Retail and Buyback Prices

Accompanying Appendix Eight to

Understanding the value of residential solar PV and storage in New Zealand

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Contents

Disclaimer

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Revisions

8-2-2025: Revised 9pm-midnight free prices to only apply during weekends and to have just one rate outside of 9pm-midnight.

1 Introduction

The residential solar investigation examines the performance of PV solar with and without storage. One of the aims of the project is to assess this performance with different retail and buyback prices and structures. Section 2 of this appendix introduces retail and buyback prices, the retail price structures used in the study, and why they were selected. Section 3 sets out how the retail prices for each structure were determined, and Section 4 sets out the buyback price structures and explains how the buyback prices were established.

This appendix is accompanied by slides titled "EECA Residential Solar Study – Project Aims and Retail and Network Prices Including Electricity Authority Competition Task Force 2A details", in the file 'Retail-network-buyback price structures and process-r02.pptx' dated 18 November 2023.

The following terms and abbreviations are used throughout this appendix.

Term / abbreviation	Meaning
Buyback	The purchase of electricity from a consumer by a retailer as a result of the export of electrical energy (see Export).
'Base' distribution prices	Refers to distribution pricing some time prior to implementing pricing consistent with the Electricity Authority's distribution pricing principles.
Consumer	The purchaser of electricity from a retailer. While not always the case, in this context a consumer is synonymous with ICP.
EDB	Electricity distribution business, also referred to an electricity distributor.
EV	Electric vehicle.
Export	The supply of electricity from an ICP to the distribution network, which in this context is from PV solar generation exceeding that of the ICP's load, and results in buyback of electricity at the buyback price (see Buyback).
Fixed charge / fixed price	The fixed price for electricity supply, with units of c/day or $/day.
GST	Goods and services tax, added to all retail and buyback prices, since the residential consumer is the final consumer.
GXP	Grid exit point, a node of the electricity transmission network at which wholesale electricity is priced, and where one or more electricity distributors take supply to distribute electricity to ICPs.
Hot water control	The control of hot water by an electricity distributor, either directly for their purposes or on contract to a retailer or another party.
ICP	The property at which electricity is metered. In this document it also refers to a consumer, or consumer refers to an ICP.
IRR	Internal rate of return, also referred to as rate of return in this appendix.
kVA	Kilovolt-amp, a unit of apparent electrical power, used to rate an electrical supply or generator.
kW	Kilo Watt, a unit of electrical power. In this appendix it refers to the average power over a half-hour or hour depending on which time period is used.

Term / abbreviation	Meaning
kWh	Kilowatt-hour, a unit of electrical energy consumed, generated, or exported over a given time period, which in this appendix is a half-hour, hour, or year.
LFC	Low fixed charge tariff regulations.
LRMC	Long run marginal cost
'LRMC recovery in peak' distribution prices	Refers to distribution pricing consistent with the Electricity Authority's distribution pricing principles – explained within this document.
PV	Photovoltaic, also sometimes used to refer to a rooftop PV solar generation system.
PV solar	Photovoltaic solar, also refers to a rooftop PV solar generation system.
Retailer	A company that sells electricity to a consumer at an ICP (see ICP).
Self-consumption	The supply of an ICP's electrical load by distributed generation, which in this context is PV solar.
ToU	Time-of-use, which in this context refers to electricity prices that vary according to the time of day and/or year that electricity is used.
Unit price / unit rate	Same as variable price, is the use-based charge for electrical energy, with units of c/kWh or $/kWh.
V2G	Vehicle to grid, which in this context refers to an EV supplying generation to an ICP via a V2G inverter/charger, which may also result in export.
Variable price / variable rate	The use-base charge for electrical energy, with units of c/kWh or $/kWh, usually referred to as a unit price in this document.

2 Retail and buyback prices

2.1 Net metering benefits of residential solar

The main two financial benefits of residential solar generation available through the net metering scheme deployed in New Zealand are selling excess energy (referred to herein as export) and offsetting retail electricity purchases (referred to as self-consumption).[1] Excess energy is exported to the distribution network and purchased by the consumer's retailer at a buyback rate, which can be between 8 c/kWh and 20 c/kWh. This may be lower or higher at certain times of the day and year and depends on the retailer.

When PV solar generated, some or all of existing load at the consumer's property is met by the solar generation. The effective load of the property is then reduced, and less electricity is purchased from the electricity retailer. This is self-consumption and leads to a cost saving through lower electricity bills, which is treated as an income stream in this study. Solar export and retail offset are illustrated in Figure 1.

[1] New Zealand, like most other countries, operates a net metering regime for distributed generation – residential photovoltaic solar (PV) being the interest in this case. Under net metering, electricity produced by the PV system is netted off the electricity used by the household before metering. Consequently, the reduction in household demand by the PV system is recognised through a lower volume of retail purchases over a given time period. This is self-consumption. Further, if the net of PV generation and demand results in excess energy, this results in sales of electricity at the buyback price, capped at the export limit, over a given time period. This is referred to as export in this study. This is advantageous where retail prices for electricity consumption are higher than buyback prices for excess generation. More information about net metering is given in the Appendix to the Residential Solar study "Assessing residential solar at different time scales".

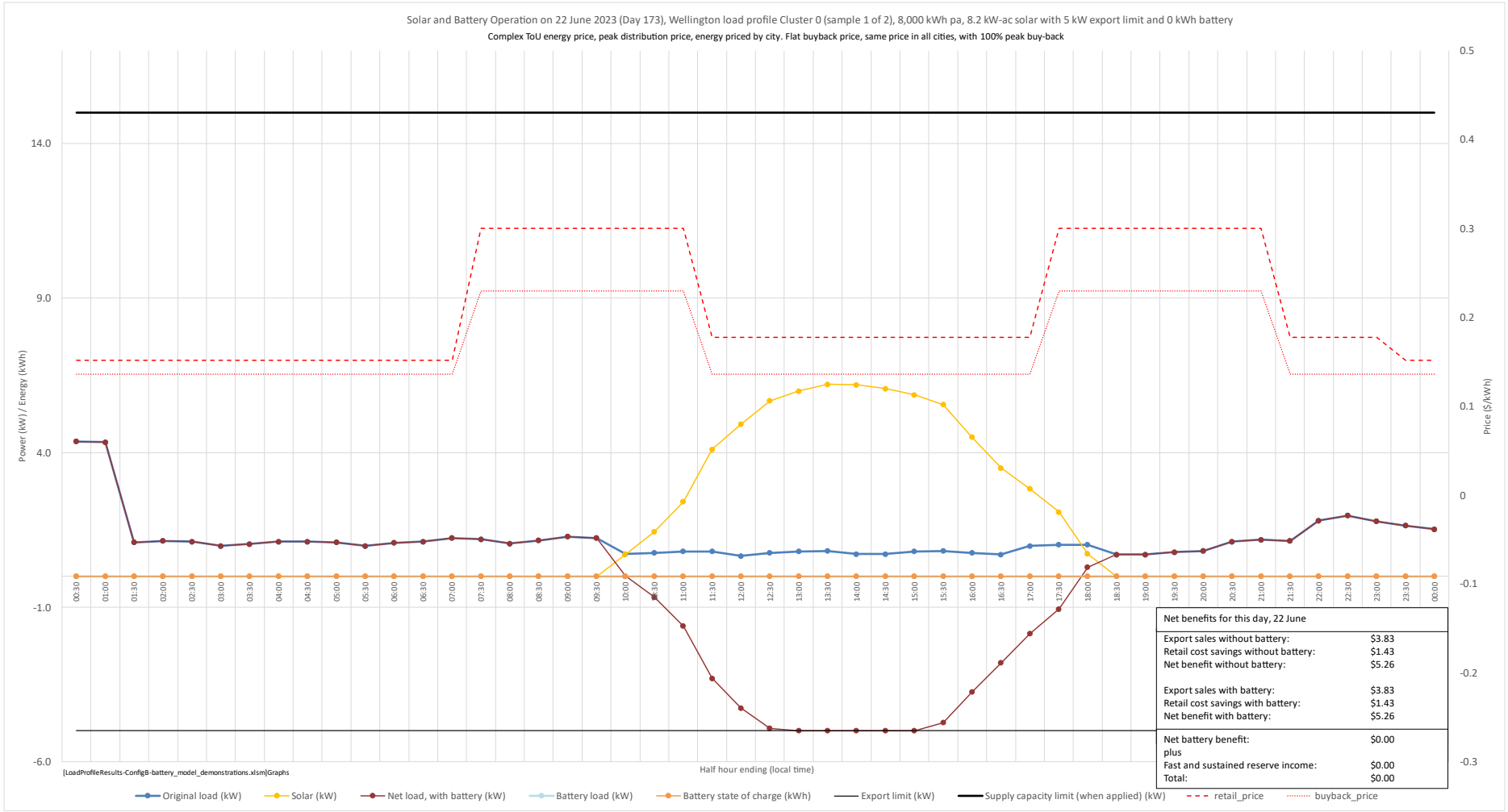

Figure 1: Load and net load after solar generation, and no battery.

The price of the electricity offset, or self-consumed, from solar generation is the retailer's price at the time of solar generation. This can range from a price lower than 10 c/kWh to higher than 30 c/kWh depending on the retailer and the time of day and year.

Figure 1 depicts both retail price and buyback price varying throughout a day. So for example, at 10:00 when solar generation entirely offsets the household load during the morning peak period, it is offsetting the purchase of the electricity in the half-hour period ending at 10:00 at a price of over 30 c/kWh. At 13:00 for example, the load is fully offset by solar generation, but at a lower price of about 19 c/kWh. At 13:00 the export is high enough to be capped at the export limit, with all export receiving a price of about 13 c/kWh. By contrast, the modest amount of export at 10:30 and 17:30 receive a price of about 22 c/kWh.

Because self-consumption and export are the main financial benefits of rooftop residential solar, the rate of return of solar is sensitive to the retail electricity price and buyback price – this was demonstrated in the Commercial Solar study.[2] Determining suitable electricity prices and buyback prices for this study, for each of the four locations, was therefore important. Moreover, it was of interest to know how prices might change in the future, and therefore what this might mean to rates of return for solar. It was also of interest to know how rates of return of solar with storage (hot water diversion or batteries) might change as prices change in the future.

Two further sources of benefit of solar combined with batteries are arbitrage between low price periods and high price periods, and provision of the instantaneous reserve ancillary service. More benefits may arise in the future, but this study only considers self-consumption, export (buyback), arbitrage, and instantaneous reserves.

2.2 Retail electricity price components

Components of a retail electricity price fall into the following three main categories:

1. Energy, which in this study includes electricity generation by the generator company selling to the retailer, retailer margin, and other overheads such as metering and the Electricity Authority Levy. Energy applies to both consumption and export by a consumer, and therefore also applies to the buyback rate. However, the buyback price is a separate price to the retail price.
2. Transmission, the transporting of electricity from generator to major regional grid exit points (GXPs) by the electricity transmission networks owned and operated by Transpower. The cost of Transmission is primarily charged to consumers via EDBs.
3. Distribution of electricity from Transpower GXPs to consumers.

There is a fourth component of electricity price, ancillary services, which is covered by both energy price and transmission. The main interest in ancillary services in this study is instantaneous reserves, which we assume can be provided by residential batteries, and thereby contribute a further source of income.

[2] EECA 2021. Commercial-scale solar in New Zealand: An analysis of the financial performance of on-site generation for businesses, August 2021.
https://www.eeca.govt.nz/insights/eeca-insights/commercial-scale-solar-in-new-zealand/

In practice, this study is only concerned with the unit components of prices (the c/kWh prices) rather than the fixed components. This is because self-consumption of solar offsets electrical energy purchases at the unit retail price, and exports of electrical energy from solar gain revenue at the unit buyback price.

2.3 Study objectives and need for different retail and buyback price structures

To implement the various objectives of the study, summarised in the main report, a variety of retail and buyback price structures were required. The objectives that required a comprehensive set of retail and buyback price structures are:

- Objective C: understand the relationship between retail price structure and internal rate of return with and without a battery, by city for the PV capacity, customer type, and consumption level with the highest internal rate of return from Objective A.

  The hypothesis is that retail price structure (and underlying distribution price structure), as well as buyback price structure, determine the value of battery storage to the consumer over PV on its own.

  It is noted that the retail price structure will include the move to distribution pricing consistent with the Electricity Authority's distribution pricing principles (referred to herein as 'LRMC recovery in peak').[3] It will also include flat export rates and compare those with time-of-use export rates.

- Objective D: for a range PV capacities and no storage, examine the impact on IRR of varying retail prices between seasons (summer and winter).[4]

  The hypothesis is that as more seasonally weighted generation (PV) supplies New Zealand's electricity, wholesale prices will differ more between seasons, and retailers will be more inclined to provide seasonal tariffs (including that electricity distributors will be more inclined to reflect network use between seasons, as Vector already does).[5] This will change the returns to consumers with PV and alter the optimal PV capacity.

  No battery storage is modelled in this objective, because they provide no arbitrage benefit between seasons. All prices are based on the 'LRMC recovery in peak' distribution pricing case, since this is the trend for distribution pricing. All consumption and buyback prices are complex time-of-use, since it is expected that this would be the first step towards time-of-use pricing (before differentiating between seasons).[6]

- Objective E: Compare IRR between complex time-of-use retail prices and buyback prices with 9pm-midnight free, with and without a supply capacity limit.

[3] Electricity Authority 2024. Distribution pricing reform: next steps, Electricity Authority, 7 May 2024. Electricity Authority 2024. Open letter to distributors, Electricity Authority, 20 May 2024.
[4] In this study summer is October to March inclusive, while winter is April to September inclusive.
[5] This is in addition to there already being seasonal variation due to scarce energy from lower hydro inflows in the winter.
[6] Complex time-of-use refers to a time-of-use electricity price structure that prices electricity by more than two time periods in a day. These are typically peak, off-peak, and night.

The hypothesis is that the 9pm-midnight free retail price structure improves internal rate of return of PV substantially, which will lead consumers to choose this over other options. In turn this will lead to substantial growth in synchronous demand (herding), which could lead to increased investment by distributors. It is of interest to assess whether a supply capacity limit tariff would reduce peak demand from synchronous demand.

- Objective G: For a given PV capacity, examine the impact on rate of return and distributor payments of different levels of distributor LRMC export rates in the buyback price over the distributor peak period.

  This objective was added at the request of the Electricity Authority in November 2024 for the purpose of assessing its Energy Competition Task Force objective Package Two A (2A). This is requiring distributors to pay a rebate when consumers export electricity at peak times.

  The hypothesis is that strengthening the buyback price in distributor peak periods will improve the rate of return of PV-battery systems, and thereby lead to peak demand reduction over time through greater incentive for consumers to invest in PV and battery systems.

  A range of retail and buyback pricing structures are used, with distributor pricing that is consistent with the Electricity Authority's distribution pricing principles, since this examines a future state.

3 Retail electricity prices

3.1 Final retail prices

It was considered important to base the analysis on retail prices in the market today, rather than a modelled energy price (calculated from an average of wholesale prices and an assumed retail margin, for example) with distribution price removed where necessary. The reason why retail prices in the market were considered important is that they have been established in a competitive retail market environment. The prices should therefore recover sufficient revenue for a company to operate profitably.

Consequently, actual 2024 prices from a retailer whose prices were available in all cities considered were used and adapted by model retail and buyback price structures and distribution prices to derive the starting point retail energy prices. These were then adjusted by an assumed energy and distribution price inflation rate of 2% to give prices in 2025 – since the model was run early in calendar year 2025 to produce results, and that all results are related to 2025.[7] Since there are numerous retail price structures used by the model, and because these combine energy price and distribution price, the discussion of final retail prices is supported by the following sub-sections:

- Sub-section 3.2 describes the retail price structures used in the model.
- Sub-section 3.3 describes the process used to adapt the actual 2024 prices from the retailer.
- Sub-section 3.4 discusses the wholesale price ratios used to adjust retail energy prices between time periods and seasons.
- Sub-section 3.5 describes the distribution prices used, and the sources used to determine them.

Buyback prices and structures are considered separately in the Section 4.

3.2 Retail price structures

The retail prices fall into two broad categories:

- Flat or simple time-of-use with distribution price bundled (1-3).
- Price structures with time-of-use distribution price fully passed through in the retail price. Energy price ranges from:
    - a flat price throughout a day and year (4), to

[7] From the Ministry of Business, Innovation and Employment Quarterly residential sales-based electricity cost, the nine-year average annual increase in total nominal residential cost of electricity over four quarters (Sept 14-June 15 to Sept 23-June 24) was 1.3%. per annum This comprises a 0.1% 'lines component' increase and a 2.0% 'energy and other component' increase. Over five years the average annual increase in nominal residential cost of electricity over four quarters (Sept 18-June 19 to Sept 23-June 24) was 2.4%. This comprises a -0.4% lines increase and a 4.4% energy increase. The five-year time period includes the DPP3 default price path period (1 April 2020 to 1 April 2025), where electricity distributor returns were lower than the pervious default price path period, and it is assumed price increases were lower as a result. From 1 April 2025 the default price quality path for electricity distribution businesses (DPP4) begins, with higher returns available to electricity distributors. This is expected to translate to higher prices. It is complicated by householder payments reported in the Ministry of Business, Innovation and Employment deriving from a mix of fixed and unit prices, although it is assumed that the increases will also apply to unit prices. An increase in distribution unit prices of 2% from 2024 to 2025 is therefore assumed. For energy price increases the longer-term nine-year period is used, giving an average annual increase of 2% per annum. This is also complicated by householder payments deriving from a mix of fixed and unit prices, but it is assumed that the 2% per annum applies to the unit prices.

- complex time-of-use prices that vary within a day (5), to
- complex time-of-use prices that vary within a day and between summer and winter (7). Note that 6 is skipped for internal consistency.

The second category, in which distribution prices are fully passed through, varies further to reflect:

- 'Base' distribution prices (.1)

  Distribution prices that existed prior to implementing pricing consistent with the Electricity Authority's pricing principles.

- 'LRMC recovery in peak' distribution prices (.2)

  Distribution prices that comply with the Electricity Authority's pricing principles, primarily through:

  - Setting peak period rates based on the electricity distributor's estimate of long-run marginal cost (LRMC) of distribution from within the electricity distributor's peak periods;
  - Accompanied by reducing off-peak and controlled rates;
  - Greater reflection of the costs of providing the electricity distribution network, primarily through increased fixed charges (the daily charge) rather than use-based charges (charges derived from c/kWh unit prices), which is more practical as the low fixed charge (LFC) tariff regulations are phased out; and
  - Passing transmission price through as a fixed price, rather than within the unit c/kWh rates.

Distribution price determination is discussed in the Section 3.5. In practice, only the 'LRMC recovery in peak' distribution prices are used in the study, since they represent a future state, and in some cases the electricity distributors in the cities investigated are well on the way to implementing them.

The model retail prices that result from the combination of these are summarised in Table 1 below, with examples of each in the following figures, referred to from Table 1. Only Auckland examples are given in the figures, as the full prices, for all price structures and cities, are summarised in Table 2 – noting that these combine energy and distribution prices, the determination of which are discussed in later sections.

Table 1: Model retail and buyback price structures. The numbering of the complex time-of-use price structures skips from 5 to 7 for internal consistency with earlier prices.

Retail price reference	Final retail price
1	Flat retail price (no variation throughout a day or year), Figure 2.
2	Simple day/night time-of-use, Figure 3.
3	Simple day/night time-of-use with 9pm-midnight free, Figure 4.
4.1	Flat energy price with distribution price pass through, 'Base' distribution prices, Figure 5.
4.2	Flat energy price with distribution price pass through, 'LRMC recovery in peak' distribution prices, Figure 5.
5.1	Time-of-use energy price with distribution price pass through, 'Base' distribution prices, Figure 6.
5.2	Time-of-use energy price with distribution price pass through, 'LRMC recovery in peak' distribution prices, Figure 6.
7.1	Time-of-use energy price that varies between summer and winter with distribution price pass through, 'Base' distribution prices, Figure 7.
7.2	Time-of-use energy price that varies between summer and winter with distribution price pass through, 'LRMC recovery in peak' distribution prices, Figure 7.

A further price structure is introduced as a variation on any of those above, in particular the 9pm-midnight free price and 'LRMC in peak' distribution prices. This is a capacity limiting tariff, which provides a variation to the supply arrangement as follows:

- Supply limit is reduced from 15 kVA to 5 kVA in exchange for a reduction in the daily fixed charge of 30 cents per day (109.5 $ / year).

The reason for introducing this relates to Objective E and is to test whether large capacity excursions after peak periods with batteries can be avoided or reduced with such a tariff, and to test any improved benefit that may be available to the consumer.

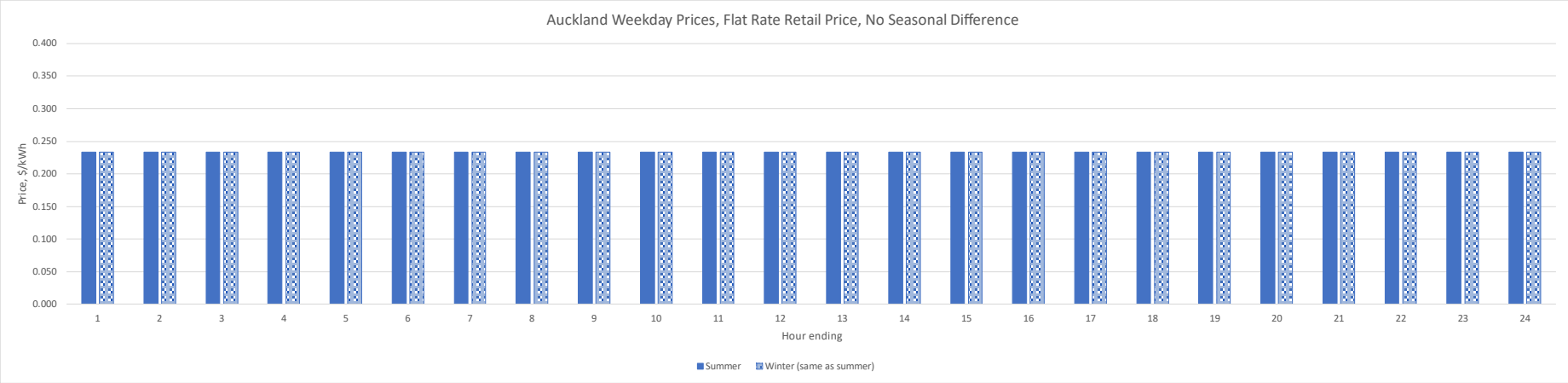

Figure 2: Flat retail price example.

Figure 3: Two-rate day/night retail price example.

Figure 4: Two-rate day/night with 9pm-midnight free retail price example (the two rates are 9pm-midnight and the rest of the day). The 9pm-midnight free only applies on weekdays.

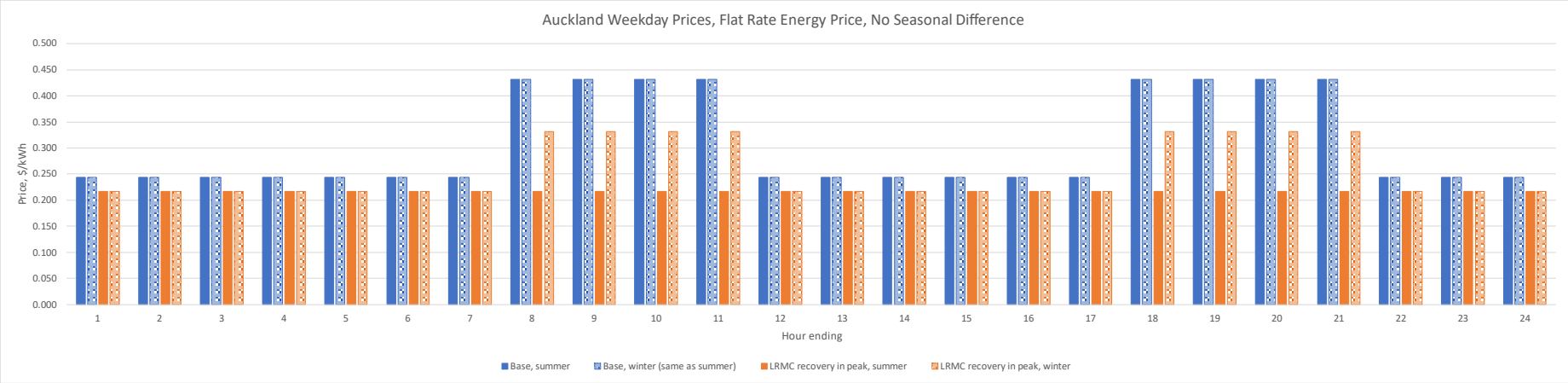

Figure 5: Flat energy price with distribution price pass through retail price example.

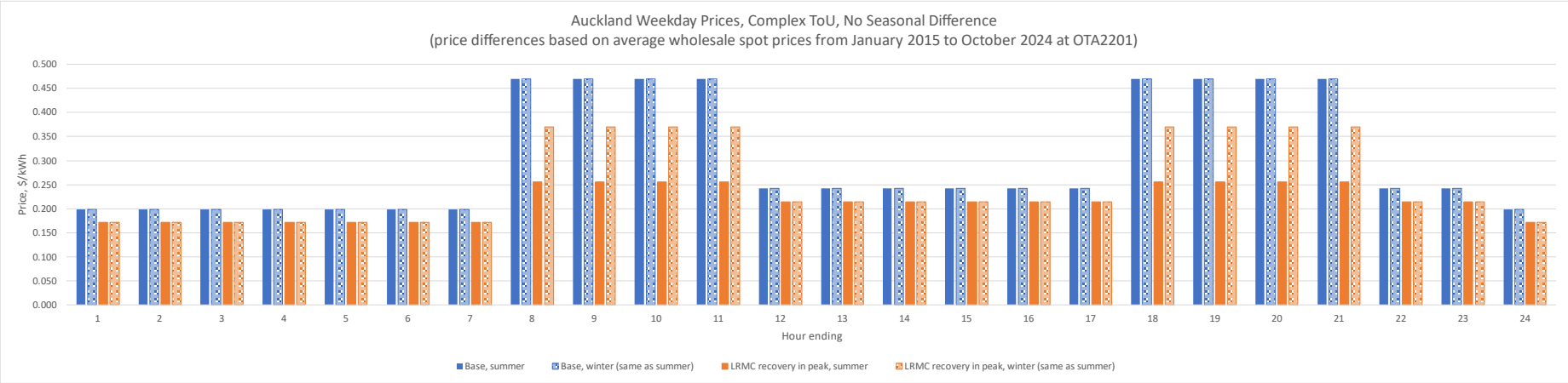

Figure 6: Complex time-of-use energy price with distribution price pass through retail price example.

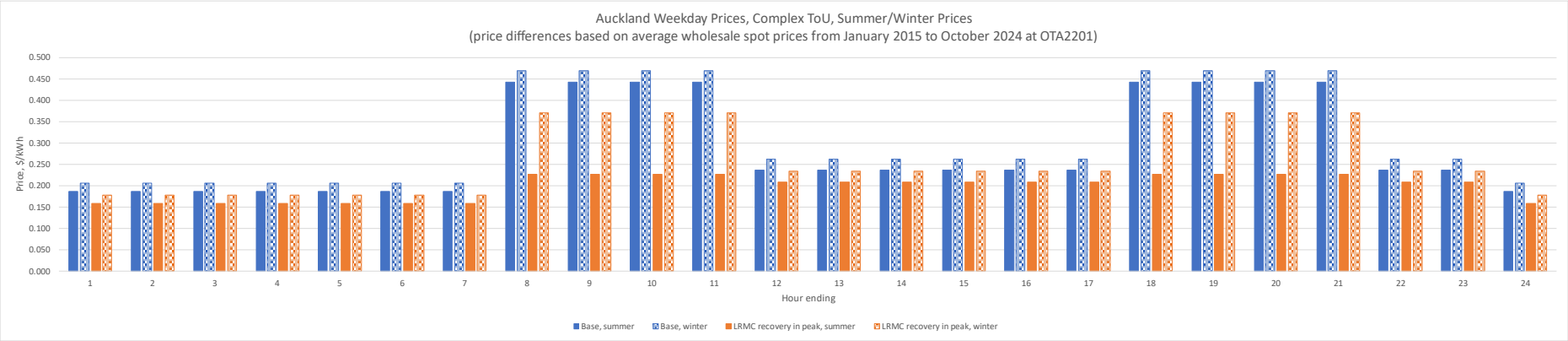

Figure 7: Complex time-of-use energy price with seasonal variation and with distribution price pass through retail price example.

Table 2: Summary of all retail prices used in the model, adjusted to 2025 and including GST. The order of prices for each city follows the same order set out in Table 1. Definitions of Peak relate to each distributor, as discussed in Section 3.5.

City	Seasonal difference	Price structure	Distribution price	Summer						Winter					
				Weekdays			Weekends			Weekdays			Weekends		
				Night	Peak	Off-peak	Night	Peak	Off-peak	Night	Peak	Off-peak	Night	Peak	Off-peak
Auckland	No	Flat rate retail price	Existing prices	0.234	0.234	0.234	0.234	0.234	0.234	0.234	0.234	0.234	0.234	0.234	0.234
		Simple two-rate day/night retail price		0.130	0.275	0.275	0.130	0.275	0.275	0.130	0.275	0.275	0.130	0.275	0.275
		Simple two-rate day/night retail price, 9-midnight free		0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262
		Flat rate energy price	Base	0.244	0.431	0.244	0.244	0.244	0.244	0.244	0.431	0.244	0.244	0.244	0.244
			LRMC recovery in peak	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.332	0.216	0.216	0.216	0.216
		Complex ToU	Base	0.199	0.470	0.242	0.199	0.242	0.242	0.199	0.470	0.242	0.199	0.242	0.242
			LRMC recovery in peak	0.171	0.255	0.214	0.171	0.214	0.214	0.171	0.371	0.214	0.171	0.214	0.214
	Yes	Complex ToU	Base	0.186	0.442	0.236	0.186	0.236	0.236	0.206	0.470	0.262	0.206	0.262	0.262
			LRMC recovery in peak	0.159	0.227	0.208	0.159	0.208	0.208	0.178	0.370	0.234	0.178	0.234	0.234
Wellington	No	Flat rate retail price	Existing prices	0.206	0.206	0.206	0.206	0.206	0.206	0.206	0.206	0.206	0.206	0.206	0.206
		Simple two-rate day/night retail price		0.119	0.246	0.246	0.119	0.246	0.246	0.119	0.246	0.246	0.119	0.246	0.246
		Simple two-rate day/night retail price, 9-midnight free		0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232
		Flat rate energy price	Base	0.226	0.286	0.226	0.226	0.226	0.226	0.226	0.286	0.226	0.226	0.226	0.226
			LRMC recovery in peak	0.179	0.273	0.179	0.179	0.179	0.179	0.179	0.273	0.179	0.179	0.179	0.179
		Complex ToU	Base	0.198	0.313	0.224	0.198	0.224	0.224	0.198	0.313	0.224	0.198	0.224	0.224
			LRMC recovery in peak	0.152	0.300	0.177	0.152	0.177	0.177	0.152	0.300	0.177	0.152	0.177	0.177
	Yes	Complex ToU	Base	0.187	0.291	0.217	0.187	0.217	0.217	0.204	0.314	0.238	0.204	0.238	0.238
			LRMC recovery in peak	0.140	0.278	0.171	0.140	0.171	0.171	0.157	0.301	0.192	0.157	0.192	0.192
Christchurch	No	Flat rate retail price	Existing prices	0.246	0.246	0.246	0.246	0.246	0.246	0.246	0.246	0.246	0.246	0.246	0.246
		Simple two-rate day/night retail price		0.134	0.303	0.303	0.134	0.303	0.303	0.134	0.303	0.303	0.134	0.303	0.303
		Simple two-rate day/night retail price, 9-midnight free		0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276
		Flat rate energy price	Base	0.197	0.247	0.247	0.197	0.197	0.197	0.197	0.247	0.247	0.197	0.197	0.197
			LRMC recovery in peak	0.180	0.281	0.236	0.201	0.201	0.201	0.180	0.281	0.236	0.201	0.201	0.201
		Complex ToU	Base	0.175	0.276	0.243	0.175	0.193	0.193	0.175	0.276	0.243	0.175	0.193	0.193
			LRMC recovery in peak	0.157	0.310	0.232	0.179	0.197	0.197	0.157	0.310	0.232	0.179	0.197	0.197
	Yes	Complex ToU	Base	0.160	0.249	0.230	0.160	0.181	0.181	0.185	0.281	0.259	0.185	0.209	0.209
			LRMC recovery in peak	0.143	0.283	0.219	0.164	0.185	0.185	0.167	0.315	0.248	0.189	0.213	0.213
Queenstown	No	Flat rate retail price	Existing prices	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302
		Simple two-rate day/night retail price		0.239	0.330	0.330	0.239	0.330	0.330	0.239	0.330	0.330	0.239	0.330	0.330
		Simple two-rate day/night retail price, 9-midnight free		0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342
		Flat rate energy price	Base	0.278	0.325	0.325	0.278	0.325	0.325	0.278	0.325	0.325	0.278	0.325	0.325
			LRMC recovery in peak	0.150	0.291	0.291	0.150	0.291	0.291	0.150	0.291	0.291	0.150	0.291	0.291
		Complex ToU	Base	0.260	0.347	0.320	0.260	0.320	0.320	0.260	0.347	0.320	0.260	0.320	0.320
			LRMC recovery in peak	0.132	0.313	0.286	0.132	0.286	0.286	0.132	0.313	0.286	0.132	0.286	0.286
	Yes	Complex ToU	Base	0.246	0.323	0.308	0.246	0.308	0.308	0.269	0.351	0.333	0.269	0.333	0.333
			LRMC recovery in peak	0.118	0.289	0.274	0.118	0.274	0.274	0.140	0.317	0.299	0.140	0.299	0.299

3.3 Adapting retailer prices to model prices / Energy price component of retail prices

The process used to adapt the existing 2024 retail prices from a retailer to the prices used in the model, related to 2025, falls into two broad categories related to the two broad retail price categories discussed in Section 3.2, and repeated below.

- Flat or simple time-of-use with distribution price bundled (1-3). The process to adapt existing prices is explained in Figure 8 and the remainder of this section.
- Price structures with time-of-use distribution price fully passed through in the retail price (4, 5 and 7). The process to adapt existing prices is explained in Figure 9 and the remainder of this section.

The following explanations refer to wholesale spot price ratios, which are discussed in Section 3.4.

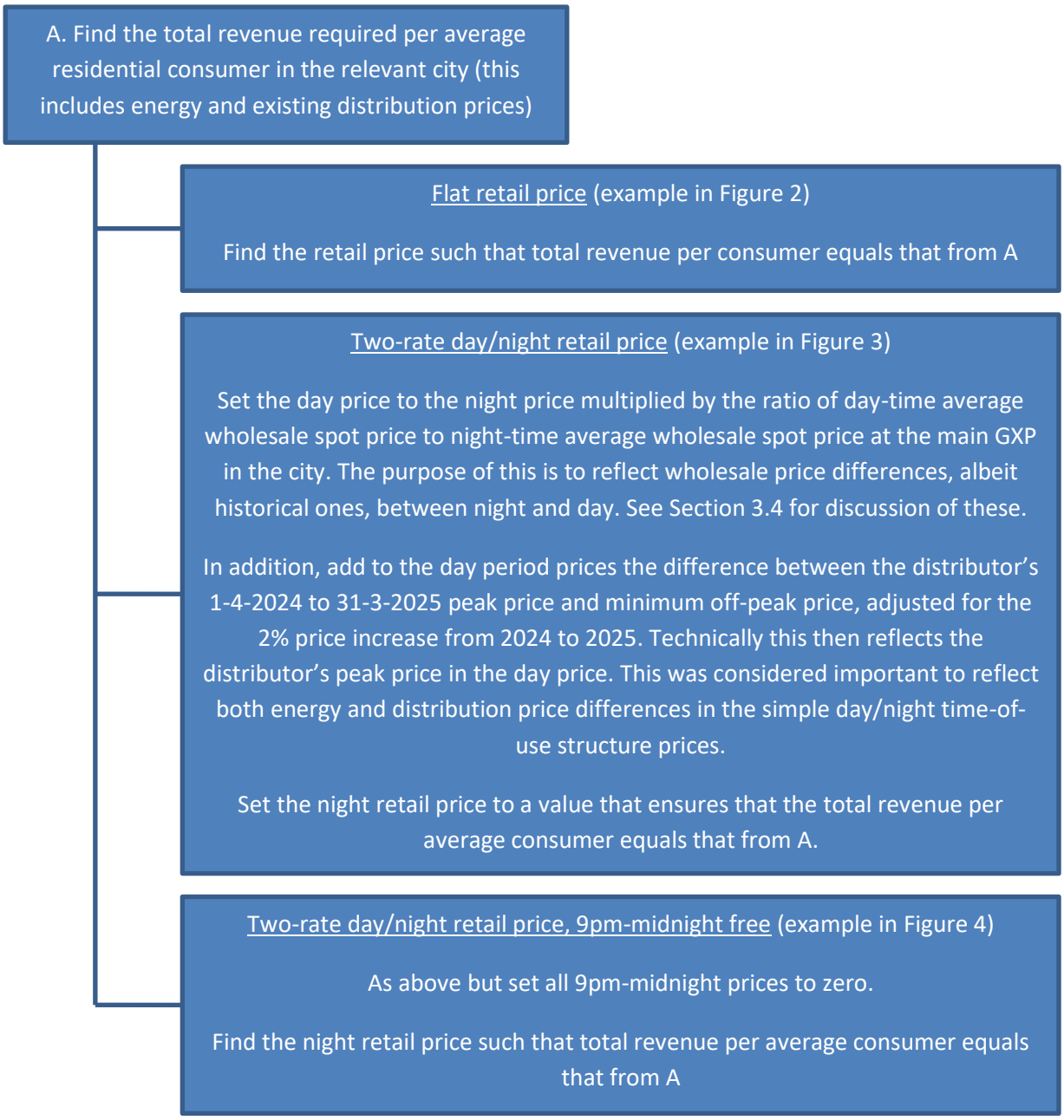

Figure 8: Determining flat or simple time-of-use prices with distribution price bundled (1-3). This includes adjusting prices to 2025. GST is also added to prices. Revenue determined in A is revenue derived from unit (c/kWh) prices only, not fixed ($/day) prices. The average consumer is strictly speaking an average ICP, although the terms are used interchangeably for convenience.

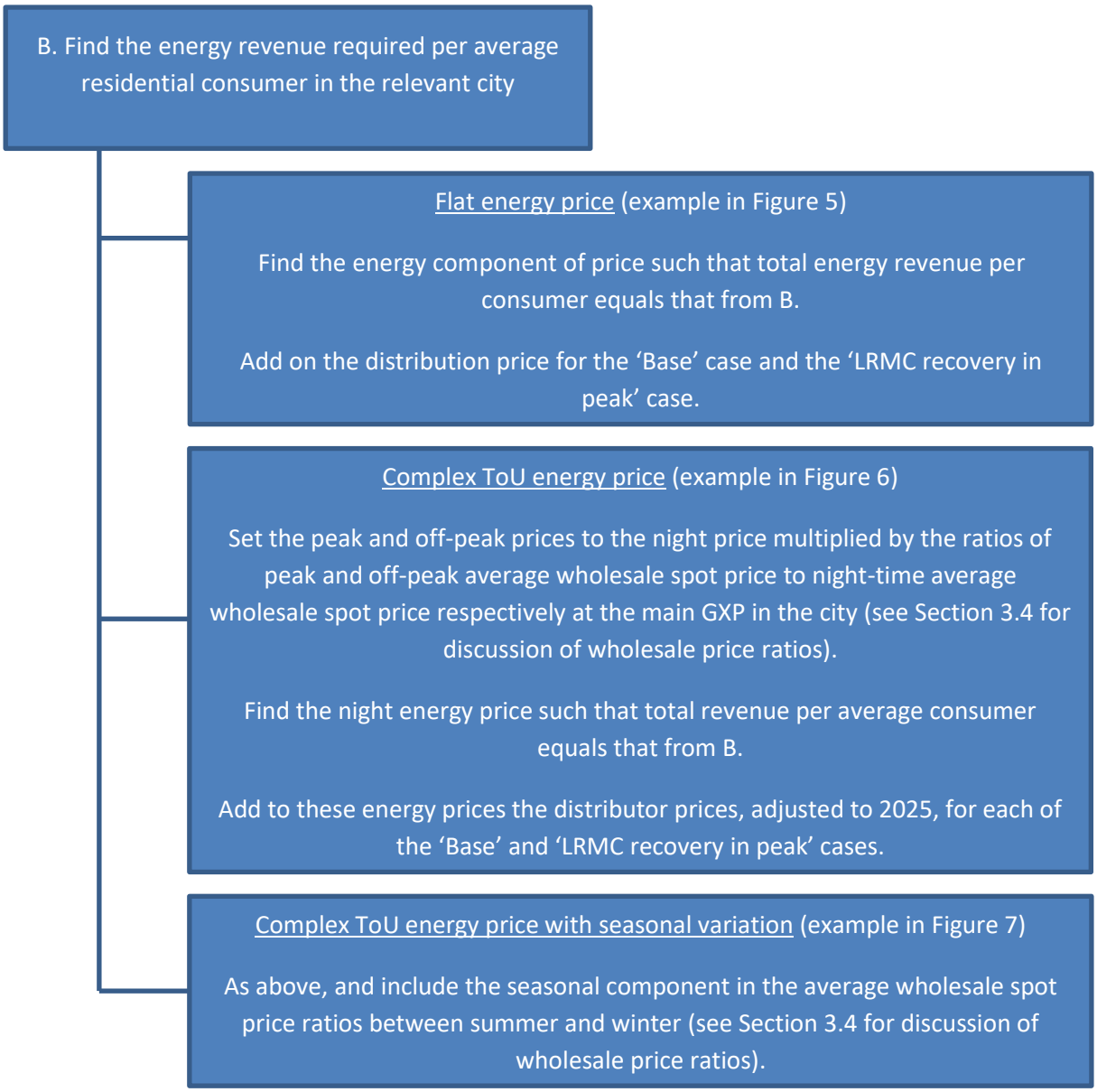

Figure 9: Determining prices where time-of-use distribution price is fully passed through in the retail price (4, 5, and 7). This includes adjusting prices to 2025. GST is also added to prices. Revenue determined in B is revenue derived from unit (c/kWh) prices only, not fixed ($/day) prices. The average consumer is strictly speaking an average ICP, although the terms are used interchangeably for convenience.

In the processes outlined in Figure 8 and Figure 9 the starting point is the determination of an average consumer's (actually an ICP's) consumption by time period in each city. This is followed by the determination of total revenue that derives from both energy and distribution prices in Figure 8 (A) and an estimation of total revenue that derives from the energy component prices only in Figure 9 (B).

An average consumer's consumption was calculated from the total of 47,045 load profiles available by city. An obvious assumption inherent in this is that the load profiles in the sample correspond to the customers of the selected retailer (discussed in Section 3.1). This is not the case, but the approach is still considered superior to determining energy prices which, as discussed earlier, would involve assumptions about wholesale prices and margins.

Moreover, the approach of deriving prices from an average consumer's revenue was taken, rather than using actual retailer prices, to allow comparison between each price structure knowing that their price levels were such that the same revenue was collected for an average consumer within each city.

In the case of A, Figure 8, total revenue is then calculated by multiplying the average consumption (kWh) by the 2024 retail price ($/kWh) in each time period, summing over all time periods, and adjusting to 2025 by an assumed energy price inflation of 2%. Since this revenue includes a component of distribution prices, an inherent assumption is that the distribution price inflation is also 2%. Highly summarised results of this are given in Table 3, Column A.

In the case of B, Figure 9, the total energy revenue is calculated by multiplying the average consumption (kWh) by the 2024 retail price, less the 1-4-2024 to 31-3-2025 distribution price in each time period, summing over all time periods, and adjusting to 2025 by the assumed energy price inflation of 2%.[8] Highly summarised results of this are given in Table 3, Column B.

[8] Conveniently ignoring the one quarter mismatch between calendar year retail prices and regulatory year distribution prices.

Table 3: Average ICP consumption and revenue. More details of the ICPs and their characteristics are available in the Appendix dealing with load profile characterisation.

City	Number of ICPs	Average ICP consumption (kWh per annum)	A: Total retailer revenue from the average ICP adjusted to 2025 ($). Derived from average ICP consumption and both unit energy and distribution prices.	B: Estimated total energy revenue from the average ICP adjusted to 2025 ($). Derived from average ICP consumption and unit energy prices only.
Auckland	14,573	7,950	$1,858	$1,721
Wellington	10,514	8,076	$1,667	$1,345
Christchurch	21,038	7,539	$1,856	$1,318
Queenstown	920	9,478	$2,861	$1,419

3.4 Wholesale price ratios used to adjust retail prices

Wholesale price ratios are referred to throughout the discussion in Section 3.3, including in Figure 8 and Figure 9. These are used to adjust prices from night to peak and off-peak time periods, as well as between seasons for the 'complex time-of-use with seasonal variation' prices. These are discussed in the following two sub-sections. In all cases the energy price is adjusted, with the distribution prices then added to give the final retail electricity price.

3.4.1 Adjustment of prices between time periods within days

Ratios used to adjust from night-time prices to peak and off-peak prices are given in Table 4. The first set of ratios are from wholesale spot prices averaged over the period from 2015 to 2024 inclusive, while the second set are from 2020 to 2024 inclusive. In most cases there is little difference between the ratios from the two averaging periods, except for Auckland and Wellington off-peak to night. Similar results for the two averaging periods are expected as they represent the ratios of peak and off-peak to night-time average generation prices rather than the absolute prices. Generally, the ratio of peak price to night-time price is higher in the winter than summer. This is also expected as the total demand during the winter peaks is higher, leading to a matching of the higher demand with the supply curve at a higher price (i.e. a steeper section of the 'generation stack').

Because the differences in ratios of prices between periods between the two averaging periods are not significantly different, for consistency with the seasonal adjustments to prices, discussed below, and the buyback price time period selected (Section 4), the longer averaging period of 2015 to 2024 is used.

3.4.2 Adjustment of prices between summer and winter for prices that reflect seasonal variation

Ratios used to adjust prices between seasons are shown in Table 5 (ratios of winter to summer prices). In contrast to ratios within days, these ratios between seasons show considerable variation between those determined over the period from 2020 to 2024 and those determined over the period from 2015 to 2024. This is largely due to there being two low inflow periods within this relatively short space (2021 and 2024). It was felt that this may therefore overstate seasonal differences in prices. Thus the 2015 to 2024 period was used as a sufficiently long period of time to average out the two low inflow periods.

Table 4: Ratios of historical average wholesale spot prices between time periods by city with the GXP from which the spot prices are obtained also given.

City (GXP)	2015-2024 inclusive						2020-2024 inclusive					
	Year		Summer (Oct-Mar)		Winter (Apr-Sep)		Year		Summer (Oct-Mar)		Winter (Apr-Sep)	
	Peak : Night	Off-peak : Night	Peak : Night	Off-peak : Night	Peak : Night	Off-peak : Night	Peak : Night	Off-peak : Night	Peak : Night	Off-peak : Night	Peak : Night	Off-peak : Night
Auckland (OTA2201)	1.49	1.25	1.43	1.31	1.54	1.20	1.52	1.24	1.49	1.31	1.49	1.31
Wellington (HAY2201)	1.39	1.18	1.34	1.24	1.44	1.14	1.41	1.17	1.40	1.23	1.40	1.23
Christchurch (ISL2201)	1.34	1.12	1.29	1.15	1.39	1.10	1.35	1.10	1.31	1.12	1.31	1.12
Queenstown (FKN0331)	1.30	1.10	1.25	1.13	1.34	1.08	1.32	1.08	1.28	1.10	1.28	1.10

Table 5: Historical average wholesale spot prices and ratios of average prices between seasons by city and GXP.

City (GXP)	Annual average price ($/kWh)		Ratio of winter to summer price	
	2015-2024	2020-2024	2015-2024	2020-2024
Auckland (OTA2201)	0.14	0.18	1.12	1.32
Wellington (HAY2201)	0.13	0.17	1.14	1.35
Christchurch (ISL2201)	0.14	0.17	1.18	1.42
Queenstown (FKN0331)	0.13	0.17	1.19	1.43

3.5 Distribution price component of retail prices

As noted in the previous section, distribution prices are added to the energy prices determined. The distribution prices used are listed in the following tables for each of Vector (Table 6), Wellington Electricity (Table 7), Orion (Table 8), and Aurora Energy (Table 9). In all tables historical unit rates have been adjusted to calendar year 2025 prices (to align with the solar analysis starting in calendar year 2025) by an assumed distribution price annual increase of 1.5% per annum in the 2022, 2023, and 2024 regulatory years, and 2% in the 2025 regulatory year (see footnote in Section 3.1 for a discussion of the nominal annual electricity price increase rate used) and include GST. While there will be some overlap in the first quarter of 2025, where regulatory year 2025 prices are still used, this approximation is considered suitable given that the final retail prices are themselves estimated, and that the determination of rate of return is over 29 years.

Only unit prices (c/kWh) are calculated, not fixed ($/day) prices, since only unit prices are used in the solar model to determine self-consumption cost saving.

Table 6: Vector unit prices for: (a) weekdays; and (b) weekends. 'Base' prices are based on Vector's 1-4-2022 to 31-3-2023 prices (a time when prices were less compliant with the Electricity Authority's distribution pricing principles).[9] 'LRMC recovery in peak' prices are based on Vector's 1-4-2024 to 31-3-2025 prices, which do not pass through transmission prices in unit prices.[10]. The time periods of the 'LRMC recovery in peak' prices are given in full in (c).[11]

(a)

2025 estimated 'Base' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP
Summer	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.215	0.215	0.215	0.215	0.028	0.028	0.028	0.028	0.028	0.028	0.215	0.215	0.215	0.215	0.028	0.028	0.028
Winter	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.215	0.215	0.215	0.215	0.028	0.028	0.028	0.028	0.028	0.028	0.215	0.215	0.215	0.215	0.028	0.028	0.028

2025 estimated 'LRMC recovery in peak' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.115	0.115	0.115	0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.115	0.115	0.115	0.115	0.000	0.000	0.000

(b)

2025 estimated 'Base' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Summer	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Winter	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028

2025 estimated 'LRMC recovery in peak' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

(c)

Time periods	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP

Time periods	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP

[9] Vector, Pricing Schedule and Policy, v2022.1, 1 April 2022 and Vector, 2023 Pricing Methodology, 1 April 2022.

[10] Vector, Pricing Schedule and Policy, v2024.1, 1 April 2024 (Res, Standard, A, Controlled (same as uncontrolled), ToU).

[11] In the 'LRMC recovery in peak' distribution prices the time periods are: OP off-peak; P peak.

Table 7: Wellington Electricity unit prices for: (a) weekdays; and (b) weekends. 'Base' prices are based on Wellington Electricity's 1-4-2021 to 31-3-2022 prices (a time when prices were less compliant with the Electricity Authority's distribution pricing principles).[12] 'LRMC recovery in peak' prices are based on Wellington Electricity's 1-4-2024 to 31-3-2025 prices, with transmission unit prices not included in the price shown, nor used in the solar model.[13]. The time periods of the 'LRMC recovery in peak' prices are given in full in (c).[14]

(a)

2025 estimated 'Base' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP
Summer	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.119	0.119	0.119	0.119	0.059	0.059	0.059	0.059	0.059	0.059	0.119	0.119	0.119	0.119	0.059	0.059	0.059
Winter	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.119	0.119	0.119	0.119	0.059	0.059	0.059	0.059	0.059	0.059	0.119	0.119	0.119	0.119	0.059	0.059	0.059

2025 estimated 'LRMC recovery in peak' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.107	0.107	0.107	0.107	0.013	0.013	0.013	0.013	0.013	0.013	0.107	0.107	0.107	0.107	0.013	0.013	0.013
Winter	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.107	0.107	0.107	0.107	0.013	0.013	0.013	0.013	0.013	0.013	0.107	0.107	0.107	0.107	0.013	0.013	0.013

(b)

2025 estimated 'Base' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Summer	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059
Winter	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059

2025 estimated 'LRMC recovery in peak' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Winter	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

(c)

Time periods	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP	OP	OP	OP	P	P	P	P	OP	OP	OP

Time periods	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP

[12] Wellington Electricity, Disclosure of Prices, 1 April 2021.

[13] Wellington Electricity, 2024/25 Disclosure of Prices, 1 April 2024 (prepared 1 March 2024) (Res, standard, UC circuit ToU. Controlled (CTRL) circuit has not been used since this is assumed to apply to HWC).

[14] In the 'LRMC recovery in peak' distribution prices the time periods are: OP off-peak; P peak.

Table 8: Orion unit prices for: (a) weekdays; and (b) weekends. 'Base' prices are based on Orion's 1-4-2022 to 31-3-2023 prices (a time when prices were less compliant with the Electricity Authority's distribution pricing principles).[15] 'LRMC recovery in peak' prices are based on Orion's 1-4-2024 to 31-3-2025 prices with transmission unit prices not included in the price shown, nor used in the solar model.[16]. The time periods of the 'LRMC recovery in peak' prices are given in full in (c).[17]

(a) Orion's weekday distribution prices adjusted to 2025 calendar year

2025 estimated 'Base' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	Night	Night	Night	Night	Night	Night	Night	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Night	Night	Night
Summer	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.022	0.022	0.022
Winter	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.022	0.022	0.022

2025 estimated 'LRMC recovery in peak' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.005	0.005	0.005	0.000	0.000	0.061	0.061	0.106	0.106	0.106	0.106	0.061	0.061	0.061	0.061	0.061	0.061	0.106	0.106	0.106	0.106	0.106	0.005	0.005
Winter	0.005	0.005	0.005	0.000	0.000	0.061	0.061	0.106	0.106	0.106	0.106	0.061	0.061	0.061	0.061	0.061	0.061	0.106	0.106	0.106	0.106	0.106	0.005	0.005

(b) Orion's weekend day distribution prices adjusted to 2025 calendar year

2025 estimated 'Base' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night	Night
Summer	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
Winter	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022

2025 estimated 'LRMC recovery in peak' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.027	0.027	0.027	0.000	0.000	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Winter	0.027	0.027	0.027	0.000	0.000	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027

(c) Orion's 'LRMC recovery in peak' distribution price time periods

Time periods	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	SOP	SOP	SH	SH	P	P	P	P	SH	SH	SH	SH	SH	SH	P	P	P	P	P	OP	OP
Winter	OP	OP	OP	SOP	SOP	SH	SH	P	P	P	P	SH	SH	SH	SH	SH	SH	P	P	P	P	P	OP	OP

Time periods	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	WKD	WKD	WKD	SOP	SOP	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD
Winter	WKD	WKD	WKD	SOP	SOP	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD	WKD

[15] Orion NZ Ltd, Electricity delivery price schedule, 1 April 2023, p:2 prices applicable from 1 April 2022.

[16] Orion NZ Ltd, Electricity delivery price schedule, 1 April 2024 (Res, Standard, Weekend, Peak, Shoulder, Off-Peak, and Super Off-Peak, Controlled (affects fixed price only), ToU), transmission unit prices not included in price used.

[17] In the 'LRMC recovery in peak' distribution prices the time periods are: OP off-peak; SOP super off-peak; SH shoulder; P peak; and WKD weekend.

Table 9: Aurora Energy unit prices for: (a) weekdays; and (b) weekends. 'Base' prices are based on Aurora Energy's 1-4-2024 to 31-3-2025 prices.[18] 'LRMC recovery in peak' prices are based on prices and LRMC signalled in Aurora Energy's pricing methodology pp:36-37, which it notes will be phased in to avoid 'bill shocks'. Assumptions made in adjusting the prices to an assumed set of prices compliant with the Electricity Authority's pricing principles are that the LRMC is only in the peak periods, the LRMC is taken from Table 11, p37, off-peak is zero, and that there is no transmission price pass through in unit prices.[19]. The time periods of the 'LRMC recovery in peak' prices are given in full in (c).[20]

(a)

2025 estimated 'Base' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP
Summer	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128
Winter	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128

2025 estimated 'LRMC recovery in peak' distribution prices

Weekdays

2025 prices, including GST	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000
Winter	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000

(b)

2025 estimated 'Base' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP
Summer	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128
Winter	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128	0.128	0.128	0.128	0.175	0.175	0.175	0.175	0.175	0.128	0.128

2025 estimated 'LRMC recovery in peak' distribution prices

Weekends

2025 prices, including GST	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Summer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000
Winter	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.141	0.141	0.141	0.000	0.000

(c)

Time periods	Weekday, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP

Time periods	Weekend day, hour ending																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season																								
Summer	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP
Winter	OP	OP	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP	OP	OP	OP	P	P	P	P	P	OP	OP

[18] Aurora, Electricity pricing schedule, 1 April 2024 (Res, (Standard), Peak & Off-Peak, Controlled circuit not used (assumed to be HWC), ToU).

[19] Aurora Energy, Pricing Methodology, 1 April 2024.

[20] In the 'LRMC recovery in peak' distribution prices the time periods are: OP off-peak; and P peak.

4 Buyback prices

Section 2.1 introduced the financial benefits that PV solar affords residential consumers. One of the benefits is the sale of electrical energy, exported to the network and purchased by a consumer's retailer at a buyback price. Hence, the determination of buyback prices is important. Buyback price structures are also important, as noted in Section 2.3 in the discussion of the study Objectives.

The buyback price structures required for Objectives C, D, and E are given in Table 10.

Table 10: Base buyback price structures.

Buyback price reference	Final buyback price
A	Flat buyback price (no variation throughout a day or year).
E	Complex time-of-use, no seasonal variation.
I	Complex time of use with seasonal (summer/winter) differences in prices.

At the request of the Electrcity Authority, for Objective G, further buyback price structures that include a payment to the consumer for export by the relevant distributor in the distributor's peak periods were included in the study. This expanded the price structures to those given in Table 11, where the payment is based on a proportion of the distributor's LRMC. Notes about the LRMC values used for each distributor are given in Table 12.

Table 11: Full buyback price structures that include distributor payments within peak periods.

Buyback price reference	Final buyback price	Additional buyback price based on a ratio of the distributor's LRMC
A	Flat buyback price (no variation throughout a day or year).	0 %
B		50%
C		100%
D		50% morning / 100% evening[21]
E	Complex time-of-use, no seasonal variation.	0 %
F		50%
G		100%
H		50% morning / 100% evening[20]
I	Complex time of use with seasonal (summer/winter) differences in prices.	0 %
J		50%
K		100%
L		50% morning / 100% evening[20]

The base buyback prices were determined from average wholesale prices since it is assumed that exported energy from PV solar would reduce the need for a retailer to purchase wholesale energy at the time of export. The wholesale prices used are those listed in Table 5, first column. These are from

[21] This was included out of interest but was not used.

the 2015 to 2024 time period to average out the two low inflow periods that occurred in the 2020 to 2024 period (as discussed earlier). These prices also give buyback prices that are available in the market today. A slight variation from prices available today is that buyback prices are varied by location, based on the average spot price in each location.

The complete buyback prices are given in Table 13 with accompanying notes in Table 14.

A variation on the buyback rates is provided, where the same rates are used in all cities, to reflect how buyback rates are currently offered. In this case the Christchurch prices are used for all cities – shown in Table 15. Indeed, in the simulations to produce results for most objectives, the same distribution prices between cities are used, even though the full range of price structures from Table 10 or Table 11 (for Objective G) are used.

Table 12: Notes on the LRMCs used in distribution prices and buyback prices.

EDB	Estimated LRMC, $/kWh (2025, including GST)	Notes	Distributor peak period
Vector	0.115	Based on the difference between peak and off-peak prices (Auckland residential standard users, controlled, time-of-use category). Reference: Vector, Pricing Schedule and Policy, v2024.1, 1 April 2024	Vector, 2025 Pricing Methodology, 1 April 2024, p:9: "...peak volume (PEAK) (0700 to 1100 and 1700 to 2100 weekdays including public holidays). The winter period is for months April to September inclusive and, the summer period is for months October to March inclusive." And "The peak volume price in summer is the same as off peak volume price." [which is zero] In all cases the Auckland Network (A) is used.
Wellington Electricity	0.094	Based on the difference between peak and off-peak prices (residential standard users, time-of-use category. Controlled circuit prices not used, as this appears to apply to a separate circuit, assumed to be hot-water control). Reference: Wellington Electricity, 2024/25 Disclosure of Prices, 1 April 2024.	Wellington Electricity, 2024/25 Disclosure of Prices, 1 April 2024 (prepared 1 March 2024): Peak definition is: 7am-11am and 5pm-9pm weekdays, off peak is 9pm-7am and 11am-5pm and all weekend.
Orion	0.106	Based on the difference between peak and super off-peak prices (residential standard users, controlled (although this affects the fixed price only) time-of-use category). Reference: Orion NZ Ltd, Electricity delivery price schedule, 1 April 2024.	Orion NZ Ltd, Schedule of delivery prices, 1 April 2024: "Peak (Mon to Fri, 7:00am to 11:00am and 5:00pm to 10:00pm)" Through the definition of weekend, and the prices given, peak periods are excluded from weekends.
Aurora Energy	0.141	Based on the publised LRMC for Queenstown to be implemented from 1 April 2026 (residential standard users, time-of-use category. Controlled prices not used, as assumed to be hot water control). Reference: Aurora Energy, Pricing Methodology, 1 April 2024, p:16, p:37.	Aurora Energy Peak Period definition: Aurora Energy, Pricing Methodology, 1 April 2024, p:11, Section 2.6 Reform Pricing Structures: "To design appropriate ToU pricing, peak periods need to be set that correspond to times of network investment pressure and are simple enough for retailers to implement. Aurora Energy has considered these two objectives and determined it is most sensible to use the same peak periods across all of the pricing regions as follows: 7am – 12pm (7 days per week) & 5pm – 10pm (7 days per week)."

Table 13: Buyback prices unique to each city used in the model.

City	Seasonal difference	Rate type	EDB LRMC multiplier in AM / PM peak	Summer				Winter			
				Night	Morning Peak	Evening peak	Off-peak	Night	Morning Peak	Evening peak	Off-peak
Auckland	No	Flat Rate Export	0.0 / 0.0	0.141	0.141	0.141	0.141	0.141	0.141	0.141	0.141
			0.5 / 0.5	0.141	0.141	0.141	0.141	0.141	0.199	0.199	0.141
			1.0 / 1.0	0.141	0.141	0.141	0.141	0.141	0.256	0.256	0.141
			0.5 / 1.0	0.141	0.141	0.141	0.141	0.141	0.199	0.256	0.141
		Complex ToU Export	0.0 / 0.0	0.117	0.175	0.175	0.147	0.117	0.175	0.175	0.147
			0.5 / 0.5	0.117	0.175	0.175	0.147	0.117	0.232	0.232	0.147
			1.0 / 1.0	0.117	0.175	0.175	0.147	0.117	0.290	0.290	0.147
			0.5 / 1.0	0.117	0.175	0.175	0.147	0.117	0.232	0.290	0.147
	Yes	Complex ToU Export	0.0 / 0.0	0.110	0.157	0.157	0.144	0.124	0.192	0.192	0.149
			0.5 / 0.5	0.110	0.157	0.157	0.144	0.124	0.250	0.250	0.149
			1.0 / 1.0	0.110	0.157	0.157	0.144	0.124	0.307	0.307	0.149
			0.5 / 1.0	0.110	0.157	0.157	0.144	0.124	0.250	0.307	0.149
Wellington	No	Flat Rate Export	0.0 / 0.0	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133
			0.5 / 0.5	0.133	0.180	0.180	0.133	0.133	0.180	0.180	0.133
			1.0 / 1.0	0.133	0.227	0.227	0.133	0.133	0.227	0.227	0.133
			0.5 / 1.0	0.133	0.180	0.227	0.133	0.133	0.180	0.227	0.133
		Complex ToU Export	0.0 / 0.0	0.115	0.160	0.160	0.136	0.115	0.160	0.160	0.136
			0.5 / 0.5	0.115	0.207	0.207	0.136	0.115	0.207	0.207	0.136
			1.0 / 1.0	0.115	0.254	0.254	0.136	0.115	0.254	0.254	0.136
			0.5 / 1.0	0.115	0.207	0.254	0.136	0.115	0.207	0.254	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.107	0.144	0.144	0.132	0.123	0.176	0.176	0.140
			0.5 / 0.5	0.107	0.191	0.191	0.132	0.123	0.223	0.223	0.140
			1.0 / 1.0	0.107	0.237	0.237	0.132	0.123	0.270	0.270	0.140
			0.5 / 1.0	0.107	0.191	0.237	0.132	0.123	0.223	0.270	0.140
Christchurch	No	Flat Rate Export	0.0 / 0.0	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
			0.5 / 0.5	0.136	0.189	0.189	0.136	0.136	0.189	0.189	0.136
			1.0 / 1.0	0.136	0.242	0.242	0.136	0.136	0.242	0.242	0.136
			0.5 / 1.0	0.136	0.189	0.242	0.136	0.136	0.189	0.242	0.136
		Complex ToU Export	0.0 / 0.0	0.121	0.163	0.163	0.136	0.121	0.163	0.163	0.136
			0.5 / 0.5	0.121	0.215	0.215	0.136	0.121	0.215	0.215	0.136
			1.0 / 1.0	0.121	0.268	0.268	0.136	0.121	0.268	0.268	0.136
			0.5 / 1.0	0.121	0.215	0.268	0.136	0.121	0.215	0.268	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.111	0.143	0.143	0.128	0.131	0.181	0.181	0.143
			0.5 / 0.5	0.111	0.196	0.196	0.128	0.131	0.234	0.234	0.143
			1.0 / 1.0	0.111	0.249	0.249	0.128	0.131	0.287	0.287	0.143
			0.5 / 1.0	0.111	0.196	0.249	0.128	0.131	0.234	0.287	0.143
Queenstown	No	Flat Rate Export	0.0 / 0.0	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
			0.5 / 0.5	0.130	0.200	0.200	0.130	0.130	0.200	0.200	0.130
			1.0 / 1.0	0.130	0.270	0.270	0.130	0.130	0.270	0.270	0.130
			0.5 / 1.0	0.130	0.200	0.270	0.130	0.130	0.200	0.270	0.130
		Complex ToU Export	0.0 / 0.0	0.117	0.152	0.152	0.129	0.117	0.152	0.152	0.129
			0.5 / 0.5	0.117	0.223	0.223	0.129	0.117	0.223	0.223	0.129
			1.0 / 1.0	0.117	0.293	0.293	0.129	0.117	0.293	0.293	0.129
			0.5 / 1.0	0.117	0.223	0.293	0.129	0.117	0.223	0.293	0.129
	Yes	Complex ToU Export	0.0 / 0.0	0.107	0.134	0.134	0.120	0.127	0.170	0.170	0.137
			0.5 / 0.5	0.107	0.205	0.205	0.120	0.127	0.240	0.240	0.137
			1.0 / 1.0	0.107	0.275	0.275	0.120	0.127	0.311	0.311	0.137
			0.5 / 1.0	0.107	0.205	0.275	0.120	0.127	0.240	0.311	0.137

Table 14: Notes to Table 13.

Export	In this context, export refers to export from an ICP to the network. Export rates are also referred to as buyback rates.
Units	All rates are $/MWh, adjusted to 2025 (2.0% energy price inflation from 2024 assumed), and include GST.
Basis for export rates	Export rates are based on the average wholesale spot prices from January 2015 to October 2024 at the main GXP in each city over the time period given (see below). GXPs used are: Auckland: OTA2201, Wellington: HAY2201, Christchurch: ISL2201, and Queenstown: FKN0331.
Flat rate	The export rate is the same in all hours of the day, seasons, and weekdays and weekends.
Complex ToU	Export rates are time of use according to: Weekdays: night, 11pm to 7am; morning-peak 7am-11am; evening-peak 5pm-9pm; and off-peak 11am-5pm and 9pm-11pm. Weekends: night, 11pm to 7am; and off-peak 7am-11pm. Note that not all EDB peak time periods align exactly with the above time periods. The model uses EDB peak time periods to determine the LRMC adjustments, not the time periods in this table, which are used for the purpose of summarising prices. An example of this is in the Auckland rates between summer and winter, where Vector's peak period only covers winter. Also note that Aurora Energy is the only distributor that has peak periods in weekends as well as weekdays, and has longer peak periods (Table 9). This relates to higher demand throughout all days of the week.
Seasonal difference	Seasonal differences are alse determined from the average wholesale spot prices. Summer is October to March inclusive, and winter is April to September inclusive.
LRMC values	In all cases except Aurora Energy the LRMC value used is based on the difference between the EDB's peak period rate and lowest off-peak period rate in their 1 April 2024 distribution prices, adjusted to 2025 by an assumed distribution price increase (2.0%), and with GST added. These are their prices without transmission prices passed through (if the EDB passes transmission prices through in their variable distribution prices). The assumption is that these EDBs are already passing LRMC through in their peak price. In the case of Vector (Auckland) and Orion (Christchurch) their off-peak prices are already zero. In the case of Wellington Electricity, a small off-peak rate is subtracted. In the case of Aurora Energy, since they are on a transition to including the full LRMC in their Queenstown prices to avoid 'bill shock' because Queenstown has the highest LRMC in their network, their calculated LRMC for full recovery from 1 April 2026 is used.

Table 15: Buyback prices the same in each city used in the model.

City	Seasonal difference	Rate type	EDB LRMC multiplier in AM / PM peak	Summer				Winter			
				Night	Morning Peak	Evening peak	Off-peak	Night	Morning Peak	Evening peak	Off-peak
Auckland	No	Flat Rate Export	0.0 / 0.0	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
			0.5 / 0.5	0.136	0.136	0.136	0.136	0.136	0.194	0.194	0.136
			1.0 / 1.0	0.136	0.136	0.136	0.136	0.136	0.251	0.251	0.136
			0.5 / 1.0	0.136	0.136	0.136	0.136	0.136	0.194	0.251	0.136
		Complex ToU Export	0.0 / 0.0	0.121	0.163	0.163	0.136	0.121	0.163	0.163	0.136
			0.5 / 0.5	0.121	0.163	0.163	0.136	0.121	0.220	0.220	0.136
			1.0 / 1.0	0.121	0.163	0.163	0.136	0.121	0.278	0.278	0.136
			0.5 / 1.0	0.121	0.163	0.163	0.136	0.121	0.220	0.278	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.111	0.143	0.143	0.128	0.131	0.181	0.181	0.143
			0.5 / 0.5	0.111	0.143	0.143	0.128	0.131	0.239	0.239	0.143
			1.0 / 1.0	0.111	0.143	0.143	0.128	0.131	0.296	0.296	0.143
			0.5 / 1.0	0.111	0.143	0.143	0.128	0.131	0.239	0.296	0.143
Wellington	No	Flat Rate Export	0.0 / 0.0	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
			0.5 / 0.5	0.136	0.183	0.183	0.136	0.136	0.183	0.183	0.136
			1.0 / 1.0	0.136	0.230	0.230	0.136	0.136	0.230	0.230	0.136
			0.5 / 1.0	0.136	0.183	0.230	0.136	0.136	0.183	0.230	0.136
		Complex ToU Export	0.0 / 0.0	0.121	0.163	0.163	0.136	0.121	0.163	0.163	0.136
			0.5 / 0.5	0.121	0.209	0.209	0.136	0.121	0.209	0.209	0.136
			1.0 / 1.0	0.121	0.256	0.256	0.136	0.121	0.256	0.256	0.136
			0.5 / 1.0	0.121	0.209	0.256	0.136	0.121	0.209	0.256	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.111	0.143	0.143	0.128	0.131	0.181	0.181	0.143
			0.5 / 0.5	0.111	0.190	0.190	0.128	0.131	0.228	0.228	0.143
			1.0 / 1.0	0.111	0.237	0.237	0.128	0.131	0.275	0.275	0.143
			0.5 / 1.0	0.111	0.190	0.237	0.128	0.131	0.228	0.275	0.143
Christchurch	No	Flat Rate Export	0.0 / 0.0	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
			0.5 / 0.5	0.136	0.189	0.189	0.136	0.136	0.189	0.189	0.136
			1.0 / 1.0	0.136	0.242	0.242	0.136	0.136	0.242	0.242	0.136
			0.5 / 1.0	0.136	0.189	0.242	0.136	0.136	0.189	0.242	0.136
		Complex ToU Export	0.0 / 0.0	0.121	0.163	0.163	0.136	0.121	0.163	0.163	0.136
			0.5 / 0.5	0.121	0.215	0.215	0.136	0.121	0.215	0.215	0.136
			1.0 / 1.0	0.121	0.268	0.268	0.136	0.121	0.268	0.268	0.136
			0.5 / 1.0	0.121	0.215	0.268	0.136	0.121	0.215	0.268	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.111	0.143	0.143	0.128	0.131	0.181	0.181	0.143
			0.5 / 0.5	0.111	0.196	0.196	0.128	0.131	0.234	0.234	0.143
			1.0 / 1.0	0.111	0.249	0.249	0.128	0.131	0.287	0.287	0.143
			0.5 / 1.0	0.111	0.196	0.249	0.128	0.131	0.234	0.287	0.143
Queenstown	No	Flat Rate Export	0.0 / 0.0	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
			0.5 / 0.5	0.136	0.206	0.206	0.136	0.136	0.206	0.206	0.136
			1.0 / 1.0	0.136	0.277	0.277	0.136	0.136	0.277	0.277	0.136
			0.5 / 1.0	0.136	0.206	0.277	0.136	0.136	0.206	0.277	0.136
		Complex ToU Export	0.0 / 0.0	0.121	0.163	0.163	0.136	0.121	0.163	0.163	0.136
			0.5 / 0.5	0.121	0.233	0.233	0.136	0.121	0.233	0.233	0.136
			1.0 / 1.0	0.121	0.303	0.303	0.136	0.121	0.303	0.303	0.136
			0.5 / 1.0	0.121	0.233	0.303	0.136	0.121	0.233	0.303	0.136
	Yes	Complex ToU Export	0.0 / 0.0	0.111	0.143	0.143	0.128	0.131	0.181	0.181	0.143
			0.5 / 0.5	0.111	0.214	0.214	0.128	0.131	0.251	0.251	0.143
			1.0 / 1.0	0.111	0.284	0.284	0.128	0.131	0.322	0.322	0.143
			0.5 / 1.0	0.111	0.214	0.284	0.128	0.131	0.251	0.322	0.143