ACIL ALLEN CONSULTING

REPORT TO
ELECTRANET

24 SEPTEMBER 2020

PROJECT ENERGYCONNECT

UPDATED ANALYSIS OF POTENTIAL IMPACT ON ELECTRICITY PRICES IN SOUTH AUSTRALIA

FINAL REPORT

ACIL ALLEN CONSULTING PTY LTD
ABN 68 102 652 148

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

LEVEL NINE
50 PITT STREET
SYDNEY NSW 2000
AUSTRALIA
T+61 2 8272 5100

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

LEVEL SIX
54 MARCUS CLARKE STREET
CANBERRA ACT 2601
AUSTRALIA
T+61 2 6103 8200

LEVEL TWELVE
28 THE ESPLANADE
PERTH WA 6000
AUSTRALIA
T+61 8 9449 9600

167 FLINDERS STREET
ADELAIDE SA 5000
AUSTRALIA
T +61 8 8122 4965

ACILALLEN.COM.AU

EXECUTIVE SUMMARY

ACIL Allen Consulting was engaged by ElectraNet to update earlier estimates of the impact that *Project EnergyConnect*, a new interconnector between New South Wales and South Australia, would have on wholesale electricity prices and, therefore, on retail electricity bills for residential and business customers in South Australia.

We have analysed the same question for ElectraNet in a report published in February 2019 and another published before that. This update differs from the earlier analysis *only* in respect of the input assumptions. These were updated to reflect changes in the market and relevant outlook since the previous work was completed.

The most substantial changes relate to including projects identified through the Australian Energy Market Operator's (AEMO) 2020 Integrated System Plan (ISP). There are also updates in the estimated cost customers would pay for the interconnector itself, i.e. broadly the assumed transmission use of system charges, which have increased slightly since our report into the same topic of February 2019. These costs were provided by ElectraNet.

The modelling was conducted using *PowerMark*, ACIL Allen's proprietary model of the National Electricity Market's wholesale spot market and was based on updated assumptions relative to prior analysis of the same question.

Project EnergyConnect was assumed to have bi-directional transfer capacity of 800 MW between New South Wales and South Australia with an aggregate transfer limit of 1,400 MW across *Project EnergyConnect* and the existing Heywood interconnector. [1]

It was also assumed that an additional line is built between Buronga in New South Wales and Red Cliffs in Victoria, which will increase the bi-directional transfer capacity between New South Wales and Victoria by 400 MW.[2]

Project EnergyConnect was assumed to be physically in place from 1 January 2024, although we understand that it is expected to operate at reduced capacity for the first six months to allow for network testing. Therefore the additional transfer capacity was introduced in stages from 1 January and 1 July 2024.

As with the earlier analysis, the current modelling indicates that *Project EnergyConnect* is projected to place downward pressure on the wholesale spot price of electricity in South Australia , though the extent of the impact has changed due to the different input assumptions. This is illustrated in **Figure ES 1**, which shows:

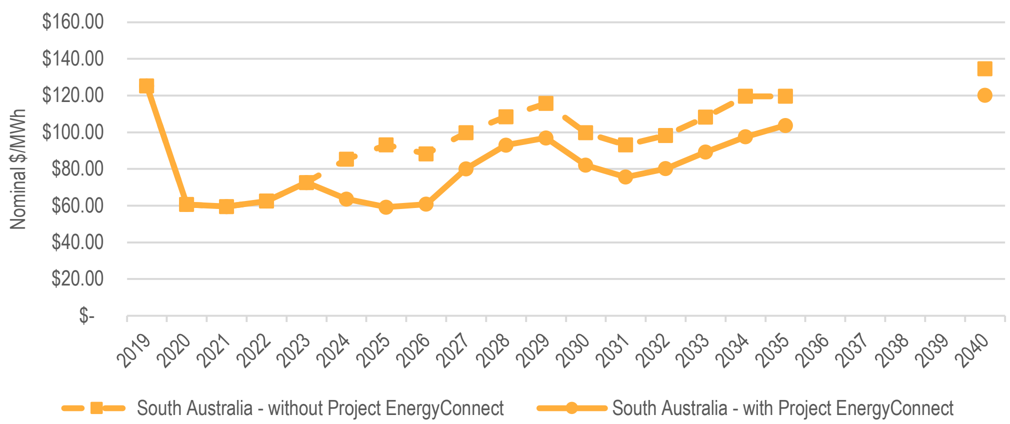
[1] We note that these capacity assumptions approximate ElectraNet's current expectations, which are that the Heywood Interconnector would be able to transfer up to 750 MW and that the joint capacity cannot exceed 1,300 MW. The differences were necessary to account for interdependencies between the two interconnectors that are not reflected in our model, but do not materially impact on the outcomes of the analysis.

[2] As per information provided to ACIL Allen by ElectraNet.

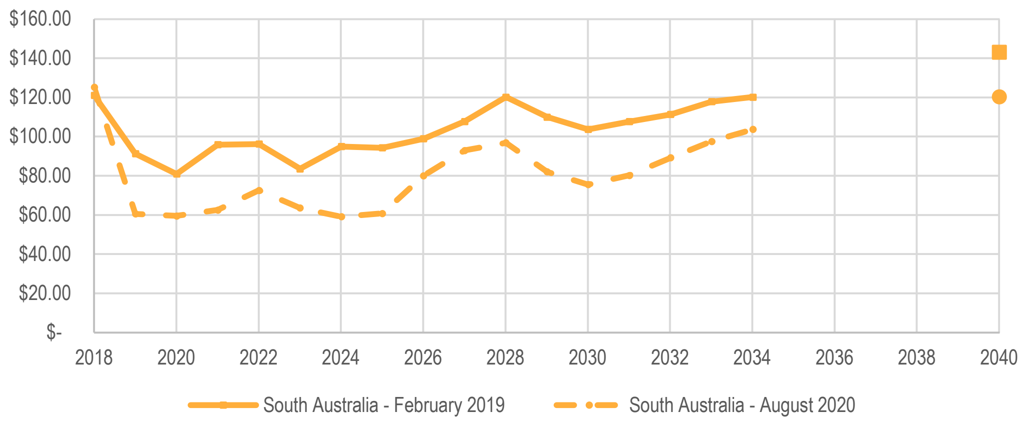
- in the upper pane, our current projection of the load weighted wholesale spot price of electricity in South Australia both 'without' (dashed) and 'with' (solid) *Project EnergyConnect*
- in the lower pane, a comparison between our current projection of the load weighted wholesale spot price of electricity 'with' *Project EnergyConnect* as we reported it in February 2019 and as we now project it to be.

FIGURE ES 1 SUMMARY OF *PROJECT ENERGYCONNECT* PROJECTED IMPACT ON LOAD WEIGHTED PRICE OF ELECTRICITY – SOUTH AUSTRALIA

Load weighted wholesale spot price of electricity with and without *Project EnergyConnect*



Comparison of load weighted spot price – *Project EnergyConnect* scenario, February 2019 and August 2020

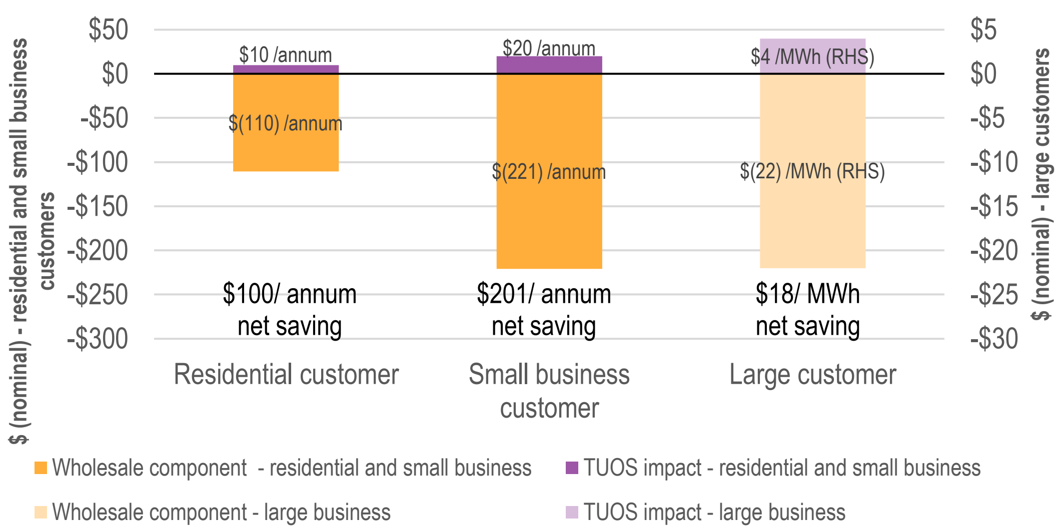


SOURCE: ACIL ALLEN CONSULTING

Impact on retail electricity bills

The projected impact of *Project EnergyConnect* on customers' electricity bills[3] is summarised in Figure ES 2 and Table ES 1.

FIGURE ES 2 PROJECTED RETAIL BILL IMPACT –SA CUSTOMERS



SOURCE: ACIL ALLEN CONSULTING

TABLE ES 1 PROJECTED RETAIL BILL IMPACT – REPRESENTATIVE CUSTOMERS

	Residential customer	Small business customer	Large customer
Transmission network cost impact	$10 /annum	$20 /annum	$4 /MWh
Average saving in wholesale component of bill	$(110) /annum	$(221) /annum	$(22) /MWh
Net bill saving	$(100) /annum	$(201) /annum	$18/MWh
Annual consumption (kWh/annum)	5,000	10,000	varied

SOURCE:ACIL ALLEN CONSULTING

As the figure and table show, we project that, on average in nominal terms from 2024 to 2030, the:

— retail bill of a representative household (residential customer) would reduce by $100 per annum

— retail bill of a representative small business customer would reduce by $201 per annum, more than for residential customers because businesses use more electricity and, hence, have more to save

— bill of a large business customer would reduce by approximately $18 for each MWh of electricity used with the total impact varying substantially depending on the particular business in question.

In all cases the projected impact on electricity bills is net of the cost of the interconnector itself.

[3] ACIL Allen has assumed that *Project EnergyConnect* will impact on the energy cost and network cost components of a customer's electricity bill. *Project EnergyConnect* is assumed to have no impact on retail operating costs and margin, and the costs associated with environmental schemes.

CONTENTS

EXECUTIVE SUMMARY I

1

INTRODUCTION 1

2

METHODOLOGY 2

2.1 Modelling the wholesale electricity market 2

2.2 Modelling the impact on customers' electricity bills 6

3

RESULTS 8

3.1 Wholesale spot price 8

3.2 Projected customer bill impacts 15

3.3 Comparison with previous modelling 16

FIGURES

FIGURE ES 1	PROJECTED RETAIL BILL IMPACT –SA CUSTOMERS	III
FIGURE 3.1	SUMMARY OF PROJECTED WHOLESALE SPOT PRICE OF ELECTRICITY, NOMINAL, CALENDAR YEARS – ANNUAL LOAD WEIGHTED AVERAGE, 2020 TO 2040, REFERENCE CASE – SOUTH AUSTRALIA	9
FIGURE 3.2	REFERENCE CASE – PROJECTED GROWTH IN WHOLESALE SPOT PRICE OF ELECTRICITY	10
FIGURE 3.3	COMPARING WHOLESALE SPOT PRICE PROJECTIONS – REFERENCE CASE BETWEEN FEBRUARY AND UPDATED MODELLING	12
FIGURE 3.4	SUMMARY OF PROJECTED WHOLESALE SPOT PRICE OF ELECTRICITY, NOMINAL, CALENDAR YEARS – ANNUAL LOAD WEIGHTED AVERAGE, 2020 TO 2040, REFERENCE CASE AND *PROJECT ENERGYCONNECT* SCENARIO – SOUTH AUSTRALIA	12
FIGURE 3.5	DENSITY PLOT OF MONTHLY LOAD WEIGHTED PRICE DIFFERENCES IN REFERENCE AND INTERCONNECTOR CASES - ($/MWH REAL 2019) – 2023 TO 2040	13
FIGURE 3.6	IMPACT ON 'HIGH' AND 'LOW' TIME WEIGHTED PRICES	14
FIGURE 3.7	PROJECTED RETAIL BILL IMPACT – SA CUSTOMERS	15
FIGURE 3.8	LOAD WEIGHTED PRICES ($/MWH, REAL 2020) WITHOUT *PROJECT ENERGYCONNECT*	16
FIGURE 3.9	IMPACT OF ENERGY CONNECT ON 'HIGH' AND 'LOW' TIME WEIGHTED PRICES COMPARED TO OUR FEBRUARY 2019 MODELLING	17

TABLES

TABLE ES 1	SUMMARY OF *PROJECT ENERGYCONNECT* PROJECTED IMPACT ON LOAD WEIGHTED PRICE OF ELECTRICITY – SOUTH AUSTRALIA	II
TABLE ES 2	PROJECTED RETAIL BILL IMPACT – REPRESENTATIVE CUSTOMERS	III
TABLE 2.1	KEY ASSUMPTIONS	3

CONTENTS

TABLE 2.2	*PROJECT ENERGYCONNECT* INTRODUCTION SCHEDULE	5
TABLE 3.1	PROJECTED RETAIL BILL IMPACT	15

1 INTRODUCTION

ElectraNet is the electricity Transmission Network Service Provider (TNSP) in South Australia.

ACIL Allen Consulting (ACIL Allen) was engaged by ElectraNet to provide updates to earlier modelling of the potential impact of a proposed new interconnector between South Australia and New South Wales (*Project EnergyConnect*). Specifically, ACIL Allen was engaged to update modelling we reported in February 2019 in which we projected the impact *Project EnergyConnect* would have on wholesale electricity spot prices and, therefore, on customers' electricity bills in South Australia.[4]

This report provides summary results of our analysis.[5] Dollar values are presented in nominal terms unless noted otherwise. The projections cover the calendar years 2020 to 2035, and spot year 2040.

The rest of this report is structured as follows:

— Chapter 2 describes the methodology we used to model the potential impact of *Project EnergyConnect* on electricity prices, both wholesale and retail, which centred around *PowerMark*, our proprietary model of the National Electricity Market (NEM) wholesale electricity market

— Chapter 3 provides the results from our electricity market modelling

[4] This was, in turn, an update on modelling conducted in July 2018.

[5] In our previous report we were also asked to estimate the broader impact *Project EnergyConnect* would have on the economies of South Australia, New South Wales and the parts of those two States that will 'host' *Project EnergyConnect*. This aspect of our work was not updated on this occasion.

2

METHODOLOGY

We have modelled the impact of *Project EnergyConnect* on customers' electricity bills in South Australia by considering the net impact it will have on :

— wholesale electricity spot prices in South Australia
— the transmission network costs associated with *Project EnergyConnect*.

The methodology for modelling the wholesale electricity market is discussed in section 2.1. The transmission network cost estimates were provided by ElectraNet.

The way these were brought together to produce estimates of bill impacts is discussed in section 2.2

2.1 Modelling the wholesale electricity market

The impact of *Project EnergyConnect* on wholesale electricity spot prices was assessed using *PowerMark*, ACIL Allen's proprietary model of the NEM's wholesale electricity market.

At its core, *PowerMark* is a simulator that emulates the settlements mechanism of the NEM. *PowerMark* uses a linear program to settle the market, as does AEMO's NEM Dispatch Engine in its real time settlement process. *PowerMark* is part of an integrated suite of models, including models of the market for Renewable Energy Certificates and the wholesale gas market.

A distinctive feature of *PowerMark* is its iteration of generator bidding. *PowerMark* constructs an authentic set of initial offer curves for each unit of generating plant prior to matching demand and determining dispatch through the market clearing rules. Unlike many other models, *PowerMark* encompasses re-bids to allow each major thermal generation portfolio in turn to seek to improve its position — normally to maximise uncontracted revenue, given the specified demand and supply balance for the hourly period in question.

PowerMark has been developed over the past 18 years in parallel with the development of the NEM, NEMS (Singapore) and WESM (Philippines). We use the model extensively in simulations and sensitivity analyses conducted on behalf of industry and Government clients.

PowerMark routinely operates at *hourly* price resolution, unlike the NEM spot market which is settled on a half hourly basis. Half hourly modelling is possible, but our experience is that hourly modelling has very little impact on the outcomes, but simplifies the model run time and analytical task substantially.

PowerMark relies on a range of assumptions, which are set out in section 2.1.1.

The scenarios modelled are discussed in section 2.1.2.

2.1.1 Assumptions

PowerMark is based on a large number of detailed input assumptions. For the most part these are drawn from our understanding of the physical and other properties of generators in the NEM and other relevant sources. ACIL Allen's standard June 2020 reference case assumption set was used for this report. This assumption set was developed using the same approach as those underpinning previous reports for ElectraNet, though the detailed inputs are different to reflect changes over time. Further, the current set is broadly consistent with the 2020 ISP as published by AEMO, though demand remains reflective of the 2019 ESOO.

Wholesale spot price impacts are presented annually to 2035, and for spot year 2040. Beyond this period, modelling results become limited by the veracity of the assumptions that underpin them. The further into the future assumptions are made, the greater the risk that they are in error.

The key assumptions upon which the modelling is based are set out in Table 2.1.

TABLE 2.1 KEY ASSUMPTIONS

Item	Summary of assumption
Macro-economic variables	Exchange rate of AUD to USD converging to 0.75 AUD/USD Inflation of 2.5 per cent p.a.
Market design/operational developments	No changes to current market design or operation
Federal greenhouse gas emission policies	Retention of the LRET in its current form Between 26 and 28 percent reduction in GHG emissions below 2005 levels by 2030 No emissions scheme required over the period 2021 to 2030. Implementation of an Emissions Intensity Scheme (EIS) from 1 July 2030 to the end of the projection period in 2050.
State based schemes	
Queensland	CleanCo's portfolio of 500 MW[6] of wind (part of MacIntyre wind farm) and 320 MW of solar (part of Western Downs Green Power Hub) capacity in Queensland Assumed deployment of an additional 100MW of battery storage by 2022 to complement CleanCo's renewable capacity, bringing its portfolio to an aggregate capacity of about 1,000 MW
Victoria	Committed plant under the first stage of the VRET auction, which enables Victoria to reach (and over-achieve) its 25 per cent renewable energy target by 2020 Assumed deployment of additional new entrant renewable plant such that Victoria meets its 40 per cent target by 2025 and 50 per cent by 2030
ACT	Inclusion of the Australian Capital Territory's latest renewable generation auction, which opened to bids in November 2019 (200 MW wind and 20 MW/40MWh battery storage).
Electricity demand	AEMO August 2019 ESOO forecast with adjustments for ACIL Allen's view of smelter closures: Tomago in July 2027 Boyne Island in July 2029 Portland in July 2030 ESOO forecast adjusted for ACIL Allen's projections for behind-the-meter solar PV, battery storage uptake as well as electric vehicle uptake Incorporates ACIL Allen's projected impact of COVID-19 on underlying demand and rooftop PV uptake

[6] Of which 400 MW is understood to result from the Queensland government's 400 Renewables initiative

Item	Summary of assumption
Supply side	
Committed projects	Named new entrant projects are included in the modelling where there is a high degree of certainty that these will go ahead (i.e. project has reached FID) Incorporates assumed delays of commissioning of new projects in the short-term due to impacts of COVID-19 Includes the Federal Government's Snowy 2.0, and two announced UNGI projects (APA Group's 220 MW reciprocating gas engines in Victoria and Quinbrook's 132 MW aeroderivative gas turbines in Queensland)
Assumed new entry and retirements	400 MW of "corporate PPA" across New South Wales and Victoria entering from mid-2021 to reflect market developments Committed or likely committed generator retirements included where the retirement has been announced by the participant (i.e. Liddell)
Projected new entry and retirements	Beyond the above committed and assumed projects, only generic new entrants which are commercial are introduced Retirements of other existing generators where the generator is projected to be unprofitable over an extended period of time
New entrant capital costs	Wind: $2,050/kW in 2020; $1,730/kW in 2030 Battery storage (four hours): $1,730/kW in 2020; $1,010/kW in 2030 Solar (Single Axis Tracking): $1,420/kW in 2020; $1,110/kW in 2030 Battery storage (one hour): $620/kW in 2020; $360/kW in 2030
Gas prices	Gas market is modelled in ACIL Allen's GasMark Australia model Gas prices for power generation are projected to rise from $5.6-$7/GJ to $10-$11/GJ by 2030. By 2035 gas prices reach LNG netback, equating to about $11-$12/GJ.
Coal prices	The marginal price of coal for electricity generation is assessed in consideration of the specific circumstances for each generator considering: Short term supply issues in New South Wales Suitability of coal for export and the assumed international thermal coal price Location of power station in relation to the mine and export terminals Mining costs Existing contractual arrangements International thermal coal prices are assumed to converge to US$61.50/t in the long term
Representation of bidding behaviour	Contracted capacity: Minimum generation levels are offered at negative or zero price Remaining contracted capacity offered at short run marginal cost Remaining capacity: Maximisation of dispatch for price takers Maximisation of net uncontracted revenue for price makers

Item	Summary of assumption
Interconnectors	Existing interconnection included ISP Group One projects included: QNI minor (Sep 2022) *Project EnergyConnect* (Jan 2024) VNI Minor (Sep 2022) VNI West (Jul 2026) Victoria's tendered System Integrity Protection Scheme (SIPS) service included as a 250 MW/125 MWh battery from 1 Jan 2021
Marginal loss factors	ACIL Allen's projections of average annual marginal loss factors (MLF) by generator DUID, developed using commercial power flow software[7]

Note: All dollar values in this table are presented in real 2020 AUD unless stated otherwise.

2.1.2 Scenarios analysed

The analysis presented in this report comprises two scenarios:

— a *reference case* based on assumptions described above, with the exception that, for this exercise we 'removed' *Project EnergyConnect* project from ACIL Allen's internal reference case[8]

— a *Project EnergyConnect* scenario.

The *Project EnergyConnect* scenario is the same as the reference case with the exception that *Project EnergyConnect* is introduced to the model from 1 January 2024 along with a small line that would connect Buronga in New South Wales with Red Cliffs in Victoria.

For the purposes of this analysis, *Project EnergyConnect* was assumed to have the following properties:

— transfer capacity of 800 MW in either direction

— Heywood interconnector limited to thermal capacity of 600 MW when *Project EnergyConnect* is in place

— aggregate transfer limit of 1,400 MW across *Project EnergyConnect* and the existing Heywood interconnector

— The Buronga to Red Cliffs line was assumed to increase transfer capacity between New South Wales and Victoria by 400 MW.[9]

Project EnergyConnect was assumed to be in place on 1 January 2024, although we understand that it is expected to operate at reduced capacity for the first six months to allow for network testing. Therefore these assumptions were introduced in a series of steps between 1 January and 1 July 2024. The steps were as shown in Table 2.1.

TABLE 2.2 *PROJECT ENERGYCONNECT* IMPLEMENTATION SCHEDULE

Date	Heywood import	Heywood export	PEC import	PEC export	Combined import	Combined export
	MW	MW	MW	MW	MW	MW
Pre-Jan 2024	-500	460	NA	NA	-500	460
1-Jan-24	-500	460	-600	600	-1100	1060
1-Apr-24	-500	460	-600	600	-1100	1060
1-Jul-24	-600	560	-800	800	-1400	1360

[7] Detailed analysis of MLF projections and trends for all generators in the NEM is available in ACIL Allen's quarterly MLF projections report.
[8] Note that we now include *Project EnergyConnect* in our internal reference case, whereas we did not when the earlier work was done. Therefore, on previous occasions we 'added' *Project EnergyConnect* to our internal reference case to obtain the *Project EnergyConnect* scenario (previously referred to as the 'new interconnector scenario'). In contrast, on this occasion we 'removed' *Project EnergyConnect* from our internal reference case. For consistency with previous reports, we refer to the scenario without *Project EnergyConnect* as the 'reference case'.
[9] As per information provided to ACIL Allen by ElectraNet.

The modelling is based on the assumption that electrical losses on *Project EnergyConnect* will be the same as those on the Heywood interconnector, relative to the different capacity of the interconnectors.

2.2 Modelling the impact on customers' electricity bills

We have modelled the impact of *Project EnergyConnect* on residential, small business and large business customers in South Australia.

We have assumed a representative residential customer consumes 5,000 kWh per annum in South Australia , consistent with assumptions made by the Australian Energy Market Commission in its 2019 electricity residential price trends report.

We have assumed a representative small business customer consumes 10,000 kWh per annum in South Australia, which is consistent with the approach the Essential Services Commission of South Australia takes in its annual Energy Retail Offers Comparison Report.[10]

We also show the impact on large business customers , although these customers are especially diverse in the amount of electricity they use. Therefore, rather than make a single assumption to convert the modelled impacts to annual bill impacts, those results are presented in terms of the impact per MWh used. They can be scaled to suit a given business.

The impact of *Project EnergyConnect* on customers' electricity bills was assessed by considering the "building blocks" of retail electricity bills, namely:

— energy costs
— network costs
— retail operating costs and margin
— costs associated with environmental schemes

We have assumed that *Project EnergyConnect* will impact on the:

— energy costs building block through the impact on the wholesale electricity market
— the network cost building block through ElectraNet's recovery of the costs for building and operating *Project EnergyConnect*.

Project EnergyConnect is assumed to have no impact on the other building blocks, that is, the movement in the other costs will be the same under the reference case and with *Project EnergyConnect*.

We note that changes in retail tariff structures and/ or the way customers use energy are quite possible over the timeframe. The former can be expected to flow from ongoing changes to the way distribution network services charge for the service they provide. Further changes in energy use at the residential level which may flow from improvements in energy efficiency, ongoing uptake of solar technology and the use of batteries could be expected. While we acknowledge that these changes might occur, we have not sought to incorporate them into the analysis, in part to allow comparison between our analysis and other presentations of retail bills, such as those in ESCOSA's Energy Retail Offers Comparison Report.

The methodology for assessing the impact of *Project EnergyConnect* on the wholesale electricity market was discussed in section 2.1.

ElectraNet provided estimates to us of the transmission network costs of building and operating *Project EnergyConnect*.[11] Those estimates were revised for this report compared to previous analyses. The assumptions are shown in Table 3.1 below.

This report presents the change in the customers' electricity bills rather than the level of the customers' electricity bills.

[10] The 2018/19 edition of this report is available from ESCOSA's website at: https://www.escosa.sa.gov.au/ArticleDocuments/540/20190830-Energy-RetailPriceOffersComparisonReport2018-19.pdf.aspx?Embed=Y. The 2020 edition was not available at the time of writing, but we do not expect a change to this element of it.
[11] At this stage we have assumed that there will be no change in distribution network costs.

The impact on customer bills, other than for large business customers, is presented as the average of the annual projected savings from 2024 to 2030 and is therefore consistent with previous presentations in our earlier reports. Note, though, that the annual projections are now available to 2035, as well as spot year 2040.

3 RESULTS

The results from the modelling are presented in this chapter. The results from the modelling of the wholesale electricity market are presented in section 3.1 and the projected changes in customers' electricity bills are presented in section 3.2.

All financial results in this section are in nominal terms (i.e. not adjusted for inflation).

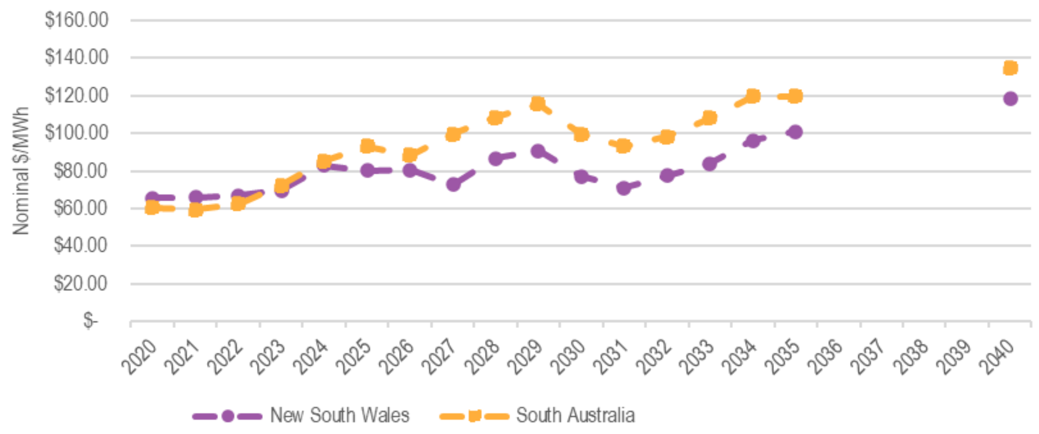
3.1 Wholesale spot price

The results from the reference case are presented in section 3.1.1 and the results from the *Project EnergyConnect* scenario are presented in section 3.1.2. As discussed below, *Project EnergyConnect* has the effect of increasing South Australia's exposure to the New South Wales wholesale electricity price, so our projection of this is shown as well.

3.1.1 Reference case

The projected annual average load weighted price of electricity[12] in South Australia and New South Wales, under the reference case (without *Project EnergyConnect*), is summarised in Figure 3.1.

FIGURE 3.1 SUMMARY OF PROJECTED WHOLESALE SPOT PRICE OF ELECTRICITY, NOMINAL, CALENDAR YEARS – ANNUAL LOAD WEIGHTED AVERAGE, 2020 TO 2040, REFERENCE CASE – SOUTH AUSTRALIA AND NEW SOUTH WALES



SOURCE: ACIL ALLEN MODELLING

Since the beginning of 2019 wholesale electricity spot market prices have been declining, driven by the entry of large amounts of renewable generation into the NEM coupled with no exiting capacity, a fall in energy requirements to be supplied by scheduled and semi-scheduled generation, and lower gas prices. The reduction in domestic gas prices is due to a slightly better global supply outlook, which has meant LNG exporters have made more supply available to the domestic market due to depressed international price.

In real, time-weighted terms (not shown here), prices are projected to continue to decline for the remainder of calendar year 2020 to reach levels of around $40-$55. They are then projected to remain at similarly low levels during the period from 2021 to 2026, largely driven by:

— additional new committed supply of renewable generation and battery storage capacity, mainly in response to state government incentives

— projected continuation of low gas prices

— projected slight decline in energy requirements from the grid, in part response to the assumed impact of COVID-19 on economic growth in 2020 and 2021, and a relatively high proportion of underlying demand being satisfied by distributed generation (rooftop solar PV).

— significant NEM-wide interconnector expansion projects

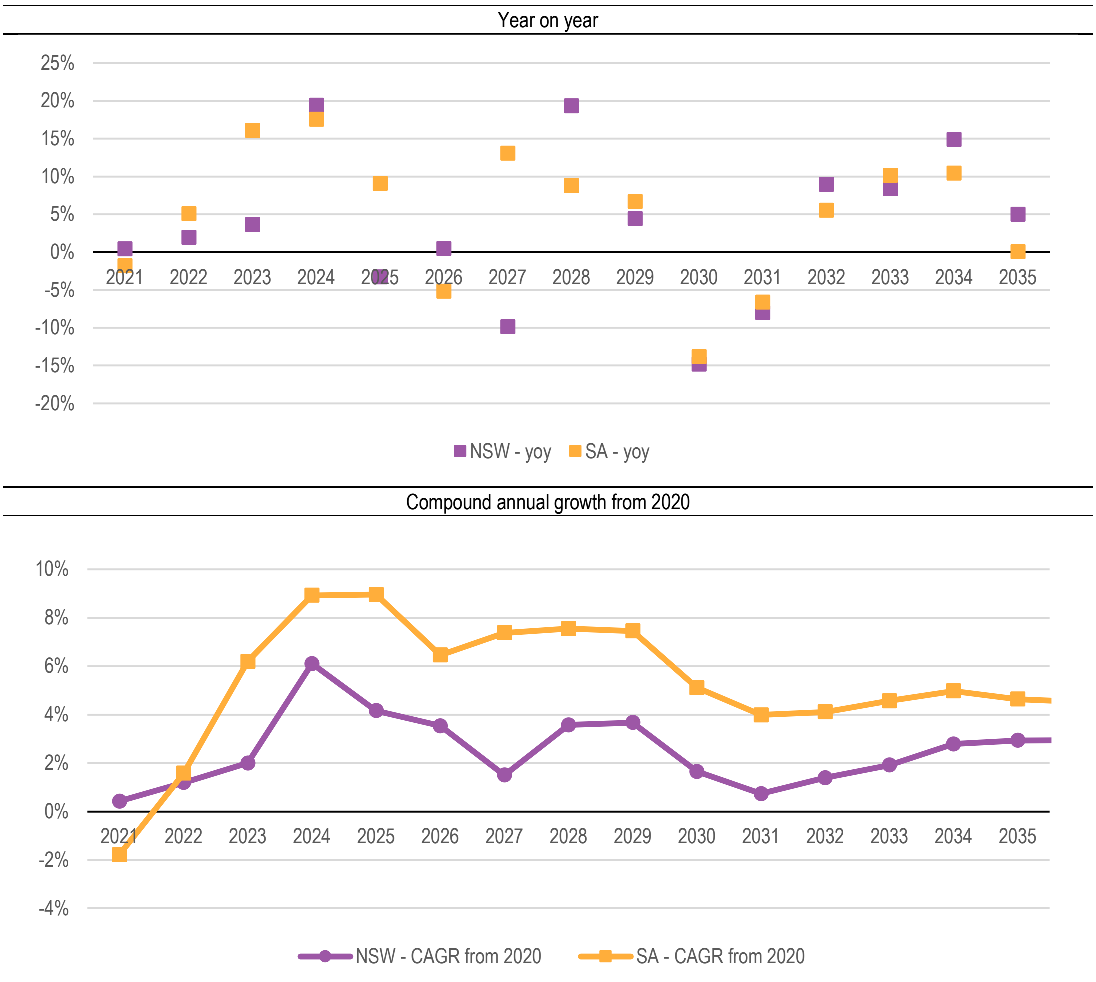
— entry of Snowy 2.0.

The *nominal* load weighted prices shown in Figure 3.1 are at higher levels than their time weighted counterparts due partly to load profiles, which are weighted to higher price periods, and partly to inflation, which is assumed to be 2.5 per cent for the projection period.

In the absence of *Project EnergyConnect,* we project that wholesale electricity prices would change in nominal terms from 2022 at the rates shown in the lower pane of Figure 3.2. This coincides roughly with the announced closure of the Torrens Island power station in (A station in 2022 and B station in 2024), which is reflected in the input assumptions. There is some possibility that these closures might be deferred if *Project EnergyConnect* were not to proceed, but this is not reflected in the modelling.

[12] Wholesale electricity price weighted by demand at the regional reference node

FIGURE 3.2 REFERENCE CASE – PROJECTED GROWTH IN WHOLESALE SPOT PRICE OF ELECTRICITY



SOURCE: ACIL ALLEN CONSULTING

Reference case - Comparison with February 2019 modelling

As noted above, the modelling presented here is an update to the modelling that accompanied ElectraNet's Project Assessment Conclusions Report, which was presented in our report of 11 February 2019.

A number of changes were made to the input assumptions used in this report as compared to those used in the previous report. For the most part those changes were made to account for changes in the NEM over the past 18 months.

The electricity demand projection was updated using AEMO's August 2019 ESOO demand forecast,[13] though we made some short-term adjustments to reflect the impact of COVID-19 on energy consumption and peak demand. Compared to our February 2019 report, which utilised AEMO's 2018 ESOO demand forecast, the projected electricity demand is lower in most regions, particularly in New South Wales and Victoria, driven by changes in AEMO's forecast of energy efficiency measures in these regions.

In addition, there are differences in the assumptions made with regards to the long-term continued operation of aluminium smelters in the NEM between this and our earlier report, which contribute to

[13] The 2020 ESOO had not been published at the time the modelling was prepared.

the lower demand projection in New South Wales, Victoria as well as Queensland. The modelling presented in this report is based on ACIL Allen's internal outlook on the market, in which we evaluate each smelter operation to determine whether they would remain globally competitive at the conclusion of their legacy power purchase agreements, based on prevailing wholesale pool prices. Based on ACIL Allen's understanding of the world aluminium smelting cost curve, Tomago and Boyne Island smelters are assumed to exit the market in July 2027 and July 2029, respectively. The Portland smelter is assumed to remain in operation until July 2030.

Since the completion of the modelling presented in our February 2019 report, there have been a large number of additional generation projects committed to enter the market in the near- to medium-term, mostly in New South Wales and Queensland. It is important to note that many of these new generation projects are experiencing difficulties connecting to the grid. This is also reflected in our modelling by incorporating delays in market entry.

Two key changes in supply-side assumptions, in contrast to our earlier projections, are:

— The inclusion of different state-based schemes such as the 2030 Victorian Renewable Energy Target, Queensland's CleanCo and the ACT Renewable Energy Reverse Auction.
— the 2,000 MW pumped hydro storage system Snowy 2.0 assumed to be committed and to enter the market in July 2026, along with a new interconnector corridor between NSW and Victoria (VNI West)

Finally, interconnector upgrades from the ISP 2020 are included when there is a high likelihood these ISP projects will proceed. These include:[14]

- QNI minor (Sep 2022)
- VNI Minor (Sep 2022)
- VNI West (Jul 2026)

This means a slight change from the February 2019 report where the second stage of the QNI upgrade was also included and the transfer capacity of the Snowylink (now VNI West) was slightly different.

Victoria's tendered System Integrity Protection Scheme (SIPS) service is included as a 250 MW/125 MWh battery from 1 Jan 2021.In our report of 11 February 2019, we used Marginal Loss Factors as provided by AEMO. This report includes our own projections of average annual marginal loss factors (MLF) by generator DUID, developed in-house using commercial power flow software.

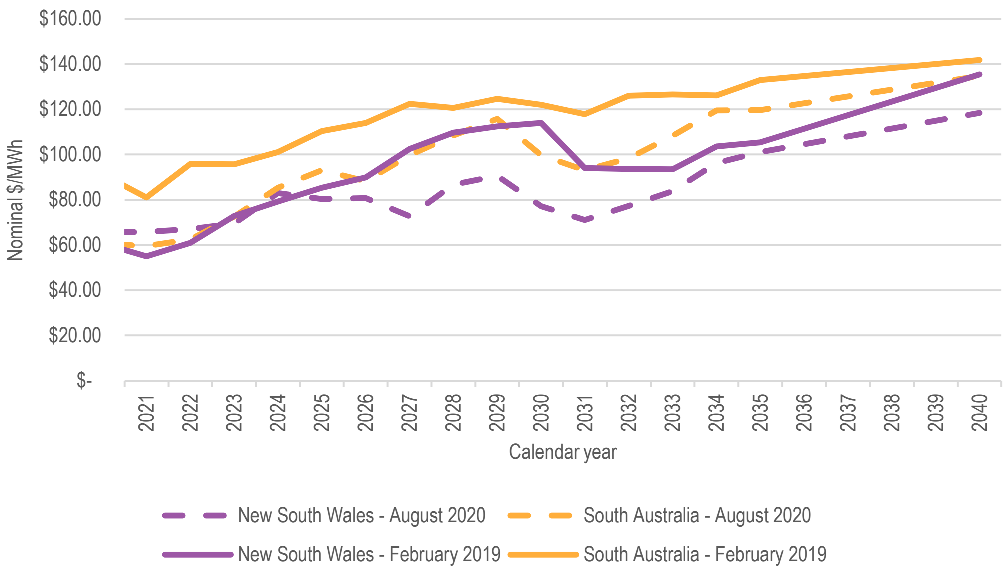
In relation to gas prices, this report includes updated assumptions regarding future gas prices, drawn from our modelling of the Eastern Australian gas market. Compared to our earlier report, gas prices have come down to about \$5.6-\$7 per GJ over the next two years. This is due to improved supply from CSG fields in Queensland and reduced international LNG export prices, as well as supressed oil and LNG demand as a result of Covid-19. Long-term gas price projections have also come down slightly as long-term gas supply has improved marginally. Future gas prices are now expected to be between \$11-\$12/GJ by 2035, a \$1-\$1.5 price difference from previous gas price projections.

Figure 3.3 shows the impact these changes in input assumptions have on the projection of the South Australian load-weighted electricity price in the reference case.

As discussed above the figure shows that our current projection is that spot prices will be lower in both New South Wales and South Australia.

[14] Obviously, we also include *Project EnergyConnect*.

FIGURE 3.3 COMPARING WHOLESALE SPOT PRICE PROJECTIONS – REFERENCE CASE BETWEEN FEBRUARY 2019 AND AUGUST 2020 MODELLING

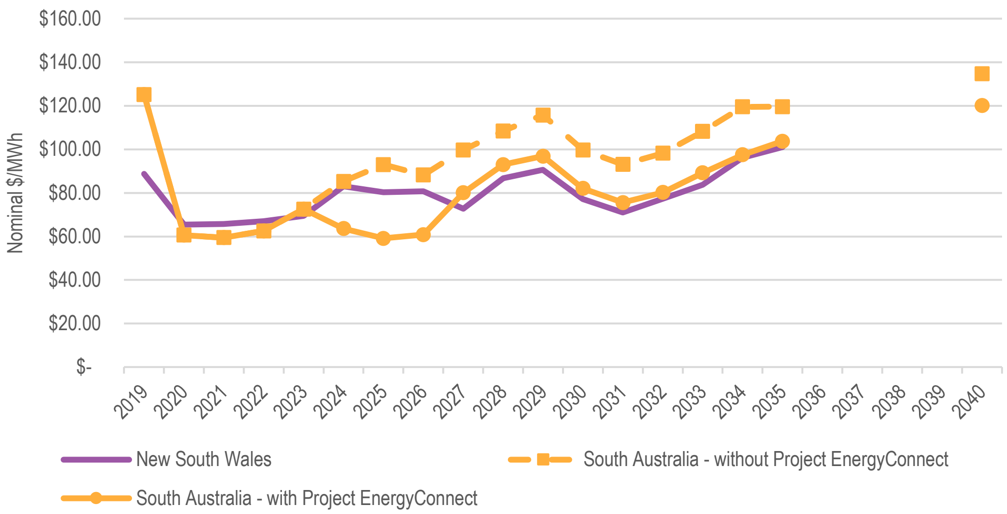


SOURCE: ACIL ALLEN CONSULTING

3.1.2 *Project EnergyConnect* scenario

The projected wholesale price of electricity in South Australia under the *Project EnergyConnect* scenario is shown in Figure 3.4 This also shows the projected wholesale prices of electricity under the reference case scenario to highlight the difference between the two projections.

FIGURE 3.4 SUMMARY OF PROJECTED WHOLESALE SPOT PRICE OF ELECTRICITY, NOMINAL, CALENDAR YEARS – ANNUAL LOAD WEIGHTED AVERAGE, 2020 TO 2040, REFERENCE CASE AND *PROJECT ENERGYCONNECT* SCENARIO – SOUTH AUSTRALIA



SOURCE: ACIL ALLEN MODELLING

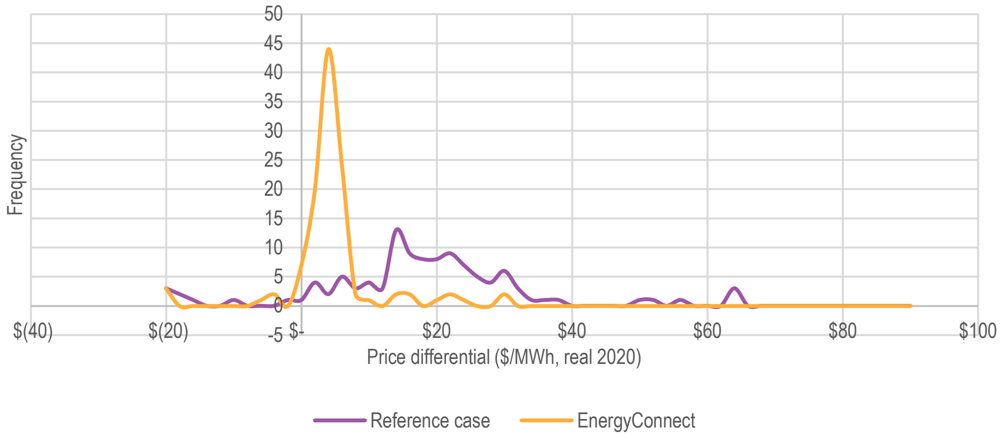
The analysis indicates that, without *Project EnergyConnect*, the wholesale spot price of electricity in the South Australian is projected to be higher than in New South Wales (Figure 3.1). *Project EnergyConnect* causes projected South Australian prices to converge on the New South Wales level

Reductions in the spot price are evident from *Project EnergyConnect's* first year of full operation (2024). In the first few years the reduction is projected to be quite substantial, peaking at just less than $34 per MWh in 2025.

From there, the projected price reduction remains fairly constant, with price *levels* increasing gradually over time.

The dominant impact of *Project EnergyConnect* from a wholesale pricing perspective is to 'bring together' prices in New South Wales and South Australia. The modelling shows that *Project EnergyConnect* would tend to 'smooth' the price differential between those two regions. This is illustrated in Figure 3.5, which shows density curves of the differences in projected monthly average prices from 1 July 2023 to 2040. It shows a much higher 'peak' of price differences at near zero levels in the interconnector than the reference case – in other words, the difference between New South Wales and South Australian prices is projected to be 'small' much more frequently with *Project EnergyConnect* in place than without it..

FIGURE 3.5 DENSITY PLOT OF MONTHLY LOAD WEIGHTED PRICE DIFFERENCES IN REFERENCE AND INTERCONNECTOR CASES - ($/MWH REAL 2019) – 2023 TO 2040



SOURCE: ACIL ALLEN MODELLING

In terms of volatility, it is well known that spot prices in the NEM are capable of 'spiking' to very high levels, which creates price risk for retailers and other customers buying electricity from the wholesale market. That risk can be managed in numerous ways including using exchange traded cap contracts, which can be used to limit exposure to prices greater than $300/MWh, which has come to be accepted as the line distinguishing 'high' and 'low' prices.

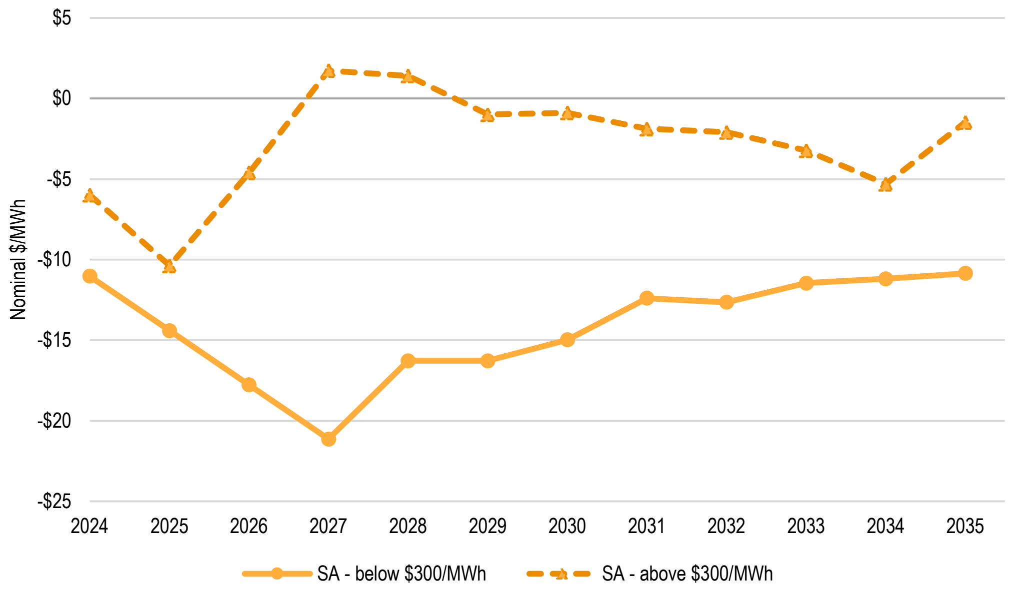
To analyse differences in volatility, we routinely separate projected prices in to 'high' (above $300/MWh) and 'low' (below $300/MWh) price outcomes and report these separately. For ease of comparison we subtract $300 from the 'high' prices so that they appear on the same chart as the 'low' prices.

The result of this process is shown in Figure 3.6. It shows that *Project EnergyConnect* is projected to put downward pressure on 'high' and 'low' prices. For example, in the period from 2024 to 2026 we project that 'high' prices will be lower the average difference in the first three years in South Australia is about $7.00 per MWh.

After 2026 the 'height' of high prices converges on the same level it is projected to be without *Project EnergyConnect.* For the period from 2024 to 2035, the average impact on 'high' prices is a reduction of about $2.80/ MWh.

'Low' prices are projected to fall substantially. The projected difference between the two scenarios increases (even lower) every year from 2024 to 2027, when the reduction peaks at about -$21.00/MWh. The reduction then deteriorates somewhat, returning to around -$12.00 per MWh for the second half of the period to 2035. On average, we project that *Project EnergyConnect* will cause an approximately $14.00/ MWh reduction in low prices in South Australia between 2024 and 2035 compared to the levels they would be at without *Project EnergyConnect.*

FIGURE 3.6 IMPACT ON 'HIGH' AND 'LOW' TIME WEIGHTED PRICES

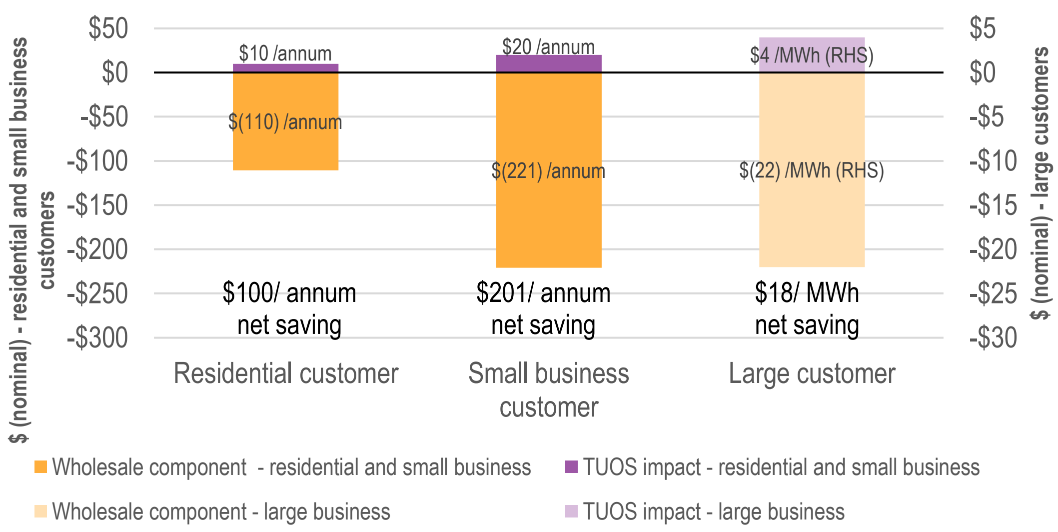


SOURCE: ACIL ALLEN MODELLING

3.2 Projected customer bill impacts

The projected impact of the new interconnector on customers' electricity bills is consistent with the projected change in wholesale spot prices. It is summarised in Figure 3.7 and Table 3.1.

FIGURE 3.7 PROJECTED RETAIL BILL IMPACT – SA CUSTOMERS



SOURCE: ACIL ALLEN CONSULTING

TABLE 3.1 PROJECTED RETAIL BILL IMPACT

	Residential customer	Small business customer	Large customer
Transmission network cost impact	$10 /annum	$20 /annum	$4 /MWh
Average saving in wholesale component of bill	$(110) /annum	$(221) /annum	$(22) /MWh
Net bill saving	$(100) /annum	$(201) /annum	$18/MWh
Annual consumption (kWh/annum)	5,000	10,000	varied

SOURCE:ACIL ALLEN CONSULTING

The figure shows two impacts on retail bills separately. The first, shown in purple, is the annual cost to each customer of the interconnector, which was provided by ElectraNet. The second component, shown in gold, is the projected impact on the wholesale energy component of each annual bill, in nominal terms, averaged over the period from 2024 to 2030.

In nominal terms, over the period to 2030, the modelling indicates that the annual representative residential customer bill would reduce on average by $100 in South Australia, with a corresponding reduction of $201 for small businesses. Larger customers are projected to save approximately $18 per MWh over the time period in net terms, with their total bill impacts varying depending on their usage.

As the figure shows, the saving attributable to projected reductions in the wholesale spot electricity price outweighs the assumed impact the interconnector would have on network use of system charges. The modelling indicates that the saving in energy costs for residential and small business customers in South Australia is projected to be around ten times the additional transmission network cost on an annual basis in the period to 2030. Larger customers are projected to receive savings in the order of five times the additional transmission network cost.

3.3 Comparison with previous modelling

When we compare our current modelling with that from February 2019, we observe a larger reduction in retail bills now than before.

Figure 3.8 shows our projections of wholesale electricity spot price as they would be without *Project EnergyConnect* from the current modelling and as we projected them in February 2019. The reason that we now project a larger reduction in retail prices with the introduction of *Project EnergyConnect* is illustrated by the increased vertical distance between:

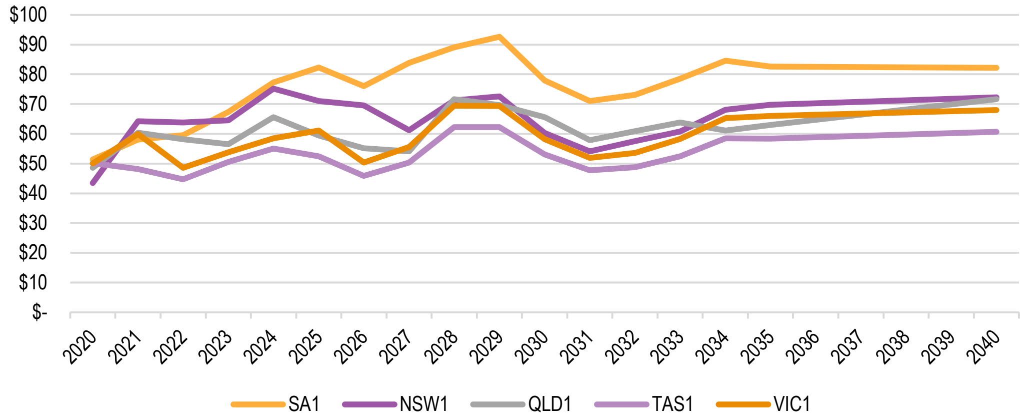
— the yellow curves representing projected wholesale price in South Australia,

— the other curves, representing projected wholesale prices in other NEM regions.

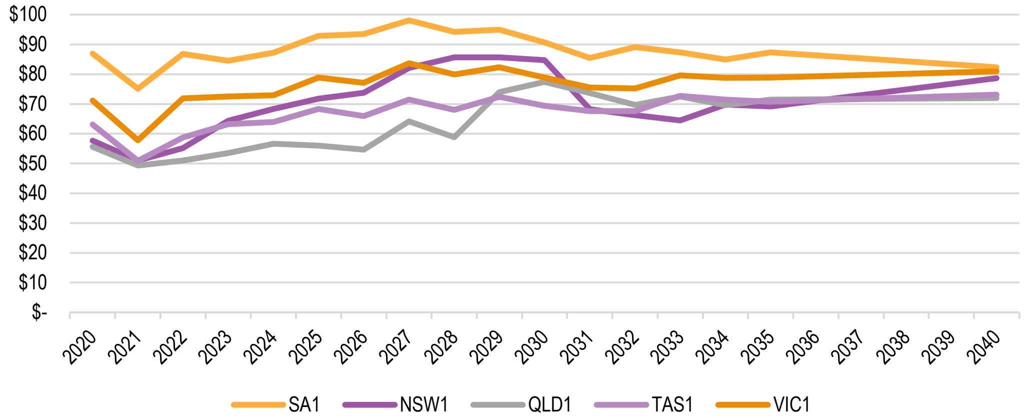
The figure clearly shows that the difference between projected South Australian wholesale prices and those in other jurisdictions has increased. In very broad terms, *Project EnergyConnect* ‘opens up’ South Australia to the other NEM regions and gives it increased access to interstate prices. Since the gap between South Australian and interstate prices is now projected to be larger than it was in February 2019, so too is the projected impact *Project EnergyConnect* will have on retail bills.

FIGURE 3.8 LOAD WEIGHTED PRICES ($/MWH, REAL 2020) WITHOUT *PROJECT ENERGYCONNECT*

As at August 2020



As at February 2019



SOURCE: ACIL ALLEN CONSULTING

The key reasons that wholesale prices are now projected to be lower outside South Australia than they were in February 2019 include that

— Projected energy demand is significantly lower in Victoria and New South Wales in the mid-2020s, due to AEMO's lower demand forecast in the 2019 vs the 2018 Electricity Statement of Opportunities
— The projected energy demand is also lower in Victoria, New South Wales and Queensland from 2027 onwards due to assumed closures of the Tomago, Boyne Island and Portland smelters in our current modelling.
— There is greater generation supply across the NEM with an increase in renewable capacity commitments, including different state based schemes like the now-legislated VRET 2030 target[1], , the ACT Reverse Auction and CleanCo capacity, as well as the commissioning of Snowy 2.0 in 2026
— The inclusion of the QNI minor and VNI minor upgrades, the VNI West interconnector, as well as SnowyLink in 2026 allows for greater resource sharing between the neighbouring regions, which has a dampening impact on prices

Figure 3.9 goes further into the impact of these changes, showing the difference in the projected impact of *Project EnergyConnect* on 'high' (above $300/MWh) and 'low' (below $300/MWh) electricity prices between the current modelling and that conducted in February 2019. This shows our projection that there is a more substantial reduction in the 'low' prices compared to our earlier modelling.

FIGURE 3.9 IMPACT OF ENERGY CONNECT ON 'HIGH' AND 'LOW' TIME WEIGHTED PRICES COMPARED WITH FEBRUARY 2019 MODELLING

SOURCE: ACIL ALLEN CONSULTING

[1] With the entry of *Project EnergyConnect*, it is assumed in the modelling that the transfer constraints on the Heywood interconnector will be relaxed. It is assumed that this equates to approximately 100 MW of additional transfer based on AEMO's 2018 ISP (p.87). This enables greater resource sharing between South Australia and Victoria, and has a downward impact on the South Australian spot price.

ACIL ALLEN CONSULTING PTY LTD
ABN 68 102 652 148

ACILALLEN.COM.AU

ABOUT ACIL ALLEN CONSULTING

ACIL ALLEN CONSULTING IS THE LARGEST INDEPENDENT, AUSTRALIAN OWNED ECONOMIC AND PUBLIC POLICY CONSULTANCY.

WE SPECIALISE IN THE USE OF APPLIED ECONOMICS AND ECONOMETRICS WITH EMPHASIS ON THE ANALYSIS, DEVELOPMENT AND EVALUATION OF POLICY, STRATEGY AND PROGRAMS.

OUR REPUTATION FOR QUALITY RESEARCH, CREDIBLE ANALYSIS AND INNOVATIVE ADVICE HAS BEEN DEVELOPED OVER A PERIOD OF MORE THAN THIRTY YEARS.