A Tale of Two Frameworks – Advancing Flexible Load Program Engagement by Redefining Engagement Frameworks and Pathways for Success

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ABSTRACT

Challenges with engaging nonparticipants in demand response (DR) programs have long persisted in the industry. While the existing body of research on customer engagement in energy efficiency programs is relatively robust with theoretical and practical frameworks in place, this is not well researched or understood for DR programs. These programs operate under a different set of ground rules—the most prominent differences are the importance of continuous engagement and customer benefits, which are harder to quantify when considering factors beyond incentives. The dependence of DR program success on customer willingness and ability to adjust their energy usage patterns long after initial enrollment necessitates a new set of frameworks and success metrics to inform who to target, how to engage them, and what strategies ensure sustained participation and desired outcomes on an ongoing basis. This paper explores, defines, and proposes new, better-fitting frameworks for customer engagement with DR programs. We offer two distinct engagement frameworks—one for residential customers and one for commercial customers. The residential framework has been tested, and the results are presented here. Building on insights from the residential framework and past commercial DR customer research, we also hypothesize a commercial framework, which we plan to test in future work. These frameworks incorporate elements of the hierarchy of effects models and theory of planned behavior/reasoned action, explore determinants of DR engagement, and illuminate customer perceptions, drivers, and blockers. By clearly outlining a path to reach more customers and the right customers, this paper provides valuable insights to help utilities and program administrators meet their load flexibility targets.

Introduction

Demand Response (DR) programs have been a core component of energy system planning for more than 40 years. Over that time, DR has evolved significantly, driven by advancements in enabling technologies, the rise of distributed energy resources (DERs), electrification policies, and changing regulatory mandates. However, much of the innovation has centered on operational capabilities, technical potential, and performance metrics. Far less attention has been paid to one of the most critical determinants of program success: how to effectively engage customers so they choose to enroll and continue to participate.

This lack of focus on customer engagement has contributed to persistent challenges in attracting and retaining nonparticipants in DR programs. While the energy efficiency sector benefits from a relatively mature body of research and well-established engagement frameworks, load flexibility programs, including DR, operate under different ground rules. These programs require ongoing behavioral participation rather than one-time decisions, and the value proposition to customers often extends beyond clear, quantifiable incentives. Further complicating matters, commercial and residential customers present unique opportunities, motivators, and barriers to engaging with DR programs, and utilities need widespread, sustained engagement across both groups to meet increasingly aggressive and complex load flexibility targets. The success of these programs depends heavily on customer willingness and ability to adjust energy usage patterns, either temporarily or on a recurring basis. As such, they

demand a new set of engagement frameworks and success metrics rooted in behavioral science and informed by real customer experience.

To close this gap, the customer experience must evolve in parallel with program design. Extreme weather events and emerging grid challenges underscore the urgency of unlocking responsive, flexible load, but the infrastructure alone is not enough. A customer-centered approach is essential, aligning program design with diverse motivations, perceived value, and barriers to participation.

This paper addresses that gap by exploring, defining, and proposing better-fitting engagement frameworks and metrics for DR and other load flexibility programs. Specifically, it presents two distinct frameworks: one for residential customers and one for commercial customers. The residential framework has been tested, and the results are presented here. Building on insights from the residential framework and past commercial DR customer research, we also hypothesize a commercial framework, which we plan to test in future work. Both frameworks draw on behavioral theories such as the hierarchy of effects model and the theory of planned behavior/reasoned action.

Xcel Energy Colorado Demand Response Programs

Xcel Energy Colorado is committed to reducing carbon emissions from electricity delivered to customers by 80% by 2030 and achieving 100% carbon-free electricity by 2050. A key strategy for meeting these goals is the evolution of the utility's demand management portfolio. Expanding and refining DR programs is essential for integrating more renewable, non-dispatchable energy sources and optimizing investments in a modernized electric distribution grid.

Xcel Energy already offers a diverse range of residential and commercial DR programs and is focused on maximizing participation in current offerings and identifying opportunities to engage customers not currently served by existing products. The utility aims to understand what motivates or deters customer participation to better tailor its offerings and enhance system-wide benefits. One of Xcel Energy's key goals for this research is to identify how to maximize the impact of its programs cost-effectively, without compromising safety or reliability. To achieve this, Xcel Energy seeks to better understand the behavior of customers who participate in current and future demand management programs, enabling a more accurate understanding of the level of effort customers are willing to take during control events.

Theoretical Framework – Residential

The Residential DR Customer Engagement Framework we propose builds on two complementary theoretical models:

- Hierarchy of Effects (Lavidge & Steiner, 1961): Describes how individuals move from awareness to action in response to messaging, moving from the cognitive (thinking) to attitudinal/affective (feeling) to conative (doing/acting).
- Theory of Planned Behavior (Ajzen, 1991): Captures the psychological factors underlying behavior, including intentions, attitudes, perceived control, and social norms.

To adapt these models to the complexity of DR decision-making, we incorporated insights from behavioral science (Karlin et al., 2015), energy literacy (Ehrhardt-Martinez et al., 2010), and customer engagement literature (Wood & Newborough, 2003). At the core of the resulting DR Customer Engagement Framework is a deceptively simple idea: enrolling in a DR program is not a single decision but rather two distinct major decisions, each followed by a series of smaller, supporting decisions. First, a customer must opt in to be a part of a program. Then, they must respond and engage, and do so continuously and predictably. The framework captures this dual decision-making process by mapping

seven critical stages of the customer journey, each grounded in theory but tailored to the reality of residential energy behavior (see Figure 1 below). We do not assume a single linear path, but instead allow for the non-linear, emotional, and contextual nature of residential decision-making.

While grounded in theory, this framework offers practical application—each stage offers a potential leverage point but can also present a potential barrier. As such, this framework helps connect the dots and supports smarter segmentation, messaging, program design, and implementation. This framework sets the stage and makes it easier to understand those leverage points. Together, the determinants in the figure below allow us to paint a much more complete and predictable picture of how to drive enrollment *and* actual behavior change.

	Determinants	Hypotheses
Cognitive	Attention	Individuals who do not pay much attention to paying utility bills, personal energy usage, interacting with their utility, and reading about energy issues are less likely to be good candidates for demand response participation.
	Energy Literacy	Customers who understand basic energy concepts are more likely to be good candidates for demand response participation.
Affective	Awareness	Customers who are unaware of demand response offerings are unable to participate in these offerings until they become aware.
	Attitudes	• Customers who value the environment are more likely to participate in demand response offerings. • Nonparticipants who have specific concerns with program details are unlikely to participate unless they are supported to change those attitudes through outreach and education.

	Determinants	Hypotheses
Conative	Investment	Non-participants without required technologies are not likely to participate in demand response programs that require those technologies.
	Energy Literacy	Customers with specific attitudes and values (e.g., environmental attitudes, locus of control, trust in utility) are more likely to participate in demand response programs.
	Behavior	Customers with attention, high energy literacy, awareness, and relevant attitudes are more likely to enroll in demand response programs and participate if they intend to take action and change behavior.

Figure 1. Residential customer DR engagement framework

Theoretical Framework – Commercial

For commercial customers, hierarchy of effects models also provide a useful starting point, but with a key modification: Our past research shows that commercial customers are primarily driven by the value proposition and risk to their business operations, financial outcomes, and reputation rather than by affective factors. While we recognize that affective factors like corporate values, brand image, and commitment to sustainability can still influence participation, the difference is usually in the weight given to affective versus analytical factors. Our research suggests that affective reasons are secondary or intertwined with analytical motivations. Thus, our model proposes replacing the affective stage with an analytical stage for this customer segment, wherein, for commercial customers, a hierarchy of effects model would look like: cognitive > analytical > conative stages.

Building on the hierarchy of effects framework and our findings from research with commercial customers and account managers about load flexibility and DR, we propose a commercial customer engagement framework for load flexibility in Figure 2. We detail these stages following the figure.

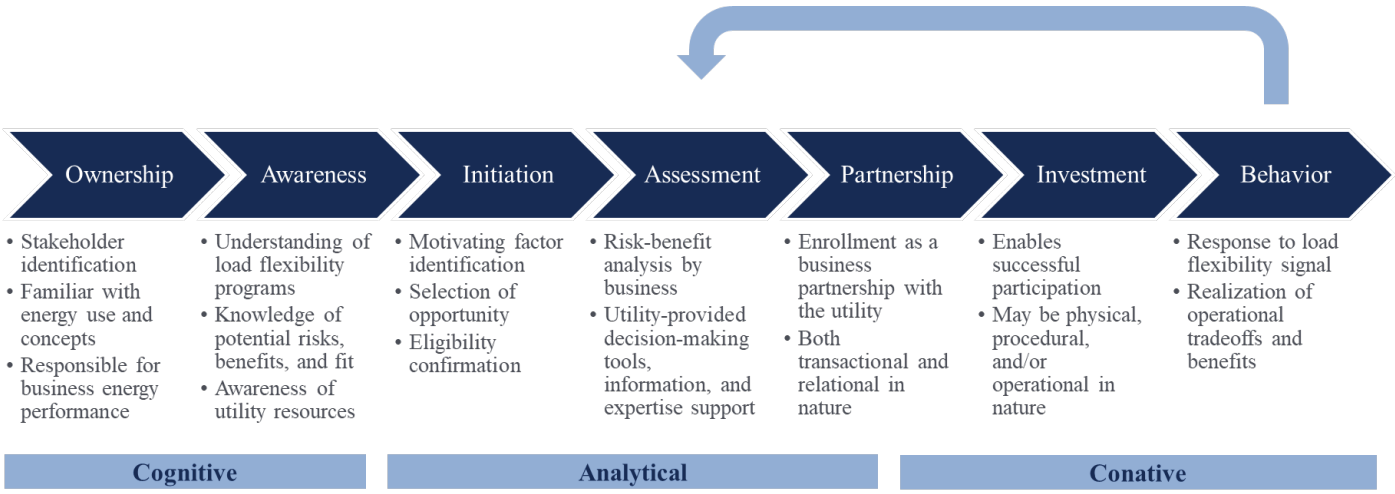

Figure 2. Commercial customer DR engagement framework

Ownership. In the first stage, one or more staff within the commercial organization takes ownership of the business's energy use and the utility relationship (the "owning individual"). They may be tasked with managing the energy use in the business facility and reducing energy costs. Identifying the individual(s) within an organization with energy knowledge and responsibility is critical for the utility, as this is the person that their marketing must reach. In many organizations, the individual with ownership over energy use, the utility relationship, and related decision-making may need to engage other stakeholders and speak to their interests or concerns to facilitate participation in a DR program.

Awareness. Next, the commercial organization, via the owning individual, becomes aware of one or more load flexibility offerings from the utility. During this stage, it is important that the utility provides enough information for the customer to develop an understanding of the portfolio of load flexibility offerings, the potential risks and benefits of each, and an initial sense of which programs might be a good fit for their own business. Utilities may choose to present a menu of programs or to focus on programs for which the customer is most likely to be eligible and a strong fit. In addition, the owning individual(s) should learn about utility resources that can support their decision to participate. Examples include access to individuals like their account manager or a small to medium business customer support team, calculators for rates or program incentives, and easy access to historic data on their hourly consumption, peak demand, and other energy consumption patterns.

Initiation. The initiation stage is when the customer moves from nonparticipant to near participant status. At this stage, the owning individual has decided to consider participation in one or more load flexibility offerings. This typically involves identifying a business motivation for considering the program (e.g., saving money on energy costs, supporting the grid and community), identifying one or more programs of interest, and confirming eligibility.

Assessment. Most businesses will conduct some form of cost-benefit analysis of enrollment in the offering to determine if it will be financially beneficial and operationally feasible. This may involve analyzing data under different scenarios and engaging with internal stakeholders in decision-making or operational

authority. Utilities can support the owning individual throughout this process to increase the chances of conversion from near participation to active participation. While mainly a customer-driven stage, engaging in this process provides the utility an opportunity to create standardized resources to support future potential participants and allows utility staff, such as customer service representatives and account managers, to gain more insights into the operational realities and decision drivers of their own commercial customers. A utility that is not adequately prepared can dampen the success of this stage if information and data are not readily accessible to support the customer's decision-making process.

Partnership. In this stage, the customer decides to enroll in a load flexibility offering. For many commercial customers, this may be viewed as a business partnership in which they offer something to the utility (load flexibility) and the utility pays them for that service. While this may seem transactional, this stage also involves a relational element—the utility can ideally trust that the business will fulfill their commitments to support the grid, while the business trusts that the utility will continue providing reliable service and fairly compensate them for their load flexibility.

Investment. The investment stage can make the difference between load flexibility enrollment and performance. Investment can take many forms and will occur before partnership in some cases. For example, for a direct load control program with a particular enabling technology required, an investment in physical hardware must come first. For behavioral programs, investment can come later and may involve creating an event response plan, determining how to shift operations in response to a new pricing signal, or developing expertise or processes to track the financial and operational implications of load flexibility on the business. The utility can reduce startup costs for businesses and make this accessible to a larger variety of organizations by providing tools and technical assistance (i.e., building on what has been successful for similar businesses) that can serve as a starting point. Such utility support is particularly beneficial when an enabling technology or behavior aligns with a utility's energy efficiency programs, thereby supporting multiple utility goals and avenues for customer bill reductions.

Behavior. In the final stage, the commercial customer makes changes to their load in response to the event or pricing signal. While the mechanics of this will vary based on the intervention—ranging from not modifying thermostat setpoints during a direct load control demand response event, to cancelling a manufacturing shift during a behaviorally-based event during critical peak hours, to shifting daily operations to better align with a time-of-use pricing signal—this is the stage where the investment and partnership come together and when the customer learns if their cost-benefit analysis was accurate. Business customers may be more scrupulous than residential customers in regularly reassessing their fit for the program or rate and whether it benefits their business. Utilities should continue to act as partners throughout this process to support customers in improving their performance and redirect them to better-fitting programs if their selection was not optimal for their operations or risk tolerance.

Methodology

The study included four separate primary data collection efforts with Xcel Energy customers in their Colorado and Minnesota service territories.

The study team conducted a quantitative survey of residential customers about the utility's DR programs to test the residential DR engagement framework. The survey was conducted in two waves and focused on nonparticipants, although it also included a small sample of 85 participants for comparison purposes. A new residential behavioral program, Energy Action Days, was added to the portfolio and included in Phase 2. The study ensured sufficient sample sizes of electric vehicle (EV) owners and customers with solar generation. Following the survey fielding, the study team applied post-stratification

weights to align survey responses with the utility customer base. Table 1 documents the survey fielding details.

Table 1. Residential nonparticipant data collection

	Phase 1	Phase 2
Survey Design	Modules exploring attention, literacy, engagement, awareness, investment, and enrollment	Same modules as Phase 1 + Energy Action Days and demographics modules [a]
Sample Frame Description	Random sample of Xcel Energy customers in Colorado service territory Panel of EV owners	Screened out respondents and nonrespondents to Phase 1 survey
Sample Size	29,773	19,068
Screening	Current program participants Ineligible nonparticipants (i.e., residents of multifamily homes, renters, customers without central cooling)	None
Fielding Dates	May 2024–June 2024	October 2024–November 2024
Incentive Amount	$10	$10
Survey Completes	Eligible nonparticipants = 487	Nonparticipants = 402 Participants = 85

[a] Energy Action Days is a population-level voluntary energy conservation program deployed under peak conditions.

The survey was designed to support an understanding of the demographics, technology ownership, awareness, knowledge, and attitudes of residential customers who do not participate in DR programs. It sought to gauge these customers' interest in, motivation for, and barriers to participation. It also tested the theoretical framework that nonparticipants' level of attention paid to their energy expenses, energy literacy, awareness of DR, attitudes towards energy, and willingness to invest are associated with their likelihood to participate in DR programs in the future.

The study team also conducted two sets of in-depth interviews with nonparticipants in the utility's commercial load flexibility programs. The interviews were conducted across two different service territories and focused on medium- to large-sized commercial customers and their motivators and barriers to program participation. In addition, the team interviewed Xcel Energy account managers of large commercial customers to gain their perspectives on recruiting customers into DR programs. These efforts are summarized in Table 2.

Table 2. Commercial customer data collection

	Study 1	Study 2	Study 3
Research Design	In-depth, semi-structured interviews focused on how account managers explain DR programs to customers, customer motivations and barriers faced during recruitment, and types of customers perceived to be strong fits for various product types	In-depth, semi-structured interviews with modules on engagement with energy expenses, satisfaction with and awareness of current rate, recruitment material recall, interest/fit and barriers to Critical Peak Pricing (CPP) Pilot participation, and firmographics	In-depth, semi-structured interviews with modules on participant motivation, program experience and satisfaction, barriers to event participation, unenrollment reasons, program improvements, and firmographics
Sample Frame Description	Purposive sample of account managers in Colorado territory identified by product staff	Business customers eligible for the CPP rate in Minnesota that received marketing materials but did not sign up, prioritizing customers that expressed interest	Business customers currently or previously enrolled in the Colorado Peak Day Partners (PDP) Program that were not taking part in events
Sample Size	Eight account managers	203 customers	Five current and former participants
Screening	None	Respondent is responsible for relationship with the utility and knowledgeable about facility energy use and costs	Respondent receives PDP event bid offers and is involved in decision-making process for event participation
Fielding Dates	October 2023	November 2024–January 2025	February 2025
Incentive Amount	None	$130	$100
Interview Completes	8	10	Complete interviews: 2 Email feedback: 2

Residential Customers Results

Customer participation in residential DR programs is essential for grid flexibility and decarbonization. However, enrollment rates and sustained engagement remain unpredictable for all but the most long-tenured programs. Despite improvements, the emergence of new program designs and pilots testing those designs, the customer journey remains poorly understood, limiting program uptake and persistence. Traditional program outreach efforts frequently conflate awareness with understanding, interest with action, and eligibility with accessibility.

We first introduced a theory-driven DR Customer Engagement Framework at the 2024 ACEEE Summer Study, where we proposed that enrollment and sustained behavioral engagement are distinct yet interconnected decisions (Steiner, 2024). That earlier work laid the theoretical foundation, rooted in behavioral science and marketing models, for understanding the layered and non-linear nature of residential customer participation in DR programs.

To build on that foundation and test the framework in a real-world context, we conducted a large-scale research study in partnership with Xcel Energy Colorado. This paper extends our earlier work by applying the model to survey findings and identifying key determinants that shape DR program engagement across program types and customer segments.

Two-thirds of nonparticipants (66%) are eligible for Xcel Energy's Existing DR programs, namely Saver Switch, AC Rewards, Optimize Your Charge, Charging Perks, and Renewable Battery Connect. We refer to these as "technology-based" DR programs primarily because they require either DERs (such as

batteries or EVs) or enabling technologies (such as smart thermostats and EV chargers) to enroll. Not-surprisingly, nonparticipants eligible for technology-based programs differ from ineligible nonparticipants across a range of demographic and housing characteristics. Specifically, they are more likely to reside in single-family residences, more likely to be homeowners, more likely to have incomes of $100K+, more likely to have higher levels of educational attainment, and certainly more likely to have DERs and enabling technologies. Given these differences, we differentiate between nonparticipants eligible and ineligible for technology-based programs, where relevant, when exploring determinants of program engagement. Below, we discuss our learnings across the key determinants mapped in the framework above.

Attention. *Measurement approach: Survey questions measuring the duration of interactions with Xcel Energy and engagement with energy bills and usage*. Most nonparticipants (69%) spend less than 10 minutes per month interacting with Xcel Energy or reviewing their bills. Autopay enrollment, which correlates with lower engagement levels, is common (52%). Attention levels did not differ meaningfully across key demographic segments or correlate with DR program awareness or engagement. Attention is a weak predictor of DR program engagement. The degree of attention is not correlated with literacy, awareness, attitudes, or other determinants of engagement. Low attention is common across the country.[1]

Literacy. *Measurement approach: A series of seven survey questions testing knowledge of grid constraints and grid resiliency. An example question is "The cost of producing/delivering energy at 6pm is higher than at 6am."* Energy literacy was relatively high among Xcel Energy nonparticipants, especially among higher-income, single-family homeowners with DERs. Over half (58%) of nonparticipants demonstrated high energy literacy. Energy literacy is positively correlated with favorable attitudes toward DR and interest in DR program engagement, especially with Optimize Your Charge and Charging Perks programs, suggesting opportunities for education to shift perceptions.

Attitudes. *Measurement approach: A series of questions measuring knowledge of energy usage, energy conservation consciousness (e.g., how often customers make an effort to live in ways that reduce energy and likelihood to make changes to daily routines with energy conservation in mind), energy mindfulness (how often customers consider energy usage then making key purchases), community mindfulness (how important it is for customers to do their part to make Colorado more efficient), and trust in Xcel Energy.* Nonparticipants demonstrated high levels of energy and community mindfulness, as well as conservation consciousness. Trust in Xcel Energy was strong and correlated with willingness to engage with DR programs. Trust emerged as a powerful determinant, especially for the Optimize Your Charge and Charging Perks programs. Programs can nurture trust through transparent communication and reliable delivery, but also actively leverage existing trust to deepen engagement and encourage sustained behavioral participation.

Awareness. *Measurement approach: Survey questions measuring unaided awareness of the term DR, aided awareness of Xcel Energy's DR programs, and ability to explain the concept of DR*. Half of nonparticipants (51%) are aware of the term "demand response," with awareness higher among those eligible for DR programs. However, many of those aware cannot accurately explain what DR is. Among those familiar with the term, only 49% are familiar with Xcel Energy's specific programs.

Limited understanding was linked to lower environmental and community-oriented attitudes and reduced interest in enrollment, suggesting that shallow awareness may hinder engagement more than a complete lack of knowledge. Simply raising awareness is insufficient; messaging must enhance customers'

[1] https://www.greentechmedia.com/articles/read/customers-spend-8-minutes-a-year-interacting-online-with-their-utility?

understanding and ensure they can meaningfully interpret what DR is and how it aligns with their values and behaviors.

Investment. *Measurement approach: Survey questions measuring likelihood of early adopter behaviors.* Only 4% of nonparticipants qualify as strong early adopters, while 72% fall into a moderate likelihood category. Participants are more likely than nonparticipants to exhibit early adopter traits, which align with characteristics such as higher education and income, homeownership, and DER ownership. Early adopters also display stronger conservation consciousness, energy knowledge, and community mindfulness. However, these traits are not associated with DR-specific literacy or trust, nor do they consistently translate into greater interest in DR participation. Technology-based DR programs often align with early adopter profiles, making them a useful target group for DER-focused outreach. In contrast, behavioral DR programs may require different engagement strategies. Early adoption is an important signal for DER and technology-oriented program design, but it is not a reliable predictor of overall DR engagement. Understanding early adopter profiles can inform differentiated strategies for technology-based versus behavioral DR offerings.

Enrollment. *Measurement approach: Survey questions measuring enrollment likelihood and barriers to enrollment.* Enrollment interest varies considerably by program: Optimize Your Charge (72%) and Charging Perks (67%) lead in appeal, while AC Rewards (40%), Saver Switch (41%), and Renewable Battery Connect (38%) generate lower enthusiasm.[2]

Across the determinants, we gained insight into nonparticipant barriers to DR participation. Barriers are program-specific and often tied to enabling technologies. For AC Rewards, concerns about losing control and limited incentives are key deterrents. EV program hesitations center on insufficient incentives and reluctance to relinquish control over charging. For battery programs, barriers include limited understanding, low incentives, and discomfort with third-party access. These patterns highlight the importance of perceived value, transparency, and customer control, all of which vary across segments and technologies and are not uniform across customer segments. Enrollment decisions are shaped by nuanced perceptions of value, control, and clarity, each varying by program and customer type. To drive participation and sustain engagement, DR programs need to address both tangible and psychological barriers through differentiated design, tailored messaging, and transparent communication. Customers require more than eligibility—they need confidence, understanding, and compelling value propositions. Table 3 summarizes the drivers and barriers discussed in this section and implications for the residential customer load flexibility engagement framework.

Table 3. Residential customer load flexibility drivers, barriers, and engagement implications

Type	Decision-Making Consideration	Engagement Framework Implications
Driver/Motivator	Energy Literacy and knowledge	Leverage higher literacy through tailored education and messaging that highlights grid benefits and DR value
	Community and conservation values	Frame DR participation as contributing to community resilience and environmental goals
Barrier/Constraint	Low attention to energy use and bills	Reduce complexity and promote low-effort, automatic participation pathways
	Shallow awareness or misunderstanding of DR	Go beyond raising awareness to ensure comprehension of what DR is, how it works, and customer benefits

[2] Percents reflect share of customers with eligible systems and technologies interested in program enrollment.

	Concerns about loss of control (e.g., thermostat, EV charging)	Highlight customer choice, flexibility, and override options in program design and communication
	Insufficient or unclear incentives	Emphasize the total value proposition, combining financial, environmental, and community benefits
	Low perceived relevance (e.g., renters, multifamily, no central cooling)	Develop alternative offerings and clear eligibility pathways for underserved segments
	Discomfort with third-party access or enabling technologies	Provide clear assurances, data privacy protections, and transparent operational safeguards

Commercial Customer Results

Commercial customers approach demand response (DR) opportunities through a business lens—balancing financial priorities, operational realities, and reputational goals. While cost savings consistently emerge as the central driver for engagement, participation decisions are rarely straightforward. Businesses weigh the potential benefits of DR against organizational capacity, decision-making complexity, and the risk of disrupting day-to-day operations. Our research highlights how these motivations and barriers shape customer behavior, revealing that while some drivers are broadly consistent across the sector, the obstacles to participation are more diverse and context-specific.

This section synthesizes what we learned from both account managers and commercial customers: the financial, social, and operational incentives that encourage participation; the structural and informational challenges that create hesitation; and the perceptions that frame how businesses view their relationship with utilities in the context of load flexibility. Together, these insights point to where utilities can focus engagement strategies—providing clear financial value, reducing complexity, and building trust to more effectively move commercial customers from awareness to action.

Participation Drivers, Blockers, and Perceptions

Our research revealed clear themes around the motivators and barriers to DR participation among commercial customers. Account managers and customers alike confirmed that the primary motivator of DR participation in this segment is saving money. Customers are most motivated to engage in DR programs during times of fiscal constraint, when reducing operational costs becomes a priority. In these cases, DR is seen as one of several strategies available for managing energy expenses.

While financial benefits are the core driver for commercial customers to participate in DR, reputational and social corporate responsibility benefits can be a secondary motivator. This is particularly true for programs with low risk to the customer (i.e., no penalty for failure to perform). For example, account managers noted that businesses with public environmental goals may be motivated to participate in DR programs to support and demonstrate progress toward these goals. Likewise, participants in a low-risk DR offering said they remain enrolled in the program despite the poor fit because it allows them to contribute to grid stability, support the community, and be a partner to the utility.

Although the motivators of load flexibility participation are quite consistent for commercial customers, barriers tend to be more diverse. One common barrier that came up in our research is a lack of awareness and subject matter expertise. Although large industrial customers are often assumed to be highly knowledgeable about their energy use and costs, this assumption does not always hold true for small- and medium-sized businesses. These customers may express interest in DR but often lack the foundational understanding needed to make confident decisions. In many cases, they are more familiar with energy efficiency measures than with DR as a strategy for cost reduction. For example, we spoke to

medium-sized business customers about a time-of-use rate option with a unique demand charge structure. These customers had limited awareness of their current rate and energy bills, despite being the key utility contact at their business, and felt unable to assess whether transitioning to this rate would save their company money. We found that at smaller businesses, staff members responsible for managing energy use and expenses often wear multiple hats, with energy management representing only a small part of their overall role rather than a dedicated area of expertise.

Even with the right information, deciding to participate in a DR program or a rate requires a lengthy internal evaluation and process that involves multiple stakeholders. Reaching the best stakeholder to champion this process can be challenging due to dispersed decision-making as well as variation between businesses. Smaller customers without a dedicated account manager may have a harder time accessing utility resources, such as DR product experts, even as they are likely to need additional support to decide due to their lack of internal subject matter experts. While some very large customers may have the data and tools to forecast the financial benefits of a new rate or DR program participation, more moderate-sized customers want the utility to help them understand the likely benefits. Customers considered this kind of support more valuable than bill protection, even though bill protection is typically viewed as a best practice in advanced rate designs. Decisions such as determining an achievable load commitment for a season or event often require access to data, dedicated staff time for analysis, and subject matter expertise—resources that are not available to all businesses. For example, among enrolled customers in a DR offering with low engagement, one barrier was the inability to estimate their appropriate contractual obligation for individual events. In this environment, a proliferation of program options is not guaranteed to garner commensurate increases in participation and may even create a barrier to participation since evaluating the risks and benefits across many programs requires substantial effort from a would-be participant. Instead, a curated portfolio of program options must be paired with decision support from the utility to effectively move customers to program participants.

Across our research, we found that commercial customers are generally unwilling to make significant changes to their operations solely to participate in a load flexibility program. They prioritize core business needs and operational requirements over the potential benefits of load flexibility participation unless cost savings are clear and come with minimal or manageable risk. Businesses may also face periods of lower or higher operational flexibility that affect their ability to perform once enrolled in a program. Account managers observe that customers with predictable and manageable operational schedules, such as manufacturing facilities, are most interested in DR. Customers with limited flexibility may still be willing to enroll in offerings with low risks (i.e., with no penalty for failure to meet load commitments), but may have poor or irregular performance. Customers may also be more willing to enroll in programs if they have access to backup generation that allows them to support the utility without sacrificing business operations. Utilities might consider pairing products like traditional DR programs or time-varying rates with battery incentives to encourage businesses to participate in load flexibility while supporting their operations.

Given the high level of effort to assess fit for DR and other load flexibility programs, monitor risks against benefits, and shift business operations in response to pricing signals or events, business customers emphasize that program incentives must be sufficient to offset these risks and costs. Account managers also report that, given the significant effort that can be required to oversee this process for some programs, staffing constraints can limit the ability of even the relatively large customers they work with to participate.

While commercial customers bring their own unique barriers and motivators for load flexibility participation, they also face some barriers analogous to those of residential consumers. The first relates to property ownership and tenancy. Small- to medium-sized business customers often lease their business location and face similar challenges to the landlord/tenant dilemma observed in residential rental

properties. In cases where the direct utility consumer is the real estate company or property manager and where energy costs are a flat fee as a part of the business lease, the incentive to participate in DR or a time-varying rate is low. While the tenant is the one who would need to shift their operations in response to events or pricing periods, only the property manager would receive the financial benefits of this effort.

The second parallel between commercial and residential customers relates to a lack of trust in the utility. We spoke to multiple business customers who incorrectly believed that participating in a behavioral load flexibility program would enable the utility to directly limit their energy consumption during on-peak periods or events, even in a behavioral offering. These customers need clearer support in understanding the variety of options available, the risks and benefits of each, and the safeguards embedded in the offerings that protect their ability to run their business.

Table 4 summarizes the drivers and barriers discussed in this section and implications for the commercial customer load flexibility engagement framework.

Table 4. Commercial customer load flexibility drivers, barriers, and engagement implications

Type	Decision-Making Consideration	Engagement Framework Implications
Driver/Motivator	Financial benefits	Emphasize clear and compelling financial opportunities
	Reputational and social benefits	Note social and community benefits of load flexibility
Barrier/Constraint	Lack of awareness and knowledge	Provide education and information
	Dispersed and complex decision-making process	Identify appropriate stakeholder(s) to engage Provide decision-making tools, information, and expertise
	Operational priority or inflexibility	Offer a variety of load flexibility opportunities Engage best-fit customers for each program
	Uncertain risks vs. benefits	Provide decision-making tools, information, and expertise Engage best-fit customers for each program
	Landlord/tenant dilemma	Offer a variety of load flexibility opportunities, including those beneficial to customers that lease their facility
	Lack of trust in utility	Provide education and build relationships

Residential Customer Conclusions

Our research reveals the nuanced and multifaceted nature of residential decision-making around DR participation. Rather than treating customer engagement as a single point of conversion, our findings underscore the importance of understanding it as a layered, dynamic process. Residential customers navigate a web of behavioral, psychological, and contextual factors that may influence their decision-making intermittently and non-linearly over time.

We find that determinants such as energy literacy, trust in the utility, and community-oriented values play a more significant role in shaping engagement than transactional factors like attention to energy bills or even direct financial incentives. Notably, these determinants interact differently across customer segments. For example, while early adopter traits strongly correlate with DER ownership, they are not consistently associated with broader interest in DR participation. This highlights the need to move beyond a one-size-fits-all approach and tailor engagement strategies based on a more refined understanding of how customers experience and respond to DR offerings.

Ultimately, this work challenges conventional assumptions and highlights the importance of interpreting residential customer behavior not through a linear or universal lens, but as a context-

sensitive, staged journey. The framework, grounded in behavioral theory and validated through field data, offers a practical model for segmenting engagement pathways and identifying critical intervention points.

Commercial Customer Conclusions

In contrast to residential customers, commercial customers approach DR participation through a more analytical and risk-oriented lens. They prioritize operational continuity, cost savings, and reputational risk management. While many have a baseline curiosity about DR programs motivated by the prospect of energy bill savings, their lack of subject matter expertise, time, or capacity to analyze complex rate structures often prevents them from fully assessing the value proposition. Moreover, energy is often just one of many responsibilities for business contacts, making sustained engagement difficult without tailored support.

DR portfolios that clearly communicate value, reduce complexity, and align with business priorities are more likely to succeed. Engagement strategies should, therefore, be built around trust, simplicity, and operational flexibility, especially when working with resource-constrained or non-specialist business contacts.

Implications for Residential and Customer Program Design and Evaluation

These findings have several implications for how utilities, policymakers, and program implementers design and evaluate DR programs.

Refine Customer Segmentation Strategies. Go beyond basic demographics to incorporate behavioral and psychographic dimensions such as energy literacy, trust in the utility, early adopter indicators, and conservation consciousness. Use these traits to align messaging, marketing channels, and program design with where customers are in their engagement journey. Recognize that customers may require different strategies across different offerings or stages of engagement. Tailor touchpoints and program content to reflect a customer's position within the engagement framework.

Provide Clear Decision Support Tools. Create simple, user-friendly tools to help customers—particularly small- and medium-sized businesses—understand their usage patterns, evaluate program options, and estimate potential benefits with minimal time investment. Supplement tools with access to trained staff or account managers who can serve as trusted guides.

Integrate Behavioral Science into Design and Messaging. Use behavioral levers such as social norms, peer comparisons, and community framing to support enrollment and continued engagement. Test and refine messaging strategies based on the stage-specific determinants of behavior, such as shifting attitudes versus nudging commitment.

Shift Evaluation Practices Toward Multi-Stage Engagement. Move away from binary participation metrics and instead map customer behavior across the engagement framework, identifying where drop-off occurs and which supports are most effective. Use this framework to target interventions more precisely and ensure continuous program performance optimization.

Next Steps for Model Refinement and Application

To further advance this work, we recommend the following:

Deepen Validation Across Contexts. Apply the engagement framework in additional service territories, especially those with different demographic, regulatory, and DER adoption contexts, to test robustness and generalizability.

Increase Sample Size for Statistical Validity. Expand the number of customer data points to strengthen the reliability and validity of quantitative analyses, especially when comparing segments or modeling engagement determinants.

Link Engagement Metrics to Load Impacts. Combine this framework with load shape and event participation data to quantify how behavioral traits correlate with actual demand reduction and persistence over time.

Advance Equity and Inclusion Goals. Use disaggregated insights from the framework to identify underserved but eligible customer segments and ensure DR portfolio strategies reflect broader equity and accessibility objectives.

By adopting these strategies, utilities and program designers can better understand and support the complete customer participation journey. Whether aiming to increase impact, expand participation, or enhance long-term engagement, this behaviorally informed, customer-focused approach provides a clear pathway for advancing demand flexibility in today's evolving energy landscape.

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