BBP DEMAND MANAGEMENT CASE STUDY

GPT demand response program

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demand management steps

1 STEP 1

Select building

2 STEP 2

Define the purpose

3 STEP 3

Understand how the building uses electricity

4 STEP 4

Identify opportunities for managing demand

5 STEP 5

Undertake a benefit analysis

6 STEP 6

Implementation plan

7 STEP 7

Measure performance

8 STEP 8

Seek feedback and improve performance

9 STEP 9

Keep an eye on the future

The Better Buildings Partnership (BBP) has developed resources that help to inform members and other property owners on how to become more active participants in the electricity market as it transforms to a renewable electricity system.

This case study supplements the Demand Management Planner available from the BBP website resource page and illustrates the nine steps described in the planner.

the GPT group

The GPT Group[1] (GPT) is committed to operating net zero carbon buildings by 2030 and the GPT Wholesale Office Fund (GWOF) has an even more ambitious target to be running net zero throughout 2020 and beyond. GPT's portfolio of office buildings are averaging NABERS Energy 4.9 stars and 'efficient buildings running on renewable energy' is the mantra. The transition to renewables comes with an understanding that renewable electricity has different performance characteristics to fossil fuels and that managing demand is one of the more important strategies to balancing the electricity system.

Given the tower-based architecture of CBD buildings, opportunities for on-site solar are limited therefore most renewable electricity needs to be delivered by the grid.

> "During the negotiation of our renewable energy procurement we realised that, in creating demand for renewables, we also needed to be playing a more active role in balancing supply and demand through the grid",
>
> Steve Ford,
> Head of Sustainability and Energy, GPT.

Efficiency in electricity system not only delivers savings to all participants, it is also one of the best way to ensure high reliability and resilience of the system. Working in partnership with electricity retailer ERM, GPT has explored how their buildings can respond when generation and grid capacity is reaching limits, particularly on hot summer afternoons.

GPT has signed an agreement with ERM to share market income created when GPT reduces building load during these critical pricing periods.

> "We see the benefits to be financially and socially responsible. Thousands of dollars of savings are possible while reducing load on the network so it stays on for everyone"
>
> Steve Ford,
> GPT Head of Sustainability and Energy

1 The GPT Group

The spot price for electricity provides a strong price signal when generation is reaching capacity. The spot price in NSW reached over $14,000/MWh in January 2020 coincident with extreme temperature days. This is clearly a strong signal but it is often only evident to those that are exposed to the spot price. Property owners are conservative energy purchasers and aim for contracts that provide certainty over time. GPT sees a potential reduction in energy contract hedge costs, and therefore retail energy contract costs, if it can demonstrate an ability to reduce grid loads during high price market events.

Once the savings sharing had been agreed, the next step was to identify loads that could be reduced or generators that could be brought online in peak periods. This is where accurate **asset registers*** really help. By taking a digital asset register and sorting by electrical load or capacity, it can quickly be determined which equipment is going to make the most difference and by how much.

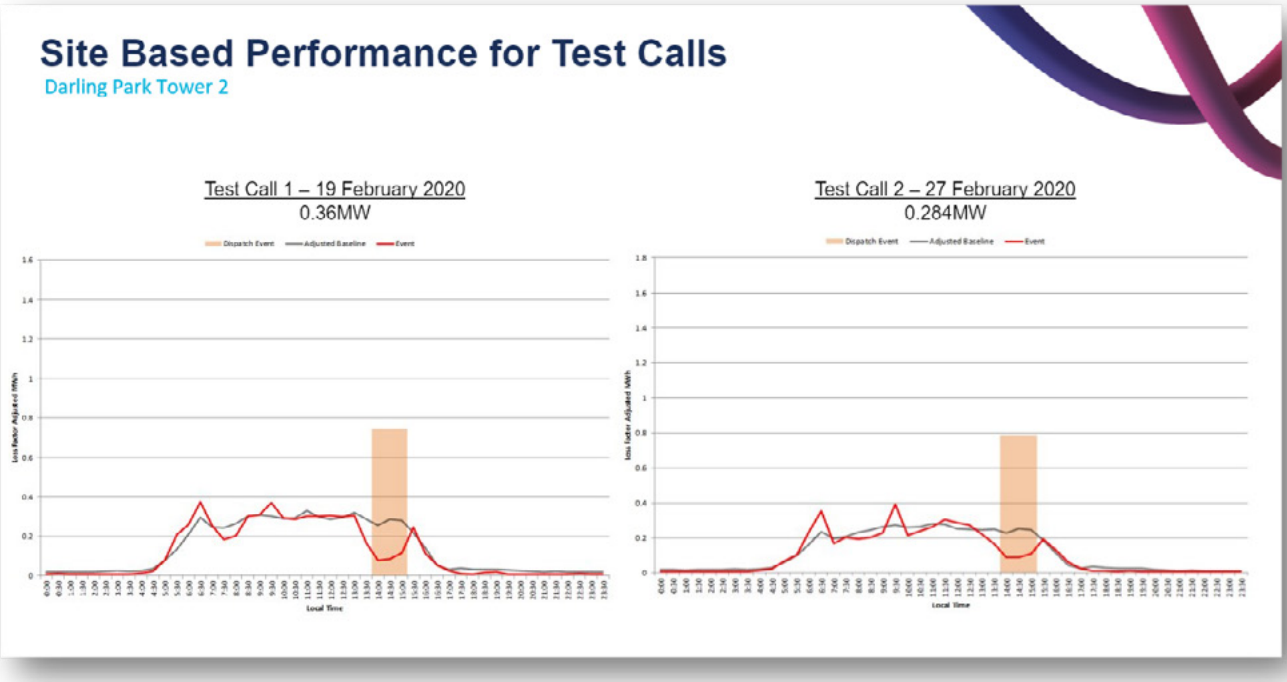
Standby generators feature highly on the list of systems because they form a large and controlled load that can be activated without affecting the performance of the building. Similarly, mothballed gas engine cogeneration systems and air conditioning chiller systems can provide an opportunity for demand response.

Not all standby generators are immediately suitable. They must be configured to operate while the grid is running, which is not the normal condition for an emergency standby generator. To be effective, generators might be configured to run in **island mode*** meaning it is isolated from the rest of the grid but with known loads switched to the generator switchboard as required. This may require some reconfiguration of switchboards and wiring so that building system loads to the capacity of the generator and is aggregated into one switchboard, facilitating switching from the grid as required.

An alternative strategy is to have generators operate in **synchronized mode*** where controls ensure the voltage and phase of the generator is matched to the grid condition. This allows the grid and the generator to power the building in parallel. The cost of these specialised controls need to be factored into the demand management project.

For GPT, the feasibility analysis required input from consulting electrical engineers and each building's facility management team to establish the potential of running generators and unloading chillers. A risk management plan provided the structure to identify and manage operational risks until all parties were satisfied that the process would not present a significant impact on building operations.

Through the summer of 2019/2020 tests proved the systems of enabling demand response: running generators, curtailing load and measuring the results.



Although it might sound perverse to have diesel and gas powered generators running in net zero emissions buildings, careful consideration was given to the short periods of operation. Some of this time offset other test run hours and there were benefits from learning about demand response. Using tools that were already available was highly valuable and will have lasting benefit.

Running the generators when the building is on, load has proven to be a more effective test than weekend runs. Testing under harsh weather conditions uncovered control scenarios that disrupted the generators from starting at high temperatures. The demand management project also improved overall testing of the back-up generators by adding further operating conditions and, in-turn, improving safety outcomes for buildings.

The same strategies will equally apply when batteries become more common in buildings. Batteries, being an inverter-based technology, are more likely to be synced, will have a lower marginal cost of operation and will have a quicker 'start-up', meaning they can operate in more market conditions. The re-charging stage of batteries will play a role in market conditions when there is excess supply capacity such as the middle of the day.

Having identified MW's of demand side load, machinery and equipment that is largely already in place, the economics of demand side management are plain to see. To accommodate the same load on the supply side could mean investment in generation, transmission and distribution assets that are only required for a small number of hours each year.

"Having tested these projects in partnership with ERM, we will continue the work to embed the peak demand strategies into GPT's properties ensuring that the equipment, controls and skills required become part of business as usual"

Steve Ford, GPT Head of Sustainability and Energy

Table 1 Important concepts highlighted in this case study

*Island mode	Standby generators are usually configured to run only when the grid is down. Running a generator in island mode mean some building loads, maybe chillers or HVAC equipment, can be switched across to run on the generator only while the remainder of the building continues to run on the grid. The generator is an island without connection to the grid. There may need to be a pause in plant operation as it is switched over to the island so must be used with caution.
*Synchronised mode	Synchronised generators are equipped with control equipment that allows the generator to feed energy into the building in parallel with the grid. There are detailed requirements set by the electricity distributor that protect the grid in this case and the cost of controls, if not already provided needs to be factored into a demand management project.
*Asset Register	Asset registers are an important primary document that lists all the major equipment in a building. They serve many purposes including informing insurance proposals, maintenance contracts and valuations, they all rely on a comprehensive and accurate asset register. A well maintained asset register is essential for a well maintained building. Make it someone's job and ensure there is a routine review to ensure it is being kept up to date.