

# Sydney Zoo case study: Designing a new site to make the most of clean energy



**Sydney Zoo is looking at integrating solar PV and an embedded network into the design and operation of its zoo under development in Western Sydney.**

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*As an innovative startup we wanted to incorporate solar PV into the design of our zoo but we didn't have the expertise to scope the opportunity. Through the clean energy strategy process we have the foundation to progress the clean energy opportunities identified.*

*Jake Burgess, Managing Director, Sydney Zoo*

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## Summary

Sydney Zoo is currently being designed and constructed in Western Sydney. The zoo's commitment to environmentally sensitive design includes the ambitious aim to become the world's first energy independent zoo.

This case study highlights the value of exploring clean energy projects in the design phase of a new development.

Sydney Zoo has set specific clean energy targets. Options for meeting its targets include substantial solar PV, an embedded network and battery storage.

## About Sydney Zoo

Sydney Zoo is an innovative start up business located in Western Sydney. The zoo is currently being designed and constructed and is expected to open to visitors in 2019. The premises spans over 40 acres, includes 24 buildings, and is expected to attract 745,000 visitors per year.

### Current energy situation

Since the zoo is in the design and construction phase and is a greenfield site, specialist expertise was needed to model the site's expected energy consumption and assess its clean energy options.

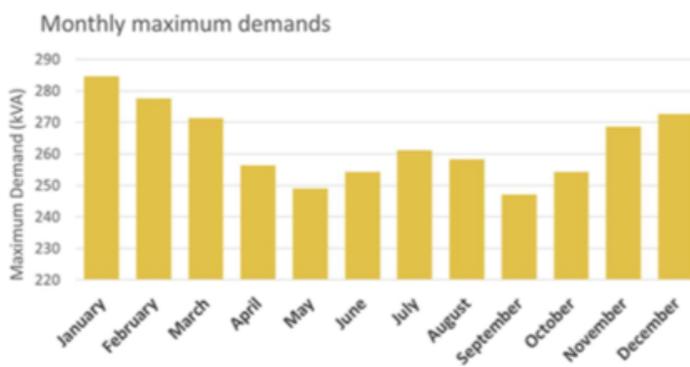


Figure 1: Estimated Sydney Zoo peak electricity demand by month

Using proposed building area, equipment design and assumptions about when during the day energy would be needed (see Figure 1), it was estimated that the zoo will need around 1,300 megawatt-hours of electricity every year (see Figure 2). This could cost the zoo about \$170,000 per annum.

The zoo's energy use is expected to be made up of around one eighth heating and cooling and one eighth lighting, with the remainder being for the on-site restaurant and zoo equipment such as aquatic habitats for animals.

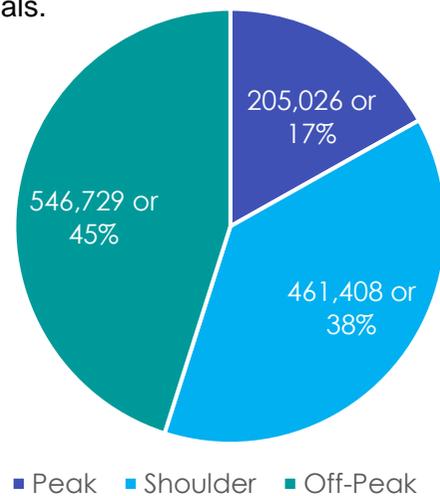


Figure 2: Annual consumption by tariff period (kWh)

## What is a clean energy strategy?

The NSW Government is actively encouraging businesses to develop clean energy strategies for achieving 100% renewable energy and emissions reduction.

A strategy includes an individually crafted mix of measures for reaching a clean energy target. Measures might include energy reduction, energy efficiency, on-site solar or other renewable energy, off-site procurement of renewable energy or purchase of carbon emission offsets.

## Fast facts: Sydney Zoo's energy situation and clean energy strategy

	<b>Energy consumption</b>	<ul style="list-style-type: none"><li>Estimated at 1,300 megawatt-hours per annum</li></ul>
	<b>Energy cost</b>	<ul style="list-style-type: none"><li>Estimated at \$170,000 per annum</li></ul>
	<b>Clean energy targets</b>	<ul style="list-style-type: none"><li>100% of energy needs met from on-site renewables</li><li>Energy independence within 10 years</li></ul>
	<b>Possible measures</b>	<ul style="list-style-type: none"><li>High efficiency heating and cooling</li><li>800 kilowatts of rooftop solar PV</li><li>A smart grid and battery energy storage</li></ul>

### Setting a target

The zoo identified five business priorities relevant to clean energy:

- reduce capital and operational expenditure to provide increased visitor amenities and experiences
- capitalise on the opportunity to incorporate energy efficiency and low-carbon energy practices into the site's design from day one
- develop readily marketable clean energy targets to aid in business promotion and a positive environmental image
- incorporate visible measures which contribute to the visitor experience
- foster research partnerships with Western Sydney University.

To align with these priorities, three targets were established:

- Target 1: Generate 100% of annual site demand from on-site renewables, to reduce capital expenditure for energy infrastructure due to the availability of financing options for renewable power generators.

The second and third targets align with the aspirational goals of the business to be 100% energy self-sufficient. Target 2 sets a mid-point to help with tracking against the longer-term Target 3.

- Target 2: Over a 5-year period, progress towards a site that is 90% energy self-sufficient, and
- Target 3: Over a 10-year period, progress towards a site that is 100% energy self-sufficient.



## Measures to reach the target

The zoo will begin its clean energy journey with a range of energy efficiency measures:

- installation of high-efficiency heating and cooling plant and equipment
- high-efficiency LED lighting
- high efficiency electric hot water
- intelligent control systems

Incorporating energy efficiency into site design from the start reduces the risk of wasteful early retirement of inefficient appliances, and makes renewable energy targets easier to achieve while reducing operating costs.

In addition, Sydney Zoo considered renewable energy, smart grid and energy storage options when developing its clean energy strategy, including:

- installation of 800 kilowatts of rooftop solar PV to generate 100% of the site's annual energy demand
- a 'smart grid' and 200 kilowatt-hours of battery energy storage to optimise the use of renewable energy generated on site and improve energy resilience
- solar car park structures and solar-battery-powered car park lighting systems
- a small-scale anaerobic digester with gas harvest or a paired generator
- on-site wind turbines.

The business is highly supportive of on-site generation of solar power as well as a smart grid and battery storage. Sydney Zoo is now undertaking detailed feasibility work to solidify the business case for these measures.

### Sydney Zoo's key clean energy strategy takeaways

**'Designing in' clean energy presents unique opportunities:** Incorporating energy efficient plant and equipment into the design of greenfield sites reduces energy demand and makes renewable energy targets easier to achieve while reducing operating costs.

**Partnering with clean energy experts:** A barrier to exploring clean energy options can be the costs associated with energy studies. Sydney Zoo has now entered a performance-based agreement with an energy specialist company to share risks and provide incentives.

For more clean energy strategy case studies and a how-to guide for developing a clean energy strategy, visit [energy.nsw.gov.au/clean-energy-strategies](http://energy.nsw.gov.au/clean-energy-strategies). While every reasonable effort has been made to ensure that this document is correct at the time of printing, the State of NSW, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance or upon the whole or any part of this document. October 2018 © Crown Copyright State of NSW through NSW Department of Planning and Environment 2018.

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