# What is the cost of electricity in the WEM?

Providing a benchmark electricity price for a large commercial office in Western Australia

A collaboration between

Get Zero x Ampere Labs




June 2024

# Introduction

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**What is this:** A case study that examines electricity costs for a fictional large commercial customer connected to the South-West Interconnected System (SWIS).

**Who is this for:** Primarily, commercial and industrial electricity customers that are connected to the SWIS.

**The need for this:** Wholesale Electricity Market (WEM) Reform in Oct 2023 was a step change for WA's electricity market. Since then, electricity charges have increased in complexity and costs have mostly risen, which has made it challenging for many to determine the current value of electricity.

**What is a benchmark electricity price:** The best available reference of a 'fair price' in the current market, based on complete spot exposure to the wholesale market and adjacent mechanisms, and zero risk management. Note that benchmark electricity prices are unique for each customer and change depending on how and when electricity is consumed.

**Caveats:**

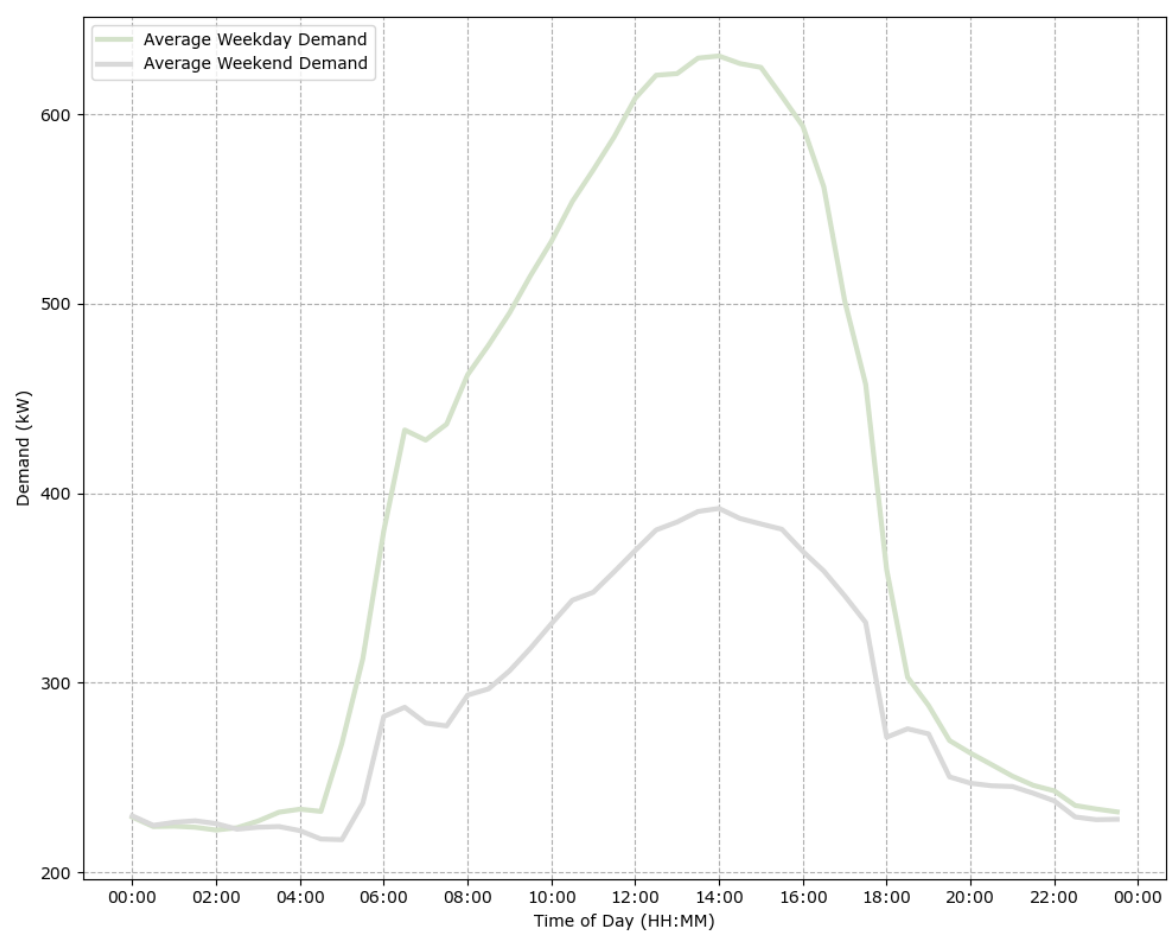
- No consideration has been given to additional contractual arrangements common in the electricity industry, such as Power Purchase Agreements (PPAs), Bilateral Contracts and retail service charges.
- As at the time of writing (June 2024), WEM Reform has only been in place for ~8 full months and not all data is available for this period. In addition, the WEM is a rapidly evolving space and trends are likely to continue to evolve.
- Publicly available pricing data has been used where possible in the production of this report, however not all data required is publicly available and assumptions have been made where necessary.

# Customer Demand Profile

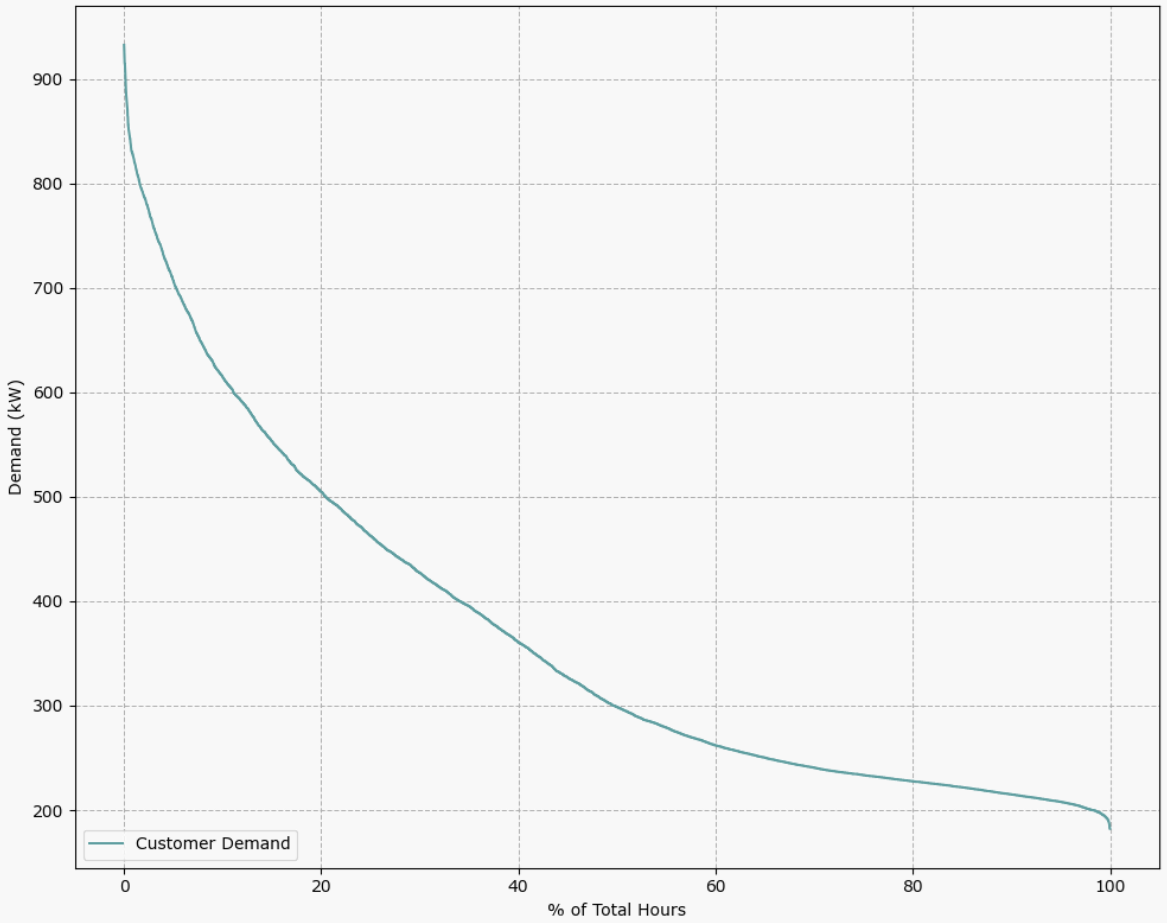
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A large commercial office building that consumes 3,000 MWh annually, primarily during business hours

## Average Time-of-Day Demand




## Demand Duration Curve

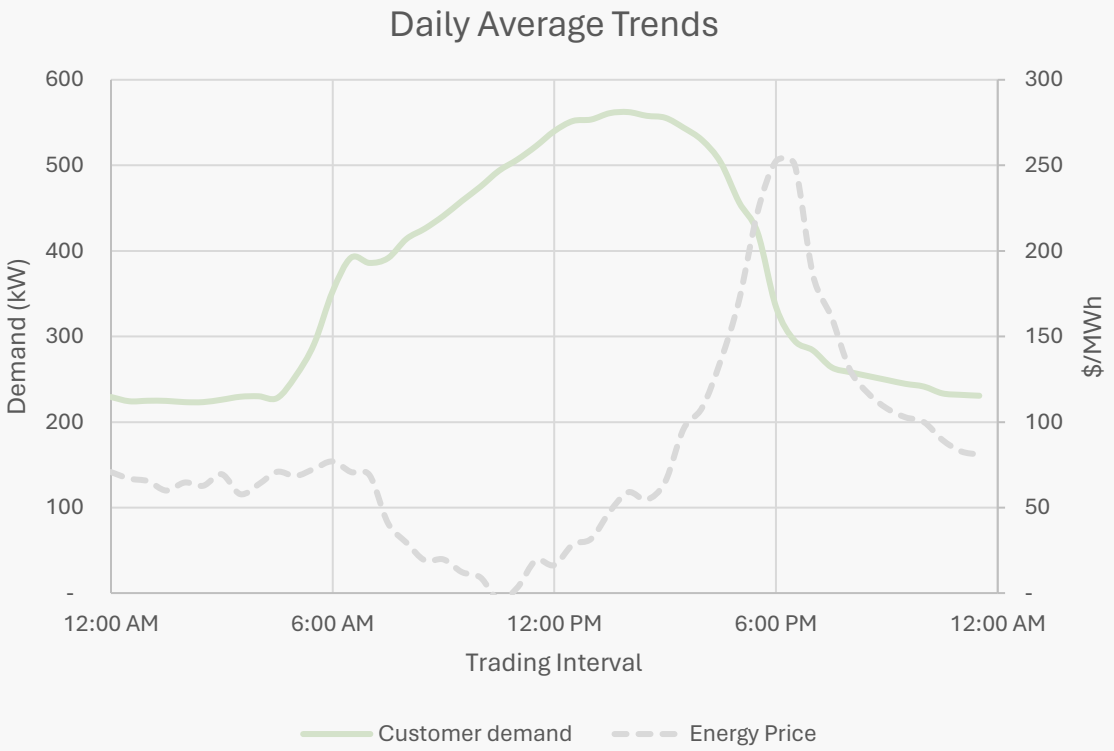


# Energy

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At $78/MWh Energy is a large component of the total cost, but significant midday consumption and reduced early evening consumption help to limit costs

- Energy supply agreements often include flat or on/off peak pricing, however the wholesale price of energy varies every 5 minutes[1]
- In this case, customer demand is:
  - Well aligned to take advantage of cheap (and often negative) midday pricing, with 40% of consumption occurring between 9AM-3PM
  - Still material in the evening peak price period, with 20% of consumption occurring between 4PM-8PM
- The resulting average price of energy for this customer is $78/MWh, for an annual cost around $230,000




*Notes:*

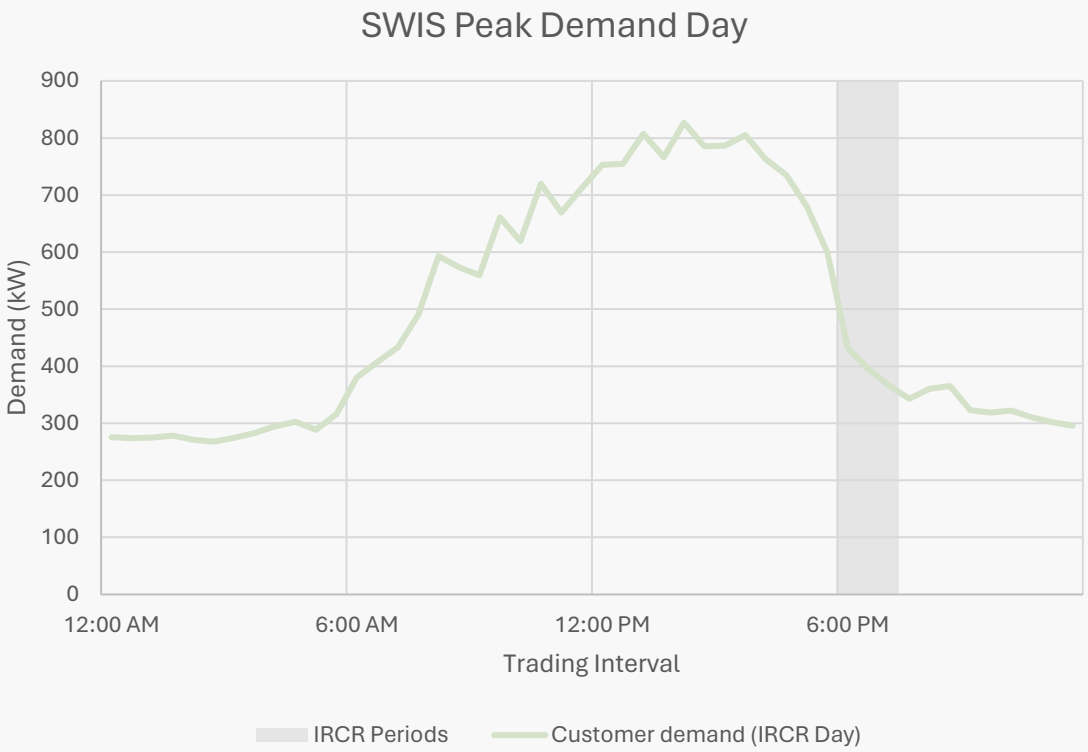
1. *Customers pay the 30-minute Reference Trading Price, which is an average of the relevant 5-minute Market Clearing Prices*

# Reserve Capacity

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At $21/MWh Reserve Capacity is a material portion of the total cost, but the worst is avoided

- Individual Reserve Capacity Requirement (IRCR) determines the Reserve Capacity cost to a customer
- IRCR periods occur on a handful of days in Summer, typically during the early evening on very hot days when demands are highest across the entire SWIS
- Customer demand drops quickly in the early evening, however there is still a median demand of 400kW which is an annual cost around $62,000
- While costs are a result of demand, not energy consumption, an approximate average cost for this customer is $21/MWh

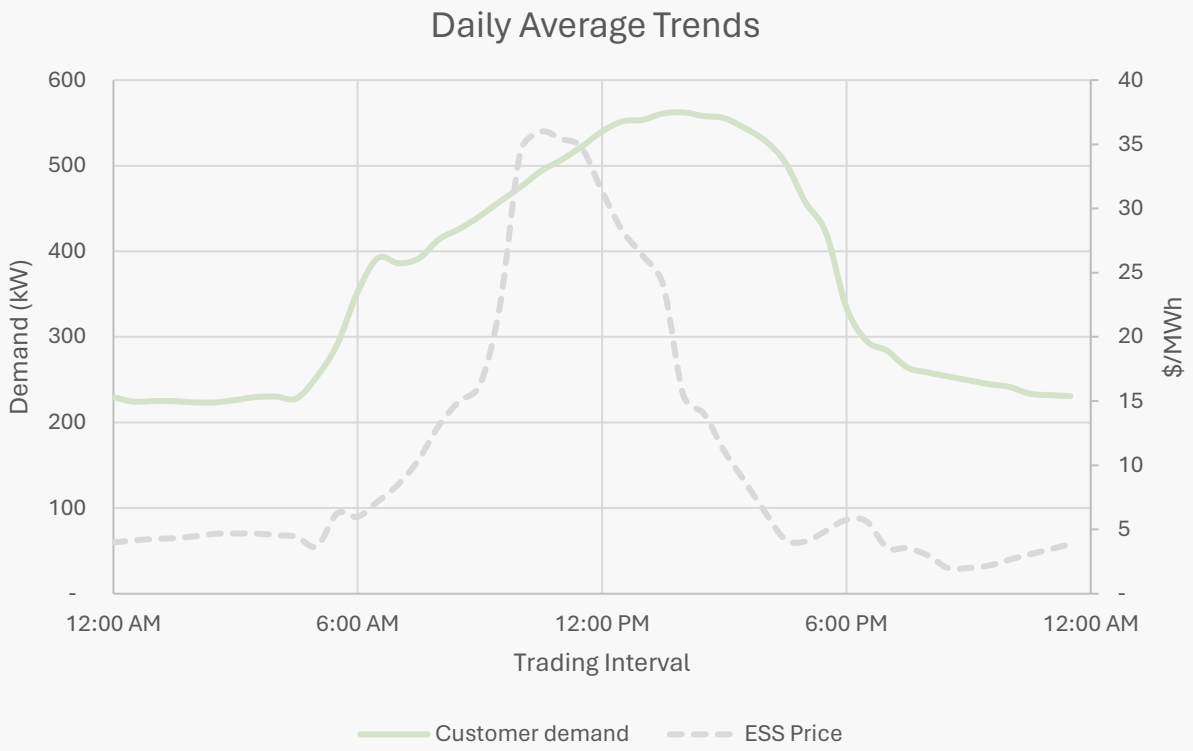


# Essential System Services

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At $14/MWh ESS are a material portion of the total cost and significant midday consumption means most ESS costs are incurred

- Introduced in Oct 2023, the Essential System Services (ESS) support power system stability and help keep the lights on
- Customer demand aligns closely with average ESS price trends, meaning the bulk of these charges are incurred
- The resulting average price of ESS for the customer is $14/MWh, which is an annual cost around $41,000
- Recently, an intervention by the WA Energy Minister has quartered the FCESS Clearing Price Ceiling and costs are expected to reduce as a result, however this is an interim measure




*Notes:*

1. *ESS costs include both Frequency Co-optimised ESS (FCESS) and Non Co-optimised ESS (NCESS)*
2. *Only ESS costs incurred by customers (i.e. loads) are included*
3. *The ESS price indicated is $/MWh as this is how costs are recovered from customers*

# Market Fees

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At $1.8/MWh market fees are a small proportion of the total cost for FY24

- Market fees are a flat rate volumetric charge that cover the operational and administrative costs of operating the electricity market
- At a flat rate of $1.8/MWh the expected FY24 cost for the customer is $5,430
- While costs have been increasing in recent years, the projected FY25 jump of the AEMO WEM fee to $2.57/MWh seems less likely since the ERA's recent draft determination cut AEMO's top up funding by half

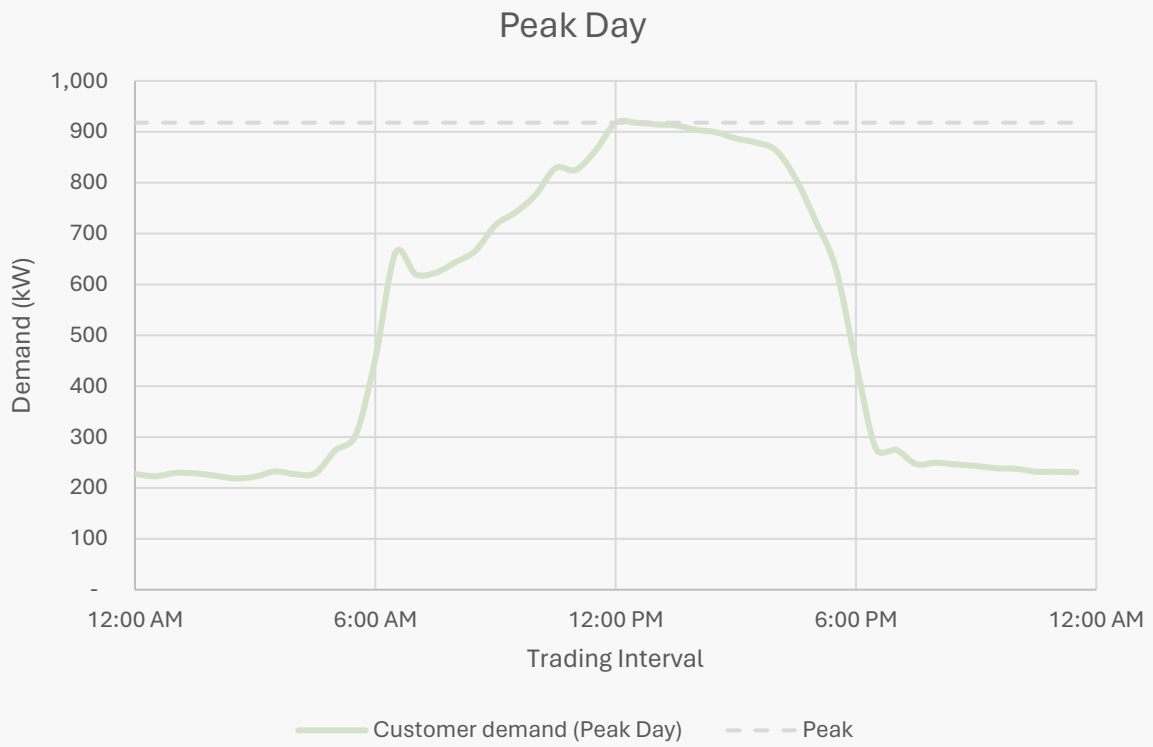
| | FY24 | |
|---|---|---|
| **Fee** | **Price** | **Cost** |
| AEMO WEM | $1.53/MWh | $4,590 |
| ERA Regulator | $0.21/MWh | $630 |
| Coordinator | $0.08/MWh | $240 |
| **Total** | **$1.81/MWh** | **$5,430** |

# Network Access Charges

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At $77/MWh NACs are a large component of the total cost and provide an incentive to manage peak demand

- Network Access Charges (NACs) are fees for use of the poles, wires and associated equipment that make up Western Power's network
- There are a range of network tariffs available but RT5 – High Voltage Metered Demand is the best option for this customer
- Peak customer demand of over 900kW results in an annual cost around $230,000
- While costs are primarily a result of peak demand, not energy consumption, an approximate average cost for this customer is $77/MWh

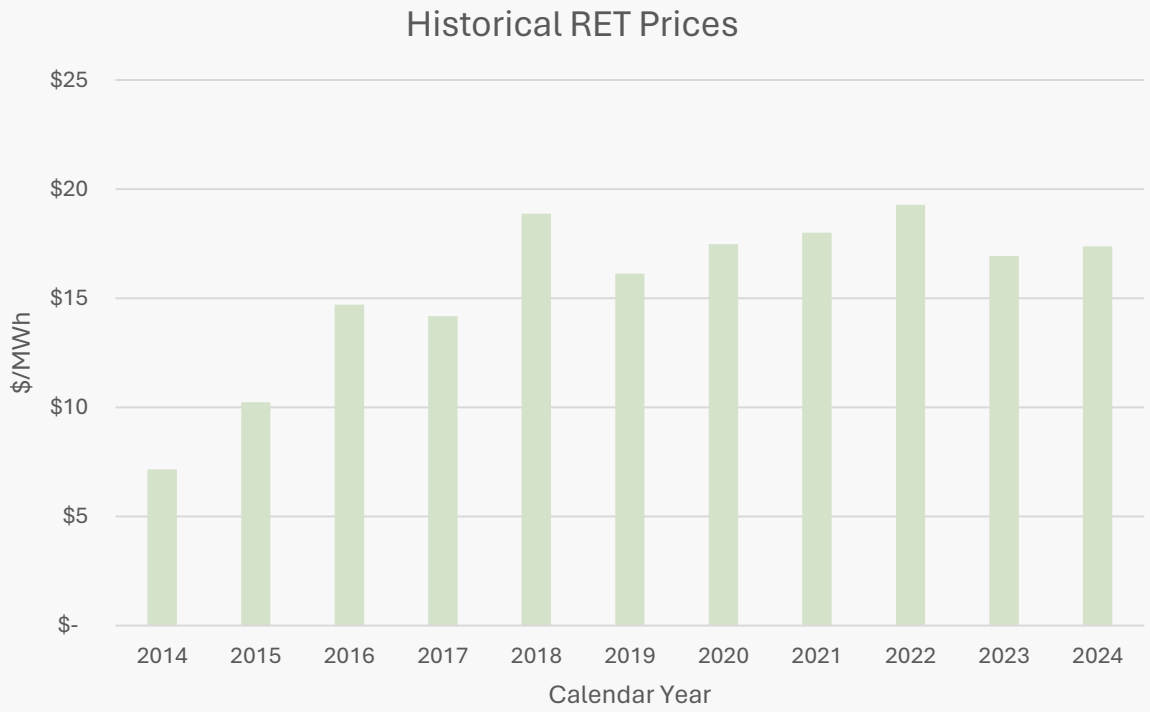


# Renewable Energy Target

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## At $18/MWh RET liabilities are a material cost and have been stable in recent years

- The Renewable Energy Target (RET) is a federal government scheme to incentivize the uptake of small and large-scale renewable electricity generation
- Liable entities must purchase a certain number of certificates each year
- While certificate prices and percentage obligations have varied over the last few years, the end price to the customer has been reasonably stable
- Current figures are around $18/MWh for an annual cost around $55,000




*Notes:*

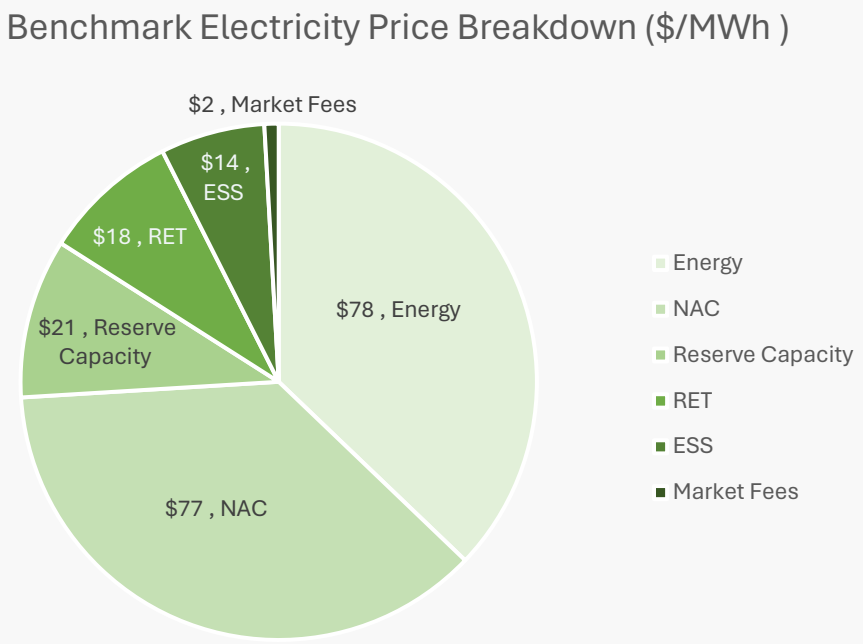
1. *Chart shows RET prices borne by the customer, not certificate prices. RET prices are a function of certificate price and percentage obligation for both Large-scale Generation Certificates (LGCs) and Small-scale Technology Certificates (STCs)*

# Benchmark Electricity Price

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The overall benchmark electricity price for this customer is an average of $209/MWh (or 21 c/kWh)

- The customer consumes 3,000 MWh annually, primarily during business hours. In line with their demand profile their annual benchmark electricity price is around $625,000
- This is equivalent to a flat rate charge of $209/MWh (or 21 c/kWh)
- The customer's demand profile of significant midday energy consumption combined with reduced consumption during the evening peak helps keep the overall cost down. However, there are always opportunities to drive costs down further



# Solar PV

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## Behind-the-meter solar PV helps reduce costs but can't mitigate all value streams

- By offsetting the customer's grid consumption, behind-the-meter solar PV can reduce costs across a range of value streams
- A series of solar PV system sizes have been modelled and the resulting benchmark electricity price provided, with a comparison against the business-as-usual scenario
- Solar PV assists in reducing costs, but has limited impacts on peak demand management and the evening peak price period

| | Benchmark Electricity Price | | |
|---|---|---|---|
| **Solar PV** | **Annual** | **Average** | **Reduction** |
| Nil | $625,000 | $209/MWh | - |
| 30kVA | $615,000 | $205/MWh | 2% |
| 100kVA | $590,000 | $197/MWh | 6% |
| 150kVA | $575,000 | $192/MWh | 8% |
| 999kVA | $415,000 | $138/MWh | 34% |

*Notes:*

1. *Nil reflects the business-as-usual scenario, with no solar PV*
2. *Resulting annual costs are the benchmark electricity prices after accounting for the effects of behind-the-meter solar PV generation*
3. *Costs of installing solar PV are not considered, the focus is the impact on electricity bills*
4. *Average $/MWh figures are against the same 3,000 MWh baseline*

# Solar PV & BESS

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## Combining BESS behind-the-meter with solar PV can further reduce costs, but BESS control strategies become a key consideration

- Behind-the-meter battery energy storage systems (BESS) can assist in further cost reductions
- BESS can employ a range of different control strategies; in this case study, it is assumed that excess solar PV charges the BESS during the day, with the BESS discharging for self-consumption during the evening
- In conjunction with a solar PV system size of 999kVA, a series of BESS system sizes have been modelled and the resulting benchmark electricity price provided, with a comparison against the business-as-usual scenario

| | Benchmark Electricity Price | | |
|---|---|---|---|
| **BESS** | **Annual** | **Average** | **Reduction** |
| Nil | $625,000 | $209/MWh | - |
| 200kWh | $385,000 | $129/MWh | 38% |
| 500kWh | $355,000 | $118/MWh | 43% |
| 1000kWh | $310,000 | $104/MWh | 50% |

*Notes:*

1. *Nil reflects the business-as-usual scenario, with no solar PV or BESS*
2. *Resulting annual costs are the benchmark electricity prices after accounting for the effects of behind-the-meter solar PV generation and BESS self-consumption*
3. *Costs of installing solar PV and BESS are not considered, the focus is the impact on electricity bills*
4. *Average $/MWh figures are against the same 3,000 MWh baseline*

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x

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Any questions, or want to know your benchmark electricity price?

Feel free to reach out:

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