Consumer Resource Flexibility

Design and Implementation Considerations to Achieve Consumer Resource Flexibility at Scale

November 2023

U.S. DEPARTMENT OF ENERGY | OFFICE OF ELECTRICITY

Acknowledgements

This document was prepared by Andrew De Martini and Paul De Martini of Newport Consulting under contract with ICF Consulting. We appreciated the review and suggestions by Chris Ayers and Dustin Metz of the North Carolina Utilities Commission, the Hawaii Consumer Advocates Office, Jeff Loiter of the National Association of Regulatory Utility Commissioners, Brenda Chew of Virtual Peaker, and Karen Ehrhardt-Martinez, Patty Cook, Saumil Patel, Surhud Viadya, and Brian Levite of ICF. We would also like to thank Energy Consumers Australia for their collaboration in the development given their leading efforts on consumer behavior considerations.

The DOE Office of Electricity sponsored this report as part of a broader ongoing effort to advance market and operational coordination of distributed energy resources, especially their evolving use as virtual power plants.

DOE Office of Electricity Program Manager Joseph Paladino oversees this work.

Disclaimer

Contents

Glossary

Bring Your Own Device (BYOD)
Bring your own device is a concept involving the utilization of consumers' energy producing, storage, and/or consumption resources through a tariff, program, and/or aggregation to provide flexibility services. The BYOD concept is based on leveraging the investment that consumers have made in these resources to enable lower cost options for the power system by avoiding power system investment. BYOD is also intended to provide additional financial and social benefits to the consumer.

Consumer Energy Resource (CER)
Consumer energy resources are those distribution energy resources owned by an individual or a group of consumers for the primary purpose of addressing their specific needs. CERs are the resources referenced in BYOD.

Co-production
Co-production, as it relates to flexibility services, is when an individual consumer influences the support and services provided by their energy resources or when groups of people get together to influence the way that flexibility services are designed, commissioned, and delivered.

DataGuard Energy Data Privacy Program (DataGuard)
DataGuard was developed by the U.S. Department of Energy (DOE) and industry stakeholders to provide consumers assurance that their energy data were being protected and treated responsibly. The DataGuard Energy Data Privacy Program Voluntary Code of Conduct provides utilities and other companies that access consumer energy use data with a framework for protecting their customers' privacy.

DER Aggregation
Aggregation of one or more DERs for purposes of participation in the capacity, energy, and/or ancillary service markets of regional transmission organizations (RTOs) and/or retail energy, capacity, and/or grid services to load-serving entities and/or distribution operators. DER aggregations are also known as a "virtual power plant."

DER Aggregator
The entity that aggregates one or more DERs for purposes of participation in the capacity, energy, and/or ancillary service markets of the RTOs and/or retail energy, capacity, and/or grid services to load-serving entities and/or distribution operators. DER aggregators include, but are not limited to, independent service providers, utility programs, load-serving entities, and DER program administrators.

Distributed Energy Resource (DER)
Any resource located on the distribution system, any subsystem thereof or behind a customer meter (CER). These resources may include, but are not limited to, resources that are in front of and behind the customer meter, electric storage resources, intermittent generation, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment. The definition is technology neutral, including any eligible resource that is technically capable of providing wholesale and/or retail services through aggregation.

FERC Order No. 2222

FERC Order No. 2222 instructed RTOs and independent system operators (ISOs) to allow DER aggregations to participate directly in the wholesale markets and establish a new category of market participants, namely DER aggregators.

Flexibility Services

Flexibility services is a general term that may be used to describe a range of wholesale energy, capacity and ancillary services, and retail energy and distribution grid services.

Sequence of Operations

The sequence of operations is an approach to the development of a building/home automation system and integration with grid-related control schemes employed by a DER aggregator.

Social License to Automate

Social License to Automate refers to the requirements to build and maintain the "social license" – which includes user understanding, acceptance, and trust – essential to the success of automation technologies for demand-side management. An International Energy Agency (IEA) task group, as part of the Technology Collaboration Programme, is investigating the social dimensions of user engagement with automated technologies in energy systems to understand how end-user trust to automate is built and maintained in different jurisdictions and cultural settings.

Introduction

This next decade will be essential in laying the foundation for how the energy industry looks to meet the challenges and consumer expectations of a 21st-century grid. One of the critical aspects is addressing the need for flexible resources to enable the transformational shift from fossil fuel to clean energy. This transformation includes significant intermittent wind and solar resources that change wholesale operation requirements as well as dynamic distribution needs driven by distributed solar generation and transportation electrification. For example, New York State identified in its Pathways to Deep Decarbonization[1] analysis that:

> *"Flexibility along multiple dimensions is key to maintaining reliability and reducing cost of a 100% zero-emission electricity system. In the electricity sector, several forms of flexibility are necessary for balancing a 100% zero-emissions grid."*

More specifically, the New York Independent System Operator (ISO) noted that under one wintertime scenario, the one-hour ramp requirements could be over 10 GW and a six-hour ramp over 25 GW.[2] New York is not alone in identifying this need for increasing dynamic flexibility to achieve deep decarbonization.

This highlights a second critical transformational aspect, the required scale of distributed and consumer energy resource utilization. Consumer energy resources (CERs) are those distributed energy resources (DERs) owned by customers. Managing customers' resources and consumption is seen as one effective option to achieve decarbonization goals and system reliability and efficiency. This includes providing needed flexibility to address system variability and deviations between generation production and consumer electricity usage patterns.

The potential contribution of distributed resources to the overall flexibility need is significant. For example, a 2019 Brattle Group report identified a consumer flexible resource potential of 200 GW by 2030, an increase of 140 GW over existing capacity in the United States.[3] Brattle estimated the national benefits of DER flexibility could exceed $15 billion per year by 2030. The 4× increase in CER participation will necessarily involve expanding consumer participation to Main Street. This would be achieved through "modernizing existing conventional programs through revamped program design and customer engagement."[4]

To achieve the national potential for flexible consumer resources, it is necessary to understand how and why consumers use their resources and their decision-making considerations to effectively engage and partner for CER participation.

The purpose of this paper is to examine those "modernization" requirements for flexibility services program design and consumer engagement to achieve this very large-scale potential, specifically: (a) how changing flexibility needs are changing the operational requirements for consumer resource participation, (b) the consumer behavioral considerations to achieve the desired scale, and (c) the conditions required for effective consumer partnership by DER aggregators. These requirements point to a change in the nature of the relationship with consumers and their resources. The flexibility required will necessarily involve a partnership model that reflects a "co-production" relationship. Co-production involves actively engaging consumers and/or communities that own resources in the design, commissioning, and operation of flexibility services. This is essential for understanding the diversity of the range of consumers' (e.g., residential and small commercial) and communities' interests. By examining these considerations, policymakers, regulators, consumer advocates, CER aggregators, utilities, market operators, and other

[1] E3, Pathways to Deep Decarbonization in New York State

[2] Climate Change Impact Phase II An Assessment of Climate Change Impacts on Power System Reliability in New York State, September 2020

[3] R. Hledik, A. Faruqui, T. Lee and J. Higham, The National Potential for Load Flexibility, Brattle, 2019

[4] Ibid.

stakeholders will have a greater appreciation of the changes needed to more effectively engage consumers.

This paper is organized into four main chapters and a conclusion. The first chapter following this introduction is Chapter 2. Mind the Flexible Resource-Consumer Gap, which provides context for the transformation involved as well as the fundamental consumer behavior considerations for CER program design/aggregation planning. Chapter 3 describes a set of consumer-oriented Flexibility Program Design Principles. Chapter 4. CER Aggregator Code of Conduct provides a blueprint for codifying an effective consumer engagement model based on emerging best practices in the United Kingdom and international research. An example CER Aggregator Code of Conduct is provided in the Appendix. Overall, the goal of this document is to identify success criteria that small commercial and residential-oriented flexibility program designs and aggregation plans should consider to achieve the significant scale of participation envisioned.

Mind the Flexible Resource-Consumer Gap

Chapter Highlights

Chapter 2. Mind the Flexible Resource-Consumer Gap sets the stage for consumer resource automation by briefly describing the history of DER utilization and then illuminating how the industry is expanding the use of flexibility services. This evolution provides context for examining the required shift away from traditional top-down paradigms to a more consumer-empathetic approach. The three key takeaways from this chapter are:

- Recognizing consumer-owned energy resources instead of abstracting to DERs that may be perceived as existing power system assets
- Adoption of a consumer partnership model recognizing their role as co-producers of flexibility services
- Consideration of five key consumer behavior factors for program design/aggregation planning to achieve large-scale CER participation

A. Evolution of Flexible DER Utilization

Uses and quality of DER services have evolved considerably over the past 50 years. The most significant change is the current shift toward a more frequently dispatched dependable operational resource over the past decade. The evolutionary progression of increasing levels of contribution began with rare emergency-based demand response to avoid system-level blackouts between 1970 and 2000. By 2000, demand response began addressing system peak shaving to supplement system operating reserves. In 2010, routine seasonal dispatch for system resource economics became a traditional way for utilities to manage their systems. Today, pursuing continuous dispatch of DERs (load modifying and supply) to provide a range of dynamic wholesale ancillary services and distribution grid services is critical to ensure the reliability of a decarbonized system (Figure 1). The ability to utilize an aggregation of distributed and consumer resources as flexible operational resources is also referred to as a “virtual power plant.”

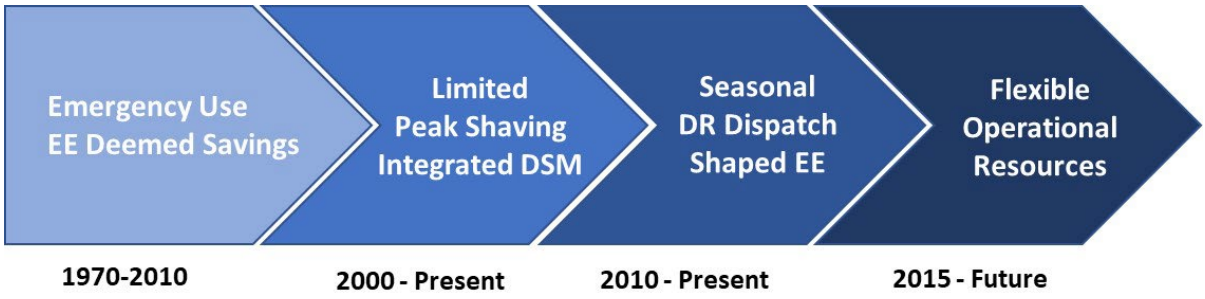

Figure 1. Evolution of DER Utilization

Today, traditional responsive load management programs (as represented in the first three chevrons above) in aggregate represent about 7% of system peak.[5] The 200 GW potential identified by Brattle would push this to nearly 30%. This will require a step change in consumer partnership to use their resources combined with greater industry-enabling capability. The flexibility needs as identified by New York and other regions and states would involve consumers' resources to "shift, shimmy, and shape" their net electricity consumption as part of new flexible resource initiatives (Figure 2).

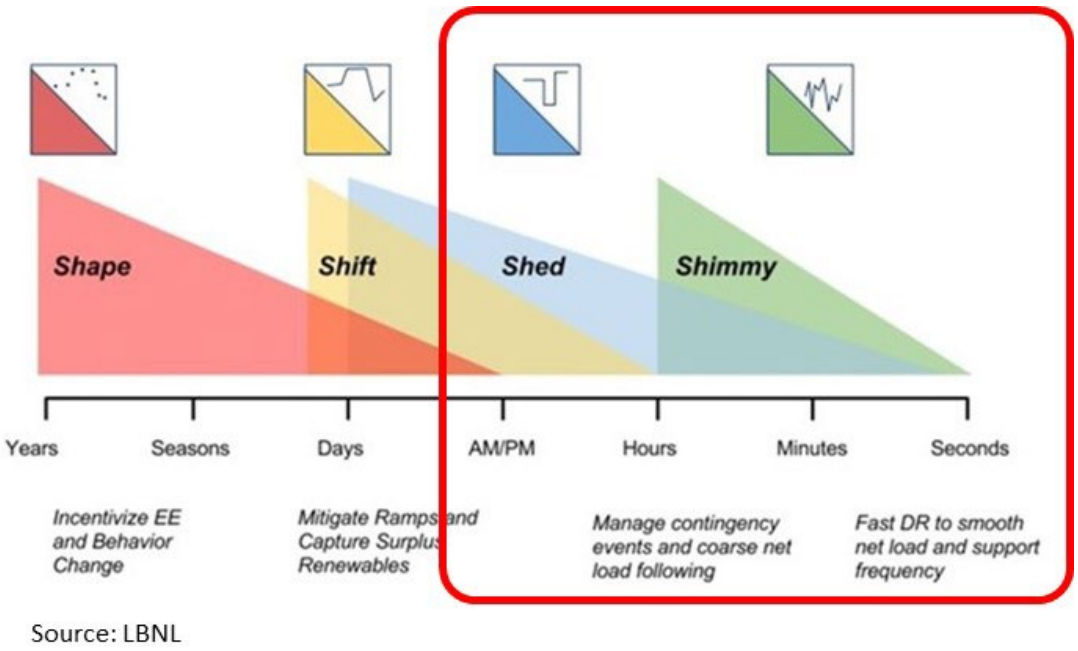

Figure 2. Flexible Consumer Resource Management Spectrum

The "Shape, Shift, Shed, and Shimmy" concepts are intended to address the increasing need for flexible load/DER management programs and aggregations to address a more dynamic power system. In particular, there is a new focus on Shed- and Shimmy-type flexibility that operates on shorter time cycles, as well as more frequently, to manage a significantly more dynamic grid. This means that distributed resource (including CER) requirements for grid services, energy dispatch, and load management systems are becoming more continuous in operation. This changing dynamic was illustrated in the 2013 Lawrence

[5] For reference, EIA reported the lower 48 states reached a peak hour of demand of 720 GW in August 2021 https://www.eia.gov/todayinenergy/detail.php?id=49216

Berkeley National Laboratory paper, DR 2.0: A Future of Customer Response (Figure 3).[6]

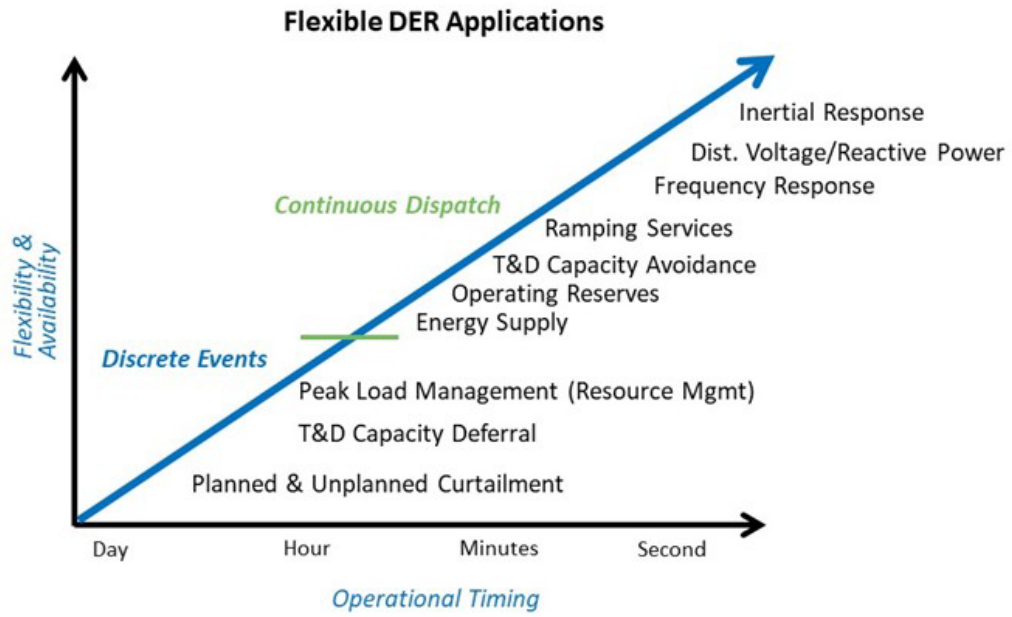

Figure 3. Potential Flexible DER Applications

Markets and pricing methods for consumer resource response will increasingly be challenged to operate on shorter time cycles. Human-based methods (i.e., grid operator, aggregator, and customer) will also be too slow in such an environment. This may also affect the usefulness of discrete event-based DER solutions, such as traditional and aggregated direct load control and semi-automated schemes that allow customer overrides or take longer to respond. This issue was highlighted in Brattle's report and research examining demand response effectiveness: [7]

> *"It is evident that requiring consumers to respond directly to prices is suboptimal and results in behaviour that cannot be explained by conventional economic models. This is a clear argument for the use of extensive automation for demand response, both to reduce the burden of price response on consumers and to ensure a more predictable and efficient response from demand."*

Regular and continuous use of consumers' resources (e.g., batteries, building automation, smart thermostats, electric water heaters, electric vehicles [EVs]) on par with traditional market-participating resources requires a deeper understanding of consumer behavioral considerations. Fundamentally, there is a need to significantly improve the operational performance of consumer resources. This includes improving the certainty of how various sourcing methods will achieve the desired scale and the timing of such scale. The scale and timing of creating an effective flexible resource portfolio are key criteria as to whether a traditional investment can be avoided. There are several technical details to evaluate, including determining baseline demand and responsive performance measurement. However, often not fully explored are the behavioral considerations regarding consumer willingness to participate and sustain participation. As such, the efficacy of various pricing, program, procurement, and market approaches should also be evaluated in terms of their ability to support large-scale participation and ongoing

[6] P. De Martini, DR 2.0: A Future of Customer Response, Lawrence Berkeley National Laboratory, July 2013. Available online at: https://s3.amazonaws.com/fonteva-customer-media/00Do0000000Yi66EAC/DR%202.0%20A%20Future%20of%20Customer%20Response.pdf

[7] O'Connell, Niamh, et al. "Benefits and Challenges of Demand Response: A Critical Review." 2013.

performance to deliver expected operational results.

It is important that consumers shape the outcomes of these efforts—regulators, aggregators, or utilities do not have the direct ability to guarantee consumer participation or performance at the levels needed. If there is uncertainty surrounding consumer resource capability to deliver flexibility services at the scale and timing needed, CERs will continue to be discounted in planning and operations. This is why a consumer-empathic approach is needed to address consumer willingness to participate and continue to provide ongoing mutually beneficial flexibility.

Factors that should be examined include what behavioral research tells us about consumers' willingness to participate in flexible load management programs, their willingness to remain in a program, how they feel about losing some control of their devices, and the value they ascribe to their resources and energy consumption. As noted in the International Energy Agency's (IEA's) "Social License to Automate" report:[8]

> *"There is no one simple hierarchy of energy loads that are more or less amenable to automated control. Acceptance of the automated control of household loads depends on a complex set of questions and contextual factors... Our cases show, however, some evidence of a hierarchy according to impact on users. The automation of loads associated with comfort or convenience, especially, is generally less acceptable to them."*

As such, it is necessary to understand who these consumers are and what factors are important to them. As a starting point, there is a need to recognize that flexible loads are customers' resources, and therefore, increased control over these resources (by utilities and/or independent aggregators) requires tacit consumer agreement based on an acceptable value proposition that addresses their interests and concerns. This value proposition may need to explicitly include community sustainability, equity, and/or resilience benefits, for example. Therefore, the success of any DER program or service is dependent on all parties realizing their expected value in the context of their respective decision considerations. A mutually beneficial partnership between customers and service providers is the foundation for the more frequent co-production of flexibility by consumer resources.

> The more that CER is expected to provide flexibility services, the more it is necessary to understand who these consumers are and what factors are important to them to obtain their partnership.

B. Consumer Energy Resources

Consumer Energy Resources versus Distributed Energy Resources

Flexible resource management anticipates service providers leveraging resources, such as smart thermostats, interactive water heaters, stationary batteries, and EVs, that are owned by consumers to meet grid needs. Ordinarily, these resources are used to enhance consumers' lives. As such, consumers have certain expectations regarding their use of these systems to provide comfort, back-up power, and/or financial security from rising and volatile energy costs. Likewise, there are considerable consumer behavioral considerations related to whether a consumer will allow their EV to be leveraged as a resource. Consumers do not buy or lease these devices and vehicles to provide services to the power system. Additionally, "ownership" extends to consumption:

> *"One thing that essentially all consumers have—regardless of their economic circumstances—is load. They are 'owners' of the amount of electricity usage that is required to live their lives: wash their clothes and dishes, shower, keep warm or cool and*

[8] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.

carry out other necessary tasks."[9]

For this reason, particularly in the context of flexible and automated demand management, these resources should be thought of as CERs. This change, while on the surface merely a difference in semantics, is meant to highlight the necessary change in how one thinks about where the resources are coming from as well as who "owns" them. This reframing of consumer DERs as CERs is important because it provides the proper context for consumer motivation to acquire their resources and use that electricity. This is particularly important as the need to frequently and often continuously dispatch these resources, akin to a power plant, raises the bar. This is what is meant by "virtual power plant."

Understanding why consumers are making investments in behind-the-meter technology is a necessary empathetic approach to designing flexible consumer load/resource services and/or programs.[10] For instance, consumers buying smart thermostats are primarily motivated by cost savings and the convenience of controlling the thermostat remotely.[11] In addition, consumers continue to invest in solar panels and/or battery storage to address, for example, financial and security concerns related to electricity prices (e.g., increasing rates) and reliable power. Residential power reliability is an area of increasing importance as work-from-home options require dependable electricity. For context, a McKinsey American Opportunity Survey found that 35% of workers have the option to work from home, and 58% have the opportunity to work from home at least one day a week.[12]

> The electricity industry at large has yet to "cross the chasm" to widescale, Main Street consumer demand response that is needed.

This is where the crux of the CER versus DER divide lies. Within the industry more broadly, CERs are often considered as assets to control, akin to traditional power system assets like large generators, without sufficient consideration of what those CER "assets" are providing on the consumer's side of the meter. Hence, there is a need for flexible load programs to be designed to address consumers' comfort and safety considerations, as well as concerns regarding participation in more advanced flexibility services in an increasingly complex power system.

To achieve the national potential for flexible consumer resources, it is necessary to understand how and why consumers use their resources and their decision-making considerations (discussed in the Consumer Behavioral Considerations section below) and effectively engage and partner with consumers to design how grid services are structured for CER participation (discussed in Chapter 3).

Consumer Co-Production

In the last 20 years, the electric power industry has seen the use of demand response evolve from that of a rarely or infrequently used resource to now becoming an almost continuous operational resource in several locales. However, the consumer engagement models for tariffs, programs, and markets that involve greater consumer flexibility have not substantially evolved. The original use case for demand response was for emergency load reductions or as an occasional peak shaving tool.[13] Now, however, the need for consumer flexibility requires more frequent and continuous operations of their devices to provide critical

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[9] Crawshaw, Jacqueline. "Death to DER? Why We Need to Change the Language We Use for the Energy Transition." *Energy Consumers Australia*, 2 May 2022, https://energyconsumersaustralia.com.au/news/death-to-der-why-we-need-to-change-the-language-we-use-for-the-energy-transition

[10] Abrahams, Matt, and Sarah Stein Greenberg. "Ideas & Empathy: How to Design and Communicate with Others in Mind." *Think Fast, Talk Smart: Communication Techniques*, episode 55, Stanford Graduate School of Business, 29 Mar. 2022.

[11] Smart Thermostat Market Assessment, Parks Associates, 2022

[12] American Opportunity Survey, McKinsey & Company, 2022

[13] McKinsey, American Opportunity Survey, June 2022. https://www.mckinsey.com/industries/real-estate/our-insights/americans-are-embracing-flexible-work-and-they-want-more-of-it

new grid services, such as ramping.[14] Additionally, requirements for flexible load management are moving from administratively determined performance to measured performance at the meter, as flexible demand must meet operational requirements to provide the expected value for the system. Further, the Brattle potential study envisions a 400% increase in customer resource participation than previously observed in demand response programs and aggregations. By implication, as the need for extensive use of consumers' resources increases, the nature of the relationship is evolving into producing a firm operational resource.

> *"Customer co-production behavior is defined as the determination and willingness of a customer to participate actively in terms of their time and effort with the service provider in the service inception and production stages."*[15]

A co-production relationship acknowledges that consumers are willing to collaborate, but it has to be viewed as a fair and reasonable exchange for the parties involved. Using the customer relationship construct of old demand response programs for these new high-utilization grid uses will not lead to successful decarbonization and power system outcomes. A co-production partnership between the power system at large and the consumer needs to be better defined and aligned. This will involve understanding and aligning the flexibility of service production requirements and the associated consumer impacts. Aggregators will, therefore, need to understand how consumers evaluate the potential value and risks associated with the use of their resources.

Anticipated Value

One of the key points of interest that consumers look for with co-production is the anticipated value proposition. Value anticipation is defined as the establishment of customer expectations regarding the co-production of service(s), which will, in turn, be informed by customer risk considerations and any relevant experience.[16] Value anticipation is an important part of consumer co-production because, according to the research, consumers who sense a greater return on value in a program are more likely to continue their participation.

One issue involves the need for consumers to clearly understand what value they can expect and what they have created and received. For example, consumers often have difficulty evaluating value given the information gap between what was communicated when signing up for a program and the subsequent review of their electric bill or incentive payment statement. These forms of communicating the value produced are too often not consumer friendly and do not provide the full picture of the value provided by the consumer.

Another issue involves an expectation mismatch between what the consumer thought the flexible program required and the actual level of discomfort/disruption that may be involved with the flexibility services. For example, consider a heatwave scenario—a grid operator or flexibility services provider is considering cycling off consumers' air conditioning to reduce peak load and create value for the power system. Under the old emergency, infrequent, and limited-use demand reduction programs paradigm, this was an acceptable value proposition. In part, consumers were willing to help do their share for

Value anticipation is defined as the establishment of customer expectations regarding the co-production of service(s), which will, in turn, be informed by customer risk considerations and any relevant experience.

[14] CAISO: Flexible Ramping Product Uncertainty – Calculation and Implementation Issues
HECO: Non-Wires Opportunity: Evaluation Methodology

[15] Ahmad, Norsiah. "The Way Forward. Customer Co-Production Behaviour." *Procedia - Social and Behavioral Sciences*, vol. 224, 15 June 2016, pp. 238–245.

[16] Ahmad, Norsiah. "The Way Forward. Customer Co-Production Behaviour." *Procedia - Social and Behavioral Sciences*, vol. 224, 15 June 2016, pp. 238–245.

the community during emergency events.[17] Expanding flexibility services to include automated and continuous dispatch will involve substantially more frequent and potentially longer disruptions for consumers. As such, using historic customer engagement models to meet emerging grid requirements may result in a vastly different and unacceptable consumer experience.

These situations are not uncommon, and, if not addressed, CER flexibility will not scale to the envisioned potential. For example, in 2021, Hawaii initiated a bring your own device (BYOD)-based Scheduled Dispatch Program to achieve 50 MW of flexible response with a particular focus on the incentives and rate structures. Not unexpectedly, this program has achieved only 10% of its goal.[18] This is not an outlier as price-based efforts to shape consumer electricity use across the country, including time-of-use rates, over the past 20 years have consistently fallen short of the desired results. A more consumer-empathetic approach that recognizes the consumer's role as a co-producer can help shape more successful outcomes.

Shared Outcomes

Another element of consumer co-production is a consumer's desire for a shared ability to shape outcomes. If service providers are asking consumers to bring their own devices (BYOD) for the provision of flexibility services, then a successful path to finding an agreement is treating them like partners. Research has identified that customers are motivated to co-produce as a means of controlling the process to achieve the desired outcome.[19]

Given that consumers have invested in energy resources and personal devices, they will want to have a greater say in the provision of grid services. At the very least, customers will require a clear understanding of when and how their resources will be used, as well as the associated compensation mechanisms documented within explicit agreements. Additionally, central planners and system operators will need explicit permission to access and utilize CERs. Therefore, there needs to be an agreement on the parameters of an effective partnership between grid operators, service providers, and consumers if flexible consumer resources are to be used. It should be noted that the evaluation of these proposed outcomes will eventually lead to a concept called "the consumer value proposition." This concept, explored further in Chapter 3, outlines the consumer calculation of potential outcomes across a number of categories, "Consumer Behavioral Considerations," in order to evaluate the fairness/reasonableness of any outcome.

C. Consumer Behavioral Considerations

Perceived risk is the consumer's uncertainty of the outcome with any purchase or the uncertainty about the consequences of any purchase.

Recognizing consumers' ownership of their resources and embracing the concept of consumer co-production is the starting point. Next, a program designer needs to understand the underlying motivations of the observable human behavior that corresponds to the consumer choices that this industry is seeing. Examples of that observable behavior can include certain types of technology adoption or program participation and expected adoption patterns seen in other consumer-oriented industries.[20] Specifically, the electricity industry at large has yet to "cross the chasm" to a widescale, Main Street consumer demand response that is needed. The motivations behind those human behaviors can be better described as "risk considerations" in the context of risks that consumers may perceive. These behavioral risk considerations are the factors that consumers consider in, for example, evaluating whether to agree to allow their resources or their energy use to be

[17] California Emergency Load Reduction Program (ELRP) https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/emergency-load-reduction-program

[18] See Hawaii PUC DER docket: https://puc.hawaii.gov/energy/der/

[19] Ahmad, Norsiah. "The Way Forward. Customer Co-Production Behaviour." *Procedia - Social and Behavioral Sciences*, vol. 224, 15 June 2016, pp. 238–245.

[20] Examples include the Bass Diffusion models of technology adoption and the market adoption factors discussed in Geoffrey Moore's seminal book, *Crossing the Chasm*.

controlled by others. The purpose of identifying these consumer behavioral risk considerations is that they speak to the motivations of consumer decision-making behavior that flexible load/resource program design will need to properly address.

It should be noted that consumer decision-making behaviors are perfectly rational from their perspective. Too often, the electricity industry focuses on a very narrow aspect—potential financial gain or loss from consumer response. This is further compounded by a focus on "price" as a primary consumer motivator. Unfortunately, this narrow lens ignores the many other factors and relative importance consumers consider in their lives and businesses.

As a start to modernizing our consumer engagement approach, we need to understand consumer behavioral risk considerations. That is, we must first understand what consumers perceive as risks. Perceived risk is the consumer's uncertainty of the outcome with any purchase or the uncertainty about the consequences of any purchase.[21]

> *"Consumers evaluate products on the basis of a few principal attributes and each represents a potential source of risk. Further, these attributes vary across product classes. Disaggregating perceived risk into product-specific components in this fashion provides much more information about why a consumer perceives risk than overall measures such as social or performance risk."*[22]

These perceived risks also apply to providing flexible load/resource management services. There are five risk categories that encapsulate overall perceived risk: Functional Risk, Physical Risk, Financial Risk, Social and Psychological Risk, and Complexity Risk. These risk categories represent the different dimensions that consumers may consider when assessing whether to agree to participate in a flexible load management program and to allow another entity to control their resources and energy consumption.

1. Functional Risk

The functional risk consideration is a consumer calculation on whether the service will "function as planned." In the context of the continuous automated demand response programs, consumers will be considering whether the automation component will perform as intended. In addition, will the required changes in consumer energy use cause measurable disruption to their normal routine? (For example, will their EV be sufficiently charged?) Thus, with respect to program design, a program should consider the magnitude of the potential disruption to normal consumer behavior during the anticipated use of the flexibility services.

In addition, it will be important that co-production expectations are clearly established at the outset and maintained. This requires careful consideration in the development of the sequence of operations for the consumer resources involved. There are four objectives that a sequence of operations needs to address: Reliability, Equipment Operation, Comfort, and Flexibility Services Efficacy.

- **Reliability** – Each building/home and use will have a different definition of "reliable" (i.e., ranging from a high tolerance of periods of degraded interior conditions to the nearly 0% system downtime for a consumer on life-supporting medical equipment). The sequence needs to address the consumer's reliability needs, which is not an option.
- **Equipment Operation** – The sequence must include protection to minimize damage to equipment, such as freezing coils, short-cycling motors, duct damage due to over/under pressurization,

[21] Taylor, James W. "The Role of Risk in Consumer Behavior." *Journal of Marketing*, vol. 38, no. 2, Apr. 1974, pp. 54–60.

[22] Zikmund, W. G. and Scott, J. E. A multivariate analysis of perceived risk, self-confidence and information sources. In S. Ward and P. Wright (Eds.), Advances in Consumer Research. Volume 1. Proceedings of the Fourth Annual Convention of the Association for Consumer Research, 1973, 411.

premature EV battery degradation, etc. This objective is also not optional.

- **Comfort** – Indoor temperatures and air quality need to be maintained at reasonable levels. These attributes have a range of acceptable values, based on how wide a range the consumer is willing to tolerate.
- **Flexibility Services Efficacy** – Increasing system efficacy for flexibility services performance may be balanced with comfort while respecting identified operational limits.

Deviations from expected operation will likely draw negative reactions from consumers, leading them to opt out of providing service(s). As such, aggregators need to engage consumers directly in the development of automated systems and communicate more effectively about the operating parameters and obligations of the consumer to provide the flexibility services.

2. Physical Risk

The physical risk consideration is a consumer analysis of their own personal health and safety as it relates to a potential flexible load management program or service. In light of ever-increasing extreme weather events, consumers have become keenly aware of their personal safety as it relates to demand response events. For example, exposure to extreme heat and/or cold temperatures due to grid operators or aggregators locking smart thermostats can lead to unintentional harmful impacts on consumers.[23,24] For context, Brattle identified that the majority of flexible consumer load management potential is from smart thermostat control.[25] Many houses in the United States do not have sufficient insulation for demand response programs to work effectively during temperature extremes when HVAC operation is limited. According to a Harvard study, nearly 25% of U.S. single family homes are considered to have "poor insulation."[26] According to the World Health Organization,[27] humans exposed to indoor temperatures below 64 degrees Fahrenheit and above 75 degrees Fahrenheit for a prolonged period of time can suffer serious health complications.[28,29] Such temperatures are especially dangerous for babies, the elderly, and those who suffer from respiratory, lung, or heart disease, for example.

Additionally, physical safety concerns extend to issues involving EVs. If EVs are not sufficiently charged, people may not be able to get to emergency centers during hot and freezing temperatures or to evacuate natural disaster areas.

The physical risk consideration primarily relates to a consumer's questions about the personal safety of providing flexibility services. In addition, the consumer will consider whether the CER aggregator's value

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[23] Allen, Jaclyn. "Thousands of Xcel Customers Locked out of Thermostats during 'Energy Emergency'." *Denver 7 ABC News*, 31 Aug. 2022, https://www.denver7.com/news/contact-denver7/thousands-of-xcel-customers-locked-out-of-thermostats-during-energy-emergency.

[24] Osborne, Ryan. "Yes, Texas Energy Companies Can Remotely Control Your Thermostat - Depending on Your Plan." *WFAA 8 ABC News*, 14 July 2022, https://www.wfaa.com/article/news/local/ercot-texas-power-grid-thermostat-yes-texas-energy-companies-can-remotely-control-your-thermostat-depending-on-your-plan/287-8e81116b-b734-4b78-957a-df835fd31955.

[25] R. Hledik, A. Faruqui, T. Lee and J. Higham, The National Potential for Load Flexibility, Brattle, 2019

[26] La Jeunesse, Elizabeth. "Significant Improvements In Energy Effeciency Characteristics Of The US Housing Stock." *Joint Center for Housing Studies of Harvard University*, 7 Aug. 2017, https://www.jchs.harvard.edu/blog/significant-improvements-in-energy-efficiency-characteristics-of-the-us-housing-stock.

[27] Health impact of low indoor temperatures. Regional Office for Europe: World Health Organization; 1987

[28] M. Farrell, Best Setting for Your Central Air Conditioning, Consumer Reports, August 6, 2021. https://www.consumerreports.org/appliances/central-air-conditioning/best-setting-for-central-air-conditioning-a1889096483/

[29] Note: The Energy Star program suggested thermostat settings have been provided without any validation regarding associated potential health concerns, particularly for at-risk populations, and are in conflict with the World Health Organization's findings.

proposition will include the consumer's safety in addition to the provider's own business interests.

This physical consideration speaks directly to the consumer value-risk tradeoff required in a consumer co-production relationship. This type of consideration also speaks to the program design principle (Chapter 3) of consumer trust. Consumers would need to have well-established lines of communication with the service provider and confidence that, as a partner, their physical well-being would be prioritized over economics. This would also require a real understanding of what the consumer sees as an acceptable temporary discomfort versus a potential personal danger.

3. Financial Risk

The financial risk consideration is one in which the consumer weighs the specific financial benefits of a program/offer. This consideration includes both the perceived personal financial benefits from cost savings and/or incentives or market-based payments. Financial risk also includes consideration of the consumer's cost to acquire the resource (e.g., battery). If material and predictable financial benefits are not assured, a consumer is less likely to invest in the equipment to become a co-producer. Financial risk also includes the opportunity costs that may be associated with allowing the resource to be used for flexibility services instead of the original purpose that led to the initial purchase. For example, using a stationary or EV battery for flexibility may diminish the battery's capacity to provide power during an outage or impair the EV warranty. There may also be costs associated with accelerated degradation of the resources when used for flexibility services (e.g., an increase in battery discharge cycles). Consumers will weigh both the benefits and costs, including the perceived likelihood of financial returns from flexible load programs, to determine their assessment of the net value that is proposed by a services provider.

4. Social and Psychological Risks

The consumer social and psychological risk considerations are two distinct categories, but each relies on the consumer's perception of the service provider within their community. The social consideration is about a consumer's perception of the service provider's contribution, through providing flexibility services, in creating social value. If the consumer understands what is being asked of them and perceives that it is a community benefit, they may react more positively to programs. Of course, the inverse is if the consumer perceives that a flexibility service does not positively or meaningfully impact their community, they may be much less willing to participate.

The psychological consideration concerns when consumers evaluate their perception of their "partner" and the quality of the co-production relationship. In simple terms, does the consumer trust that the service provider will do the right thing for the consumer? For instance, in determining whether they view a service provider as a good "partner," the consumer is likely to also factor in the functional, physical, and financial considerations.

5. Complexity Risk

The final consumer behavioral risk consideration category is complexity. In the design of flexible DER/load response programs, there will be varying levels of active consumer participation (across multiple dimensions), which is a break from the traditional consumer relationship with the industry. The risk consideration here describes the consumer's calculation about whether the program is asking them to be more involved than they want or, at times, not involved enough. Rates, programs, and market designs introduce complexity risk for consumers. The myriad of pricing and incentives is very confusing to most consumers (for example, EV charging at certain hours to get an appropriate utility rate, while also being asked by an auto manufacturer—that is also an aggregator—to use their EV to provide grid services, while also being asked by the solar-battery installer to use those resources for other services and yet again by a thermostat firm to manage their heating and cooling). Today, every energy smart device (including EVs) has a set of aggregators largely focused on that type of device. Beyond this, consumers will also have varying levels of technology literacy, which means that their willingness to participate may be strongly impacted by their need to learn how to "provide" the flexibility services. As noted in consumer behavioral research:

"…as co-producers, the perception of customers' capabilities and skills would only be based on the customers' own judgement, which is termed 'self-efficacy' in the context of this present research. Self-efficacy is the perception of one's own capabilities, knowledge and skills in a particular service production. …A customer who is perceived as having a high degree of self-efficacy tends to co-produce." [30]

One implication is that initial participants may have high self-efficacy. However, to reach greater levels of flexibility services participation, program designers may require an increasing level of consumer education so consumers understand the technology and their co-production role along with the value proposition sufficient to address this complexity consideration.[31] Alternately, program designers may need to identify solutions that reflect consumers' needs by, for example, simplifying the consumer experience and lessening the potential disruptions to their lives and businesses.

Flexibility Program Design Principles

Chapter Highlights

Building upon the insights from the consumer behavioral considerations, Chapter 3 describes a set of principles that should be considered in flexibility program design and/or aggregation plans. While these principles have their own unique challenges that will need to be addressed, aggregators should view them holistically as progress across all five categories will likely have a greater impact than progress in just one category. The two key takeaways from this chapter are:

- Design principles to establish the consumer behavioral-based parameters for development of effective CER programs and aggregations
- The importance of establishing and maintaining consumer trust through the entire lifecycle from initial engagement, contracting/enrollment, flexibility services operation, performance evaluation, and settlement

Consumer Aggregation Design Principles

Program design principles should be viewed as objectives that act as building blocks for the success of a flexible load/resource program. The following set of principles addresses the key consumer behavioral considerations discussed in Chapter 2 in relation to the proposed consumer co-production partnership:

- Consumer Trust
- Consumer Health and Safety
- Consumer Value Proposition
- Proactive Consumer Engagement
- Program Efficacy

These principles are interrelated and should be approached holistically by aggregators/flexibility program designers. In addition, aggregators should consider that the application of these principles into a flexibility services program or offering will always be unique to a regional transmission organization's (RTO's)/ independent system operator's (ISO's) region or utility service area and customer types (i.e., large

[30] Ahmad, Norsiah. "The Way Forward. Customer Co-Production Behaviour." *Procedia - Social and Behavioral Sciences*, vol. 224, 15 June 2016, pp. 238–245.

[31] Consumer adoption/participation is expected to follow characteristics of classic product/technology adoption dynamics. See: G. Moore, Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products to Mainstream Customers, 2014

commercial, institutional, and industrial versus small commercial and residential).

At a strategic policy level, regulators should consider complementary rulemaking that encourages a consumer co-production partnership through a flexibility services provider code of conduct that addresses these principles. Such a code of conduct is described in Chapter 4, and an example is provided in the Appendix.

A. Trust and Transparency

The first principle, consumer trust, is the most important because obtaining and maintaining trust will be necessary for any program to solicit enough participation, and then maintain it, to achieve its goals. This requires not just maintaining the support from consumers already willing to participate in programs but also building trust with a consumer base that either has not been actively engaged or has felt alienated due to past experiences. Consumer trust is also a key component of the other principles in this document because, in a co-production partnership, service providers will need to establish trust across each principle. In this regard, program designers will need to consider the insights from the consumer behavioral considerations in Chapter 2 to identify the areas where consumer trust will be a necessary step for progress to occur.

> Consumer trust is the most important principle - obtaining and maintaining consumer trust will be necessary for any program to solicit enough participation, and then maintain it, for success.

Critical to establishing trust is getting consumers comfortable with (1) who is collecting their data, (2) who will have access to their data, and (3) the uses of the data. Privacy considerations are of paramount concern and need to be proactively addressed not just by utilities, but also by DER aggregators and other retail energy providers with access to personally identifiable information (PII), as well as energy use and financial information. The DataGuard Voluntary Code of Conduct is one dimension of a broader governance model and comprehensive code of conduct that should be considered. Program designs may consider a few of the following questions when trying to address consumer trust:

- Why is there a need for consumer resource provision of flexibility services?
- What is being automated and how often?
- How will this impact consumers' energy use and their lives?
- How are privacy concerns being addressed by all entities interacting with the consumer for flexibility services?
- What is the personal and social value proposition for the consumer?
- Are there clear examples of how similar programs have succeeded?

Consumer empathy is essential for establishing trust and should be followed with fair dealings during the marketing, sales, and contracting processes. Flexibility services designers should utilize the consumer co-production concept as a means of aligning service parameters toward more equitable outcomes for consumers. Additionally, trust is dependent upon transparency as part of a proactive lifecycle communication model.[32]

B. Health and Safety

Health and safety have emerged as a key factor given recent extreme weather events and the use of automated load curtailment, namely bricking consumers' smart thermostats. This use of automation has, in some instances, unintentionally created negative impacts on participating consumers' health and general

[32] Morey, Timothy, et al. "Customer Data: Designing for Transparency and Trust." *Harvard Business Review*, May 2015, pp. 96–105, https://hbr.org/2015/05/customer-data-designing-for-transparency-and-trust.

well-being. As a principle, there needs to be a better understanding of the implications of automated control of consumer resources in the design of the service's operating parameters. This health and safety principle requires a human-centered approach to flexibility services design, especially as it relates to automated services that can have a material impact on consumers' well-being. A few questions to consider include:

- What are the appropriate operating parameters during extreme weather events?
- What does health science say regarding potential consumer health and safety risks?
- What processes and/or mechanisms should consumers have to unilaterally address their personal safety?
- What safeguards should be considered and implemented to prevent misuse of automated control that would put consumers at risk?

As noted above, consumers need to have a clear understanding of how they may be able to override automation and dispatch of their devices as a means of protecting their health and safety. This would include consumer education on when and how they could override dispatch signals as well as the steps to execute that override.

C. Consumer Value Proposition

The consumer value proposition is a consumer-centric analysis that weighs both monetary and non-monetary value, gained or lost, in the co-production of flexibility services. For example, consumers are likely to consider their values (e.g., comfort, security, or safety) in the context of the value offered by flexibility services. As noted earlier in the Hawaii example, flexibility services have often used a value proposition focused on the direct monetary benefit to consumers from incentives, shared market revenue, and/or cost savings. However, value may also be positioned in terms of social value (e.g., decarbonization, reliability). More continuous or frequent use of consumer resources, however, will require a more compelling value proposition. When developing that proposition, financial reward is important but will be balanced against consumer perceptions of their own direct and indirect costs to determine their risk-adjusted net value of participating.[33]

Questions designers should consider include:

- Is the economic value "fair" in relation to the consumers' direct and indirect costs and related risks?
- How should the flexibility services proposal be shaped to reflect a consumer-empathic approach?
- How should the customer value proposition be developed for specific customer segments and local considerations?
- How is the consumers' contribution to social value being aligned with specific consumers' interests?
- How are consumers' risk concerns being addressed in the proposal?

As such, flexibility services designers should holistically address all consumer behavioral considerations (Chapter 3) that comprise consumers' decision making.

D. Proactive Engagement

A proactive engagement strategy includes considering the most effective and efficient way of engaging

[33] Nolan, Sheila, and Mark O'Malley. "Challenges and Barriers to Demand Response Deployment and Evaluation." *Applied Energy*, Elsevier, 15 May 2015.

participating consumers during the entire lifecycle of flexibility services provision, from initial contact and agreement through the service commitment.

> *"Actively reach out to participants, provide actionable information on how shifting can be achieved, as detailed and time-near feedback as possible to increase energy literacy and self-efficacy feelings among end-users, and ensure that perceived benefits are sufficient to motivate participation as significant personal investment of participants is required for self-motivated behaviour change. Long-term behaviour change is (except among highly engaged users) likely only possible through the building of new habits supported through the above-mentioned aspects as well as dedicated intervention strategies such as commitments, prompts, social norms communication and rewarded goal-setting until they are solidly formed. Within this process, people's realities regarding flexibility need to be considered through tailoring and personalisation options."*[34]

Building a robust engagement model is not only the foundation for enabling consumer trust but is also essential for tackling the challenges associated with adapting to the real concerns consumers have about their health and safety in these types of programs. A consumer engagement model also needs to match the technological sophistication of target consumers. Designers should consider what is important to meet consumers where they are since it will be incredibly important to remain in dialogue with consumers in a co-production partnership. Additionally, an engagement model needs to consider multiple channels of communication. This is critical to address the need for lines of communication to remain open under stressed system conditions, such as extreme temperatures, when dispatch of consumer resources may be desired by grid operators. Finally, consumer engagement involves the exchange of consumer data, so data privacy and security should be addressed early and repeatedly.

It is critically important to meet consumers where they are and to match the flexibility program with the sophistication of target consumers.

An effective engagement model should address the consumer behavioral considerations discussed in Chapter 3. Some of the questions those insights might foster include:

- How will aggregators manage ongoing clear, consistent expectations about the customer's role and related value proposition before, during, and after each event for the lifecycle of the co-produced service?
- How will changes in the use of the flexibility services be proactively communicated and agreed upon?
- What communication channels are needed to engage consumers in a co-production-based flexibility service?
- What level of oversight is needed to ensure effective communication between a flexibility services provider and a consumer?
- What are the appropriate requirements for how consumer information can be used and protected?

E. Efficacy

Efficacy refers to the need for flexibility services to function and deliver results as expected from a consumer's perspective, not just from a grid operator's perspective. An increase in automation levels to enable the flexibility services desired by grid operators drives the potential for disruptive effects on

[34] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.

consumers' use of electricity. Therefore, it is essential that consumers realize the benefits required to sustain their participation.

> *"As the automation level rises, this task of engaging the consumer to act moves on through a key phase of control provision to one of providing accountability, transparency, and justification through the communication of achievements."*[35]

Consumer efficacy is critical to growing participation based on participants' positive experiences in terms of the operation of the service co-production and the benefits realized. This specifically includes the need for transparency on what exactly will be done, what was done during the event, and the benefits of the response. For example, a mismatch between consumer expectations on how the flexibility services would be dispatched (based on what was sold to them) versus what occurred will create mistrust and erode participation.

This specifically includes the need for transparency on what exactly will be done, what was done during the event, and the full benefits of the response.

> *"Strong benefit communication as well the communication of control is also still of great importance as these are the automation levels that are most likely to make participants feel interfered with and out of control."*[36]

There is a need to also provide consumer feedback on positive results, both the individual economic benefits to participating consumers and their broader social contribution. The realized social benefits can provide a significant motivation for sustained consumer participation. This is important, as research has noted that there has been a potential "*under-use of a community perspective within interaction and benefit communication which has the potential to contribute to the development of shared green community identities*."[37]

CER Aggregator Code of Conduct

Chapter Highlights

Achieving and sustaining large-scale CER-based flexibility services will also require institutional action to ensure effective engagement between program administrators/aggregators and consumers to form effective partnering agreements through tariffs, programs, and bi-lateral agreements. This explicitly recognizes that consumers are at a significant information disadvantage when entering into a flexibility program or services agreement with CER aggregators.

As such, there is a need for a structural change in this relationship dynamic through a change in program/service structures and the establishment of a CER aggregator code of conduct to ensure consumers' concerns are addressed. The outline for a code of conduct is provided below.

A. Automated Use of Consumer Resources Requires Institutional Changes

Power system dynamics are increasing in variability. This phenomenon is a key driver for the increasing reliance of grid operators and planners on flexible consumer resources to balance electricity supply and demand and manage distribution capacity. However, unlike traditional load management, faster and more frequent responses from consumer resources are needed to manage variability on the grid. This is creating

[35] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.
[36] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.
[37] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.

the need for more dispatchable fast-responding consumer resources.[38] The new operational requirements for flexible resources are redefining the functional requirements for consumer-provided flexibility services.

> *"Policy-makers, program and service designers will need to grapple with how consumers will engage with an energy system that is becoming increasingly complex, given the preference for simplicity that comes through the research."*[39]

The nature of flexible consumer load/DER management is a step change in consumer expectations and potential impacts from traditional demand management programs. Flexible consumer load/resource management requires a new relationship paradigm oriented toward a "co-production" partnership. This partnership should be structured to realize *"the determination and willingness of a customer to participate actively in terms of their time and effort with the service provider in the service inception and production stages."* [40]

Institutional action is needed to ensure effective engagement between flexibility services aggregators and consumers to form effective partnering agreements to achieve scale.

As such, a customer-centric power system must consider the basic human and economic needs of customers as part of any effort to utilize flexible load management as a resource. This new paradigm requires empathy in the design of any tariff, program, or market if flexible load management is desired at the scale envisioned. Additionally, expanded flexible load management programs will require a relationship with customers built upon customer-centered principles discussed above in Chapter 3. These principles lay the foundation for an effective co-production relationship between aggregators and consumers in the use of consumers' resources (including energy-consuming devices) to manage the grid.

The pursuit of flexible customer resources to provide critical grid services requires enabling technology and market designs. This goal will also require institutional action to ensure effective engagement between aggregators and consumers to form effective partnering agreements through tariffs, programs, and bi-lateral agreements. The approach to the structure of these relationships over the past decade, as accomplished through programs and bi-lateral agreements, has not fully addressed the consumer behavioral considerations discussed in Chapter 2 or the program design principles described in Chapter 3. In many cases, the principles identified are either unaddressed or ignored in program design and consumer resource use agreements. Consumers are at a significant information disadvantage when entering into a program or services agreement with CER aggregators. This is especially problematic given the anticipated need for the more pervasive use of consumer resources.

> *"There are limits to behavioral flexible energy use. Consumers may not have the scope to adjust energy use, or may do so for a period, but then revert to their previous energy use over time. Automated flexible energy use may help consumers manage the complexity associated with flexible DER and energy use, but it requires expensive technology and high levels of trust – in the energy sector more broadly, as well as the provider, and the product or service."*[41]

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[38] P. Alstone, et al., 2025 California Demand Response Potential Study –Charting California's Demand Response Future: Final Report on Phase 2 Results. 2017. Lawrence Berkeley National Laboratory. https://escholarship.org/uc/item/2m68c4xh

[39] ACIL Allen, "Barriers and Enablers for Rewarding Consumers for Access to Flexible DER and Energy Use.", 20 June 2022.

[40] Ahmad, Norsiah. "The Way Forward. Customer Co-Production Behaviour." *Procedia - Social and Behavioral Sciences*, vol. 224, 15 June 2016, pp. 238–245.

[41] ACIL Allen, "Barriers and Enablers for Rewarding Consumers for Access to Flexible DER and Energy Use.", 20 June 2022.

Failure by flexibility services providers to address these principles will lead to the failure of flexible consumer resource-provided services. As such, there is a need for a structural change in this relationship dynamic through a change in program/service structures and the establishment of a CER aggregator code of conduct to ensure consumers' concerns are addressed. Such a standard of conduct would help ensure consumers' interests are respected.

B. Aggregator Code of Conduct

Establishing an aggregator code of conduct should be considered part of an overall governance model as most consumers are at a significant knowledge disadvantage. This need has been recognized in the United Kingdom through the Flex Assure and HOMEFlex initiatives, as noted below, as well as the IEA's "Social License to Automate."[42]

> *"Trust in how Flexibility Services Providers [Aggregators] communicate with and deliver solutions to customers is essential."* [43]

Additionally, this code would identify incremental requirements to existing U.S. regulatory rules for aggregators.[44] In doing so, such a code should address the principles identified in Chapter 3 to facilitate consumer trust by setting standards of conduct and encouraging best practices for flexible load management. While the U.K. efforts address the customer sales and contracting aspects, they do not address the operational dispatch aspects that can greatly impact consumer safety and ongoing participation. The following is an outline for a code of conduct to support effective partnerships with consumers. An annotation of this outline is provided in the Appendix.

Consumer Enrollment

- Advertising and promotion
- Sales behavior
- Competition
- Proposals (financial benefit, costs, and assigned risks)
- Contracting

Flexibility Services Operations

- Communications and channels (before, during, and after)
- Automation transparency (process and technology)
- Control options (opt-in, opt-out, turn-off)
- Operational parameters for consumer health and safety
- Performance metrics and feedback
- Customer and social benefit

Administrative

- Settlement and billing

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[42] Adams, Sophie, et al., User-Centered Energy Systems, "Social License to Automate." Oct. 2021.

[43] Flex Assure, "*Flex Assure Code of Conduct*", 2021. https://www.flexassure.org/images/Flex_Assure_Code_of_Conduct_Final.pdf

[44] California PUC Demand Response Provider requirements: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/registered-demand-response-providers-drps-aggregators-and-faq

- Complaints and dispute resolution
- Privacy and cybersecurity

Services Provider Governance

- Oversight roles and responsibilities
- Reporting and auditing

Conclusion

There is a recognized need for significantly expanding consumer participation in providing flexibility services from their resources to enable a clean energy transition in the United States. The opportunity is to realize the 150 GW (4×) potential increase in responsive consumer load management. The challenge is evolving the consumer engagement model from traditional approaches to a partnership that reflects consumer behavioral considerations. This paradigm shift is necessary to reach Main Street consumers in order to scale and sustain participation. As discussed in this paper, there are five key takeaways for consideration regarding a consumer empathetic approach.

1. Think differently about consumer resource management than in the past because (a) consumers own the resources and the electric industry needs permission and (b) much of the flexibility needed involves more frequent and continuous operation.
2. Establish guidance adopting flexibility program design principles and specific consumer considerations required for the development and operation of CER flexibility initiatives. This is based on a foundation of establishing consumer trust through transparency and consumer-friendly communications.
3. Develop consumer partnership models based on trust and an understanding of consumer decision considerations regarding co-production of flexibility services.
4. Identify and develop effective value propositions for CER flexibility that speak directly to consumers' interests, including their financial and social benefits, while ensuring their health and safety.
5. Establish consumer engagement and protection guidelines for the implementation of flexibility programs, including consideration of a CER aggregation code of conduct or other consumer engagement best practices.

The following questions are offered to facilitate stakeholder discussion of these key considerations.

- How will increased use of frequent and continuous flexible CER management at scale impact respective consumers' lives and businesses?
- What level of trust is necessary to meet the required levels of sustained consumer participation?
- How will the quality of consumers' electric services be ensured, even enhanced, through flexibility services?
- What is the appropriate standard for consumer-friendly communications that overcome present knowledge and information gaps regarding electric service, rates/incentives, and billing?
- What steps will be necessary to ensure a consumer-empathetic approach to flexibility program design?
- Is there sufficient recognition of the need of—and effective methods for—digitalization/social

media in order to meet consumers where they are?

- How will the principles regarding consumer co-production be incorporated into design?
- How will flexible program designs ensure shared beneficial outcomes for consumers?
- How will potential consumer health and safety concerns with flexibility services be addressed?
- What guidance is needed to protect consumers' interests in the solicitation for participation and operation of flexibility services?

Appendix: Flexibility Services Provider Code of Conduct

A. Applicability

This code of conduct (Code) is applicable to any entity that engages customers and their resources to participate in the provision of flexibility services for the power system. This includes CER aggregators, and DER program administrators (e.g., utilities, state energy programs, community choice aggregators).

B. Consumer Enrollment

Advertising and Promotion

Aggregators must ensure that any representations (including verbal statements, advertising, and sales materials) are accurate and current to the best of their knowledge and do not intentionally deceive customers into making decisions under false pretenses.

All performance claims, testimonials, and claims about energy savings, technical performance, financial payback, or income from energy flexibility services in advertisements and sales promotions must:

a. Be clearly attributed to a source and not be the personal opinions or advice of those making representations (which shall not be expressed to influence customer decisions);

b. Withstand third-party scrutiny regarding reasonable underlying assumptions and be made available to the Scheme Administrator upon request;

c. Follow accounting best practices; and

d. Include a statement of the level of risk to the customer's potential revenue.

Sales Behavior

A relationship between aggregators and customers must be initiated in an honest and technically proficient manner. Accordingly, sales materials must be accurate, and sales representatives must behave with honesty and integrity. This Code requires sales staff to be properly trained to communicate technicalities to customers and provide reliable data to back up product claims. Additionally, staff must behave in a manner that does not deceive, pressure, or harass potential customers. Aggregators should be held responsible for all sales-related actions of their employees and of third parties contracted to sell on their behalf. Service providers must adhere to all applicable consumer protection laws and regulations.

Competition

Aggregators must comply with federal and state antitrust laws and regulations regarding anti-competitive behavior.

Proposals (Customer Financial Benefit, Any Costs and Assigned Risks)

Development of flexibility services proposals must be fair and accurate and should not deceive customers into signing up for services they do not want. Therefore, all relevant benefits must be clearly described, any fees clearly and thoroughly explained, and the flexibility services requirements clearly presented to customers.

Aggregators must provide the customer with a thorough written proposal before the arrangement is agreed to and the contract signed. At a minimum, the proposal must include:

a. Full detail of the confirmed and potential benefits under the terms of the agreement;

b. Flexibility services co-production requirements for the customer;

c. A clear and transparent statement of the operational parameters under which the customer will be dispatched;

d. Any financial estimates; and

e. A detailed quotation.

Aggregators will provide the customer with a written estimate that is based on the information the customer has given them and will make clear whether the numbers used in the estimate are definite figures or assumptions.

Contracting

A customer must be presented with a standard flexibility services contract form that clearly states the terms and conditions and that also makes the customer aware of their share of benefits, risks, liabilities, and obligations. This includes providing a plain-language, jargon-free standard template "Key Facts" document along with a second document with the finer details. This ensures that aggregators and customers enter into agreements that are mutually acceptable.

Before the customer enters into a flexibility services contract, a flexibility services provider must, in writing:

a. Inform the customer that they are entering into a legally binding contract; and

b. Inform the customer that they may owe legal obligations to other parties (apart from the flexibility services provider, such as an ISO) as a result of entering into the contract and provide details on what those legal obligations are and to whom they are owed.

C. Flexibility Services Operations

Communications and Channels (Before, During, and After)

Participating customers must be provided with adequate notice before the operational period would start. This is necessary to ensure participating customers have an opportunity to take appropriate action, if they would choose to do so.

Automation Transparency (Process and Technology)

Aggregators must provide documentation clearly explaining what technology will be used to provide the flexibility services. This includes any constraints on the use of a consumer's resource as a result of co-production of the service. Additionally, the operation of the flexibility services must also be described clearly, including the role and responsibilities of the participating customer. This includes providing customers with visibility regarding how their resource will be controlled individually and as part of a larger aggregation, if applicable. Additionally, customers must be provided with the ability to override or opt out of automation events.

Operational Parameters for Consumer Health and Safety

Flexibility services operations must respect customer health and safety issues before and during operational dispatch and during extreme weather events. Operational constraints consistent with governmental health agencies' guidelines[45] must be incorporated into the flexibility services operating parameters and reflected in the services contract.

Performance Metrics and Feedback

Flexibility services providers must provide participating customers with clear and consistent feedback in a timely manner on the customer's performance in providing the flexibility services (after operation) and the tangible shared benefits among the customer, CER aggregator, broader power system, and society. Continued co-production of flexibility services by customers is dependent on reassuring, justifying, and providing transparency and accountability.

[45] For example, Health impact of low indoor temperatures. Regional Office for Europe: World Health Organization; 1987

D. Administrative

Complaints

Aggregators must provide customers with a procedure and system for registering complaints and resolving disputes. The procedure will address the process steps and the timing to resolve a customer complaint, including the steps a customer can take if they are unable to resolve the complaint within a defined period of time, including filing a complaint with a Regulatory Authority.

Privacy

Aggregators must comply with their obligations under applicable consumer data protection laws in the collection and processing of PII and other sensitive consumer data. In addition, flexibility services providers must adhere to the U.S. Department of Energy (DOE) DataGuard Energy Data Privacy Program Voluntary Code of Conduct.[46] The CER aggregator must inform each participating customer within each flexibility services contract of information concerning the conditions of use of customer information and explicit permissions required of the customer.

Cybersecurity

Aggregators must take appropriate and proportionate technical and organizational measures to manage cyber risks, consistent with the applicable National Institute for Standards and Technology (NIST), North American Electric Reliability Corporation (NERC), and other cybersecurity frameworks and standards.[47] This is to ensure the security of their cyber systems and those communications and information interfaces with consumers' devices and to provide proper responses in the event of a system failure.

E. Services Provider Governance

Oversight

Regulatory oversight of customer flexibility services agreements and service providers' compliance with this Code is required. All flexibility services providers must be registered with a Regulatory Authority and comply with the rules established.[48] Consumers must be made aware of the regulatory oversight, the applicable rules and standards, and processes for initiating a complaint.

If a Regulatory Authority has reason to believe a Code violation has occurred, either based on its own assessment or a complaint received, it should investigate. The Regulatory Authority should have the power to investigate after notice and opportunity for a public hearing. If it finds a violation occurred, it should be able to enter any orders as may be in the public interest to appropriately enforce the Code within the Regulatory Authority's statutory authority.

Reporting

A flexibility services provider should be in full compliance with a code on the date ordered by the applicable Regulatory Authority. This would be evidenced by a flexibility services provider filing with the applicable Regulatory Authority for review and approval and a compliance plan demonstrating adequate procedures in place that adhere to the Code to ensure fair and equitable dealings.

Record Keeping

Aggregators must keep a record, for a minimum number of years from any sales activity, of the written information provided to a customer during a sales visit, including but not limited to printed or electronic sales communications with customers that they or their representatives make. This record may be kept in printed form, digitally or in any other format, and must include all site-specific performance calculations on

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

[47] NIST Cybersecurity Framework, 800-53, 800-171 https://www.nist.gov/cyberframework

[48] California PUC Demand Response Provider requirements: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/registered-demand-response-providers-drps-aggregators-and-faq

which they have based predictions of savings or periods of recovery. Aggregators must supply all relevant records to the Regulatory Authority, when requested.