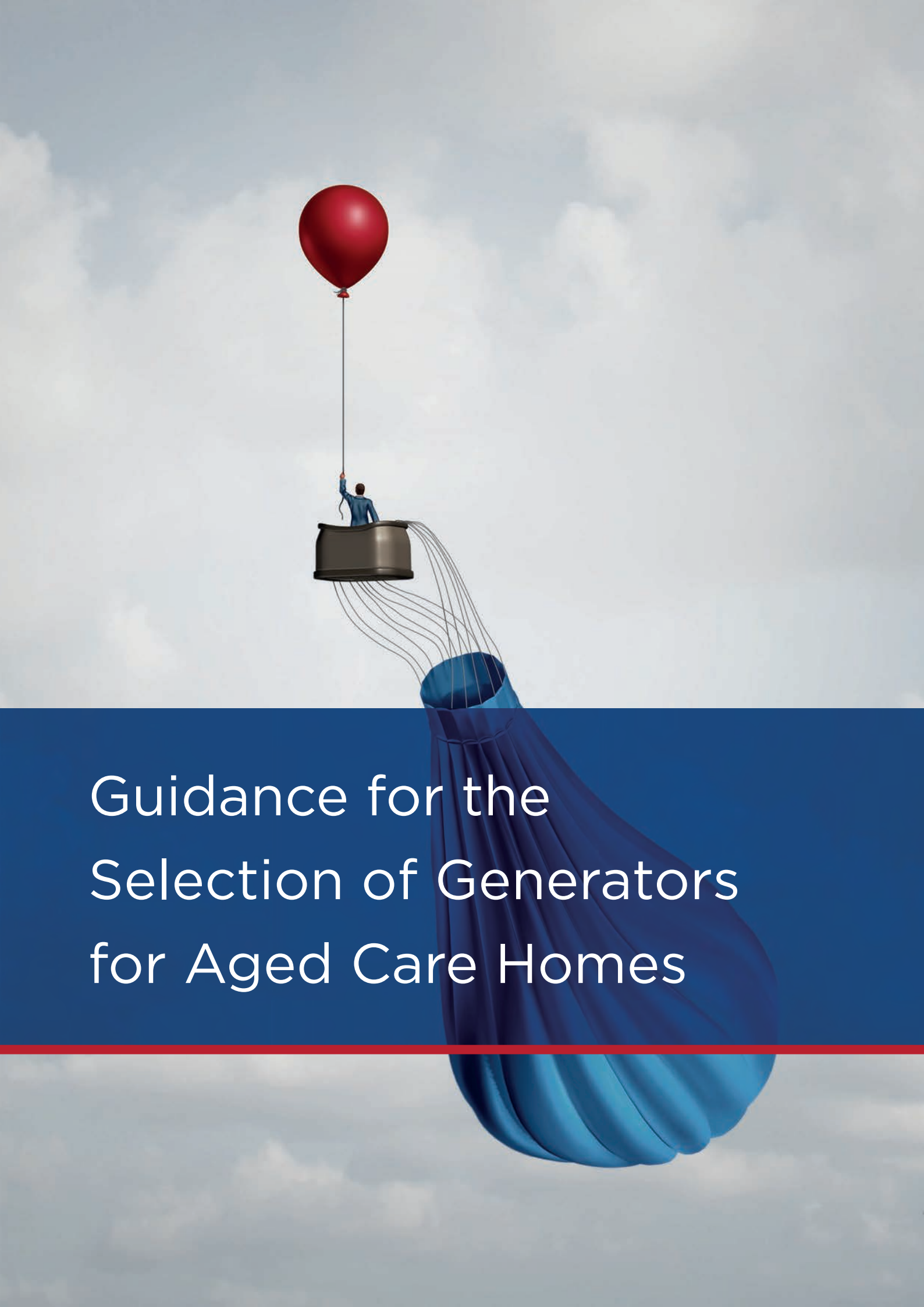

Guidance for the Selection of Generators for Aged Care Homes

Statement of Funding

The Australian Government collaborates with state and territory governments to fund priority disaster resilience initiatives through the National Partnership Agreement on Natural Disaster Resilience. A total of $26.1 million is invested each year which is matched by state and territory governments, providing them with the flexibility to effectively meet the requirements of local communities threatened by disasters, and to support projects that address specific local risks. This project was funded under the Natural Disaster Resilience Program by the South Australian State Government and the Commonwealth Department of Home Affairs

Disclaimer

Acknowledgement

This guide was prepared by the Torrens Resilience Institute of Flinders University and Resthaven Inc. based on records and interviews with Resthaven Inc. home managers and senior staff, in 2017 and in consultation with other industry representatives. Special thanks to the Aged and Community Services Australia. This guidance was reviewed and approved by the Project Advisory Group.

Preface

“Established in 1935, Resthaven Inc. provides support and services to older people, delivering high quality residential and community services throughout metropolitan Adelaide and regional South Australia. As a not-for-profit aged care community service associated with the Uniting Church in Australia, Resthaven Inc. is a separately incorporated, financially independent, charitable public benevolent institution.

Following our experiences of the South Australian ‘Black System’ event, occurring in September 2016, we learnt valuable lessons in relation to maintaining stable power supply and subsequently took steps to ensure resilience-building measures against power supply loss in the future. Working with the Torrens Resilience Institute and Aged and Community Services Australia, we developed these guidelines for other industry partners to guide and assist in building resilience across the whole sector.”

Richard Hearn
Chief Executive Officer,
Resthaven Inc.

“The Torrens Resilience Institute (TRI) at Flinders University was established to improve the capacity of organisations and societies to respond to disruptive challenges which have the potential to overwhelm local disaster management capabilities and plans. As a national and international centre of excellence for the development of advanced thinking in the concept of resilience, TRI assists federal and state governments, the emergency services, organisations and civil society to enhance their leadership and management capabilities, thus enabling them to prepare for, and respond better to, disruptive challenges.

We hope this project enables the residential aged care sector and, in particular, residential aged care homes, to build resilience against power outages, and provide basic guidance and considerations when selecting appropriate power generators for homes.”

Professor Paul Arbon AM
Director
Torrens Resilience Institute
Flinders University

Contents

How to use this guide

The guide is intended for residential aged care provider managers, maintenance managers, property and asset managers, finance controllers, work health and safety officers, emergency officers, fire wardens, and others in the residential aged care industry to identify and understand the process and the issues to consider when implementing generator backup power in residential aged care homes.

Directors of residential aged care homes may also find this document useful for understanding what drives the need to build resilience to power outages, and how this might affect critical services and residents.

The guide may also be of use to retirement village operators.

Although the majority of information in this document is tailored towards aged care homes, where the needs of residents are different (e.g., retirement village residents are potentially less energy dependent and more mobile), there are enough general lessons learned and advice for planning that the guide could be used in different contexts.

The guide is divided into six sections which can either be read together or separately.

The guide consolidates lessons learned from a number of residential aged care home sites when seeking to strengthen their resilience to external power failure through installing generators. It provides a framework for residential aged care homes seeking to mitigate the risk associated with loss of electrical power supply to residents and staff by considering some of the challenges in designing, selecting and installing an on-site power generator, how problems can be overcome, and the key considerations for the owners and operators of residential aged care homes.

The guide considers broad principles drawn from the experience of other aged care providers. In each specific case where the installation and use of generators is being considered, specialist technical advice will be required. These guidelines do not provide essential technical guidance.

1 | Introduction

The importance of residential aged care homes being ready in the event of a power blackout cannot be overstated.

With this in mind, this guide has been designed to facilitate initial thought and discussion about the installation of a backup generator, in order for residential aged care homes to improve their resilience to adverse conditions.

It is not meant to be an exhaustive document, as different sites require different considerations. However, this guide is a starting point for considering various aspects of generator installation, and preparing aged care home staff for the challenges ahead.

The first part of the guide 'Electrical power and residential aged care providers' looks at three examples of power outages which caused multiple issues for residential aged care homes.

These examples are drawn from the South Australian storms in 2016, the 2009 Victorian bushfires, and Hurricane Sandy in 2012 in the United States, and illustrate how the flow-on effects from a power outage can affect residential aged care homes.

'What do I need to think about in the first instance?' takes readers through several initial questions and issues before generator installation commences. This section includes consulting an electrical engineer, liaising with local or State government regarding development status, performing an energy audit, working out the cost of installation and the budget, the expected timeframe, and how to formulate a procurement strategy.

'How do I choose the correct generator for my home?' deals with the selection of a generator. There are many different types which can be confusing for those with no technical background. This part of the guide provides a brief overview of what to look for in a generator, and a simple list of the pros and cons associated with the various types.

'What ongoing considerations do I need to factor in?' examines ongoing issues with installing a generator, such as regular maintenance and staff training. Installing the generator is undoubtedly the hardest part of the project, but in order to extend the life of your generator and ensuring its useability continues, these considerations are important.

2 | Electrical power and residential aged care providers

As Australia's population ages, there is an increasing demand for residential aged care services, which is projected to increase by approximately 150% over the next 40 years.[1]

In June 2016, there were 5,069 residential aged care homes in Australia, consuming approximately 7.8 million gigajoules of energy in Australia each year.[2] These residential aged care homes rely on power for many daily essential tasks, such as lighting and temperature control. With the emergence of new technologies, especially healthcare devices associated with the care of higher dependency residents, it is likely that energy will remain critical in the day-to-day running of residential aged care homes. Preparation for emergencies, especially those that may threaten power supply such as heatwave conditions, need to consider the centrality of energy demands.

Power blackouts are disruptive events that interfere with communities' ability to function, affecting communication networks, traffic flow, and food storage, amongst other things (see Figure 1). While short or isolated power outages may be an inconvenience rather than a danger, prolonged outages bring modern life to a standstill, causing cascading issues. Outages are often caused by other events such as severe storms, bushfires, or heatwaves, which heighten the risk of other pieces of critical infrastructure failing, such as communication and transport lines.

Elderly people may be more vulnerable to disaster than the general population for various reasons. Decreased mobility results in people being unable to remove themselves from danger; conditions that cause decreased brain function might limit people's ability to follow instructions; decreased ability to regulate body temperature means higher risk of extreme temperature events exacerbating health conditions; and falls causing injury are more likely with a lack of adequate lighting.

Evacuating residential aged care homes is logistically challenging and has the potential to cause severe health risks for residents[3]. This means that many residential aged care homes will choose to 'invacuate' (remain in the home) where possible. For this reason, ensuring residential aged care homes are resilient and have power during blackout periods is particularly important, as it avoids unnecessary evacuations and decreases the risk of adverse health effects caused by displacement and stress.

Increasingly, the extent of power dependency and the impact its disruption has on everyday activities is being recognised. In 2014, the Victorian state government invested $40 million to install backup generators in approximately 400 residential aged care, residential, and disability homes to increase resilience during natural disasters. In the United States of America (the USA), attempts have been made to legally require residential aged care providers to have robust backup generators to ensure minimal loss of electricity during power outages in response to the experience of Hurricane Sandy and the subsequent snow storms[4].

Generators ensure that critical medical equipment, air conditioning, food services, communications, safe levels of lighting, and specialised equipment such as duress alarms and home security, continue to function during power disruptions.

This guide will inform and empower home operators to address identified gaps and implement improvements to help build resilience against disruption of power supplies. The following case studies illustrate the extent of the effects that a power blackout might present, focusing on relevant considerations for residential aged care homes.

Figure 1 illustrates the areas of residential care homes that are commonly affected by power outages.

[1] Commonwealth of Australia 2017, p.3

[2] Office of Environment and Heritage 2014, p.2

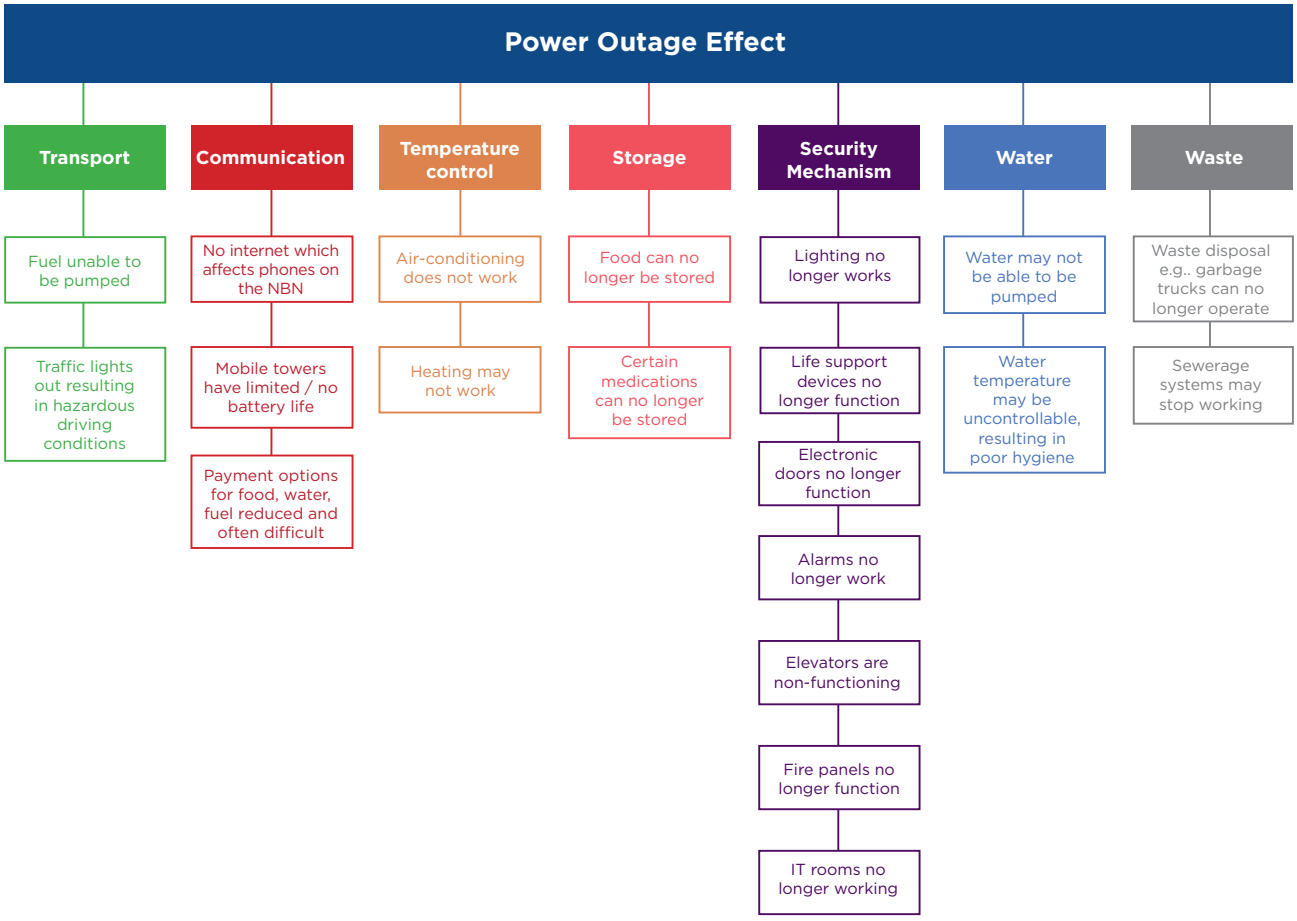

FIGURE. 1 POWER OUTAGES EFFECT

Case Study 1: South Australia, Australia

On Wednesday 28th September 2016 at 3:48pm, South Australia experienced a state-wide power blackout as a result of severe storms that damaged power equipment across the state. This triggered a cascading series of five faults, resulting in the disconnection of 850,000 customers. This was an unprecedented 'black system' event, causing problems across the entire state[5]. While 80-90% of customers had power restored just after midnight (a downtime of around 7.5 hours), areas around Port Lincoln experienced reduced and unstable power until the 8th of October.

This prolonged period of unstable electricity supply prompted SA Water to advise residents in Port Lincoln and surrounds to use as little water as possible, due to the difficulty of pumping water without power[6].

A number of residential aged care homes also encountered difficulties when trying to access electrical power generators. Many generator providers were booked out due to the increased demand across sectors or could not put delivery trucks on the road due to the dangerous conditions imposed by severe weather and non-functional traffic lights. This left residential aged care homes across the state with no means of obtaining backup power, increasing the risk of negative cascading effects for residential aged care providers such as lack of storage for medication and food, as well as reduced communication.

[3] Cacchione, Willoughby, Langan & Culp 2011
[4] The News Service of Florida 2017
[5] Burns, Adams & Buckley 2016, p.xi
[6] ABC 2016

Case Study 2: Victoria, Australia

On the 7th of February 2009, bushfires devastated the state of Victoria, resulting in the deaths of 173 people. 'Black Saturday' as it came to be known remains one of the worst bushfires in Australian history. The Royal Commission into this disaster identified the loss of power, and the associated loss of telecommunications, as a critical factor that hindered relief efforts[7]. Significantly, individuals aged over 60 made up 30% of the total deaths, compared to only 16% of the Victorian regional population being aged over 65[8].

This bushfire also coincided with a heatwave, during which individuals over 60 years of age were more prone to heat-related illnesses[9]. There is a strong link between extreme heat and an increase in patient presentations to emergency departments up to 10 days afterwards, where emergency departments continue to deal with higher-than-normal numbers of patients, as pre-existing illnesses can be exacerbated by extreme temperatures, a problem that particularly affects the elderly[10]. The need for residential aged care homes to maintain comfortable temperatures, to ensure residents remain healthy, is critical.

While power loss in certain instances was caused directly by the bushfires, there were also outages instigated by the power network provider to prevent new outbreaks of fire, in the event of a power line being damaged and sparking. In these cases, power networks are not always able to advise ahead of time if power will be cut, thus making essential the quick response of an inbuilt generator, or the ability to quickly procure one.

Case Study 3: United States of America

On the 29th of October 2012, Hurricane Sandy in the USA caused a power blackout affecting over 8 million customers across 21 states, including New York. These power outages were extensive, with power not being fully restored in some states until the 16th of November – a full 18 days later[11].

Prior to the arrival of Hurricane Sandy, consumers were advised that the power would likely be down for three days. Many already had some alternate form of energy, owing to Hurricane Irene's impact the year before. In the case of Hurricane Sandy, the sufficiency, accessibility and usability of the generators became critical. As the power blackout continued, people were unable to refuel their generators due to petrol stations not having a way to connect a generator (if it was even available) to the fuel pump. There were also occasions in which generators were not located in areas where they were accessible when required. Mobile telephone towers, typically located on the tops of buildings, were unable to connect to a generator, due to the difficulty of getting a generator to the tower. Other problems included flooding, which destroyed many poorly-placed generators, generators that did not match the electrical circuit, and a general lack of familiarity with generator connections and maintenance which led to many available generators being rendered useless. In this event, 117 people died, the majority of whom were over 65 years of age. While the most common cause of death was drowning, the third most common cause of death was related to poor lighting, with people falling down stairs or over hazards in poorly-lit conditions[12].

[7] Parliament of Victoria 2010
[8] Squair 2010
[9] Commissioner for Environmental Sustainability 2012, p.121
[10] Mayner, Arbon & Usher 2010, p.175

[11] Henry & Ramirez-Marquez 2016
[12] Daniel 2012

Applicability

From these case studies it is clear that:

- Loss of power can have significant effects
- Extreme weather events can lead to power blackouts that cause severe disruptions to everyday life, and increased risk for vulnerable people, especially when communications are disrupted
- Restoration of power can be unpredictable and outages can last longer than anticipated
- Power outages and their consequences need to be planned for in emergency and business continuity plans
- Generators offer a viable solution in preparing for outages, but these devices need to be fit for purpose - a generator that is not fit for purpose may not be able to be used
- Careful selection of generator, selection and training of staff and maintenance schedule is essential for ensuring that generators are going to be useful in a power outage
- Consideration needs to be given to the possibility of running generators for extended periods of time in the event of a power outage

This guide provides a framework for residential aged care homes seeking to mitigate the risk to residents by presenting some of the challenges in installing a generator and how problems can be overcome. While generators can potentially be sourced in the event of an isolated or small suburban blackout, experience indicates that this will not be the case in a widespread emergency. This means that for many residential aged care homes, it may be prudent to investigate installing an onsite generator.

3 | What do I need to think about in the first instance?

While improving a home's resilience should be a major goal of any residential aged care provider, the cost and time spent installing the generator can be prohibitive. It is important that residential aged care providers understand what they are undertaking.

In the event that generator installation is deemed too cost prohibitive or difficult to undertake at the current point in time, there are alternative options that may also bolster resilience and improve outcomes during an emergency, such as invacuation and evacuation strategies that are regularly tested against possible scenarios, with clear and reliable avenues to safely provide staff with transportation and an evacuation site.

Another option is to ensure the availability of communication methods that do not rely on electrical power. Maintaining links with local emergency services can also ensure that your home is able to access information about the severity of the situation and make adjustments accordingly, as well as obtaining assistance when necessary.

For further ideas, please contact the Torrens Resilience Institute for details regarding the Torrens Resilience Institute Aged Care Facility Resilience Scorecard.

Consult the relevant planning authority

The relevant planning authority (local/state/territory government) should be consulted to determine if the installation of the generator requires their endorsement/ approval and the nature of the authorising process. In the event that authorisation is required, this should be sought and received prior to proceeding.

Electrical Engineer

An experienced electrical engineer should be contracted to determine if there are any site-specific electrical issues, such as wiring, that may need to be fixed or changed before a generator can be installed. Some buildings, particularly older ones, may require extensive and expensive wiring issues to be resolved. An electrical engineer will be able to determine any modifications you might need, and will also provide a quote for works. This provides correct advice about your site before beginning, and enables you to budget appropriately.

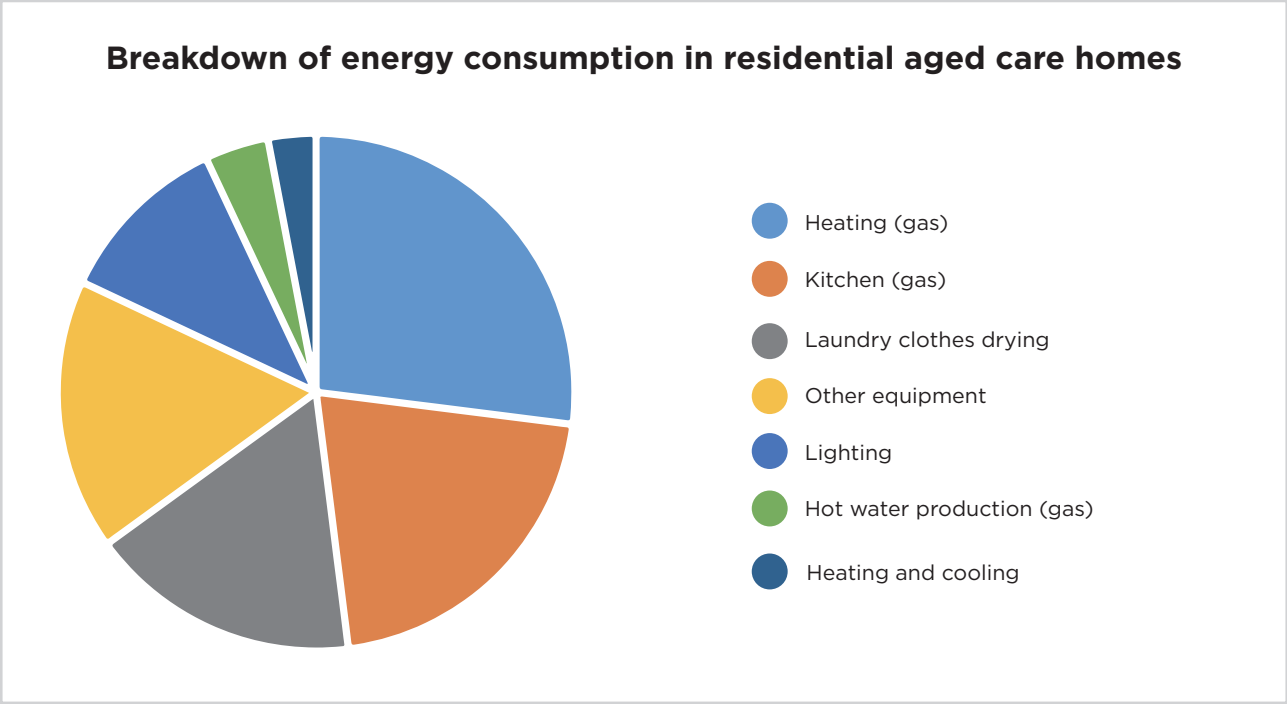

FIGURE. 2: BREAKDOWN OF ENERGY CONSUMPTION IN RESIDENTIAL AGED CARE HOMES[13]

Energy Audit

Before you begin to consider which type of generator might be suitable for your home, you first need to determine your energy use. The top three uses of energy in a residential aged care home are electricity used for heating and cooling buildings, gas used for hot water production, and electricity for lighting. These three important functions average around 65% of the total energy consumption, as shown in Figure 2 above.

The typical overnight base load use drops by around 20% in comparison to day time usage. Daily usage changes seasonally, with peaks due to temperature control occurring around midday in summer, and in the early morning/early evening in winter.

If your home consumes more than 160MWh per year, the half-hourly data for energy consumption may be available from your power provider. Contact them to obtain your power usage data and to find out your maximum power needs. The data should cover a minimum of 12 months usage to gather an accurate picture. If there have been significant changes to the site, a longer period of data may need to be obtained. As well, compare the last 12 months of data with the periods of peak use during which an outage may be more likely (e.g. summer, storm season). If this number is higher than the 12-month average, it is worth considering installing a generator that can handle your maximum demands.

Consider if you have planned or expected upgrades to buildings anticipated in the next 5-10 years, such as extra rooms, more specialised rooms or different lighting. A generator's lifespan is likely to be long, so planning for any foreseeable increases in power consumption is worthwhile.

You should also consider whether you are going to power the entire site or only selected areas. If powering selected areas/infrastructure, it might be possible to reduce the capacity of the generator and associated cost. To enable the generator to be limited to certain areas/infrastructure requires that they be isolated to a separate circuit. If this was not factored into the initial wiring of the site, the trade-off between the cost of separating the electricity supply for these items, and the saving that will arise from purchasing and operating a smaller generator should be considered. These options should be considered at the outset of the project.

[13] Information obtained from Office of Environment and Heritage 2014

Cost

The biggest constraint for many residential aged care homes considering installing a generator will be costs. Capital costs such as the cost of the generator and its transportation, expenses for engineering design and project management, installation, cabling and associated trenching, transfer switches, contractor or builder wages, and council permits must be taken into account. There are also operational costs to consider, such as ongoing maintenance and staff training, and fuel requirements. This can quickly add up, making the initial outlay for such a project relatively costly. If your building has two mains power supply boards, it may become necessary to install two (or more) generators. This means that for any cost analysis to be comprehensive, a thorough check of the building by an electrical engineer and other contractors will be necessary.

Timeframe

Installing a generator is not a simple or fast process, and requires a good deal of planning. In addition to needing time to work with a contractor, there is also the possibility that a ready-to-install generator will not be available, or will have to be built-to-order, which can take up to several months.
Council permission may also need to be sought, and different councils may have different rules. Check with your local council prior to starting work to ensure that you will not be violating codes or development approval conditions. Extra infrastructure (such as cabling and a transfer switch to ensure the generator is connected to the building and can be turned on) needs to be installed, and a platform or base for the generator must be constructed. This means that installing a generator is likely to take some time.

Procurement Strategy

It is important to consider your strategy for obtaining the generator. Hiring a contractor to oversee the project, or several contractors to oversee the different parts of the project, may take some of the stress out of procuring a generator, but there are still many issues to consider.

There are different stages to installing a generator. Firstly, the site must be made ready to house a generator. This involves gathering information about the infrastructure on your site and working out a safe location that is not subject to extreme temperatures or located somewhere prone to flooding. Additionally, the generator must be able to be positioned on this site, so ensure that trees and power lines will not affect your ability to get the generator in place. This is a substantially different part of the project to the electrical side of the generator installation, involving different skillsets and, as such, may require two separate contractors.

Identifying and liaising with distributors and ensuring that you will be supplied with a generator that will meet your needs can take some time. It is best to contact these distributors before performing any earthworks.

All stages of generator installation are highly dependent on the others. If any part of the project is delayed, it is likely to impact on the project timelines. You should start collecting the necessary permissions (whether internal, such as from a board of directors or CEO, or external, such as power networks and the local council), quotes, and projected timeframes before any work is started.

These issues will be compounded if you are attempting to install a generator at more than one site. Each site will require all the steps to be done individually, which exponentially increases the amount of work needed. If installing at multiple sites, you will need to decide whether to hire site-specific contractors or to use an overarching contractor, whether one member of the organisation will be responsible for permissions or if it will be staff members from the individual sites, and if there are any differences in site specifications/requirements. It is likely that each site will require individual and specific solutions to the multiple issues that may arise, and careful consideration of how best to approach the overall organisational aims is needed.

4 | How do I select the correct generator for my residential aged care home?

The generator required will vary from home to home, and will be dictated by individual energy needs. If we consider heatwaves, which are becoming more common in Australia[14] and which place a heavy energy burden on the power sector, we can see how individual energy needs can vary, and how important power is.

Temperature control places a large burden on the energy system, and accounts for an average of 27% of usage in residential aged care homes[15], as residents tend to be vulnerable to extreme temperatures. Larger residential aged care homes will generally require more energy to cool than smaller ones, older buildings may be harder to cool than newer buildings, and the size of rooms and types of air-conditioners can all affect energy usage. In the event of a power blackout caused by a heatwave, residents will be sensitive to the heat and require air-conditioning to maintain their health.

It is important to ensure that you understand the start-up requirements of your equipment. Older or large equipment such as refrigerators and air-conditioners may use more power on start-up. In the event of a heatwave, an older air-conditioner being turned on can result in a large wattage increase, sometimes up to eight times the amount of power the air-conditioner will use when it is in the middle of its run cycle. If you do not account for this, it is possible that the generator will overload on start-up, causing it to fail. For this reason, make sure that your maximum demand calculations take this start-up wattage into account. You can generally find this information via the user manual or by contacting the manufacturer.

Also consider the period of time the generator will be required to run at full capacity. Full capacity periods generally occur during the day, with night decreasing the draw on the generator. In the above scenario, the generator could be running at close to maximum demand throughout the middle of the day, with load decreasing as the outside temperature cools. However, the generator may not have the capacity

[14] Steffen, W Hughes, L Perkins, S 2014
[15] National Energy Efficiency Network 2015

to continue through the next day in the event of a multi-day blackout, which could place residents at risk. A back-up plan in the event the generator does not function for as long as is required should also be considered.

Achieving a longer run time in the event of a multi-day blackout (without cutting down on electricity consumption) involves the use of additional fuel supply, either external fuel tanks and/or regularly filling up the fuel tank(s). This introduces further challenges and costs. Transfer pumps, pipework, and fuel storage issues further complicate the setup, capital, and operating costs of the generator, while compliance issues with local councils will also be compounded. Fuel life is also an issue when having backup tanks. Fuel has a finite life and will need to be checked and, when required, topped up with additives. Backup fuel is unlikely to be regularly changed due to cost, but will also eventually need to be disposed of in a safe and legal manner if not used.

There can be issues associated with relying on external suppliers to provide backup fuel. Not many suppliers conduct on-site refuelling, and there are no guarantees that suppliers will allow drivers out on the road during an emergency due to worker health and safety considerations. Roads between your site and the supplier may be closed by authorities during an emergency such as a wildfire, flooding, or severe storm, preventing access to your site. There is no guarantee that fuel can be sourced from a local service station, and accessing fuel from a service station would raise logistical questions such as ease of transporting the fuel back to the generator in containers, which in times of emergency will be potentially hazardous.

The risk of being without power for an extended period of time also heightens the further away from a capital city the home is located, as seen in the case of Port Lincoln, where power was restored much later than in Adelaide during the 'Black System' event in 2016. While there is a chance that capital cities will be left without power for a long timeframe, rural residential aged care homes clearly have higher risk when it comes to needing backup fuel. These choices are ultimately specific to the residential aged care homes concerned and require residential aged care providers to think comprehensively about their individual needs and circumstances. A feasibility study is recommended.

Issues to consider include:

- What needs to be powered by the generator?
- What are the generator size requirements to power my site/s?
- Where do I get advice on the design of infrastructure and connections?
- What is the best location for the generator?
- What legal requirements or council planning approvals need to be obtained?
- What is the environmental and operational impact of the generator?
- What is the cost per site?
- Who is the best manufacturer to obtain the generator(s) from?
- What are the ongoing operation and maintenance costs and logistics?
- How will the long-term plans for this site affect future energy demands?

What type of generator should I select?

There are many different kinds of generator, including portable and permanent types. This guide applies to issues with permanent generators. However, portable generators are a good option if the goal is to maintain essentials such as refrigeration of food and medications. In the event that residents require power, permanent generators are safer, more reliable, and allow a more responsive and automatic power supply.

Generator Type	Pros	Cons
Permanent	• Can power whole site • Quieter • Can turn on and off automatically if installed with an Automatic Transfer Switch • Generally run smoothly, making them less likely to damage computers, TVs etc • Generally constructed to secure the controls, fuel tank and the like from tampering	• More expensive • Hard to setup initially (requires electricians, contractors, permits etc)
Portable	• More affordable • Simpler setup (though training is still necessary) • Transportable	• Will only power individual selected items commensurate with capacity • Generally require refuelling more frequently • Still requires an electrician to ensure the generator can be safely connected to, and disconnected from, the premises

TABLE 1: GENERATOR TYPES

Fuel is an important consideration with fuel type impacting on price-point, storage capacity, availability and efficiency. Some generators also have the potential to work with multiple fuel types.

Generator Fuel	Pros	Cons
Petrol	• Wider variety of models	• Petrol is highly flammable, causing a fire hazard • Petrol generators reach a higher temperature than diesel generators, meaning more frequent maintenance and repair • Fuel life is relatively short • Less efficient than diesel
Natural Gas	• Cleaner fuel source than petrol or diesel • No odour • Natural gas is generally available in large cities through pipelines, meaning fuel storage is not as critical (except in events in which the pipeline is disrupted)	• More expensive to run (up to 25%) • Natural gas is extremely explosive, and can be a serious fire hazard
Diesel	• More energy efficient per litre • Generally requires less maintenance • Does not require spark plugs or internal wires which reduces costs and risks of fire • Diesel is less flammable than other fuels	• Initial cost tends to be higher • Bulky and heavy build – undesirable as a portable generator

TABLE 2: FUEL TYPES FOR GENERATOR

The type of power your generator can deliver is also a consideration.

Power Type	Pros	Cons
Single-Phase Produces a single voltage that alternates continuously	• Less expensive • Less complex • Best suited to smaller loads	• Limited to small applications
Three-Phase Produces three separate waves of AC power that operate in sequence	• Continuous flow of power that doesn't drop to zero • Better for bigger loads/homes	• More expensive • More complex

TABLE 3: TYPE OF POWER THE GENERATOR PRODUCES

Different generator types should be discussed with a contractor, electrician or generator expert to ensure you are making the right choice for your home. The above is a simple guide only.

Where should I place my generator?

The placement of the generator is important. Associated cabling costs, and the location of existing infrastructure such as water pipes or existing underground cables must be taken into account. The generator and its foundations should not obstruct access to any infrastructure. The generator must be accessible for servicing, refuelling, and checking. It must also be placed somewhere that is not at risk of flooding, or on a raised platform to mitigate flood risks.

Depending on how the generator is to power the site, the incoming supply authorities' network may need to be intercepted. Close proximity to this incoming supply may minimise capital costs.

Many generators can only operate up to a certain temperature, which means that placement must consider ambient heat as a factor. Concrete environments such as car parks typically reach higher temperatures than gardens or dirt, so installing on, or near, a dirt bed may be preferable.

The local council should be contacted to ensure that no approvals are required. For example, if the generator requires space that is currently occupied by a parking bay, council approval will likely be required as it may alter original planning approvals.

The position of the generator in relation to care residents' rooms or neighbours' properties must also be considered, since many people perceive generators to be noisy and polluting and may take issue with one being installed in their proximity.

Cabling

Cabling from the generator back to the premises switchboard is required to connect the generator to the building so that electricity can be supplied. A qualified electrician should be contracted for this task, as incorrectly installed generators can result in a dangerous phenomenon known as 'backfeeding'[16], which has the potential to cause severe injury or death to lines people working on power lines in the area or results in a non-working generator.

When installing a generator, an electrician needs to liaise with the electricity supply authority to isolate power to the site from the street. This involves completing relevant forms and gaining approval from the supply authority. Once set, this date may not be flexible, so any delay may require a further application form and a future appointment date. This can significantly affect the projected time-frame.

Automatic vs Manual Transfer Switches

An Automatic Transfer Switch makes it possible for an inbuilt generator to connect to a building to power a home. The switch continuously monitors fluctuations or other power quality issues, and turns the generator on in the event it detects an issue with power supply. This means that you are only without power for the time it takes for the generator to start, stabilise output, and connect to buildings, which generally takes under a minute. The Automatic Transfer Switch will monitor the mains power and reconnect the mains when it detects that power has been restored and is stable, allowing the generator to commence its shutdown operation.

A Manual Transfer Switch requires you to trigger the start-up of the generator, first by identifying that there is a power blackout, then manually starting the generator and turning the switch to the generator position. This will result in a longer period of time during which power is not accessible to the home. You will require trained on-site personnel who are capable and competent in this procedure to handle the generator during this time.

Although the Manual Transfer Switch is cheaper to purchase, it is worth considering the types of conditions that may require a staff member at any time of the day and week to operate the generator and the Manual Transfer Switch (for example, in extreme heat, flooding), and whether the home can be without power for the time it takes for the generator to commence operation.

Both types of switch are required to be custom built. Your selected switch will then require installation on the switchboard.

Switchboard

The setup of the building's electrical services and switchboard(s) will significantly influence how a generator supports the building's emergency power operation. This can pose challenges if power needs to be conserved, as further consideration needs to be given to how the electrical demand will be managed across the building. Staff and residents may need to be instructed to conserve power and limit the use of lights, televisions etc.

Home changes to internal layouts and/or functions can mean that what was once an essential nurse's station is now a laundry room. It is important to know exactly what will be powered before an event occurs. Changing the building's internal electrical wiring or switchboard may also take considerable time, resulting in disruptions to site operations, incurring additional time and costs.

[16] Backfeeding is the flow of electrical energy in the reverse direction from its normal flow. This is extremely dangerous and is an electrocution risk to utility workers and neighbours served by the same utility transformer. It also bypasses some of the built-in household circuit protection devices.

5 | What ongoing considerations do I need to factor in?

Noise

As residential aged care homes try to ensure that their residents are comfortable and content and that the amenity of the local environment is not infringed by excessive noise, generator noise is an important consideration in selection. It is essential to manage care recipient expectations of the intrusiveness of the generator to ensure that they understand the day-to-day impact. Consideration should also be given to the surrounding neighbours of the site to ensure minimal impact to their privacy and amenity should the generator be required to operate whether in an emergency or during routine maintenance testing.

Permanent box generators may therefore be the best solution for residential aged care homes. Box generators are contained in a box which is secure and attenuates the noise. It is also self-contained in regards to the battery, charging, the motor, the generator, the fuel tank and the controls. In addition to being quieter than open generators, these generators are also more aesthetically pleasing and easier for staff to access to inspect gauges and fuel levels.

Maintenance

The ongoing maintenance of the generator is a particularly important consideration. A generator requires frequent inspection and testing to maximise its life and to ensure it will start when needed. Regular testing of the generator requires monitoring and eventual replenishment of fuel levels, which contributes towards maintaining fuel life. Deliberation should be given to whether the maintenance will be performed by a contractor or by in-house resources, or a combination of both.

As the generator is likely to be located outside, there is also the problem of how to set it up in such a way that the generator can communicate issues to staff onsite, such as low fuel or other faults. Some manufacturers offer the possibility of a remote communication panel located inside where staff can easily access and monitor the generator, or other technologies that will enable communication via an IT network for remote monitoring.

Staff training is essential for ensuring that the generator remains in

operational mode, including during perceived low-risk times. Attention should be given to how turnover of trained staff will be handled.

Safety

Safety is an important consideration. Ongoing staff training and maintenance of the generator must be performed. This will ensure that the generator is able to safely and effectively power the site and decrease the risk of injury to staff and residents. In addition, resources need to be made available and strict safety standards followed. In most cases, this involves the use of auditing systems such as maintenance log books, to record when maintenance and servicing has occurred. This ensures that the long-term safety aspects of the generator's use are being addressed.

Maintenance may require planned outages that can be lengthy in duration. This means that maintenance can be delayed due to weather considerations, events, or simply to avoid disrupting residents if other issues have occurred internally. Ensuring that audits are followed properly thus requires setting expectations for both staff and residents and ensuring that there is communication of the importance of maintenance to everybody in the home. These audit systems should be robust enough to detect any lapse in maintenance and to rectify this as soon as possible.

Site selection is of paramount importance. You need to ensure that the generator is placed away from doors, windows or vents that lead inside, to avoid the potential for carbon monoxide poisoning (depending on the type of fuel used). A carbon monoxide detector should be installed near the generator to detect fumes and sound an alarm. Placement of the generator can also mitigate environmental factors that may make the generator unsafe, such as extreme temperatures or the potential for the site to flood.

A spill tray should be used for the generator, to ensure that fuel does not escape and enter the stormwater system or form puddles on the ground. The spill tray must be emptied regularly.

Electrocution is also a risk. It is important to ensure that a qualified electrician installs the generator and that servicing is carried out regularly by qualified technicians.

If the generator is located in an area at risk of bushfires, excessive heat, or contact with flames, this could result in the generator exploding. Special consideration needs to be made to the type of generator and the fuel that powers it before installation. An emergency shutdown procedure should be incorporated into the emergency and evacuation plan for the site.

Once again, staff training is essential to ensure that staff understand the warning signs and know how to safely operate the generator if necessary.

6 | Checklist

This checklist condenses this document into a series of questions designed to prompt thought and discussion regarding the scope and practicalities of generator installation.

Before starting the project:

1. Have you determined the number of sites that need a generator installed?
2. Have you performed an energy audit of the site/s?
3. Have you performed an audit of the existing electrical infrastructure and its suitability to connect a backup generator?
4. Have you given thought to a procurement strategy?
5. Have you called distributors and received a quote/timeframe for the type of generator you require?
6. Have you considered whether or not to hire a contractor? Have you contacted multiple contractors to see what they can manage/recommend for you?
7. Have you considered hiring multiple contractors to oversee different parts of the project according to their specialities?
8. Have you planned out the timeframe for installation? Is this realistic or is it a best-case scenario? If you decide not to go with a contractor, you will still need to engage the assistance of many different tradespeople. Have you sought out an electrician or earthworks company?
9. Have you received the necessary permissions, both internally and externally?
   - Board of Directors and CEO
   - Local council
   - Power network (to connect the generator to the building – it may take several months to get permission, so it is best to start early)

During the project:

1. Who are the points of contact during the project? Who needs to be contacted if there are issues? Who can give permission for things to be done?
2. Do you know the stages of the project and the estimated timeframes? Does this allow time for delays?
3. Have you performed a site audit to determine the best placement of the generator?
   - Away from flood-prone areas
   - Away from extreme ambient heat
   - Not near a door or window where fumes might be able to get inside
   - Close to the switchboard/ power lines
   - Not under power lines or trees that may prevent the generator being placed there
4. Have you ensured that you know the location of essential infrastructure to the building to avoid damage to these lines?
5. Where are you going to place alarms for the generator? E.g. carbon monoxide, low fuel, etc.
6. Have you arranged to update your fire and safety policies to reflect the use of a generator?

Ongoing issues:

1. Have you considered who will maintain the generator?
2. Have you put an audit system in place for maintenance of the generator?
3. Have staff been trained in how to safely turn on, check, and perform basic maintenance on the generator?
4. Have you scheduled training for new staff, and refresher training for tenured staff?
5. Have you arranged a contract for fuel supply?

Additional Resources

The resources listed below are intended for reference. Inclusion does not imply endorsement of information or practices contained.

http://www.agedcommunity.asn.au/providers/aged-care-emergency-planning/

- This website has been designed to assist aged care facilities' providers and country hospitals in planning, preparing for and responding to emergency events. The information contained in the website is not intended to be prescriptive or regulatory, rather it is intended as a central repository of resources to assist you in the development of your own local tools and processes.

https://agedcare.health.gov.au/publications-and-articles/guides-advice-and-policies/risk-management-for-emergency-events-in-aged-care

- The Department of Health website discusses risk management for emergency events in aged care.

https://www.aacqa.gov.au/providers/education/the-standard/november-2017/summer-emergencies-are-you-ready

- Useful links on emergency preparedness in aged care.

https://www2.health.vic.gov.au/ageing-and-aged-care/residential-aged-care/emergency-preparedness/heat-health

- The Department of Health & Human Services developed the *Residential aged care services heatwave ready resource* to help Victorian residential aged care services (RACS) plan and prepare for heatwaves. The resource provides information on heat health and older people. The resource includes a checklist to help RACS prepare for hot summers, covering policies, procedures and protocols, resident care needs, staffing, environment, equipment, services and supplies. The resource also contains templates for residents, families and carers about ten common myths and misunderstandings about heatwaves, information for residents and information for carers and families.

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