Industry in the Pandemic: Who's up? Who's down? Where to focus?

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ABSTRACT

Connecting customer data and energy efficiency program data is even more critical in a pandemic era. Program administrators (PAs) need to consider different analytics approaches to gauge opportunities. At the same time, PAs must continue to be more comprehensive with projects as they manage pre-pandemic challenges, such as higher goals and the phase-out of lighting measures.

This paper will first summarize one utility's data-driven approach to understanding Covid-19's impact on industrial customers by segment and geography. It will then review comprehensive projects with a deep dive on a food processing plant as a strong case study to emulate in future go-to-market planning.

Industrial trends associated with Covid-19 have been both positive and negative. Sectors connected to online shopping (distribution/warehousing, packaging), life sciences (pharmaceutical manufacturing), and snack foods (food & beverage) have benefitted. Other sectors have suffered from decreased demand and geographical recession. Billed usage (and distributed generation) data can serve as a proxy for business activity and help identify customers to target. This can serve as a first pass.

The next step involves considering past participation in programs with an emphasis on savings by end use. This presentation will cover the specific insights from both the portfolio-level review and also the industrial customer case study.

Introduction

A data driven approach to efficiency go-to-market planning is more relevant now than ever based on increasing goals and the disruption caused by the Covid-19 pandemic. Eversource's longstanding approach is to maintain a segmentation model that emphasizes customer-specific outreach while considering industry, usage, and past participation.

The mechanics start with aggregating individual billing accounts into groupings to understand customer usage across the portfolio. Those groupings are then assigned a usage-based segment and an industry segment. In terms of outreach, the largest Commercial & Industrial (C&I) customers are the starting point since higher usage typically corresponds to higher savings potential. Larger organizations also have more resources and more capability to respond to custom offerings.

In the case of Connecticut, a quartile analysis—the usage-based segmentation—shows over 21,000 distinct gas customers in Eversource territory (see Table 1). Just 527 of those customers (i.e., around 2%) account for 75% of the usage. These are the customers that align with Large C&I offerings; conducting the quartile analysis allows for a much clearer picture of the organizations that can have the biggest impact.

Table 1. Eversource Connecticut 2020 gas customer quartile segmentation

Gas Quartile	Number of C&I Customers	2020 Percent of Total C&I Gas Usage (CCF)
Q1	8	25%
Q2	55	25%
Q3	464	25%
Q4	20,645	25%
TOTAL	21,172	100%

Source: Eversource customer segmentation database.

The next consideration is industry. Using the Connecticut example again, the highest energy consuming industry is the manufacturing sector with it representing 26% of electric usage and 35% of gas usage among Large C&I (see Table 2). Understanding the largest customers and most relevant sectors enables better targeting and resource allocation.

Table 2. 2020 Connecticut Q1-Q3 electric and gas customers by segment and usage

Segment	Number of Electric C&I Customers	Percent of Q1-Q3 Electric Usage (KWH)	Number of Gas Customers	Percent of Q1-Q3 Gas Usage (CCF)
Manufacturing	482	26%	149	35%
Retail	325	16%	87	8%
Government Agency	149	16%	71	16%
Real Estate Management	299	9%	64	4%
Communication & Entertainment	106	8%	22	8%
Educational	64	5%	24	4%
Hospital	25	5%	14	6%
Utility	29	3%	14	8%
Other	441	12%	81	11%
Total	1,920	100%	526	100%

Source: Eversource customer segmentation database.

The other large data component in Eversource's traditional segmentation analysis is past participation data. Analysts can target customers that have never participated. Or alternatively, customers that have participated but have more opportunity compared to their segment.

There are also other ways to use both customer usage and past participation data to identify opportunities; this paper will discuss some of those with examples from recent analyses. It will then highlight a successful industrial customer that has implemented comprehensive projects. Lastly, this paper includes a summary of next steps on how the featured data approaches can identify similar opportunities for comprehensive projects going forward.

End Use Analysis

Targeting customers that have never done an energy efficiency project is a straight-forward way to identify leads but it is not always enough. Another approach is what is called an "indexing analysis," which involves comparing the percent of savings data to the percent of usage data and looking for cases where the share of savings from a given segment or customer is

below its share of usage. Eversource recently expanded its "indexing analysis" approach to better identify which customers and industrial segments are good targets.

Specifically, the expanded approach involves indexing by end-use and comparing the usage by end use to savings by end use (by manufacturer sector). Eversource used DOE MECS[1] data to estimate average consumption by end use for the various manufacturing sectors. Figure 1 shows the total energy usage for the sectors. Non-process HVAC and lighting consumption are emphasized with the blue and yellow colors. As is to be expected, the process energy consumption accounts for the majority[2] of the usage for almost all manufacturing sectors.
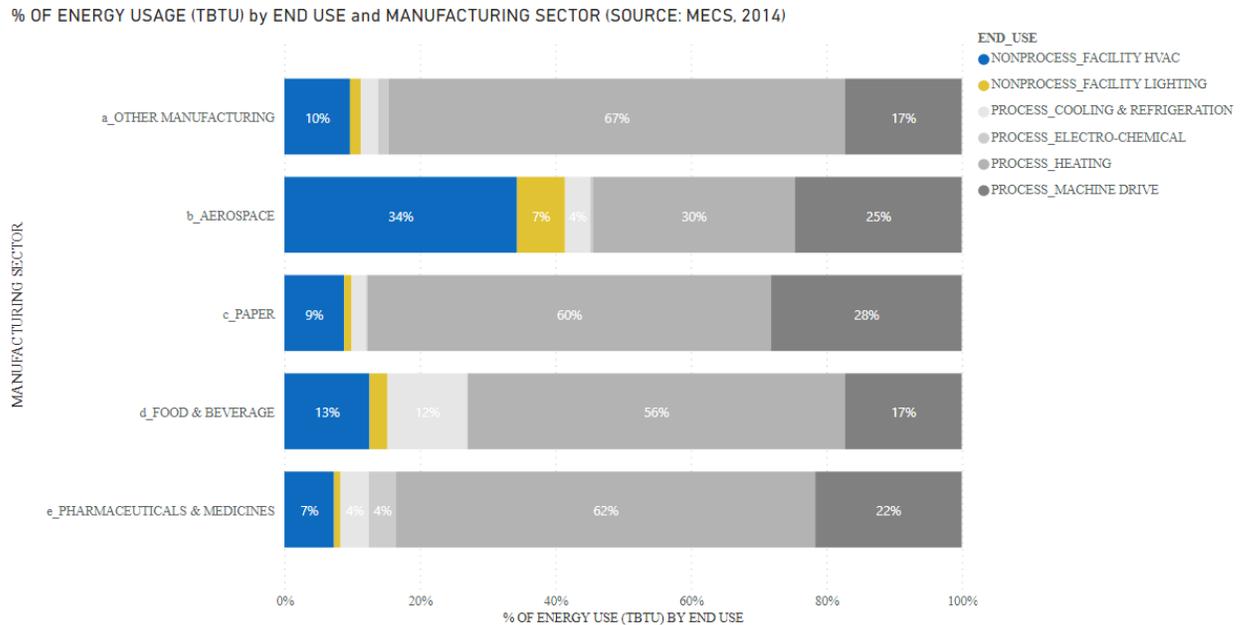

Figure 1. Percent of Energy Usage (TBTU) by end use and manufacturing sector, 2014. *Source: MECS 2014.*

After mocking-up the usage, the next step is to consider the manufacturing energy efficiency project data by end use. In figure 2, the same manufacturing sectors are considered and the end use bars use the same color scheme as the usage figure above. The immediate take-away from compiling the data is the lighting representation. While it is common knowledge that lighting is "low-hanging fruit" for efficiency projects, organizing the data this way allows analysts to see the magnitude of its over-indexing. It also shows the sectors with the largest imbalance.

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[1] US Department of Energy (DOE) Manufacturing Energy Consumption Survey (MECS).
[2] Process energy accounts for 87% of total energy use in manufacturing sector. The combined process and non-process energy is comprised of electric energy (24%), fuel energy (47%) and steam energy (29%).
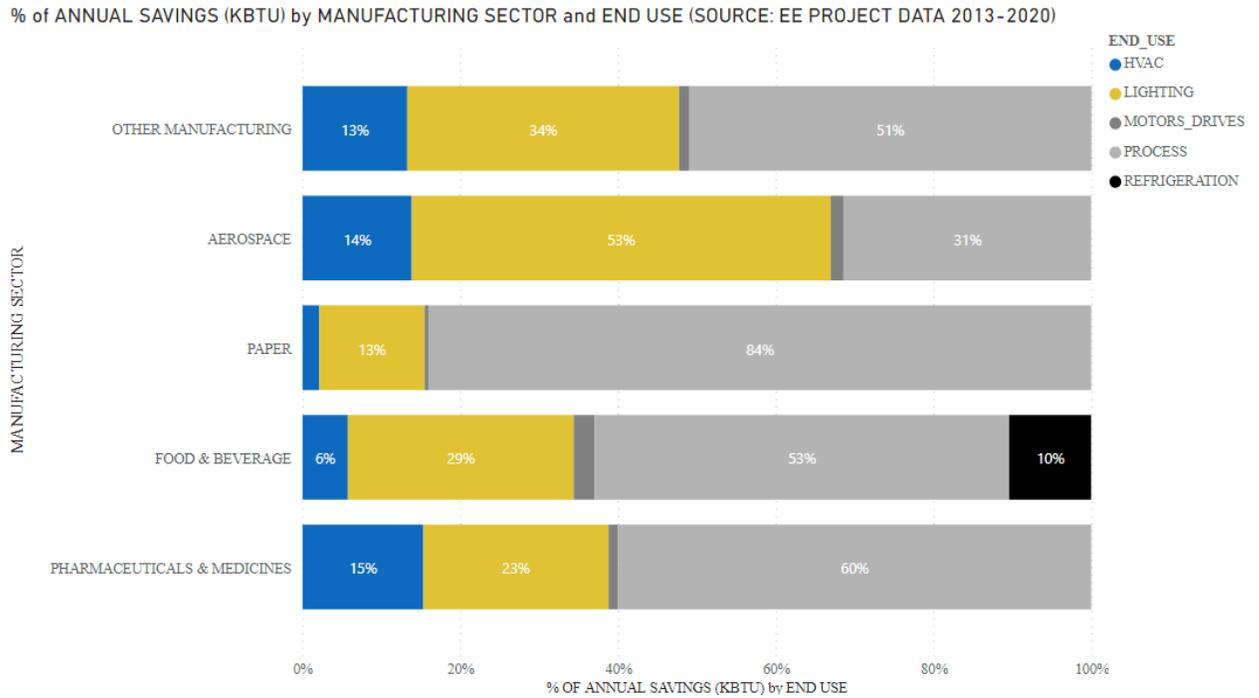
Figure 2. Percent of annual savings (KBTU) by manufacturing sector and end use, 2013-2020. *Source: Eversource tracking database.*

In the case of the Food & Beverage sector, the data shows lighting representing 3% of typical usage but Eversource is getting 29% of its Food & Beverage savings from lighting. These data raise interesting questions about the specific customers in these categories. Who are the ones who have participated? If they have done a project, was it only lighting?

This exercise demonstrates a way of using past participation data to more effectively target manufacturing customers based on history and potential. The resulting list of customers is actionable in a "business-as-usual" environment but that has not been the case for the last year. The next section considers how the Covid-19 pandemic impact materializes in usage data and how that pertains to specific manufacturing sectors.

Covid-19 Impact

Segment Analysis

Industrial customers are grouped into segments for purposes of tailoring energy efficiency programs to diverse sets of customers. For these customer segments, billed usage was calendar normalized. This process breaks utility billing periods into the constituent calendar months, and assigns billed usage based on average daily usage. Monthly usage for 2020 was then compared to the monthly average usage for the seven years 2013 through 2019. Time series charts of billed usage for the entire study period were also produced. These charts show long term trends in billed usage.

During 2020, some industrial segments were deeply impacted by the Covid-19 pandemic, while others largely escaped, as shown in Table 3. In Connecticut, paper manufacturing was

impacted the most, followed by the aerospace subsegment. Unclassified manufacturing decreased by 8% in 2020.

Distribution and warehousing, which includes e-commerce, dropped by 9% in Connecticut, which indicates it withstood the pandemic better than the average business segment. While in the overall Eversource territory pharmaceutical manufacturing showed growth, in Connecticut it dipped slightly in 2020, compared to the preceding seven-year period. Food and beverage posted a robust growth of 10% for the year.

Table 3. Connecticut Industrial Segment Billed Usage

Segment	Historical Average Annual MWh	2020 MWh	MWh Change
All Segments	11,253,385	9,724,701	-14%
Aerospace	384,910	338,031	-12%
Distribution & Warehousing	203,335	184,851	-9%
Food & Beverage	167,837	185,422	10%
Other manufacturing	1,557,627	1,430,194	-8%
Paper	113,830	69,744	-27%
Pharmaceuticals & Medicines	97,576	92,742	-5%

The long-term trend for Connecticut industrial customers in the aggregate is decreasing billed usage. The compound annual growth rate from 2013 to 2019 is –1.1%; when the pandemic year of 2020 is included, the growth rate is –1.5%. This is illustrated in figure 3.
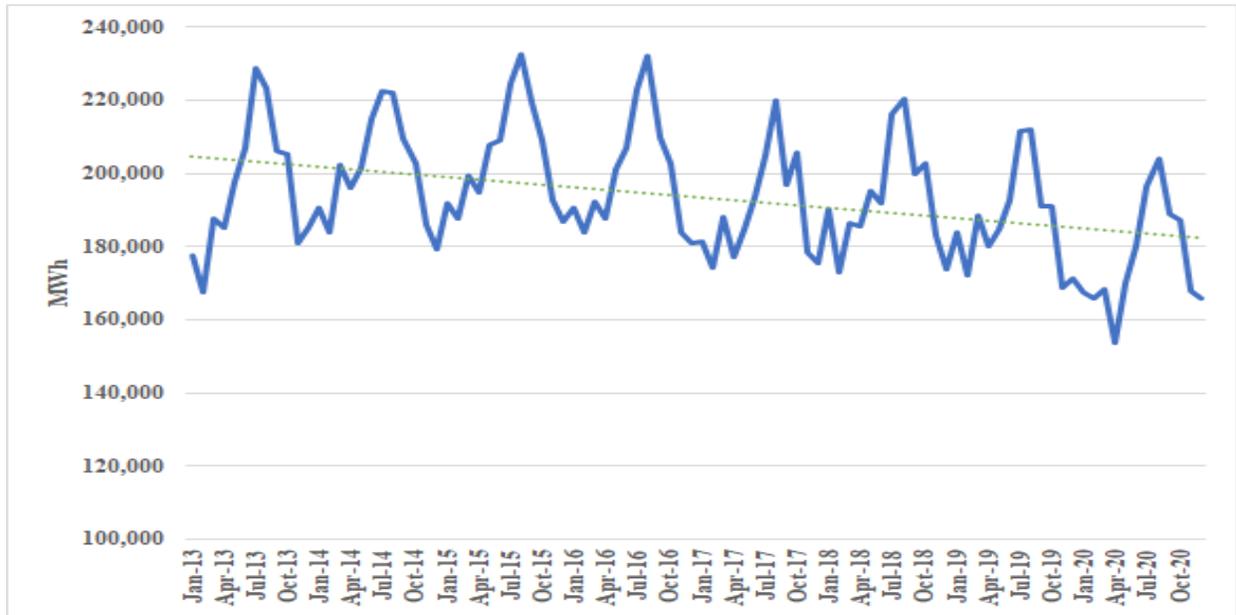

Figure 3. Connecticut Industrial Billed Usage Decline.

The monthly trend for industry overall in Connecticut shows a fairly consistent decrease throughout the year, as shown in Figure 4. There is a larger billed usage decrease starting in March and continuing through June, as the pandemic induced economic slowdown took effect.
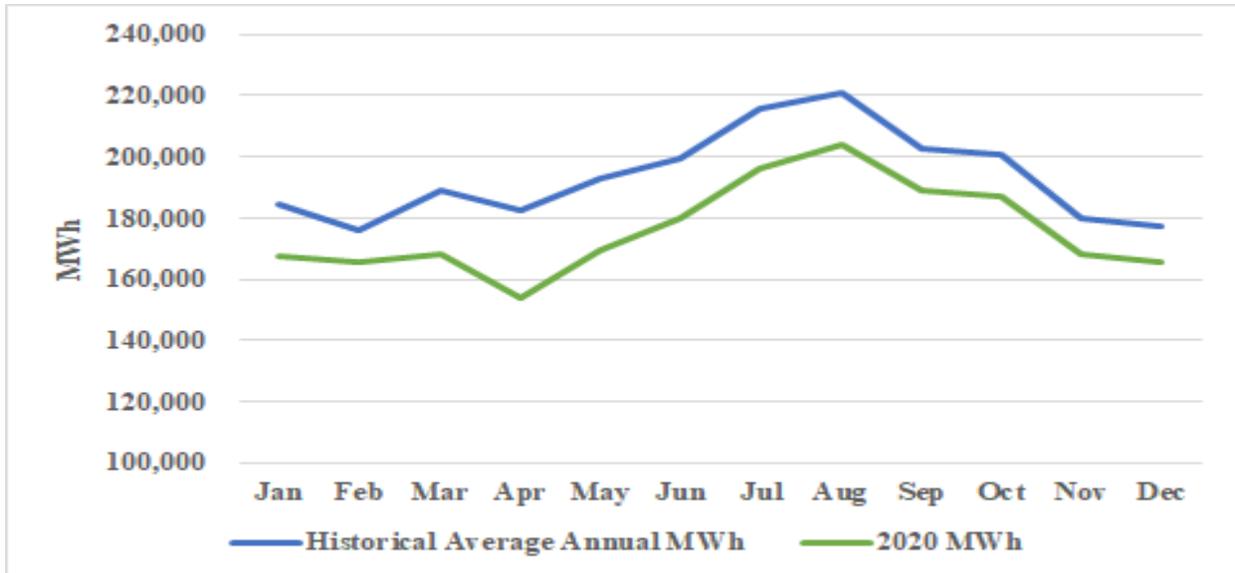

Figure 4. 2020 Monthly Billed Usage Compared to Historical Average

However, when large Eversource industrial customers[3] are excluded, the first quarter of 2020 is in line with the historical average. The effect of large customers driving down the 2020 billed usage at the beginning of the year may be due to increased utilization of combined heat and power plants, as the average first quarter natural gas price at this time was the lowest since 1999. Therefore, excluding these customers does a better job of isolating the effect of Covid-19, shown in Figure 5. Billed usage for small to medium-sized customers was in-line with the average until April, when it experienced a dramatic decrease and stayed below the average for the rest of the year.

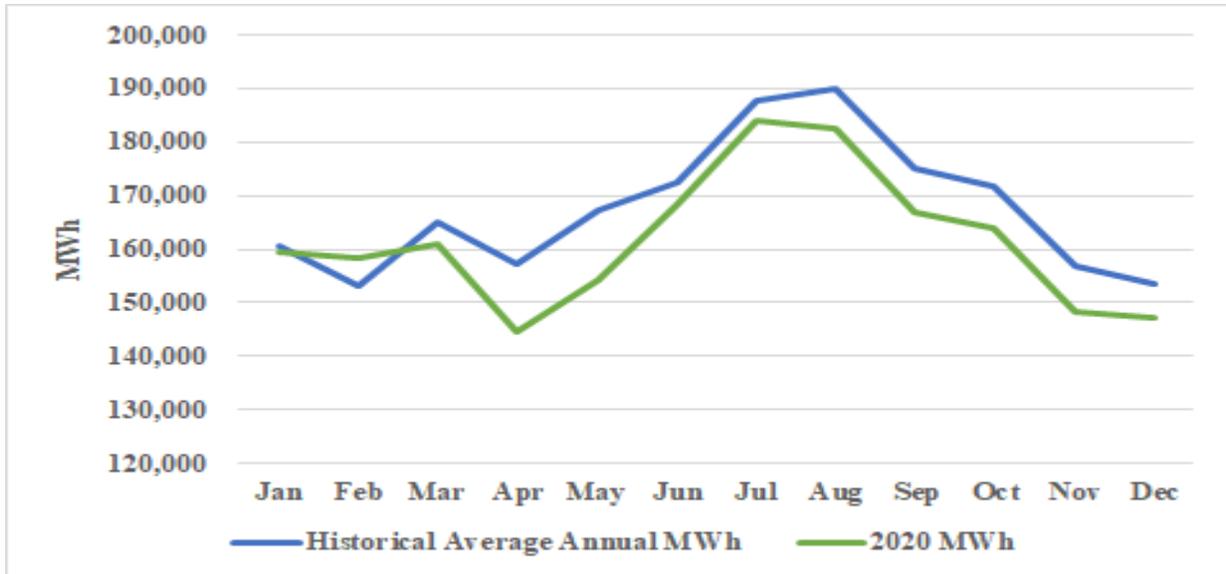[3] First Quartile (Q1) customers as measured over the entire Eversource territory.

Figure 5. 2020 Monthly Billed Usage Compared to Historical Average - Small & Medium

Industry Trends

The Connecticut Food & Beverage industry had a very strong year compared to recent years. In Figure 6, every month of 2020 saw higher billed usage than the historical average.
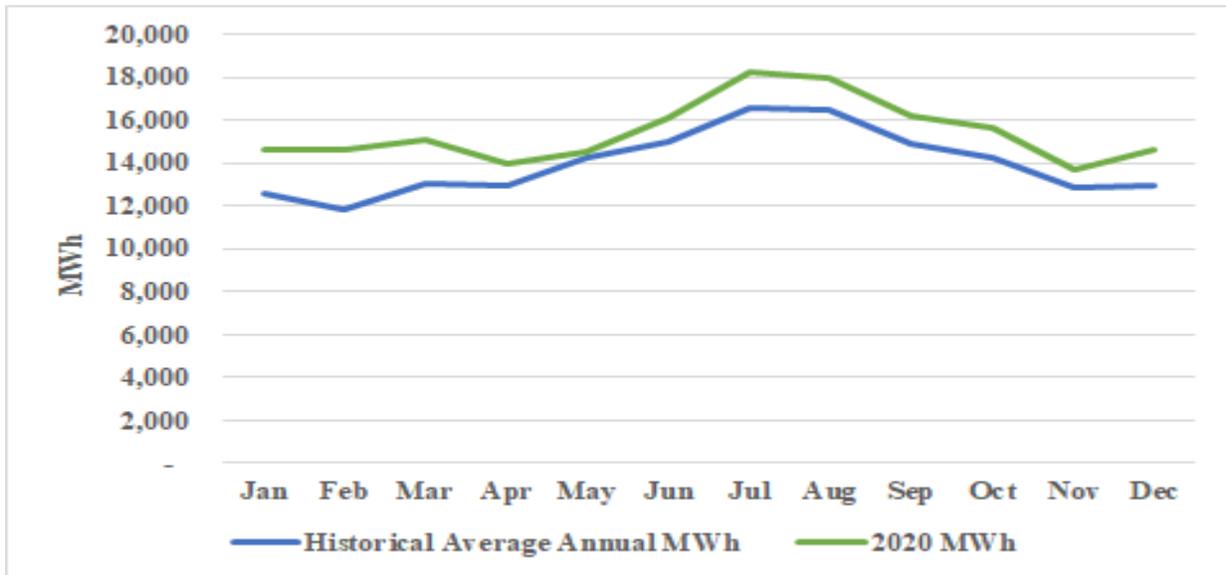

Figure 6. 2020 Monthly Billed Usage Compared to Historical Average – Food & Beverage

When viewed over the entire timeframe, food and beverage has had strong growth, particularly between 2016 and 2019, when it grew at an annual rate of 10.8%. The segment did retreat in 2020 back to 2018 usage levels, as seen in Figure 7.
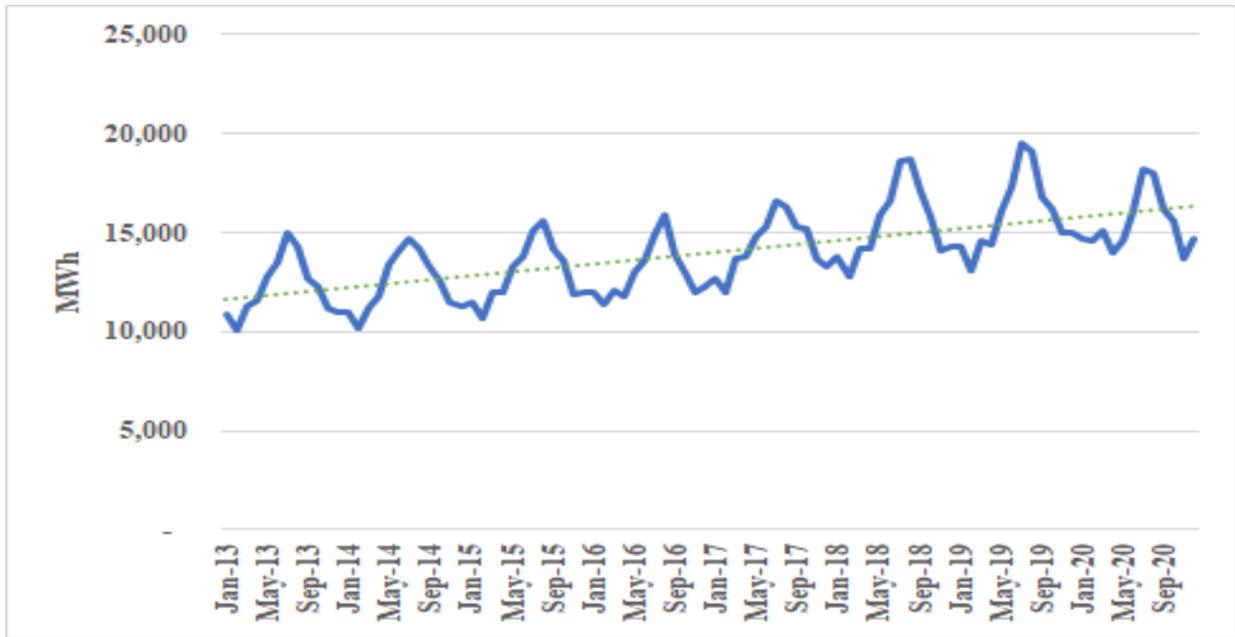
Figure 7. Food & Beverage Long Term Usage Trend

Case Study

Customer History

These trends are also evident at the individual customer level. Here we will examine an industry leader in the manufacturing of snack foods. Its facility is in Eastern CT and occupies approximately 300,000 square feet on over 80 acres. The facility—despite being nearly 40 years old—was the first manufacturing building awarded LEED Gold Certification in the state of Connecticut.

This customer utilizes approximately 30MM kWh of electricity and 7MM CCF of natural gas annually. Its facility processes everything from food manufacturing to packaging. It uses energy to power friers, ovens, steam, compressed air, and lighting. The facility operates 24 hours a day 7 days a week and has minimal shutdowns.

Eversource has worked with its operations team for nearly a decade and has been integral to the customer's sustainability initiatives. Nearly every year since the partnership initiated, the customer has participated in energy efficiency projects, which have yielded over 3MM kWh in electrical and over 250,000 CCF in gas savings.

Project examples from the past 3 years for this customer are displayed in Table 4. As seen in the table, the projects completed for this customer have included more than one measure. Steam trap repairs are a measure this customer frequently implements, and which continuously bring in gas savings.

Table 4. Project Electric and Gas Annual Savings

Project Year	Annual kWh Savings	Annual CCF Savings	Measures Included in Project

2020	120,594	16,438	Steam trap repairs, N2 Generator, Pipe insulation
2019	645,875	36,616	Lighting, Steam trap repairs
2018	2,188,329	160,021	Lighting, Compressor, Multiple process measures, EMS and VFD controls

Eversource is currently working on a list of repairs generated from recently completed steam trap and compressed air surveys. Although this customer has an active maintenance team, these surveys help call out repairs that are sometimes overlooked in day-to-day operation. The following examples demonstrate how energy consuming resources used throughout the facility can be a moving target and regular surveys prove to be a valuable tool for facility operators.

Additionally, the air leak survey indicates the plant uses over 3,500 CFM of compressed air. A total of 39 total leaks were found during the survey, which yielded over 128 CFM of air loss, constituting over 168,000 kWh of lost energy annually. The cost to repair these leaks is just over $20,000 with an anticipated incentive of over $9,000. Simple payback on a repair of this nature is less than 6 months.

The steam trap survey on the nearly 200 traps found 5 that were blowing through and another 13 that were leaking. These steam leaks account for nearly 16,000 CCF of natural gas annually. The cost of these repairs is under $25,000 with an incentive of over $9,000. Simple payback on a repair of this nature is under 10 months.

Furthermore, Eversource is partnering with the customer and third-party engineers in updating two of its five ovens, which should yield an additional 200,000 CCF annually.

Customer End Use Analysis

One of the earlier sections in this paper showed historical energy efficiency project savings in Connecticut and how all manufacturing segments (including Food & Beverage) over-index when it comes to lighting measures. By contrast, the customer presented as a case study in this paper is an example of a more comprehensive approach to energy efficiency. This customer has achieved high electric and gas savings (over 3MM kWh in electrical and over 250,000 CCF in gas savings) with lighting accounting for only 19% of the total savings (see table 5). This is much lower than the lighting category total for Food & Beverage manufacturing (i.e., 29%) and a strong case study to replicate across the portfolio wherever possible.

Table 5. Case Study Customer 2013-2020 Annual Savings (KBTU) by End Use

End Use	Annual KBTU Savings	% of Total
Process	24,731,571	64%
Lighting	7,284,146	19%,
HVAC	6,734,134	17%
Total	38,749,850	100%

Conclusion

The substantial impact from Covid-19 on industrial segments brought about new approaches to reviewing and analyzing data. End use analysis is one technique described in this paper that can serve as a way to measure program penetration and identify energy efficiency opportunities at both the segment and customer level. Other more traditional segment-level analyses can also show new insights and must be included in any data driven approach to go-to-market planning. Markets are constantly changing and it is critical for utilities to monitor the trends in order to maximize energy efficiency outreach.

The food and beverage segment is an example of a category that trended upward in terms of energy usage during 2020. As a case study, this paper highlighted a snack food processing manufacturer with an ongoing partnership with Eversource. The collaboration includes pandemic-year projects and many non-lighting efficiency initiatives including compressed air and steam trap surveys. The high energy savings and other positive results from this case study are a great template for similar customers to do successful comprehensive projects.

It becomes increasingly important to prioritize non-lighting and more comprehensive energy efficiency projects as more companies are focusing on sustainability goals, such as achieving net zero greenhouse gas emissions. Diving deeper into the specifics of customer operations allows for more opportunities to identify these comprehensive measures. For example, if the customer proposes to do a lighting retrofit, to learn more about its operations and identify additional energy efficiency opportunities, ask if they use steam or compressed air in the facility. This could lead to implementing Eversource's programs such as an engineering study, an Energy Usage Assessment (EUA), Strategic Energy Management (SEM), or even Process Re-Engineering of Increased Manufacturing Efficiency (PRIME). Having conversations about the customer's short- and long-term goals help combine measures to take advantage of comprehensive incentives.

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