Money on the Table: How Utility Program Planning Practices are Failing to Harness the Full Value of Demand Response

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ABSTRACT

Demand response is moving from legacy or fringe utility programs to essential components of the utility and ISO resource mix—even competing head-to-head with generation in ISO markets. But many utilities still keep DR in a silo of the DSM program group where system planners and grid operators have little input to program design and little confidence in the value of securing or dispatching the DR resource. This paper proposes the hypothesis that common practices at U.S. utilities in developing and utilizing DR programs are insufficient to ensure the continued expansion of DR resources that will be used by system planners to defer alternative capacity investments and by grid operators as a substitute for the dispatch of peaking units. Citing anecdotes from a variety of utility programs, the paper makes the case that most utilities are not fully realizing the potential value of their DR resources.

Introduction

The number of demand response (DR) programs continues to expand throughout the United States, and DR is is growing in importance both as a reliability resource at utilities and as a policy priority within the federal government (FERC, 2010; Wellinghoff, 2010). DR is moving from legacy or fringe utility programs to essential components of the utility and ISO resource mix—even competing head-to-head with generation in ISO markets. However, many utilities have not modernized the way they design and utilize DR resources. Too often utilities keep DR in a silo of the demand-side management (DSM) program group where system planners and grid operators have little input to program design and little confidence in the value of securing or dispatching the DR resource.

This paper proposes the hypothesis that common practices at U.S. utilities in developing and utilizing DR programs are insufficient to ensure the continued expansion of DR resources that will be used by system planners to defer alternative capacity investments and by grid operators as a substitute for the dispatch of peaking units—especially outside of organized markets run by independent system operators (ISOs). This hypothesis was developed through the author's experience assisting utilities in designing and evaluating DR programs over a period of more than five years. It is currently being tested through a series of in-depth interviews with utility DR program managers and staff from resource planning and grid operations groups. The specific contentions contained in this paper are based on direct observations and are supported by anecdotes where possible.

In the context of this discussion, "DR resources" are defined as those utility-administered programs or third-party contracts that provide load curtailment in response to discrete, finite events initiated by the utility. This includes residential direct load control, commercial/industrial load curtailment events, and critical peak pricing so long as the resource provides load reductions during a discrete, non-routine event and the reductions are either automated or enforced via contract. Thus, regularly scheduled time-of-use rates and voluntary reductions from smart grid/information programs are not considered DR resources for purposes of this discussion. This paper may use the terms "DR resource" and "DR program" synonymously.

Program Drivers and Utility Roles in Program Planning

In theory, the value of a DR resource depends on the amount of curtailable MW, the frequency and duration with which the curtailments can occur, and the direct measure of value provided by the curtailments, such as the avoided cost of long-term capacity, fuel cost savings from reduced turbine starts, and any other financial or non-monetary benefits. In practice, however, the value realized by utilities is heavily influenced by two additional factors:[1]

1. Drivers of (rationale for) program development; and
2. Roles in program planning and design within the utility.

Drivers of DR Programs

Demand response programs are not a fundamental and necessary part of a utility's business operations in the same way that generating plants or distribution systems are; rather, there are typically one or more drivers for a company's decision to develop a DR resource. These drivers may include, for example, a regulatory requirement or a business decision to defer generation capacity, whether for economic reasons or to buy time for permitting. While there are many possible drivers that can lead to development of a DR program, they tend to have vastly different influences on the characteristics of the resulting DR resource and how integrated the resource is within utility business operations.

Hypothesis: The drivers behind a utility's decision to develop DR resources are a strong indicator of the degree to which these resources are integrated with resource planning and grid operations functions.

For example, one of the most prominent drivers of DR, especially among vertically integrated utilities, is a regulatory requirement to offer DR programs to customers. Utilities in this regulatory situation can often meet the requirements by developing and marketing a program that attracts a modest number of participants that is considered by resource planners and occasionally dispatched by grid operations staff. However, such a program—driver by external forces rather than internal needs—is unlikely to be highly integrated with business processes and therefore is unlikely to provide great value to the utility, ratepayers, or the grid. Conversely, DR resources developed by the utility primarily to defer generation capacity (perhaps as a lower-cost alternative to new generation or wholesale supply) are more likely to be developed in a manner that achieves buy-in from planning and operations staff.

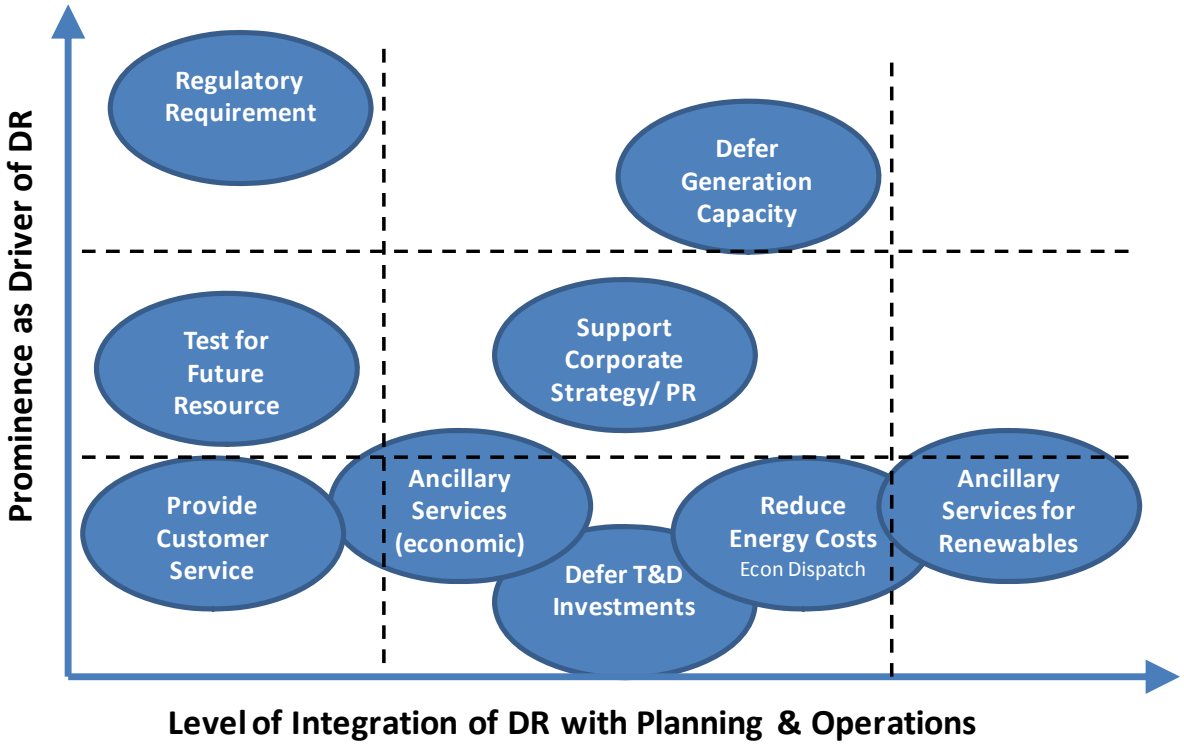
Figure 1 illustrates the relative importance of various drivers of DR, with insights gleaned from among more than a dozen utilities that the author has worked with directly or is familiar with through review of industry trade publications and participation in industry associations, conferences, and online discussion groups. A higher position along the y-axis represents a more prominent driver. The x-axis represents the relative level of integration of DR resources with utility planning and operations; a position farther to the right along the x-axis indicates that a given driver is more likely to result in a DR resource that is well-integrated with the core utility business functions. For example, a few utilities and regions (e.g., Hawaiian Electric Company, the Pacific Northwest) are investigating the use of DR to provide ancillary services to support integration of renewable energy on the grid. While these efforts are in a nascent stage, it is expected that any programs resulting from these investigations will be highly integrated with utility operations in order to provide the desired outcome.

In practice, there may be several drivers working simultaneously. A utility conducting a pilot DR program that may ultimately support renewables integration could well maintain the pilot in a silo until such time as the program grows large enough to have a significant impacts on the grid (see the "Test for

[1] Another important factor influencing the value of DR to utilities is the manner in which the programs are administered, including in-house vs. outsourced administration and the way that roles are defined, goals are set, and incentives provided.

Future Resource" oval at the far left of the diagram). However, such an approach can be risky if the resulting resource does not meet the operation needs of the control center staff charged with dispatching the curtailments (see Roles in DR Planning within the Utility, below).

Figure 1. Drivers of DR Programs and the Related Level of Integration with Utility Operations



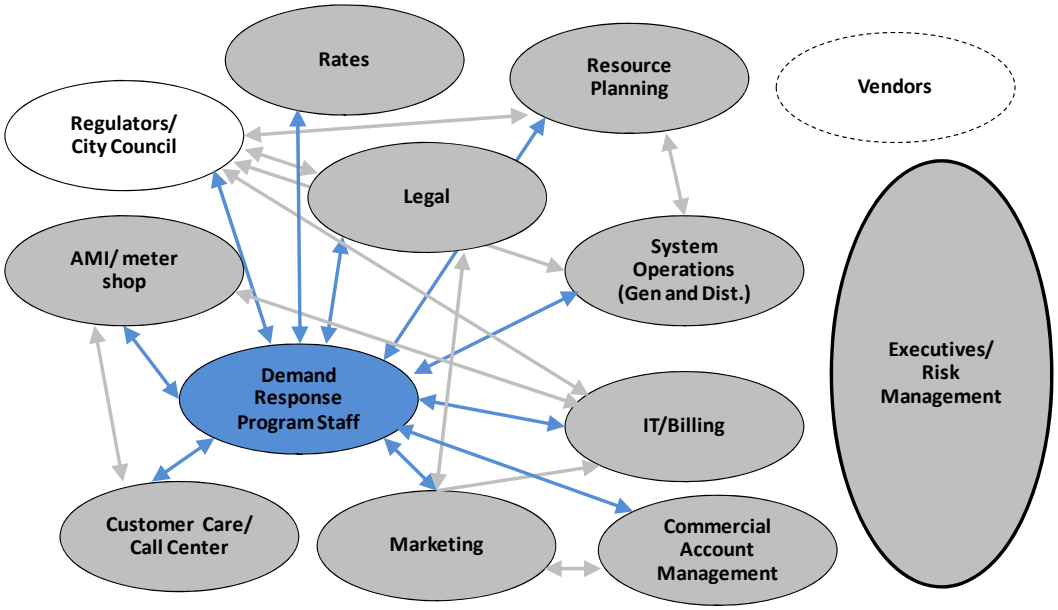
Roles in DR Planning within the Utility

Demand response programs are commonly conceived and developed by the same functional groups within the utility that oversee energy efficiency programs. While these groups may have the requisite staff and infrastructure to design programs, they must closely coordinate with other departments if the resulting programs are to become effective resources that provide value to the organizations. Whereas an energy efficiency program typically is treated as a reduction in hourly loads over the forecasted time horizon, DR resources are increasingly viewed on par with supply-side resources that are used to meet the forecasted loads.[2] As supply-side resources, they must be understood and trusted by resource planners and grid dispatchers; and as resources that rely on customer participation, they must account for a variety of considerations from departments as diverse as the call center, marketing, and the meter shops.

In fact, there may be a dozen or more departments, business units, and even outside entities that should be a part of the program planning and design process. Figure 2 presents many of these potential coordination relationships, with the darker blue arrows representing interactions with the DR program staff and the light gray arrows expected areas of DR-related interaction between other departments.

[2] See *Is Direct Load Control a Program or a Resource? The Evolution of Demand Response and Why It Matters to Utilities Developing Load Control Capability*, (Schare, 2008).

Figure 2. Required Coordination between Utility Departments for Effective DR Planning



<u>Hypothesis</u>: Close coordination between DR program planners and other functional groups within a utility results in more effective programs that are relied upon by planners and operators.

All of the functional groups in Figure 2 play a potentially significant role in the development and functioning of DR resources. Other than the designated DR program staff, rarely are any of these groups prominent players in DR program planning, however. This can lead to under-developed or under-utilized DR resources. Consider these examples related to three commercial/industrial load curtailment programs:

- **Marketing.** One utility developed program rules aimed at meeting the strict engineering requests of the grid operations group. This led to a requirement that curtailable customer loads be equipped with an under-frequency relay that would automatically trip when voltage variation exceeded a predetermined threshold. This mandatory element tied the hands of the utilities' marketing department and resulted in participation of only a single customer after more than six months of program operation. Eventually, the company relaxed the requirement, introduced additional flexibility to encourage participation, and outsourced some of the marketing functions to a third-party aggregator.
- **Resource Planning.** The value of DR resources from capacity deferral can be realized only to the extent that resource planners accept the reliability of the resource and account for DR capacity in meeting future reserve margin requirements. If planners are not included in DR program planning (or choose not to participate for lack or interest/priority), the resulting resource may remain a customer program and never become a functioning asset regardless of how many megawatts it can produce. In practice, only a share of the potential DR curtailments in utility-run programs are typically used in resource planning due to uncertainties in performance. This is analogous to the reduced capacity value often assigned to renewable resources for purposes of meeting future capacity requirements (Jaske 2008), and it reflects the resource's relative firmness compared to generation capacity. The more invested a resource planning department is in the design of a DR program, the greater the generation capacity deferrals are likely to be. In one

case, the lack of liquidated damages or similarly strict penalties for non-performance in a contract with a third-party provider has rendered the curtailable megawatts of little value for resource planning; however, the utility considers the resource to be a growing part of its portfolio and it will re-address the issue of firmness in subsequent contracting processes.

- **Grid Operations.** DR may be dispatched for a variety of reasons including to maintain reliability under system emergencies, to avoid expensive wholesale purchases, and to reduce the need to start combustion turbines for spinning reserves. Grid operators' perspectives on DR run the gamut from highly skeptical ("I'd rather have steel in the ground") to wholeheartedly accepting ("Every time we've implemented it, we've seen results"). Where they fall on the spectrum is largely a product of their exposure to DR, including input to the DR program design and personal experience dispatching and monitoring the effectiveness of DR resources. If grid stability requires a 10-minute response time, but DR program planners (absent grid operator input) unwittingly guarantee a one-hour advance notification to customers, then the resource loses much of its value. Similarly, one operator does not yet trust the 10-minute response time provided by the utility's DR program and therefore fires up a turbine when additional spinning reserves are needed rather than relying on the available DR capacity.

Conclusions

A missing link in the discussion of utility DR programs is how they contribute to deferral of generation resources and otherwise provide value to the utilities offering the programs. Even the most well-subscribed program is of little value if resource planners do not use the megawatts from the program to reduce the amount of capacity needed from supply-side resources. Similarly, there is little value unless grid operators dispatch the resource to provide economic benefits and additional reliability.

Common utility practices appear to be underutilizing DR resources by developing programs in a silo with relatively little input from departments whose participation in the planning and design process should be considered critical to shaping the resource. As a result, many DR programs are not meeting their potential in terms of size of the resource (curtailable megawatts) or the characteristics of the resource are such that planners and grid operators cannot fully utilize the megawatts to add reliability and create value for the utility. Ongoing research into utility DR planning and operational practices will shed new light on this topic and help answer the question of whether common practices at U.S. utilities are sufficient to ensure the continued expansion of DR resources that will be used by system planners and grid operators to provide value to the utilities.

References

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