How has COVID-19 impacted utilities' energy savings programs?

The composition of utilities' demand-side management (DSM) portfolios can tell us a lot about how the pandemic is likely to affect their residential and commercial programs.

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Introduction

Many pandemic impacts have been studied, noted, and written about—but for utility demand-side management (DSM) program managers, questions still remain. Given the coronavirus-induced behavior changes that have defined 2020, what are the implications for potential DSM program savings? What about customer energy demand? Program participation?

We wanted to understand how fear of the virus and the high levels of uncertainty were impacting decision making for participation in DSM programs. How would individuals and commercial and industrial customers react to the perception of risk?

To shed some light on these questions, we conducted an uncertainty analysis for a midwestern utility. Our analysis was based on limited program performance data from March to mid-June of 2020 and did not constitute a full economic analysis of the expected impacts of the global pandemic. However, it does illustrate the impact of a full-shutdown scenario on program participation.

The details of how COVID-19 will impact program participation is the first issue to address. Some of the major concerns with COVID-19 are from sharing indoor space due to limited indoor ventilation and transmission risk from people outside the household. The risk of transmission is heightened based on the infection potential of the virus despite a long delay in presentation of symptoms as well as spread from asymptomatic individuals infected. Both of these are compounded by the fact that many people are now working from home when able. These aspects pose a risk of greatly reduced program participation from residential programs as well as for commercial programs being at additional risk based on shutdowns for infection control, working from home, or business closure.

In addition to the participation impacts from the pandemic, avoided costs and the discount rates were also varied for the analysis due to other concerns from the underlying study.

The results of the analysis are shown through a select set of indicators: energy savings, demand savings, and portfolio cost-effectiveness. We share some of our key findings below.

Inputs

For this analysis, the inputs we chose were avoided energy cost, avoided capacity cost, discount rate, and participation. Each variable has a description of the boundaries defined for it as well as the distribution used for the sampling algorithm.

For the avoided energy cost, the bounds were based on scenarios used in the latest IRP for the utility with a uniform distribution for sampling. For the avoided capacity cost, the bounds were varied over time starting at 50% to 100% of the baseline and rising to 75% to 125% of the baseline by year seven and for all future years with a uniform distribution for sampling. For the discount rate, the bounds were between 3.5% and 4.5% with a uniform distribution for sampling.

TABLE 1: SENSITIVITY ANALYSIS PARTICIPATION REDUCTION PARAMETERS

Sector	Measure type	First year reduction magnitude
Residential	• Home energy reports • Do-it-yourself (e.g., lighting) • Large appliances (e.g., HVAC)	Low reduction
	• Shell measures • Energy savings kits • Smart thermostats	Medium reduction
	• Direct install • Direct load control	High reduction
Commercial and industrial	• Behavioral/SEM	Low reduction
	• All others • Smart thermostats	Medium reduction
	• Direct install • Direct load control	High reduction

For participation, the boundaries were set independently for each program, with the maximum reduction in the first year. The maximum reduction in the first year was set according to Table 1 above for each program. Large reductions were close to complete reductions, while medium and low reductions in participation were equal to three quarters and half of the participation of the baseline, respectively. The sampling used a distribution skewed towards the status quo. The boundaries were developed based on data and insight from the program implementers. After the first year, the participation increased, gradually returning to the baseline participation by the fifth year.

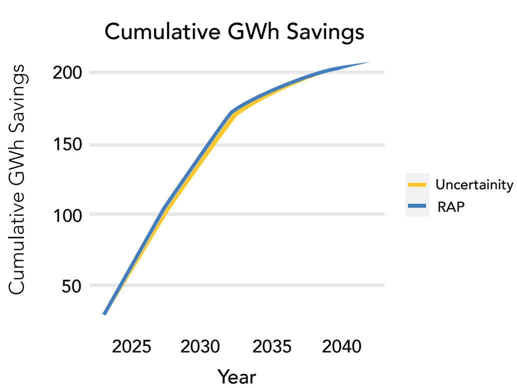
Results

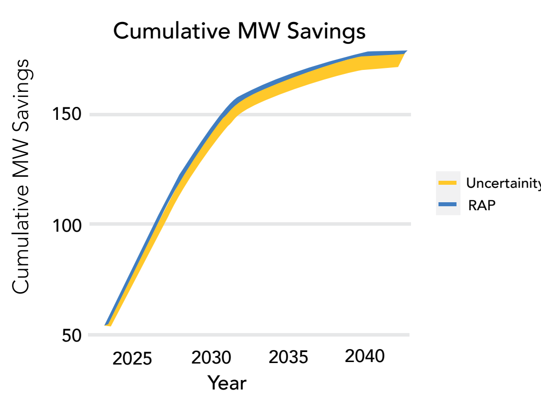
While the variation in the avoided costs and the discount rate result in a wide variation in the Total Resource Cost (TRC) test and the Program Administrator Cost (PAC) test, the portfolio remains cost effective in most cases when measures use the TRC and in all cases when measures use the PAC. In the long term, the portfolio is expected to perform quite similarly to the baseline. Participation reductions used to estimate the impacts of COVID-19 are more significant for the commercial and industrial sectors than the residential sector, but the impacts estimated through 2028 are only modest. In addition, energy savings and cost-effectiveness vary independently of each other indicating that the main drivers behind the cost-effectiveness are the avoided costs and discount rate, and not the energy savings.

1. Residential

The impact of the participation reductions on energy savings in the residential sector are minimal because most savings come from programs that only had small reductions. The impact of the participation reductions is more substantial for demand savings since DR measures are more significantly impacted. These demand savings impacts persist much more than other savings reductions due to the nature of the smart thermostat program and the expected participation trajectory.

The variation in the incremental savings in the first year is relatively substantial, with a range of roughly 15% of the baseline savings, but shrinks quickly, with a range of roughly 5% by the third year.

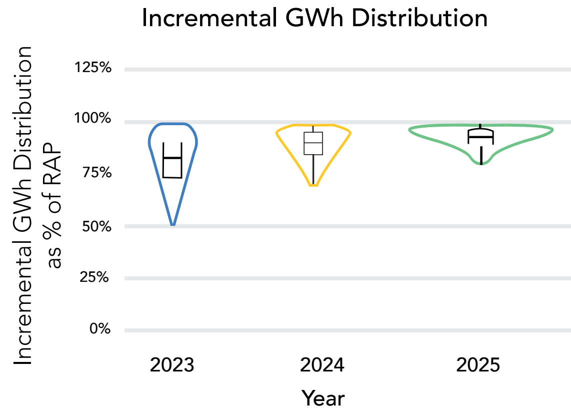


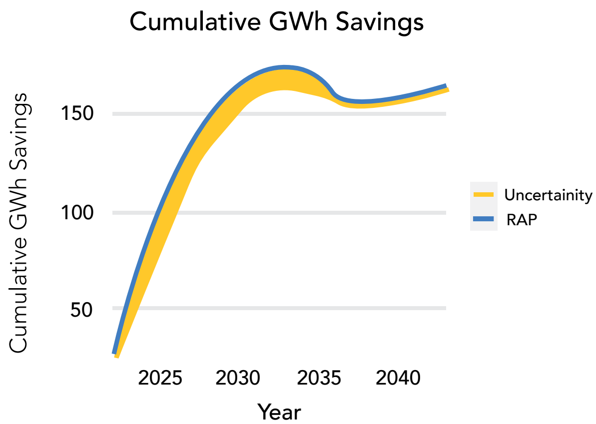


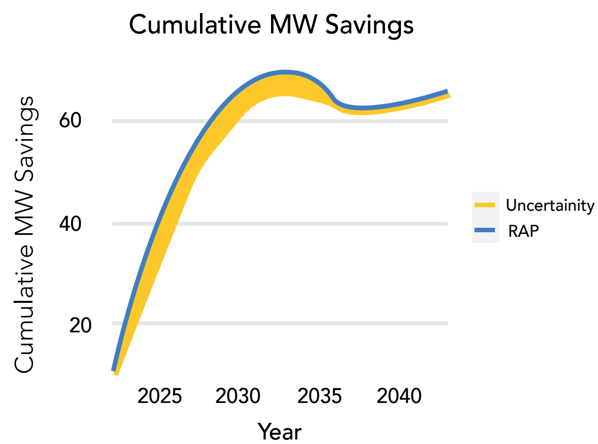
2. Commercial

The impact of the participation reductions on the energy savings in the commercial sector is more significant than for the residential sector since most of the programs, including the customer program, see at least a medium reduction. The impact of the participation reductions on the demand savings is initially like that of the residential sector but savings rebound in the later years of the study.

The variation in the incremental savings in the first year is very substantial, with a range of roughly 50% of the baseline savings, but it shrinks quickly as participation picks back up again, like the residential variation.

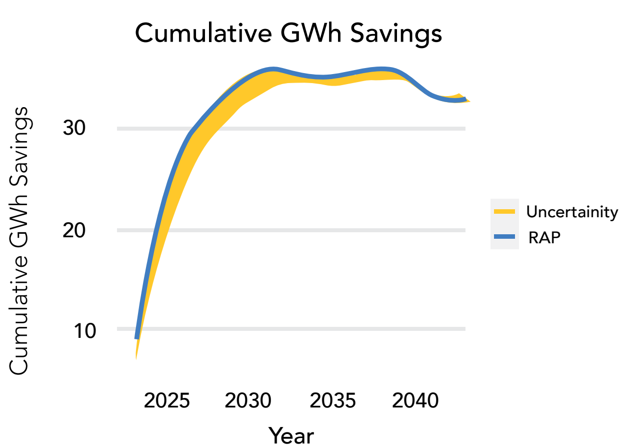






3. Industrial

Because all the industrial sector programs also serve the commercial sector, the results are very similar between the two sectors. The effects of reduced participation are more significant for energy savings than demand savings and the variation in the incremental savings are large, though not quite as large as for the commercial portfolio.



How to show COVID-19's full impact on DSM programs?

There are several possible next steps to the research into the impact of COVID-19 on DSM programs based on the limitations in this study. Our recommended actions include:

- Conduct further analysis: Our analysis used data from the lockdown period (March-June 2020) and it would be valuable to see how program impacts have changed as the situation with the pandemic fluctuates between normalization and new lockdown measures.
- Add more jurisdictions: To improve the generalizability of the study, additional jurisdictions should be added to the analysis for both overall and regional specific impacts.
- Connect the dots: The changes in customer energy demand from the pandemic may also impact the potential savings from efficient measures, which would change the benefits and cost-effectiveness of programs.
- Look at changes in utility spending: There may be a large impact on DSM programs based on changes in spending by the utilities funding the programs.

Although our analysis was limited, it illustrates some important COVID-19 impacts that DSM program managers should bear in mind. Because impacts will vary based on a utility's specific region and context, it's important to review your portfolio to evaluate your COVID-19 risks and exposures and analyze your participation data to understand customer response in your territory.

As the vaccine rollout continues, there will be a return to some sort of "new normal" as fears about transmission subside. But the lessons learned from this pandemic should not be relegated to utilities' short-term memory. Customers will likely have long-term skittishness about the potential of future pandemics and there are opportunities to proof DSM programs against these concerns before they arise. One opportunity that also aligns with new DSM program advances is to shift from on-site audit to virtual audits.

Stay tuned as we pull together additional insights from our analysis and share subsequent articles. To learn more about how we support utilities, explore our DSM solutions.

About the authors

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Dr. Ali Bozorgi is a senior manager with ICF's flex load management / DER analytics team. He supports a variety of projects, including DER potential studies for various utilities and states, DSM program design and cost-effectiveness analysis, DSM portfolio planning, as well as development of various DSM planning tools and building energy assessment tools for clients and ICF's DSM program implementation teams. Dr. Ali has extensive experience in working with sophisticated risk analysis techniques and optimization, e.g. Monte Carlo simulation and @ Risk software, for modeling and presenting risk and uncertainty.

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Ben Staver is a senior energy markets consultant on ICF's DSM analytics team with more than 10 year of experience in energy policy and modeling methods. He has been involved in various projects ranging from ICF's core business to the cutting edge. These include deep dives into cost-effectiveness analyses and quantifying non-energy impacts, studying DSM as a generation resource, developing EE program plans, long-term potential studies, project implementation support, and ensuring state regulatory compliance across the US. He has also been heavily involved in developing the latest generation of potential study tools, integrating the capabilities for program optimization, sensitivity analysis, and uncertainty assessment.

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Youssef is an energy markets analytics consultant with ICF's flex load management / DER analytics team. Youssef has significant expertise in data analytics and modelling, particularly in the context of demand side management modelling. Youssef has played a key role in developing ICF's potential and beneficial electrification modelling capabilities through script-based modelling. Since joining ICF, Youssef has worked on a wide range of projects including the Evergy Missouri 2023-2042 Potential Study, Entergy Arkansas 2020-2022 Demand-Side Management Program design, Oncor Portfolio Design Support, DTE NWA Program Design, USAID Commercial and Industrial Customer Smart Metering Data Analysis, and has analytically supported ICF's energy efficiency program implementation efforts in Arkansas and Wisconsin. Youssef also has experience analyzing wholesale electricity markets. Youssef graduated from the University of Toronto with a bachelor's degree in energy systems engineering and a double minor in economics and engineering business.

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EET PPR 1015 0511