TECH

"Platform" is a modern-day buzzword with as many definitions as there are apps in an App Store. We have social platforms like Facebook, shopping platforms like Amazon, and communication platforms like Signal. In this paper, we define a digital platform as software through which other entities make and sell their own software. Examples include operating systems such as Microsoft Windows and Apple's iOS. Platforms act as funnels or bottlenecks through which customers access other products and services.

Digital platform owners are powerful middlemen. They host, curate, monetize, and deliver digital goods. Increasingly, in tech, they also act like banks, publishers, tax collectors, and judges who mediate disputes among their users. Charitably, platform owners could be described as gardeners, pruning the walled environment for users' enjoyment. Less charitably, they could be described as rent-seekers, censors, and iron-fisted rulers. Regardless of individual temperament, platform owners undeniably wield considerable power. They own the real estate in which commerce occurs, and their tenants can't afford to be evicted.

THE POWER OF THE APP STORE

Almost from day one, Spotify had problems with Apple's App Store.

From its launch in 2008, the music-streaming app became one of the most popular apps on Apple's iPhone, propelling Spotify's meteoric growth. But as the App Store matured, its guidelines began rapidly changing. The most profound change involved in-app purchases (IAP). Apple required apps to use Apple's built-in payment system, meaning that Spotify users wishing to upgrade from "free" to "premium" service couldn't pay Spotify directly. Users would need to enter their credit card into Apple's payment system, where Apple would charge a 30% fee. If Spotify didn't submit to Apple's payment system, Spotify had two options: Either cripple Spotify's functionality by eliminating all "premium" service, or have Spotify removed from the App Store altogether.

Spotify has alleged that Apple's conduct is unfair and discriminatory, with the issue growing into an ongoing anti-trust investigation of Apple in the European Union. Other app makers have made similar complaints: Amazon's Kindle app for iPhone doesn't allow users to buy books from the app, because that would compete with Apple's own iBooks; gaming apps from Microsoft, Google and Facebook aren't allowed on the App Store because it would disrupt Apple's existing game economy.

In addition to IAP, other guidelines are a moving target. App developers find themselves on a treadmill, spending millions of dollars adding and subtracting features to remain in compliance with the latest standards. And even if developers keep up with the dizzying pace of updates, they might find that the App Store guidelines are not evenly enforced. For example, Apple permits Uber to intake credit card information directly from customers without using Apple's IAP. "We aren't seeking special treatment," said Daniel Ek, Spotify's CEO. "We simply want the same treatment as numerous other apps on the App Store, like Uber or Deliveroo, who aren't subject to the Apple tax and therefore don't have the same restrictions."[5]

As recently as June, 2020, angry app developers took to social media to complain as Apple refused app updates from numerous developers until they submitted to in-app purchases (and Apple's 30% fee). Remarking on this outburst, tech journalist and analyst Ben Thompson noted that app developers are intimidated into silence:

> *I wondered on Twitter[6] if Apple was blocking other developers from updating their apps unless they added in-app purchase, and was surprised at the response: twenty-one app developers who contacted me had added in-app purchase in the last twelve months…Nine more had either committed to adding in-app purchase, still had their app in limbo, or had simply given up on the App Store.*

5 https://newsroom.spotify.com/2019-03-13/consumers-and-innovators-win-on-a-level-playing-field/

6 https://twitter.com/benthompson/status/1273079296618201093

I have sat on these anecdotes for several months now, in part because this is all I can say: none of the developers were willing to go on the record for fear of angering Apple.

Successful platforms such as the iPhone have considerable power over app developers. The iPhone has created fertile ground and a large user base for apps to thrive, but with that potential comes a downside: App developers are often forced to submit to whatever financial, technical or business arrangement Apple wants.

Similarly, utilities could charge third party DERs exorbitant sums to appear on the meter-based app store. Utilities could offer their own apps to customers at no charge, harming precisely the innovation that these new smart meters promised to bring to consumers. In addition, utilities could modify their app store's terms and conditions to disadvantage any apps perceived as a strategic or competitive threat.

Regardless of one's views on Apple's practices, electric utilities deserve greater scrutiny from regulators because electric utilities have received government-sanctioned monopolies. Nowhere in America do consumers have a choice as to which meter is installed on the side of their house. Consumers' level of captivity can be debated in the tech world, but complete captivity is incontestable in the electricity sector. Regulators therefore have an obligation to ensure that meter-based digital platforms are truly open to the competitive marketplace and are not monopolized by their utility owners.

FEATURES FOR ME, BUT NOT FOR THEE

Discriminatory behavior of platform owners can also extend beyond business terms and sales commissions to the selective availability of certain technical features to some app developers but not to others. Take Tile, a helpful product for finding lost keys and wallets. Buy a one-inch-square Tile and put it in your wallet, and it broadcasts a Bluetooth beacon that makes your wallet findable with your iPhone. Among forgetful consumers, Tile saw considerable commercial success. That is, until Apple announced they would be adding a different type of radio to iPhone that is superior to Bluetooth for use by Apple's competing product, AirTags. AirTags — small disks — serve the same purpose as Tiles, but they broadcast ultra wideband radio signals that propagate through walls more effectively than Bluetooth, and with lower battery drain. Conveniently for Apple, it appears that iOS will make the ultra wideband radio accessible only to Apple's AirTags and not to competitors such as Tile. After incubating a lucrative market around finding lost objects using iPhone and Bluetooth, Apple is now tilting the playing field in its favor by selectively "crippling" certain features of new iPhones for app developers.

Similarly, utilities could ban all apps (except their own) that use voltage and current readings in disaggregating energy usage. As described above, high-frequency voltage and current measurements can significantly improve the accuracy of statistical inferences, permitting apps to determine how much energy is being used by each device or appliance. Excluding such apps from the app store would tilt the playing field in the utility's favor even further, ensuring that only the utility would have detailed insights into household energy usage patterns.

RECOMMENDATIONS

PRINCIPLES FOR DIGITAL PLATFORM REGULATION

Public utility commissions have a historic opportunity to become leaders in digital platform regulation **before** millions of electric meters across the U.S. are upgraded. The question about meter replacements is not merely about "smart meters"; it is whether on-board computers will be included. Addressing the potential (and, some would say, inevitable) harms from these computers requires Commission oversight. The following principles — based on non-discrimination, due process rights, and fair competition — should be incorporated into Commission orders and rules:

1. **App Stores' policies shall be fair, reasonable and non-discriminatory (FRAND).**
    - **Commission approval of terms.** The Commission must approve the terms under which DERs access and use the App Store. This includes business terms and cybersecurity terms. Utilities should not be permitted to impose their own terms without Commission approval.
    - **No crippling:** Every app developer gets access to the same hardware and software features as the utility. For example, a utility shall not reserve voltage or current measurement capabilities only for itself. If meters support Wifi (as many manufacturers'

do), utilities shall not ban apps that bypass the utility by sending meter readings out to a third party over the customer's Wifi network.

- **No self-preferencing.** Utilities shall not be permitted to pre-install their own apps on meters.
- **Regulatory oversight of costs and revenues.** Charges to third parties for use of the platform may not be excessive in relation to the utility's actual operating costs for maintaining the App Store. Revenues, if any, should be scrutinized so that ratepayers are not forced to subsidize unregulated businesses.

2. **Due process rights for DERs.**
   - **Rapid adjudication of disputes.** Commissions should hear disputes raised by DERs and permit discovery. In order to operate at the pace of modern technology, regulators should target resolution of disputes within 60-90 days.
   - **Structurally separate approval of apps.** To avoid conflicts of interest and anti-competitive conduct, approval of an app to exist on a utility's App Store should be the Commission's responsibility, not the utility's. App developers should have the opportunity to comment on utilities' proposed apps prior to Commission approval.
3. **Fair Competition.**
   - **Transparency of platform features.** Pre-release documentation on changes to meters and the App Store over time should be available to all app developers with sufficient advance notice.
   - **Reverse compatibility.** If upgrades to meters or the App Store become necessary and would result in apps not being backwards-compatible with prior versions, the utility shall provide sufficient notice and opportunity for app makers to adapt.
   - **No snooping ("mind your own business"):** Utilities may not surveil, reverse-engineer or gain insights into third party apps. Utilities may only monitor apps for legitimate system health reasons. Commissions should conduct periodic audits to ensure compliance.
   - **Prohibition on using a metering App Store until policies are in place.** If a regulator is unable to ensure a utility's compliance withthese principles, then the regulator should prohibit *all* use of meter-based App Stores, including the utility's use.

TOOLS FOR REGULATORS

In addition to implementing the principles above, state regulators need a new set of tools and information to monitor utilities' IT platforms. Quarterly or annual written reports are simply inadequate in a digital age. Regulators need to invest in information systems to continuously monitor compliance and implement service level agreements (SLAs), a mainstay of modern IT contracting. Only then can Commissions become true digital platform regulators. Specifically, Commissions should:

1. **Require issue tracking systems.** Issue-trackers or web-based "help desks" are simple online tools for submitting support requests. Support requests are submitted by an app developer who, for example, may be confused by an unknown error message. The Commission should have supervisory visibility over all issues in order to assess the utility's responsiveness and overall uptime of the platform. Issue-tracking websites must be administered by the Commission rather than delegated to utilities.
2. **Performance metrics.** Key metrics should be reported on a continuously-updated, publicly-accessible website. Performance metrics are essential in how modern technology companies manage their IT vendors in a competitive market, and public disclosure helps ensure equal access to information and aids in enforcement. Key metrics include:
   a. Availability / uptime of meter-based computers and the App Store
   b. Statistics regarding errors in App Store operation, such as number, description, severity and duration of errors
   c. User experience time to complete an authorization for loading an app onto his or her meter
   d. Time for the utility to conduct technical app reviews
   e. Number and severity of reported issues by DERs in the online issue-tracker, including mean acknowledgment time and mean resolution time

3. **Service Level Agreements (SLAs).** SLAs establish minimum performance criteria for platform operators and are extremely common in IT contracting today. In order to ensure accountability. SLAs for utilities should prescribe the following:
    a. Maximum time to acknowledge a reported defect according to severity classification (mild, medium, severe)
    b. Maximum time to resolve a reported defect according to severity
    c. Punishments for violations, such as financial penalties

CONCLUSION

Electric meters are part of a utility's natural monopoly, but the software that runs on them is not. Major manufacturers are now shipping meters with on-board computers, scrambling existing notions of the demarcation line between monopoly and competitive service. Meter-based app stores that support a range of innovative apps from independent entities could bring tremendous new benefits to consumers, such as tailored recommendations for energy efficiency. However, these benefits to consumers will not materialize in an optimal or efficient manner without effective oversight from state regulators. In order to establish a level playing field, public utility commissions must embrace their new role as digital platform regulators.