

Revised Final Plan
Attachment 11.4

**ACIL Allen Report:
Gas Demand Review**

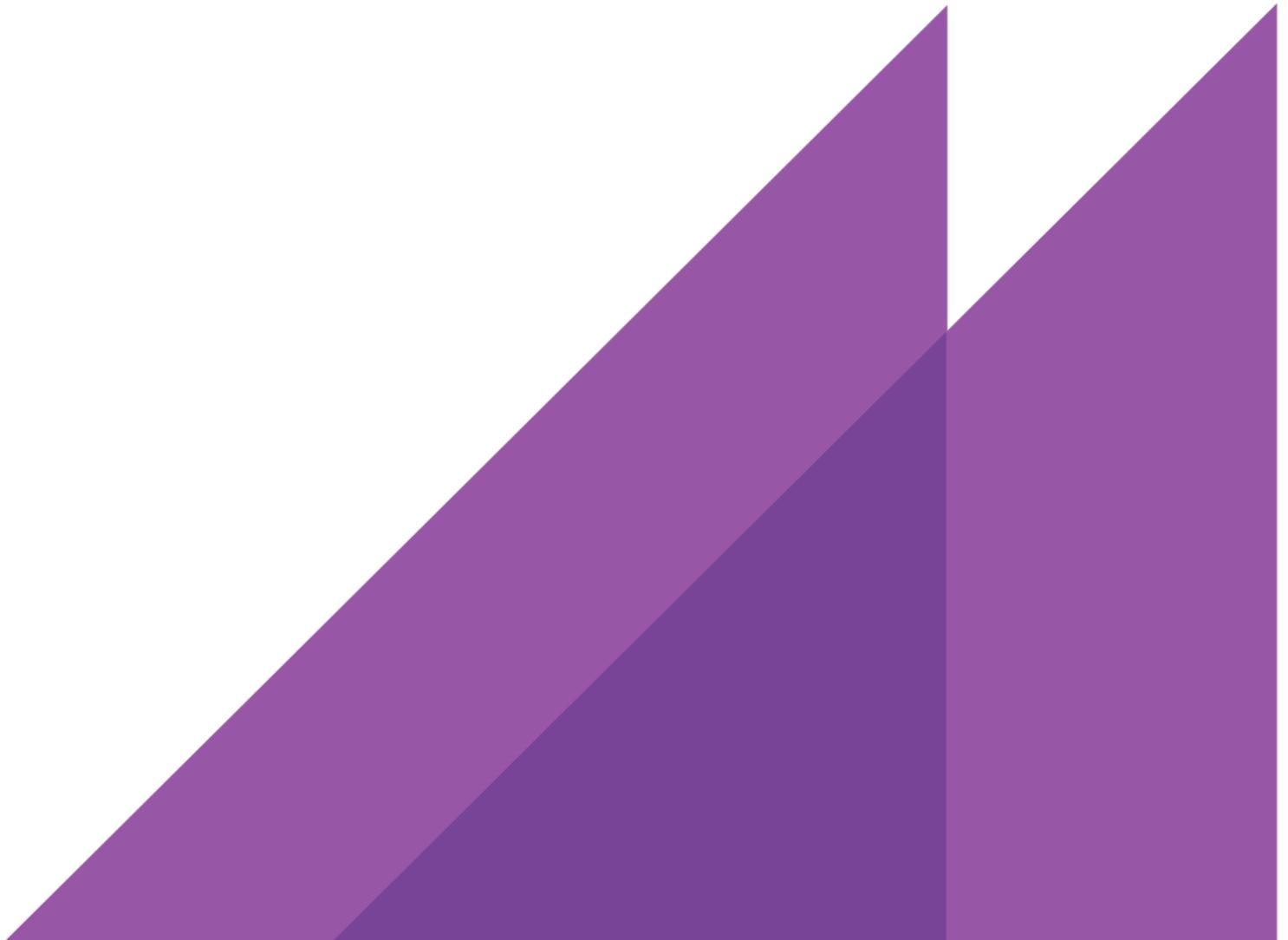
October 2020

REPORT TO
**AGIG ON BEHALF OF DBNGP (WA) NOMINEES PTY LTD AS
TRUSTEE FOR THE DBNGP (WA) PIPELINE TRUST**
6 OCTOBER 2020

GAS DEMAND REVIEW



DAMPIER TO BUNBURY
NATURAL GAS PIPELINE





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

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 THE REPORT MUST NOT BE PUBLISHED, QUOTED OR DISSEMINATED TO ANY OTHER PARTY WITHOUT ACIL ALLEN CONSULTING'S PRIOR WRITTEN CONSENT.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. ACIL ALLEN CONSULTING HAS RELIED UPON THE INFORMATION PROVIDED BY THE ADDRESSEE AND HAS NOT SOUGHT TO VERIFY THE ACCURACY OF THE INFORMATION SUPPLIED. 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.

C O N T E N T S

1

INTRODUCTION	1
--------------	---

2

DEMAND FOR CONTRACTED CAPACITY	2
--------------------------------	---

[REDACTED]	3
[REDACTED]	5

3

GAS THROUGHPUT PROJECTIONS	8
----------------------------	---

3.1 SWIS historical generation	10
3.2 SWIS projected generation (AA5)	10
3.3 Reconciling gas throughput forecasts	13

A

ACIL ALLEN BACKGROUND	A-1
-----------------------	-----

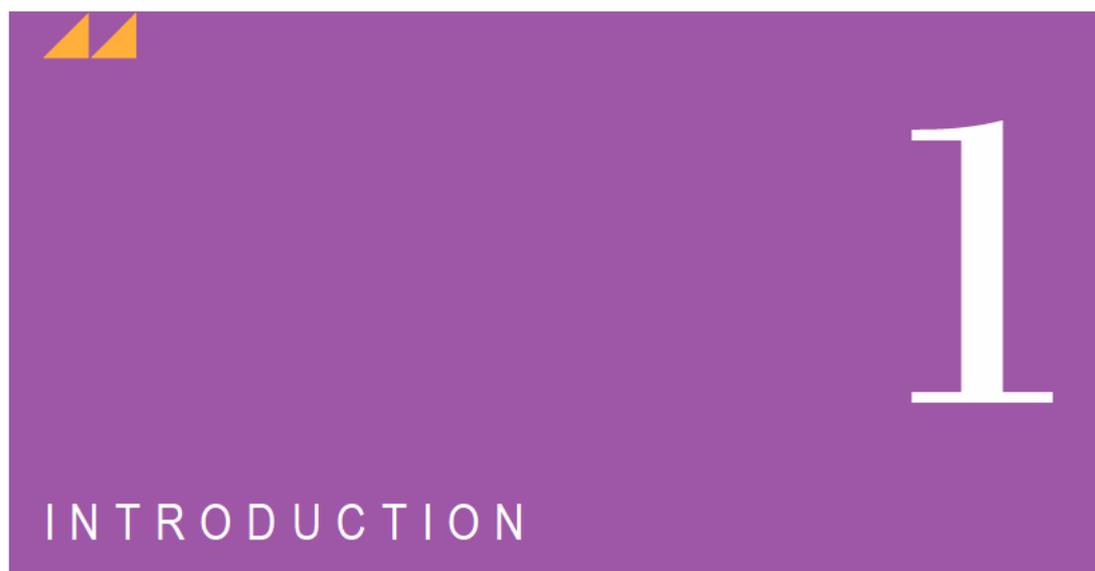
A.1 Electricity market capability	A-1
A.2 Paul Hyslop – CEO, ACIL Allen Consulting	A-2

FIGURES

FIGURE 3.1	PROJECTED SWIS GAS CONSUMPTION (PROJECTIONS IN 2007, 2014 AND 2020)	9
FIGURE 3.2	HISTORICAL POWER GENERATION – SWIS – 2007 TO 2019	10
FIGURE 3.3	HISTORICAL AND PROJECTED POWER GENERATION – SWIS – 2016 TO 2025	11

TABLES

[REDACTED]	[REDACTED]	3
[REDACTED]	[REDACTED]	4
[REDACTED]	[REDACTED]	6
TABLE 3.1	ACIL ALLEN AND RBP SWIS GPG PROJECTIONS	12
[REDACTED]	[REDACTED]	13
[REDACTED]	[REDACTED]	14



ACIL Allen Consulting – (ACIL Allen) has been asked by the Australian Gas Infrastructure Group (AGIG) to provide further advice in relation to gas demand and incentives for shippers to contract for gas on the Dampier to Bunbury Natural Gas Pipeline (DBP).

ACIL Allen is Australia’s largest independent economic consultancy. The company has been providing advice to Australia’s energy sector for more than 30 years. Our advice relies heavily on our analytical capability using applied economics, econometrics and mathematical modelling. Our electricity and gas models are used extensively in our advice in both east and west coast markets and have been relied upon by equity owners, financiers, regulators and governments in relation to investments, regulatory reviews, policy development and assessment.

The advice relies in part on ACIL Allen modelling of electricity generation and gas for power generation in the South West Interconnected System (SWIS). This modelling was undertaken independently of this advice (as a standard update to our internal Reference case). AGIG did not procure the modelling nor did it have any say over modelling assumptions or any influence over the reported results. Some further credentials about ACIL Allen are included in Appendix A.

ACIL Allen provided earlier advice in our report *Demand Assessment: Dampier to Bunbury Natural Gas Pipeline* dated 20 December 2019. In that report we reviewed the demand for contracted capacity and a throughput assessment of the DBP. In this report we have updated some of the information in that earlier report, where warranted, and otherwise confirm that the earlier report remains relevant, despite the period of nine months since it was published.

This report covers the following matters:

- Chapter 2 reviews:
 - the demand for contract capacity on the DBP
 - the continuing incentives to change contracting strategy for shippers exposed to gas for power generation in AA5
 - the benefits and support for the rational uptake of the new non-reference service Peaker contracts by shippers exposed to gas for power generation.
- Chapter 3 provides:
 - a history of gas for power generation projections for the SWIS
 - a review of historical and projected generation by fuel source as a basis for understanding ACIL Allen’s current (Reference case) projection for the SWIS
 - a critique of the AEMO gas for power generation forecasts including differences with ACIL Allen projections
 - a review of AGIG’s reconciliation of the GSOO South West gas throughput forecast with DBP’s gas throughput forecast.



2

DEMAND FOR CONTRACTED CAPACITY

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.2.1 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.1 above, [REDACTED]



SWIS gas for power generation consumption projections

Gas for power generation in the SWIS is a major consumer of domestic gas supply in Western Australia consuming between 70 PJ and 80 PJ per year over the last 10 years. Projections of SWIS gas for power generation consumption is highly dependent on the outlook for gas fired generation at the time that the projection is being made.

ACIL Allen models the WEM using our proprietary *PowerMark WA* simulation model with half hour granularity. Each generator's dispatch is explicitly modelled using detailed technical and cost characteristics. The modelling that we refer to below was undertaken at different times over the last 13 years. The current (2020) case was developed independently (as a Reference case) by ACIL Allen.

Around the commencement of the WEM, there was a very strong outlook for gas consumption. This outlook was heavily influenced by:

- Expected strong electricity demand growth
- Historically low gas prices



ACIL Allen's 2007 WEM market outlook incorporated these features with SWIS gas consumption projected to average around 130 PJ per annum over the period 2021 to 2025 (the next regulatory period) as shown in Figure 3.1.

By 2014, the environment had changed significantly:

- Gas prices rose as oil and LNG prices rose making gas less competitive
- Several significant wind farms had either entered or were in the process of entering the market
- The falling cost of wind and solar technologies drove projections of additional wind and solar farms to enter.

As shown in Figure 3.1, ACIL Allen's 2014 WEM market outlook projected SWIS gas consumption to average around 70 PJ per annum over the current regulatory period and 72 PJ per annum over the period 2021 to 2025 (the next regulatory period).

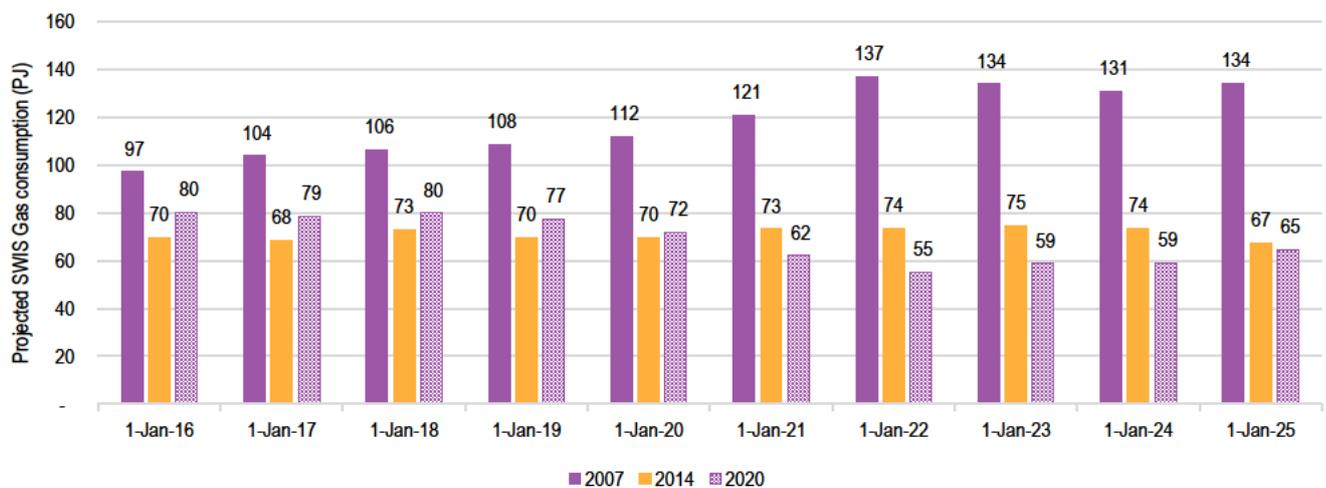
By 2020, there were further developments as follows:

- Renewable technology costs improved faster than projected in 2014 with several large-scale wind and solar projects being developed

- The reintegration of Synergy (retailer) and Verve (generator) from 2014 – new entity called Synergy – increased incentives to develop self-owned renewable energy in the SWIS
- Shortages in renewable energy certificates led to large rise in REC spot prices and the forward curve (during the latter part of the last decade), increasing general interest in the development of renewable projects
- Grid based demand fell as rooftop solar PV increased
- Muja A&B was closed with Muja C to be closed progressively from 2022-2024
- The Kwinana gas fired generators owned by Synergy were retired.

As shown in Figure 3.1, these factors have resulted in a collapse in projected SWIS gas consumption compared with earlier years, with projected consumption between 2021 and 2025 to be around 60 PJ per annum.

FIGURE 3.1 PROJECTED SWIS GAS CONSUMPTION (PROJECTIONS IN 2007, 2014 AND 2020)



NOTE: Data for 2016 to 2019 for the 2020 forecast are actuals

SOURCE: AEMO (HISTORICAL) ACIL ALLEN (PROJECTIONS)

Notably, our current WEM projection shows gas for power generation falling from 72 PJ for 2020 to 62 PJ for 2021, which is a 13.3 per cent fall year on year in gas throughput. This compares with AEMO's 2019 GSOO forecast of 5.3 per cent.⁶ AEMO associate the reduction with renewable generation entering the WEM over that period.

We are in broad agreement with AEMO's view of wind and solar entering the market, which we estimate at around 2,000 GWh per annum over the period 2020 and 2021. In addition, the Kwinana WtE plant, expected to come online in 2020 and the East Rockingham WtE plant expected to come online in 2022 are expected to add another 500 GWh in renewable energy over that period.

We project that most of this new energy will substitute for gas-fired power generation – around 1000 GWh displaced in 2021 compared with 2020 and another 1000 GWh displaced in 2022 compared with 2021. Using an approximate heat rate of 10 GJ/MWh the displaced gas-fired generation results in around 10 PJ less gas consumption in power generation in 2021 (compared with 2020) and a further 10 PJ reduction in 2022.

However, in late 2022, the first unit of the Muja C coal fired power station is projected to close, making more room for gas and so the projected incremental reduction in gas fired generation is less than the change between 2020 and 2021.

⁶ AEMO (2019) WA Gas Statement of Opportunities, P.22.

We also note that our projection for gas for power generation in the SWIS, derived from our detailed WEM modelling, shows a 23 per cent reduction in average annual throughput in AA5 compared to the annual average usage in the current regulatory period (AA4).

3.1 SWIS historical generation

As noted above, ACIL Allen developed its current Reference case outlook for the WEM internally without reference to the work that we have undertaken for AGIG in this report. We have provided relevant data from that Reference case in undertaking some of the analysis in this report.

Our Reference case gas for power generation usage reflects gas for power consumed within the SWIS – so is relevant when considering and comparing AGIG throughput projections to the South West.

Figure 3.2 shows the historical power generation in the SWIS from 2007 to 2019. There are several important trends as follows.

Total electricity demand grew from the period 2007 to 2016 at an annual growth rate of 1.8 per cent. Over the same period gas-fired power generation hardly changed at all with a growth rate of 0.2 per cent. However, gas-fired generation grew at 1.2 per cent per annum to 2009 and then fell at a rate of 0.9 per cent from 2009 to 2016. This fall was driven by:

- increased coal-fired generation – 416 MW Bluewater power station commissioned in 2009 and the recommissioning of the 240 MW Muja A&B power station around 2013
- increased renewable generation growing from 4.8 per cent to 9.2 per cent of total demand over the same period.

FIGURE 3.2 HISTORICAL POWER GENERATION – SWIS – 2007 TO 2019



SOURCE: AEMO

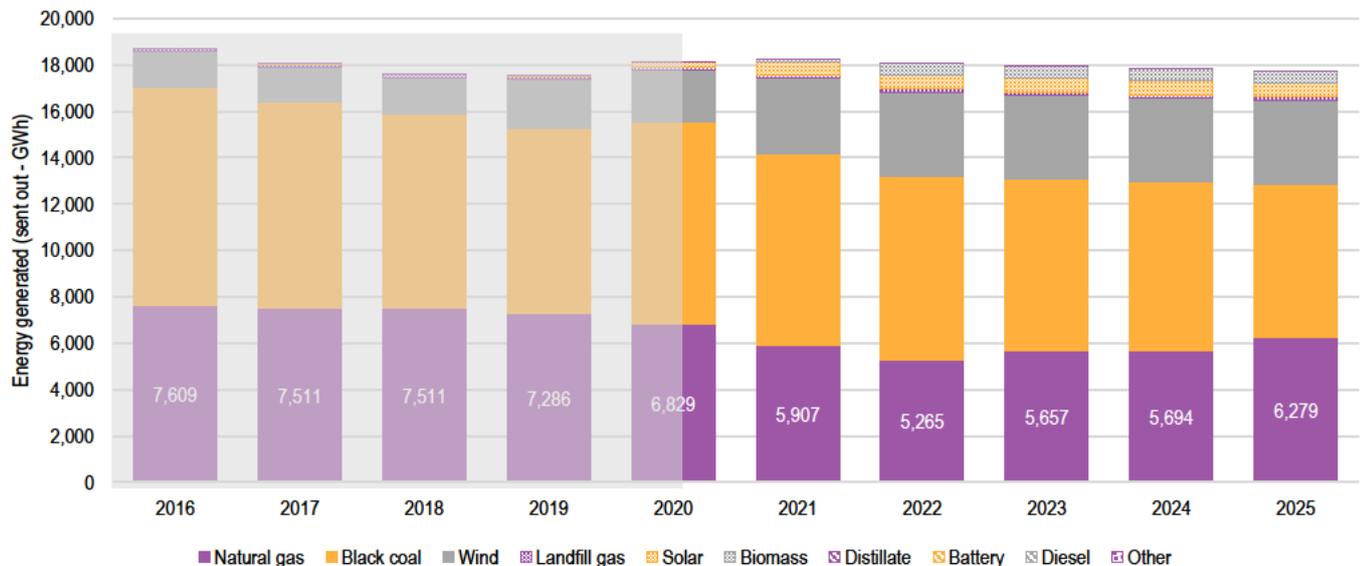
3.2 SWIS projected generation (AA5)

Figure 3.3 covers the existing AA4 (2016-20) and next AA5 (2021-2025) regulatory periods. The historical information is to April 2020, with the data from May 2020 based on ACIL Allen projections independently derived Reference case using our proprietary PowerMark WA market simulation software for the WEM. As noted above, this simulation software projects the dispatch of each existing and entering power station on a half hour trading interval basis based on the technical characteristics

and costs of fuel for each power station. The demand in each half hour is based on AEMO ES00 demand projections.

In simulating the WEM, ACIL Allen projects SWIS annual gas fired electricity production to fall over the 2021-25 regulatory period compared with the AA4 period. The annual average gas-fired power generation over the AA5 period is projected to be around 78 per cent of the annual average gas-fired power generation over the AA4 period.

FIGURE 3.3 HISTORICAL AND PROJECTED POWER GENERATION – SWIS – 2016 TO 2025



SOURCE: AEMO (HISTORICAL) ACIL ALLEN (PROJECTIONS)

The projected fall in gas-fired power generation in the AA5 period is driven by additional rooftop solar PV installations and grid-based renewable energy entering the market. The grid-based renewable energy plants that are committed or under construction to enter the WEM over the AA5 period are as follows⁷:

- Kwinana (2020) and East Rockingham (2022) waste to energy (around 500 GWh per annum)
- Warradarge (late 2020) and Yandin (mid 2021) wind farms (around 1,600 GWh per annum)
- Greenough River Stage 2 (mid 2020) and Merredin (late 2020) solar farms (around 400 GWh per annum).

This is a projected increase in renewable energy generation of around 2,500 GWh of renewable energy in the WEM over the period 2020-22.

Ignoring the very small volumes of diesel consumed in some peaking plant, gas is the most expensive fossil fuel used to fire electricity generation in the WEM. Therefore, it is essentially the swing fuel in the WEM; as other plants are committed and generate into the WEM, gas-fired plant would be expected to respond and reduce output. Compared with the estimated increase in renewable energy of around 2,500 GWh to 2022, ACIL Allen WEM simulation modelling projects gas-fired generation will contract by around 2,000 GWh by 2022 in an environment where total electricity consumption is also expected to contract slightly.

With the retirement of the Muja C power station in stages in late 2022 and late 2024 (loss of around 1,700 GWh⁸ of coal-fired generation when fully closed), gas-fired power generation is projected to increase by around 1,000 GWh by 2025, from the low point in 2022. This relative increase in gas-fired generation is consistent with the expected loss of coal-fired generation over the latter part of AA5.

⁷ The AEMO 2019 GS00 includes the wind and solar plants identified by ACIL Allen (footnote in GS00 on page 7). There is no reference to either of the waste to energy projects.

⁸ Estimated loss of generation is based on annual average production between 2013 and 2019 – historical data provided by AEMO.

AEMO does not explicitly produce gas for power generation forecasts for the SWIS, but they commissioned a consultant⁹ to provide these forecasts. The forecaster provided a chart but not tabular results on page 25 of the consultant report.¹⁰ We read the forecast off the chart and so it may be in error by 1-2 PJ/annum in each year but the relativities between years should be largely correct.

There are several notable differences between our and the AEMO consultant's projections:

- The consultant has a significantly lower projection for 2020 which may reflect that the projection was undertaken in 2019 and is now out of date. Our 2020 projection includes actual data to the end of April 2020
- The consultant shows a modest reduction in gas consumption in 2021 and 2022 despite some 2,500 GWh of renewable energy entering the market and electricity demand projected to decline by 2.2 per cent over the AA5 period.
- The closure of the first unit of Muja C in 2022 appears to have no effect on gas for power generation consumption in 2023 and 2024
- The recovery in gas for power generation between 2024 and 2025, after the second Muja C unit closes is only around two thirds of the increase projected by ACIL Allen.

TABLE 3.1 ACIL ALLEN AND RBP SWIS GPG PROJECTIONS

Projection	2020	2021	2022	2023	2024	2025
RBP forecast (Base)	66	63	64	64	65	69
ACIL Allen forecast	72	62	55	59	59	65
Difference RBP less ACIL Allen	-6	1	9	5	6	4

SOURCE: RBP AND ACIL ALLEN

We consider these gas for power generation projections by AEMO's consultant and which we understand AEMO relied upon for its 20199 GSOO forecast, to be unreliable as they:

- appear to be out of date
- appear inconsistent with the expected entry of renewables and displacement of gas-fired generation
- appear inconsistent with the expected exit of Muja C and increased requirement for gas-fired generation

In contrast, ACIL Allen's projected reduction in gas-fired generation is consistent with the stable demand environment and the entry of large-scale renewable energy generators into the WEM.

In relying on the consultant's projections for the 2019 GSOO, AEMO forecasts a relatively small 5.3 per cent reduction in demand for gas for power generation in the SWIS from 2020 to 2021 which remains stable through to 2024 and then grows again substantially from 2024 (around 6.5 per cent higher in 2025 compared with 2020).

The ACIL Allen projection, which has later information and a more consistent treatment of gas and renewables, shows a 13.3 per cent reduction from 2020 to 2021, a further 11.4 per cent fall from 2021 to 2022, a 6.7 per cent increase from 2022 to 2023 (exit of first Muja C unit in 2022), stable gas usage from 2023 to 2024 and then a 9.3 per cent increase from 2024 to 2025 (exit of second Muja C unit in 2024)

AEMO states that part of the increase is caused by increased ramping of generators because of increased rooftop and grid-based solar. However, the GSOO gas forecasts do not appear to take account of this increased solar penetration displacing gas for power generation.¹¹ The AEMO

⁹ RBP (2019), *Gas Powered Generation Forecast Modelling – Final Report*.

¹⁰ The chart refers to total gas consumption from GPG (as modelled). The x axis is by calendar year, so we have assumed it is annual aggregate consumption. The Chart title refers to GJ. The ya-axis is not labelled but has a scale from 0 to 80,000, which would be 0 to 80 TJ. The scale is out by a factor of 1000, as it should be 0-80 PJ if it is aggregate annual GPG consumption. We have assumed that this is an error in labelling.

¹¹ AEMO provides GPG projections for the state but not for the SWIS. However, there is no evident uptick in gas usage in 2021-2023 associated with increased need for ramping (stable in 2022 and the increases in 2023 and 2024 would be explained by the closure of Muja C, cetera paribus). Significant increases from 2025 would be expected to be linked to lower projected grid demand (higher rooftop solar) or more grid-based renewables displacing gas-fired generation.

projections for the SWIS do not appear consistent and appear to underestimate the effect of renewables entering and displacing gas-fired generation.

In conclusion, AEMO appears to rely on out of date information and potentially flawed modelling of the entry of renewable energy and its effect on gas-fired generation in the SWIS. This raises valid concerns about relying on the 2019 GSOO in determining DBP throughput forecasts for AA5

3.3 Reconciling gas throughput forecasts

AGIG provided ACIL Allen with the data in Table 3.2 below. The data is throughput data provided as average TJ/day.

AGIG took the 2019 GSOO South West throughput forecast and removed the projected throughput for part haul and back haul contracts and for the non-reference service contracts. The result is then shown as an Adjusted GSOO South West forecast. The last three rows of the table show the difference between the Adjusted GSOO South West forecast and the DBP Full Haul throughput forecast in average TJ/day and PJ/annum and as a percentage of .

Year	Adjusted GSOO South West forecast (TJ/day)	DBP Full Haul throughput forecast (TJ/day)	Difference (TJ/day)	Difference (PJ/annum)	Difference (%)
2020	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2021	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2022	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2023	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2024	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2025	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2026	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2027	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2028	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2029	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2030	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2031	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2032	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2033	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2034	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2035	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2036	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2037	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2038	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2039	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2040	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2041	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2042	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2043	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2044	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2045	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2046	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2047	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2048	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2049	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2050	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

AGIG have asked ACIL Allen to comment on this gap, especially in the context of the different views in gas for power generation.

ACIL Allen’s gas for power generation projection (from our 2020 Reference case) is lower in each year of AA5 compared with AEMO’s consultant used for the 2019 GSOO forecast. The difference between the ACIL Allen projection and the GSOO forecast is shown in Table 3.1 above. If we make further adjustments to the above reconciliation for these differences, the difference between the GSOO and the DBP forecast are as shown in the last row of Table 3.3.

We consider the remaining differences to be within reasonable error estimates of this type of forecasting and reflecting the increasing level of uncertainty in assumptions at the back end of AA5 (AEMO project a significant rise in South West gas consumption in 2025 but contracted levels fall).

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]



ACIL Allen is Australia's leading independent economic consultancy, specialising in the use of applied economics and econometrics with emphasis on the development and analysis of policy and strategy. We have built a reputation for quality research, credible analysis, and innovative advice on economic, policy and strategic matters over a period of more than thirty years.

ACIL Allen operates across a wide range of industries including energy, minerals, transport, water, agriculture and infrastructure and provides specialist advice to companies, governments, regulators and industry associations. We comprise over 60 consultants plus support staff across offices in Melbourne, Sydney, Brisbane, Canberra, Perth and Adelaide.

ACIL Allen advises clients on market, policy and regulatory issues in the context of feasibility studies, capital raisings, mergers, acquisitions and prospectus development. We help governments, regulators, vendors, purchasers, financiers and insurers of major infrastructure assets understand how market, policy and regulatory issues impact on asset valuations and other key business decisions. The results of our analysis are often presented to due diligence committees and provided in the form of independent expert reports for inclusion in due diligence documentation and prospectuses.

Our analytical and modelling skills enable us to provide robust quantitative estimates of the impacts of market, policy and regulatory risk. We often use risk-based decision tools such as real options frameworks to advise clients on risk management strategies and opportunities. Much of our experience in these roles relates to major infrastructure assets, supporting feasibility assessments, equity raisings, sale and acquisition processes and funding of infrastructure assets, including power stations, natural gas and electricity transmission and distribution systems, roads, railways, airports, and ports.

ACIL Allen has been at the forefront of analysis of changes and policy issues in these sectors. We have helped governments to develop a number of policy mechanisms applied in response to these changes and policy issues. We have also helped many private corporations to develop the responsive business strategies in this dynamic environment.

A.1 Electricity market capability

ACIL Allen has a strong energy practice focusing on Australia and South East Asia. We have undertaken a wide range of assignments in the past and our reports are held in high regard within the sector. We have a reputation for credible quantitative analyses, backed by easily readable reports.

ACIL Allen has a deep understanding of the energy industry and has considerable experience in acting as market advisors, undertaking market analysis, due diligence processes and regulatory analysis. ACIL Allen has the longest track record in modelling and analysis of the National Electricity Market (NEM), extending back to the mid-1990s and the WEM, since its inception in 2006. We have extensive experience in modelling off grid markets and renewable energy certificate markets.

We have a long track record advising both governments and market participants in the electricity sector – particularly on complex renewable energy policy matters – and for renewable energy proponents in recent years seeking to proceed to project development, and for refinancing existing thermal or renewable power stations. We are able to combine real world commercial market and project experience with highly developed capacity in the development and analysis of energy market policy in providing our advice to the panel. Our reports are regularly published, and form part of the resources used in public consultation. Our modelling and policy work have proven to be rigorous, robust and able to withstand public scrutiny.

The Curriculum Vitae for Paul Hyslop, the principal author of this report, is attached.

A.2 Paul Hyslop – CEO, ACIL Allen Consulting

A.2.1 Qualifications

Master of Economics – (University of New England – 2011)

Graduate Diploma of Economics – (University of New England – 2008)

Master of Business Administration (Deakin University – 1999).

Graduate Diploma of Applied Finance and Investment (Financial Services Institute of Australasia – 2004)

Bachelor of Arts (political science) (University of Queensland 1992)

Bachelor of Engineering (Electrical, Honours) (University of New South Wales – 1985)

Paul has 30 years of experience in the energy, water, infrastructure and climate change sectors, with more than 25 years in senior executive roles. He has worked at senior levels in a broad range of businesses and in a broad range of areas including general management, business development, mergers and acquisitions and business regulation. He has held profit centre responsibility in a number of these roles. He advises clients at a strategic level across markets covering energy, water and infrastructure. Paul's advice typically involves optimising decision making with respect to investment and utilisation of infrastructure and assets. He also regularly acts as an expert witness on energy market and related matters.

A.2.2 Experience

Most of Paul's working career has been involved with the investment, management and operation of large infrastructure in the energy, water and related market segments. This has included power stations (both conventional and renewable), electricity networks, gas production and transportation, various types of water infrastructure including dams, pipelines, canals and natural transport paths along rivers.

Paul has commercial and operational experience within a range of private and government owned business. He has a broad and detailed understanding of debt and equity markets. He has established and managed a range of asset-based partnerships and joint ventures across the electricity, gas and coal sectors. He has detailed experience in negotiating a range of commercial and financing agreements including partnerships and joint ventures, farm-ins, commodity contracts (electricity, gas, coal and water), derivative contracts and debt financing agreements.

Paul has extensive experience in undertaking economic modelling and financial analysis including reviewing and assessing business cases for private and public investment. He has led several significant public policy reviews including the economic modelling and analysis of the RET for the 2014 Commonwealth Government Review and economic modelling and market modelling and analysis in support of the Western Australian Energy Market Review in 2014. In 2016 Paul served as a member of the Expert Panel advising the Queensland Government on credible paths to 50% renewable energy by 2030.

Between 2006 and 2008 Paul led the New Business Division within CS Energy and was a member of CS Energy's executive management team. New Business covered the development of new business and the development and management of resources including fuel and water and the disposal of ash.

Paul led teams that successfully renegotiated two long term coal supply agreements for CS Energy power stations and the execution of a major gas supply farm-in agreement and the negotiations for a number of long dated electricity contracts.

During the period 1997 through 2005, Paul held the position of Vice President Marketing and Trading for Edison Mission Energy's (EME) Asia Pacific region. This role covered business development and energy trading activities throughout Asia and the Pacific. Paul set up EME's trading function in Australia and was responsible for all marketing and trading aspects for the Loy Yang B 1000 MW base load power station and the Valley power 300 MW Peaking power station, both in Victoria.

While at EME, Paul also led several acquisitions related due diligence activities and teams including during EME's successful acquisition of a cornerstone stake in Contact Energy in NZ (Hydro, gas, geothermal). In addition, Paul led teams on various green field business development activities including the successful development of the Valley Power Peaking Station (Victoria). This included the negotiation of a long-dated hedging agreement with a Victorian based retailer.

Prior to joining EME in 1997, Paul held a range of roles in the sector. Paul's ACIL Allen projects have included:

- Development of the NESA framework for the Department of Environment and Energy
- Development of the standard form contracts and associated advice for the Underwriting New Generation Investment (UNGI) program
- Advice to Commonwealth Treasury and the Energy Security Board on the potential implementation of the National Energy Guarantee
- Member of the Queensland expert panel advising the Queensland Government on pathways to implement a 50 percent renewables policy by 2030
- Review and assessment of alternative market designs for the Western Australian electricity market reform process
- Review and assessment of the renewable energy market for the Warburton Renewable Energy Market review
- Energy market advisor to NSW Government for the sale of generating assets
- Advisor to Qld Government for the sale of network and generating assets
- Advisor to a consortium involved in the acquisition of generating assets in NSW
- Strategic market advisor in relation to several energy market asset acquisitions/divestments within Australia
- Multiple assessments of the efficiency and effectiveness of specific government policies including carbon pricing, renewable energy policy, energy efficiency and industry development funding
- Analysis and assessment of long run electricity infrastructure costs and benefits for several clients
- Analysis of the effects of government policy on retail electricity and gas prices for several clients including both government and private sector clients
- Review and assessment of the energy and demand projections for regulators and network service providers
- Estimating energy costs to support retail price benchmark tariffs in Queensland
- Expert witness in relation to a review of regulated retail prices in Queensland
- Multiple confidential client studies in relation to the assessment, valuation and development of electricity market assets in Australia
- Multiple confidential client studies assessing the impact of government climate change policies on existing assets and potential investments
- Multiple confidential client studies providing assessment and analysis of renewable energy investment under the expanded RET scheme.

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.

