

REPORT TO
QUEENSLAND COMPETITION AUTHORITY

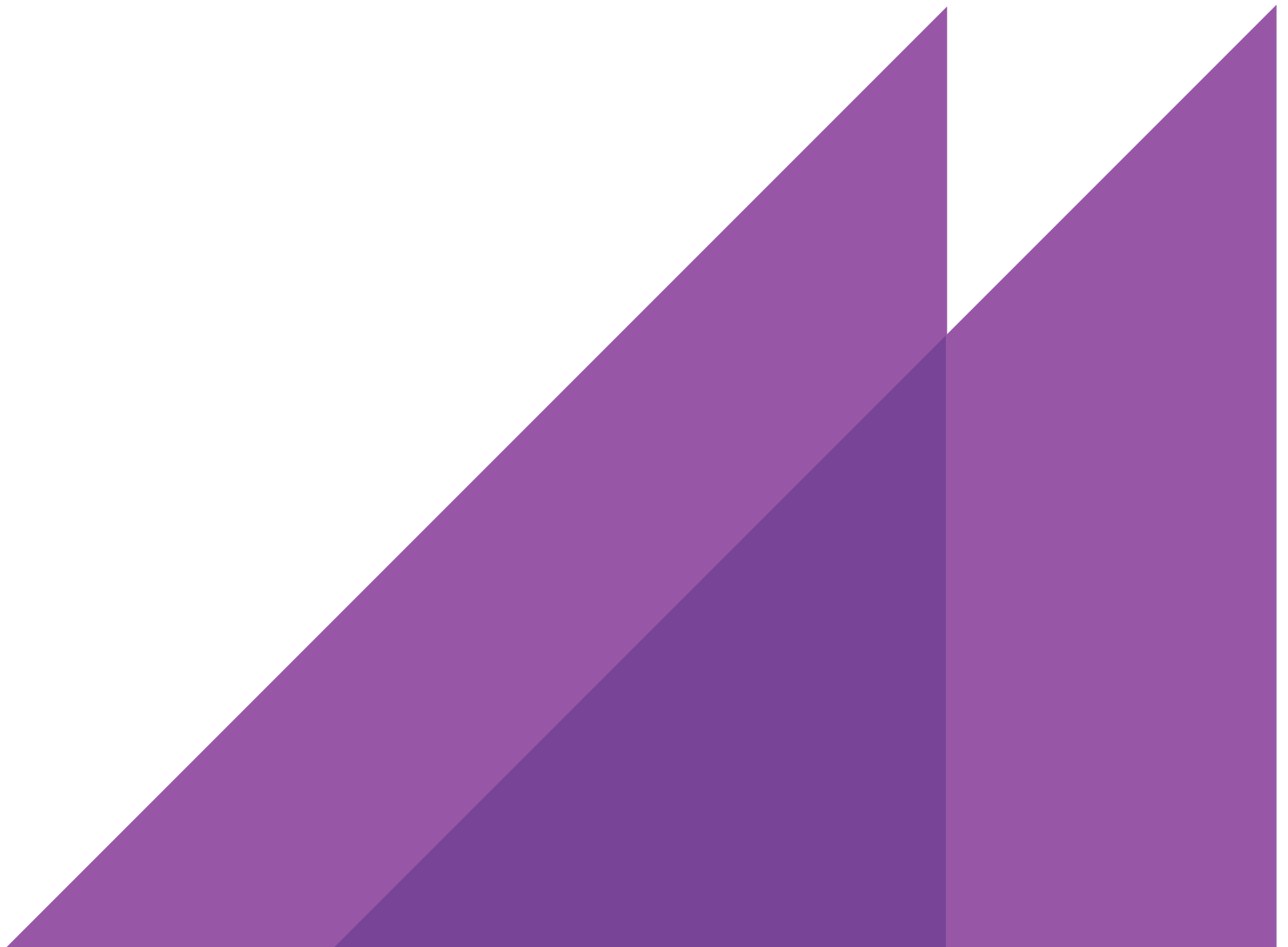
24 JULY 2017

WHOLESALE ELECTRICITY SPOT PRICES



ESTIMATION OF QUEENSLAND
WHOLESALE ELECTRICITY
SPOT PRICES FOR 2017-18

FOR USE BY THE QUEENSLAND COMPETITION AUTHORITY IN
ITS ADVICE ON TIME VARYING FEED-IN TARIFFS





ACIL ALLEN CONSULTING PTY LTD
ABN 68 102 652 148

LEVEL FIFTEEN
127 CREEK STREET
BRISBANE QLD 4000
AUSTRALIA
T+61 7 3009 8700
F+61 7 3009 8799

LEVEL ONE
15 LONDON CIRCUIT
CANBERRA ACT 2600
AUSTRALIA
T+61 2 6103 8200
F+61 2 6103 8233

LEVEL NINE
60 COLLINS STREET
MELBOURNE VIC 3000
AUSTRALIA
T+61 3 8650 6000
F+61 3 9654 6363

LEVEL ONE
50 PITT STREET
SYDNEY NSW 2000
AUSTRALIA
T+61 2 8272 5100
F+61 2 9247 2455

LEVEL TWELVE, BGC CENTRE
28 THE ESPLANADE
PERTH WA 6000
AUSTRALIA
T+61 8 9449 9600
F+61 8 9322 3955

161 WAKEFIELD STREET
ADELAIDE SA 5000
AUSTRALIA
T +61 8 8122 4965

ACILALLEN.COM.AU

SUGGESTED CITATION FOR THIS REPORT

ESTIMATED WHOLESALE ELECTRICITY SPOT PRICES FOR 2017-18 TIME VARYING FEED-IN TARIFFS, ACIL ALLEN, JULY 2017

RELIANCE AND DISCLAIMER THE PROFESSIONAL ANALYSIS AND ADVICE IN THIS REPORT HAS BEEN PREPARED BY ACIL ALLEN CONSULTING FOR THE EXCLUSIVE USE OF THE PARTY OR PARTIES TO WHOM IT IS ADDRESSED (THE ADDRESSEE) AND FOR THE PURPOSES SPECIFIED IN IT. THIS REPORT IS SUPPLIED IN GOOD FAITH AND REFLECTS THE KNOWLEDGE, EXPERTISE AND EXPERIENCE OF THE CONSULTANTS INVOLVED. THE REPORT MUST NOT BE PUBLISHED, QUOTED OR DISSEMINATED TO ANY OTHER PARTY WITHOUT ACIL ALLEN CONSULTING'S PRIOR WRITTEN CONSENT. ACIL ALLEN CONSULTING ACCEPTS NO RESPONSIBILITY WHATSOEVER FOR ANY LOSS OCCASIONED BY ANY PERSON ACTING OR REFRAINING FROM ACTION AS A RESULT OF RELIANCE ON THE REPORT, OTHER THAN THE ADDRESSEE.

IN CONDUCTING THE ANALYSIS IN THIS REPORT ACIL ALLEN CONSULTING HAS ENDEAVOURED TO USE WHAT IT CONSIDERS IS THE BEST INFORMATION AVAILABLE AT THE DATE OF PUBLICATION, INCLUDING INFORMATION SUPPLIED BY THE ADDRESSEE. UNLESS STATED OTHERWISE, ACIL ALLEN CONSULTING DOES NOT WARRANT THE ACCURACY OF ANY FORECAST OR PROJECTION IN THE REPORT. ALTHOUGH ACIL ALLEN CONSULTING EXERCISES REASONABLE CARE WHEN MAKING FORECASTS OR PROJECTIONS, FACTORS IN THE PROCESS, SUCH AS FUTURE MARKET BEHAVIOUR, ARE INHERENTLY UNCERTAIN AND CANNOT BE FORECAST OR PROJECTED RELIABLY.

ACIL ALLEN CONSULTING SHALL NOT BE LIABLE IN RESPECT OF ANY CLAIM ARISING OUT OF THE FAILURE OF A CLIENT INVESTMENT TO PERFORM TO THE ADVANTAGE OF THE CLIENT OR TO THE ADVANTAGE OF THE CLIENT TO THE DEGREE SUGGESTED OR ASSUMED IN ANY ADVICE OR FORECAST GIVEN BY ACIL ALLEN CONSULTING.

© ACIL ALLEN CONSULTING 2017

C O N T E N T S

1

<i>Introduction</i>	1
---------------------	---

2

<i>Scope and deliverables</i>	2
-------------------------------	---

3

<i>Key assumptions updates</i>	3
--------------------------------	---

4

<i>Estimation of wholesale electricity spot prices</i>	5
4.1 Estimation of the spot wholesale electricity price by period type	5
4.2 Estimation of other energy costs	8
4.3 Summary of the final estimated values for the Ergon Energy east zone	8

FIGURES

FIGURE 3.1	COMPARISON OF QUEENSLAND'S PROJECTED PEAK DEMAND FOR 2017-18	4
FIGURE 4.1	PROJECTED ANNUAL WHOLESAL ELEC TRICIT Y PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)	6
FIGURE 4.2	PROJECTED ANNUAL AVERAGE WHOLESAL ELEC TRICIT Y PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)	7
FIGURE 4.3	COMPARISON OF PROJECTED ANNUAL AVERAGE WHOLESAL ELEC TRICIT Y PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)	8

TABLES

TABLE 4.1	PROJECTED ANNUAL WHOLESAL ELEC TRICIT Y PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL) – AT THE QUEENSLAND RRN	6
TABLE 4.2	BUILD UP OF PROJECTED ANNUAL WHOLESAL ELEC TRICIT Y PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL) – FOR ERGON ENERGY EAST ZONE	9



ACIL Allen Consulting Pty Ltd (ACIL Allen) has been engaged by the Queensland Competition Authority (QCA) to provide expert advice on estimating the Queensland spot wholesale electricity price values to inform a time varying feed-in tariff (t-FiT) for regional Queensland for 2017-18.

Our engagement is in response to the Terms of Reference (ToR) ACIL Allen received from the QCA. The QCA has been directed by the Minister for Energy and Water Supply (the Minister) to provide advice (the advice) on a number of matters to inform the development of a t-FiT to apply in regional Queensland for 2017-18.

On 1 June 2017, ACIL Allen delivered its report¹ to the QCA outlining our estimates of wholesale electricity spot price values. Since delivery of the June report, the following have occurred:


- the Queensland Government directed Stanwell to return Swanbank E to service for summer 2017-2018
- a number of new entrant renewable energy power stations were announced as committed in Queensland
- the Australian Energy Market Operator (AEMO) released its 2017 Electricity Forecasting Insights (EFI) document – including updated energy and summer/winter peak demand forecasts for 2017-18.

Accordingly, the QCA has asked ACIL Allen to update its analysis.

This report contains the following sections:

- Section 2 provides ACIL Allen's understanding of the scope and deliverables of the assignment as described in the QCA's ToR
- Section 3 describes the key input assumptions changes adopted for the updated analysis
- Section 4 provides a summary of the estimated prices for use by the QCA.

¹ <http://www.qca.org.au/getattachment/0e2732a2-54c5-4cc7-9a8f-7caa5ea7e87f/ACIL-Allen-report-on-wholesale-electricity-price.aspx>



2

SCOPE AND DELIVERABLES

The engagement comprises two tasks:

- Task 1: ACIL Allen is required to provide expert advice to the QCA on Queensland spot wholesale electricity pool price values for each of the peak period definitions below and a corresponding off-peak period covering the remaining hours of a day. These values must be relevant for the 2017-18 tariff year. The peak time periods to be calculated are:
 - a peak period not less than two hours which provides the highest wholesale energy value when solar PV is generating
 - a period not less than two hours which reflects the highest electricity demand on the Ergon Energy network
 - a peak period from 5pm–7pm
 - a peak period from 4pm–7pm
 - a peak period from 3pm–7pm.

This in effect provides five peak period definitions (and consequently, five off-peak period definitions).
- Task 2: ACIL Allen is also required to calculate a build-up (in dollars per megawatt hour) of peak and off-peak values (for each time period referred to in relation to Task 1) which includes:
 - the wholesale values calculated for Task 1 above
 - energy losses for Ergon Energy's east pricing zone
 - National Electricity Market and ancillary services fees.

ACIL Allen has not been asked to provide any other advice to matters related to this assignment.



3

KEY ASSUMPTIONS UPDATES

This section briefly outlines the key changes made to the input assumptions prior to ACIL Allen running the 506 simulations of the NEM for 2017-18 in *PowerMark*.

The key supply side changes included in the latest round of modelling are:

- **Swanbank E power station, Natural gas CCGT, 385 MW, QLD:** Swanbank E was mothballed in December 2014, allowing Stanwell to on-sell the gas that would have fed into Swanbank E, achieving a greater revenue than using this gas to produce electricity. In June 2017, the Queensland Government announced it would restart Swanbank E to increase supply and reduce price volatility. In the modelling, Swanbank E is assumed to be available from January 2018.
- **Manildra Solar, utility scale-solar single axis tracking, 42.5 MW, QLD:** Manildra Solar is assumed to be fully commissioned in the first quarter of 2018. Manildra solar farm is a project funded by the Australian Renewable Energy Agency (ARENA).
- **Clare Solar, utility scale-solar single axis tracking, 100 MW, QLD:** Clare Solar is assumed to be fully commissioned in the first quarter of 2018.
- **Collinsville Solar, utility scale-solar single axis tracking, 42.5MW, QLD:** Collinsville Solar is assumed to be fully commissioned in the second quarter of 2018. Collinsville solar farm is a project funded by ARENA.
- **Hamilton Solar, utility scale-solar single axis tracking, 57.5 MW, QLD:** Hamilton Solar is assumed to be fully commissioned in the second quarter of 2018.
- **Kidston Solar, utility scale-solar single axis tracking, 50 MW, QLD:** Kidston Solar is assumed to be fully commissioned in the first quarter of 2018. Kidston solar farm is a project funded by ARENA.
- **Mt Emerald Wind Farm, onshore wind, 170 MW, QLD:** Mt Emerald Wind Farm is assumed to be fully commissioned in the first quarter of 2018.
- **SunMetals Solar, utility scale-solar single axis tracking, 100 MW, QLD:** SunMetals Solar is assumed to be fully commissioned in the second quarter of 2018.
- **Whitsundays Solar, utility scale-solar single axis tracking, 58.1 MW, QLD:** Whitsundays Solar is assumed to be fully commissioned in the second quarter of 2018. Whitsundays solar farm is a project funded by ARENA.

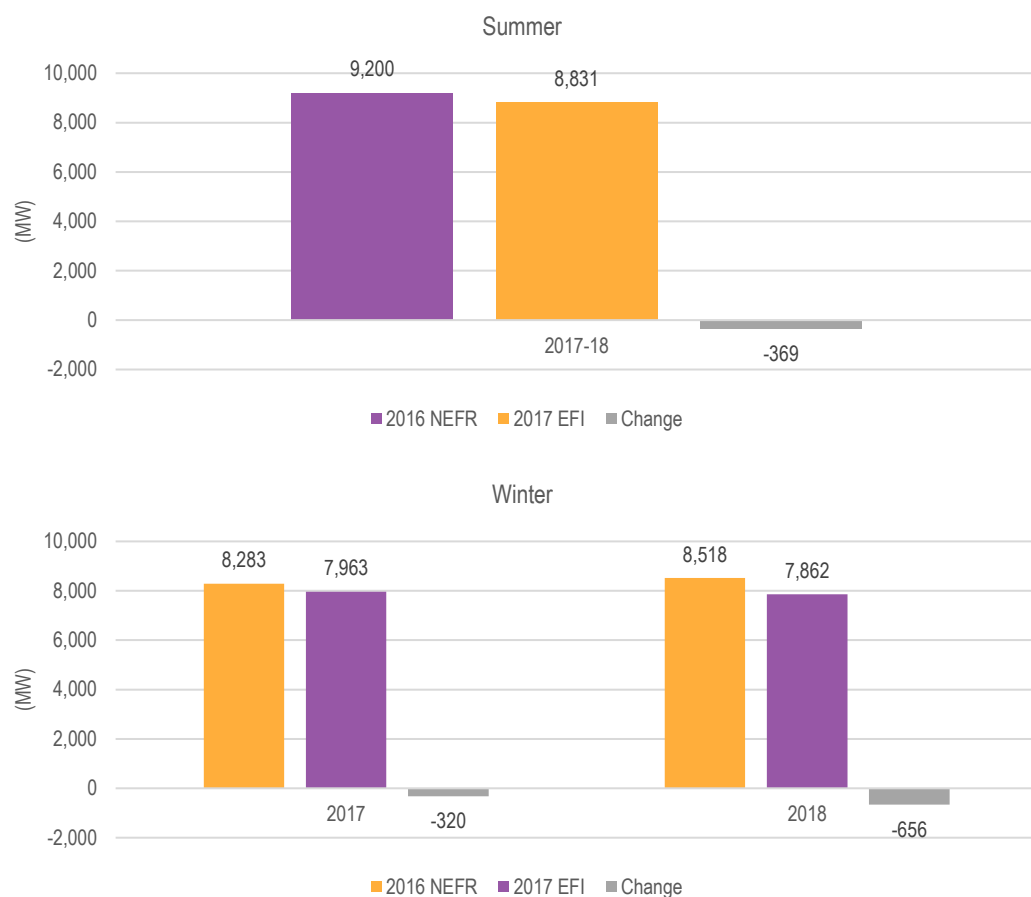
It is worth noting that in the previous round of modelling for the June report, ACIL Allen had assumed a number of the above solar farms in the modelling – although they were not individually specified because at that stage the projects had not reached financial close.

In addition to returning to service Swanbank E, the Queensland Government, as part of its *Powering Queensland Plan*, has directed Stanwell Corporation to undertake strategies to place downward pressure on wholesale prices. It is unclear at this stage what these strategies may be, and to what extent they may impact on price outcomes. Given this, ACIL Allen has not made any adjustments to

Stanwell Corporation within *PowerMark*, aside from the return to service of Swanbank E from 1 January 2018.

AEMO's updated forecast for electricity demand was published in late June 2017 in its EFI. The demand data accompanying the EFI suggests that Queensland's peak summer and winter demands for 2017-18 are going to be between 300 MW and 600 MW lower than previously projected in the 2016 National Electricity Forecasting Report (NEFR) which was published 12 months earlier. The updated energy and demand forecasts for Queensland and the other regions of the NEM as published in the 2017 EFI have been adopted in the updated modelling.

FIGURE 3.1 COMPARISON OF QUEENSLAND'S PROJECTED PEAK DEMAND FOR 2017-18



Note: Vales are P50 operational demand

SOURCE: ACIL ALLEN ANALYSIS OF AEMO DATA



In this chapter we summarise the updated estimates of the wholesale electricity spot prices for each period type definition for 2017-18 using the same methodology described in the June report.

4.1 Estimation of the spot wholesale electricity price by period type

ACIL Allen has taken the results of the 506 market simulations and calculated the distribution of annual price outcomes for each of the period type definitions which are presented in Table 4.1 and Figure 4.1.

As with the June report, our updated analysis concludes that defining the peak period as 5 pm to 7 pm provides the highest spot market value for a period of not less than two continuous hours when solar PV is generating (i.e. the first period definition in the ToR). This of course, is the same as the third period type definition.

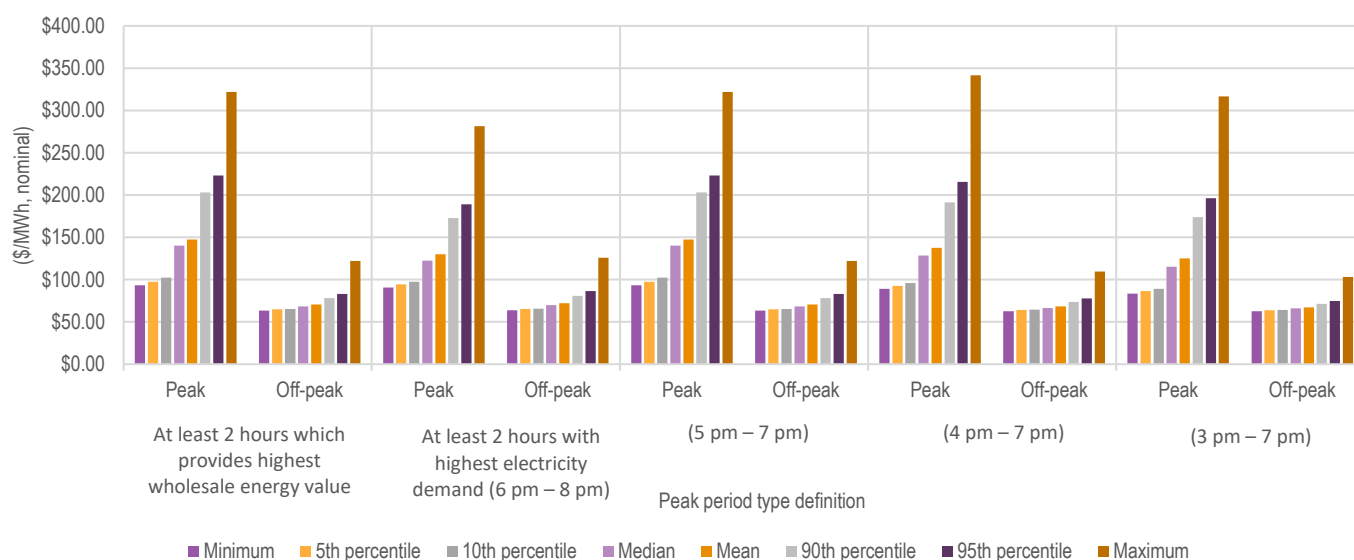
The table and graph show there is quite a spread in the values across the different percentiles within each period type definition. ACIL Allen concludes that using either the 5th or 95th percentile would run the risk of the resulting price values undervaluing or overvaluing the market outcomes quite considerably, particularly given the prices are spot values rather than hedged values. Therefore the choice in value can be shortlisted to the median and mean. Using the median effectively means there is a 50 per cent chance that the resulting price undervalues or overvalues the market. However, the mean value takes into account the skewed nature of spot wholesale electricity price outcomes which is a fundamental feature of the NEM. ACIL Allen is of the opinion that, in the context of the Ergon distribution network, the mean value is appropriate for the purpose of estimating a single price per period type.

TABLE 4.1 PROJECTED ANNUAL WHOLESALE ELECTRICITY PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL) – AT THE QUEENSLAND RRN

Peak period definition	Period	Minimum	5 th percentile	10 th percentile	Median	Mean	90 th percentile	95 th percentile	Maximum
Not less than 2 hours which provides highest wholesale energy value (5 pm – 7 pm)	Peak	\$93.43	\$97.58	\$102.32	\$140.36	\$147.49	\$202.94	\$222.99	\$321.86
	Off-peak	\$63.56	\$64.89	\$65.31	\$68.27	\$70.57	\$78.08	\$83.23	\$121.98
Not less than 2 hours which reflects highest electricity demand on Ergon energy network (6 pm – 8 pm)	Peak	\$90.61	\$94.42	\$97.44	\$122.32	\$130.18	\$172.94	\$189.05	\$281.40
	Off-peak	\$63.82	\$65.18	\$65.76	\$69.91	\$72.14	\$80.81	\$86.32	\$125.66
5 pm – 7 pm	Peak	\$93.43	\$97.58	\$102.32	\$140.36	\$147.49	\$202.94	\$222.99	\$321.86
	Off-peak	\$63.56	\$64.89	\$65.31	\$68.27	\$70.57	\$78.08	\$83.23	\$121.98
4 pm – 7 pm	Peak	\$89.10	\$92.41	\$95.83	\$128.68	\$137.70	\$191.34	\$215.37	\$341.52
	Off-peak	\$62.76	\$64.07	\$64.48	\$66.51	\$68.30	\$73.79	\$77.67	\$109.65
3 pm – 7 pm	Peak	\$83.35	\$86.43	\$89.20	\$115.37	\$125.23	\$173.92	\$196.07	\$316.71
	Off-peak	\$62.59	\$63.85	\$64.24	\$66.06	\$67.32	\$71.40	\$74.64	\$103.02

SOURCE: ACIL ALLEN ANALYSIS

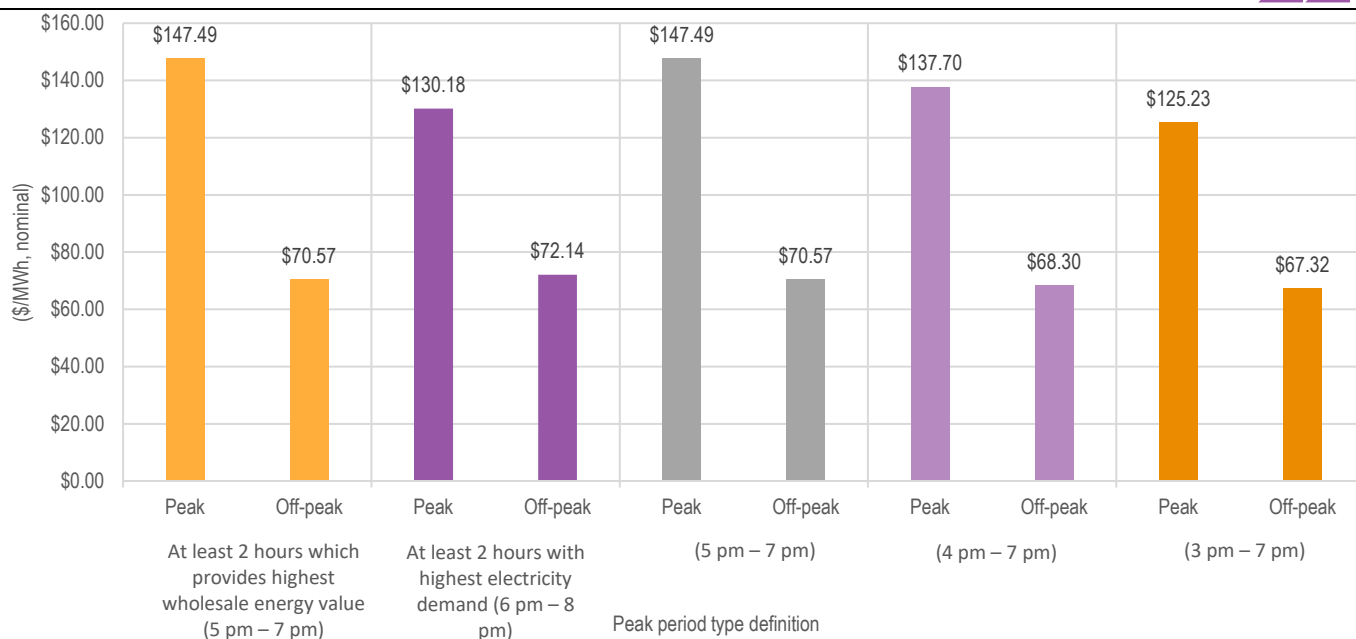
FIGURE 4.1 PROJECTED ANNUAL WHOLESALE ELECTRICITY PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)



SOURCE: ACIL ALLEN ANALYSIS

Figure 4.2 compares the projected annual price for the different period type definitions. The graph shows that the 5 pm to 7 pm definition provides the highest peak price, and that by extending this definition to include 4 pm and 3 pm progressively decreases the peak price.

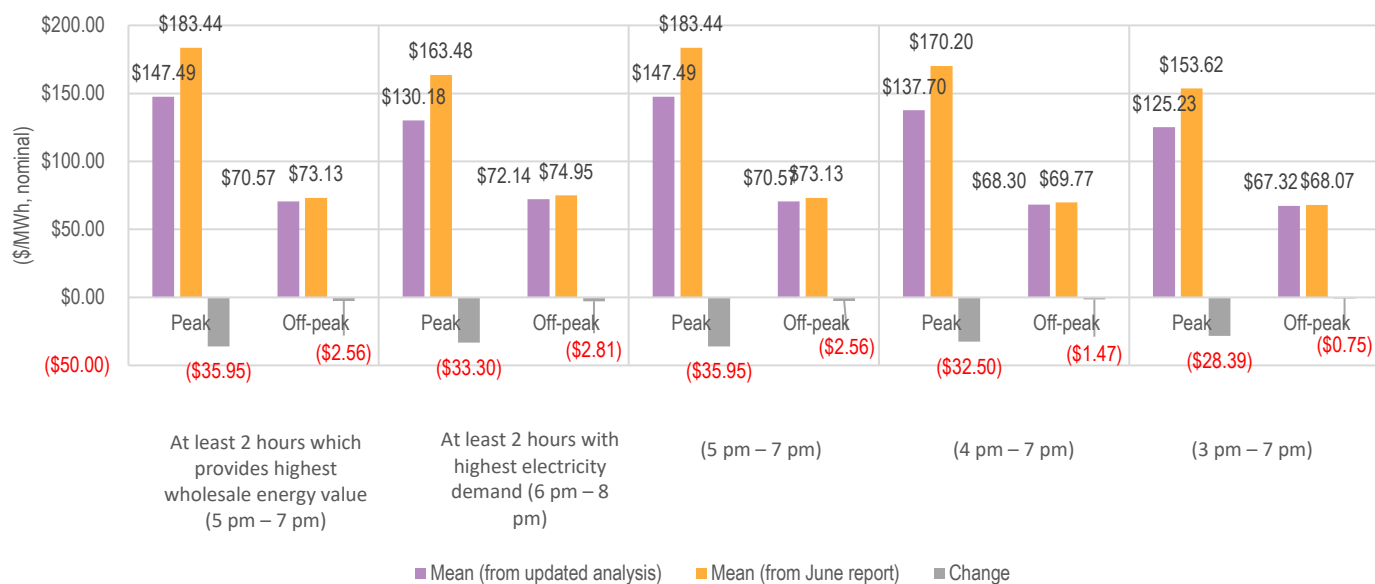
FIGURE 4.2 PROJECTED ANNUAL AVERAGE WHOLESALE ELECTRICITY PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)



SOURCE: ACIL ALLEN ANALYSIS

Figure 4.3 compares the updated estimates with the June estimates. It is not surprising that the changes to the input assumptions have had more of an effect on spot price outcomes during peak periods than off-peak periods. The lower peak demands and return of Swanbank E assumed in the updated analysis reduce price volatility far more than uniformly reducing prices across all hours of the year. Prices in the peak periods, across the various definitions, have reduced by between about \$30 and \$35/MWh.

FIGURE 4.3 COMPARISON OF PROJECTED ANNUAL AVERAGE WHOLESALE ELECTRICITY PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL)



SOURCE: ACIL ALLEN ANALYSIS

4.2 Estimation of other energy costs

ACIL Allen's estimates of the NEM and ancillary services fees from our engagement for the final determination of the 2017-18 regulated retail prices² are:

- NEM fees: \$0.53/MWh
- Ancillary Service fees: \$0.34/MWh.

ACIL Allen's estimate of the total loss factor for the Ergon Energy east zone from our engagement for the final determination of the 2017-18 regulated retail prices is:

- 1.079.

4.3 Summary of the final estimated values for the Ergon Energy east zone

Taking account of the projected mean spot wholesale price values together with our estimates of NEM and ancillary services fees, as well as the total losses for the Ergon Energy east zone, we estimate the final values as shown in Table 4.2.

² <http://www.qca.org.au/getattachment/f86e85e9-6969-49e3-a888-3a91889af9c3/ACIL-Allen-cost-of-energy-report-final-determinati.aspx>

TABLE 4.2 BUILD UP OF PROJECTED ANNUAL WHOLESALE ELECTRICITY PRICE VALUE IN QUEENSLAND IN 2017-18 BY PERIOD TYPE DEFINITION (\$/MWH, NOMINAL) – FOR ERGON ENERGY EAST ZONE

Peak period definition	Period	Wholesale spot value at RRN	Wholesale spot value plus NEM and Ancillary Service fees – at RRN	Value of Total losses	Final estimate
Not less than 2 hours which provides highest wholesale energy value (5 pm – 7 pm)	Peak	\$147.49	\$148.36	\$11.72	\$160.08
	Off-peak	\$70.57	\$71.44	\$5.64	\$77.08
Not less than 2 hours which reflects highest electricity demand on Ergon energy network (6 pm – 8 pm)	Peak	\$130.18	\$131.05	\$10.35	\$141.40
	Off-peak	\$72.14	\$73.01	\$5.77	\$78.78
5 pm – 7 pm	Peak	\$147.49	\$148.36	\$11.72	\$160.08
	Off-peak	\$70.57	\$71.44	\$5.64	\$77.08
4 pm – 7 pm	Peak	\$137.70	\$138.57	\$10.95	\$149.51
	Off-peak	\$68.30	\$69.17	\$5.46	\$74.64
3 pm – 7 pm	Peak	\$125.23	\$126.10	\$9.96	\$136.06
	Off-peak	\$67.32	\$68.19	\$5.39	\$73.58

SOURCE: ACIL ALLEN ANALYSIS