

# **Vacation Destination Nantucket – No Walk in the Park When You Are on an Island: Conducting Residential Metering Study and Site Visits on Nantucket Island**

*Aquila Velonis, The Cadmus Group, Inc.*

*Antonio Larson, National Grid*

*Matt Piantedosi, The Cadmus Group, Inc.*

*Bradley Jones, The Cadmus Group, Inc.*

*David Kim, The Cadmus Group, Inc.*

## **ABSTRACT**

Collecting data through site visits and metering studies is commonplace in the energy efficiency industry. But, what does data collection look like in remote regions that are difficult to access or unique vacation destinations with limited resources? This paper presents a study that addressed those questions on Nantucket, an island 30 miles off the coast of New England. To support the utility's efforts to enhance infrastructure resiliency on Nantucket Island, an investigation was conducted to assess the potential for reducing peak demand loads through energy efficiency programs.

Because of the unique customer population on Nantucket, there was not an abundance of readily available data that could be used for the study. Yet, a reliable assessment of the potential for peak demand reduction through energy efficiency programs required data that were specific to Nantucket's residential customers. As such, the investigation called for a comprehensive and multifaceted data collection effort.

The paper presents key aspects of the site visits conducted that were crucial to successfully collecting data in a remote region. This includes:

- Efficiently recruiting and scheduling participants;
- Strategically and creatively planning logistics;
- Streamlining equipment and methodologies; and
- Remotely accessing metering data.

During the early stages of the project, various challenges were presented by the geographic remoteness and the special characteristics of the Nantucket population, some of which were foreseen and others that were rather unexpected. These hurdles were successfully overcome through a series of creative approaches to make the logistics planning more efficient and lean, optimize field staff utilization rates, and pay close attention to details that might typically be considered trivial but proved to be crucial for the project. This ranged from leveraging local alliances and relationships to appreciating the value of the island's only shipment center.

During the investigation, a multipronged approach was executed to collect data. In addition to conducting phone surveys with residential customers, 70 site visits were conducted to catalog the energy-consuming equipment and appliances. Several hundred pieces of metering equipment were installed to meter consumption during the summer peak demand loads. Additionally, stand-alone loggers were installed to capture the lighting load profiles for different residential spaces.

The strategies employed to successfully complete the data collection activities in Nantucket were more than just one-time patchwork solutions. These tested approaches provide valuable lessons that others can leverage to effectively execute field work in a variety of remote regions. This information will undoubtedly benefit field-work coordinators and managers planning to execute comprehensive investigations in hard-to-reach territories with unique population demographics.

## The Challenge: Summer Season

Nantucket's appeal as a seasonal tourist destination and summer colony causes the population of around 11,000 year-round residents to swell to 50,000-60,000 residents during the summer months.<sup>1</sup> This seasonal population increase was the impetus for the peak demand study. Increasing peak demand in the summer could necessitate an additional transmission line to the island in the near future. The seasonal population increase also created obstacles for the project team. In order to recruit homeowners (many of whom only live on the island seasonally) and also capture data for the entire summer season, recruiting and site visits both needed to take place in the late spring/early summer. Ferry tickets and lodging on Nantucket are both scarce commodities during this time of year. Additionally, some summer residents are only part-time or weekend residents, and many could not commit to being available for a removal visit at the end of the summer. Collectively, these obstacles made it very challenging to recruit, schedule, and conduct 70 site visits which included various project activities. **Table 1** summarizes the three data collection activities performed during the residential site visits and the techniques used for each.

**Table 1.** Overview of On-Site Data Collection Activities

On-Site Data Collection Activity	Techniques Used
Assessment of Installed Equipment & Home Characteristics	<ul style="list-style-type: none"> <li>• Performed walk-through assessment of site</li> </ul>
Total Premise Metering	<ul style="list-style-type: none"> <li>• Metered the main circuit breaker inside the electric panel (electrical permit required)</li> </ul>
End-Use Sub-Metering	<ul style="list-style-type: none"> <li>• Metered the branch circuits inside the electric panel (electrical permit required)</li> <li>• Metered plug loads at the point of use (equipment)</li> <li>• (For lighting) metered time of use</li> </ul>

These on-site activities posed several challenges: electrical panel metering requiring a licensed electrician and an electrical permit, availability of having remote access to metering data, and transporting large quantities of metering equipment.

---

<sup>1</sup> <http://www.bostonglobe.com/lifestyle/2014/09/06/what-like-live-nantucket/xfUa7mP4UgwXOb5sUwcQyN/story.html>

## **Efficiently Recruiting and Scheduling Participants**

### **Summer Scheduling**

The schedulers faced a number of difficulties in the recruiting process. The scarcity of ferry tickets was challenging for schedulers who sometime recruited homeowners that were willing to participate in the study, but unavailable during the field staff's pre-determined dates. In addition, the installed metering equipment needed to remain in place for the entire peak summer season. Some homeowners rented their homes to vacationers in the summer months and were unwilling to "bother" their tenants with either the installation visit from the field staff or with the presence of metering equipment in their homes. Although schedulers could not confirm how often this was the case, they suspected that many summer-only residents had not arrived on Nantucket before the planned installation dates. In some cases, the phone numbers provided by the utility were cell phone numbers, and schedulers were able to speak with summer-only residents of Nantucket who explained that they would not yet be on the island during the available installation dates. Schedulers also mentioned that some homeowners were wary of "non-islanders." In two cases, participants of the study were only willing to allow an installation visit if it involved someone that they knew locally. In both cases, the visits were scheduled with a specific installation team that included a local electrician as well as internal staff.

Whatever the reason, schedulers found the recruitment process to be unusually difficult. Schedulers only successfully scheduled a site visit on 7% of their call attempts, resulting in over 1,000 calls being made to recruit 70 participants. In a similar recruiting process in mainland Massachusetts, schedulers successfully scheduled a site visit on almost 15% of their calls—approximately twice as often.

Given the restrictions on flexible travel and the low percentage of successful recruitment calls, the field staff made themselves available for long days (available for early morning or evening visits) and weekends. This dedication from the field staff was crucial to visiting the targeted number of homes within an inflexible schedule. While individual field staff's schedules did not allow for complete overlap, an effort was made to have enough field staff on Nantucket to utilize 2-3 separate teams on most days. Given the relatively small driving distances between most recruited homes (the island is approximately 48 square miles), schedulers were able to fill each day's schedule to the brim and trust that the different teams could cover for each other if any visit took longer than expected. Schedulers also attempted to offer an approximate "arrival window" to participants instead of a fixed time. This was possible in most cases and allowed field staff to adjust the order of their visits (and occasionally trade visits between teams) as needed. To assess what type of metering equipment would be needed, schedulers also probed homeowners on the availability of a wireless network and general home equipment characteristics. Schedulers were careful to include very detailed notes on each participant's flexibility (or their requirement of a fixed time) in the Outlook invitations sent to field staff. Having detailed site information proved invaluable for field staff to optimize their time just by looking at their smart phone. The detailed information included: site contact information, potential flexibility of the homeowners, an estimate of what type metering equipment would be needed, and general notes to help field staff to access the site.

## **Local Presence**

In an effort to hasten the recruitment process, project staff worked with the energy coordinator at the Town of Nantucket Energy Office. The energy coordinator posted a notice on the Energy Office website advertising the peak demand study. In addition, the energy coordinator provided a list of rental owners and property managers that could be used to enlist additional homes for the study. While the notice posted on the Energy Office web site did not appear to result in any calls from potential participants, schedulers *were* able to set many potential participants at ease by mentioning the energy coordinator by name. In many cases, homeowners who were worried about the legitimacy of the study were appeased when they heard a local name that they recognized and trusted. While a few of the rental owners and property managers provided by the energy coordinator volunteered to participate with their own home, none of them were willing to participate with a rental property, or a property that they managed. In each case, the property managers and rental owners stated that it was their busiest time of year (late spring/early summer) as they prepared for the summer residents and they either didn't want to disturb occupied residences, or couldn't take any additional time out of their busy schedules to help recruit sites.

As previously mentioned, the project staff recruited a local electrician to be a member of one of the field teams. This was both a benefit and a detriment to the overall effort. Some homeowners only agreed to participate after being assured that there would be someone local as part of the study visit. Being able to provide these homeowners with the name of a local electrician that they recognized was very helpful. Additionally the project staff did not need to concern themselves with ferry or lodging availability for the local electrician. However, the local electrician's availability was limited since it was his busiest time of the year and he prioritized his own independent work over the site visits for the study. Under normal circumstances, the project staff would have hired additional electricians to fill in the gap. This was not an option on an island with few other electricians, none of whom were available during this time period. As a result this led to prioritizing his time to key sites where a local presence was needed, where project staff could not reach homeowners during a certain time and/or when homeowners were flexible to have the local electrician drop in with short notice.

## **Strategically and Creatively Planning Logistics**

### **Travel and Lodging**

Field staff travelled to Nantucket by ferry (approximately 2 hours from Southeastern Massachusetts). As we discovered, ferry tickets (and especially reserved spaces for automobiles) sold out many days in advance during the summer season. As a result, field staff were obliged to book their ferry tickets in advance and were unable to change their reserved times later on. This lack of flexibility was a challenge for the scheduling process and required schedulers to begin the recruitment process farther in advance than they normally would.

Most accommodations were sold out months in advance of the field staff's travel dates. Under normal circumstances, field staff would have dealt with sold out lodging by booking lodging farther from the target location as needed. However, this was not an option on an island, and as a result the project coordinator spent a considerable amount of time seeking affordable lodging for the field staff—eventually finding a vacation rental that could be shared by the whole

team. The added reward for this effort was that the vacation rental owner agreed to include this rental home in the study.

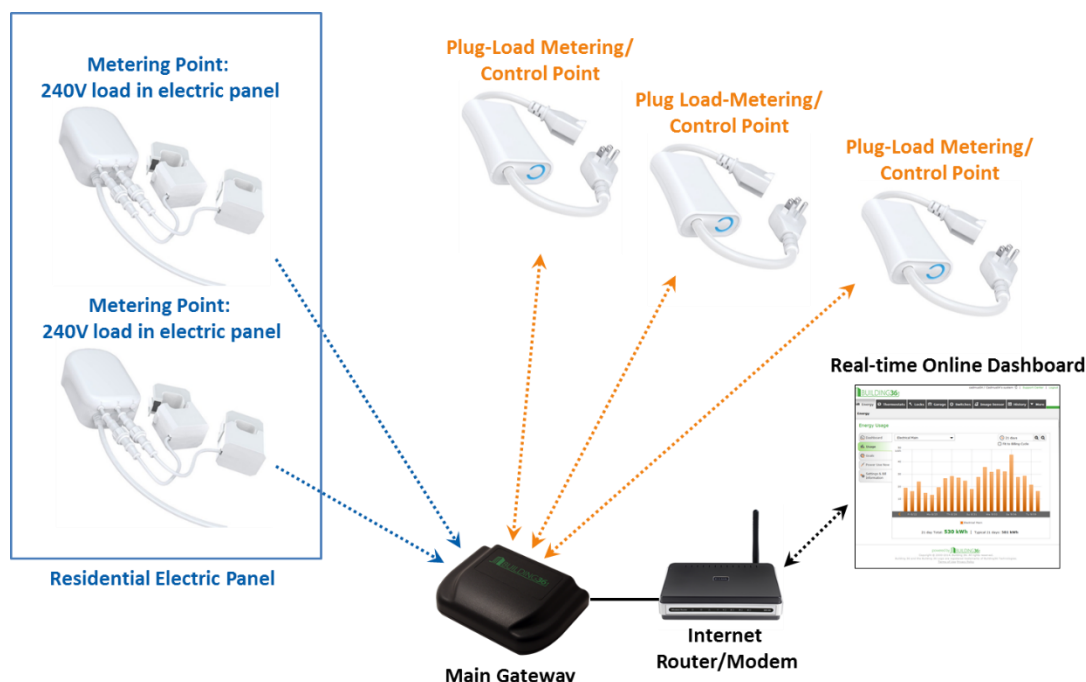
## **Shipping Logistics**

Mobilization of equipment to the island took a unique level of consideration and coordination. Some trips were as easy as filling a minivan and taking the vehicle ferry. In the event the vehicle ferry was full, we took a different yet creative approach: We rented a minivan by our main office in Waltham, Massachusetts, filled it with equipment and field staff, and drove to the ferry on the mainland. The equipment and field staff were loaded on the ferry, and our driver returned the minivan. At the same time, another field engineer flew to the island from Boston, rented a minivan on the island, and met the team at the ferry in Nantucket. This approach was much more cost effective than flying all the equipment and staff to the island directly.

During the installation weeks, a combination of minivans, personal vehicles, and other rental cars were used to mobilize engineers and equipment between sites. Unlike other locations across the country, next-day shipping via FedEx was not available. This resulted in bringing plenty of spare parts and equipment. Storage and easy access of all this equipment was also important. Because of our relationship with the local electrician, we were able to store equipment at his shop and was a useful staging area for field staff.

## **Streamlining Equipment and Methodologies**

This project contained a new type of challenge. We were investigating multiple end-use profiles from the premise electrical panel consumption and large 240V loads (central air conditioners, electric water heaters, pool pumps, dryers, etc.) to consumptions of various common plug loads (dehumidifiers, room air conditioners, televisions, set top boxes, etc.). This meant several hundred CT-based data loggers, plug load meters, and light loggers would need to be deployed in 70 homes across the island. To achieve this diversity in metering loads, we relied upon large quantities of in-field deployment of emerging metering technologies that connect to existing home area networks to expedite this project. This new metering equipment had the flexibility to monitor the loads at the main circuit breaker and the individual branch circuits as well as plug-through meter installed between an electrical outlet and the equipment to monitor the equipment's load. This unobtrusive equipment was paired with a hub/gateway (via a z-wave network). This allowed the hub to send real-time data to a cloud-based data storage system through the home's internet connection. Error! Reference source not found. presents a schematic summarizing the setup of components used in the study.



**Figure 1.** Setup of Connected Home Area Network Devices

We worked closely with the staff and metering manufacture to arrange the order placement and shipping. In addition, a field technician from the metering company joined us during the first week of install. While we tested this equipment in our lab before entering into the field, it was extremely beneficial to have the manufacturer technician available since we were unsure about compatibility with the meters in the homes we were to encounter. However, we brought as backup stand-alone and cellular equipment from Onset Computer Corporation if the new metering equipment wasn't compatible. After the first day, we had a strong understanding of the different home types and unique requirements for the new metering equipment to operate effectively. Our internal electrician worked closely with the local electrician to both introduce the new equipment, and to understand some unique electrical characteristics with the local homes.

Adding to the complexity of the moving parts of this project, all electric panel installations required issuances of local electrical permits by the Town of Nantucket. This meant main circuit breaker metering work needed to be completed by a licensed electrician. We worked with the permitting officials during the inspection process, and they provided all needed documentation.

## Remotely Accessing Metering Data

Because of the location of this project, it was essential that the data we collected was able to be accessed remotely. Not only were our engineers able to begin analysis very early in the process, but it also allowed us to identify equipment or individual meters that were not working properly. The hourly summary of real-time metered results were accessible online via a cloud-based subscription service; we used this service as a quality assurance tool for each participant site and identified any dubious metering points and/or malfunctioning devices. This made

troubleshooting very easy, and solutions to fix the problems were performed by the next field team resulting in minimized downtime. In the event homeowners did not have internet access, cellular equipment was used from inside the electrical panels, and was complemented with stand-alone plug load meters. In rare events that both Ethernet and cellular data was not available, the entire metering installation was stand-alone.

## **Conclusion**

The success of this project hinged on staff efficiency, strategic planning, and creative logistics to effectively use a multipronged data collection approach on this hard-to-reach island. All the challenges faced on the island would have been minimized in a traditional main-land project; from having typically homeowners (non-vacation homes) to the ease of overnight shipping of last-minute equipment used in the field. Working on Nantucket Island did require additional planning and creativity. We found that using local resources was paramount to the efficiency of this project, including getting local outreach support, utilizing local name recognition, and storing metering equipment – and added together they helped make this a successful project. We also found additional time was needed for recruiting sites, staff resources to research available options, logistical coordination, and general project management. From this experience, we recommend allocating additional budget and staff resources when working in isolated locations.

Deploying diverse metering equipment with remote monitoring capabilities also contributed to the success of this project. This meant investing in metering technologies up front to save staff field resources in the end as well as ensured proper data quality.

With all the restrictions encountered on this project, we needed to find a balance between being too rigidly organized and having endless flexibility with our resources. In the middle, we found the creative-mix of strategies to be successful in completing the data collection activities in Nantucket. These tested approaches will provide valuable lessons that others can leverage to effectively execute field work in a variety of remote regions. This information in the future will undoubtedly benefit field-work coordinators and managers planning to execute comprehensive investigations in hard-to-reach territories with unique population demographics.