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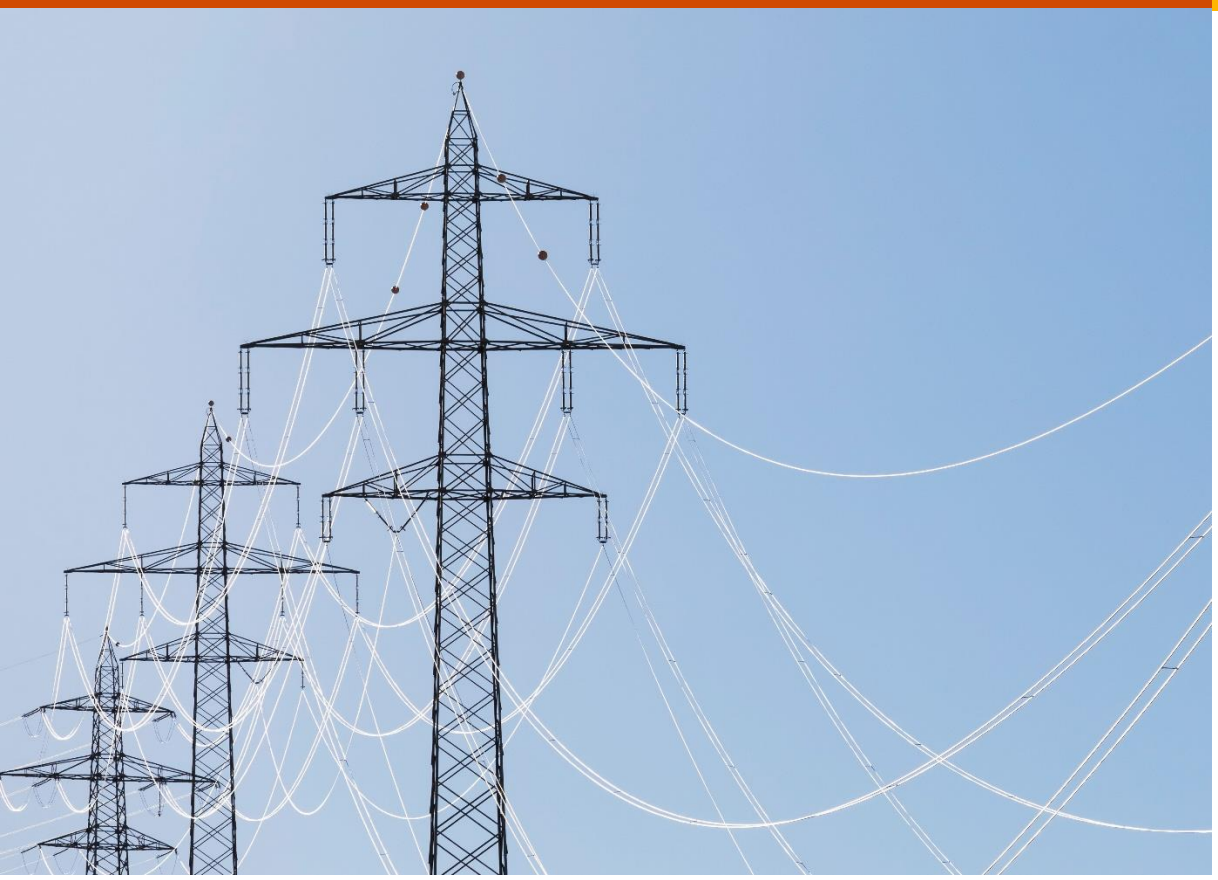
SIPS 2020

Validation Business Case for a Victorian SIPS Service

4 November 2020



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1 Executive summary

1.1 Overview

This Validation Business Case (**Business Case**) for SIPS 2020 (the **Project**) is provided in relation to the Department of Environment, Land, Water and Planning's (**DELWP's**) requested procurement by the Australian Energy Market Operator (**AEMO**) of a provider (**Service Provider**) of System Integrity Protection Scheme (**SIPS**) services (the **Services**). AEMO is in the process of concluding a two-stage tender process to appoint a Service Provider to develop, construct, own and operate a facility that is capable of providing the Services (the **Facility**). The purpose of the Services is to increase the import capacity to Victoria of the Victoria to New South Wales Interconnector (**VNI**) by up to 250 MW during peak demand periods. The Facility will be a battery energy storage system (**BESS**) and will provide standby generation capacity, thereby allowing VNI to be operated closer to its maximum physical capacity.

In the normal course of events, AEMO must arrange for power flows across the transmission network at a 15-minute thermal rating, so that in the event of a network contingency event (e.g. a transmission line trip), AEMO has 15 minutes to secure the system and prevent overloading VNI, potentially avoiding a system black event. The presence of the SIPS Service means that AEMO can safely increase southward flows over VNI, and, in the absence of a network contingency event, it can do so for long periods of time. AEMO will be able to run VNI closer to its maximum physical capacity. The degree of capacity uplift is determined by temperature, with the greatest comparative uplift potential occurring during higher temperatures. AEMO is able to do this because, in the event of a network contingency event, the Facility could be discharged (at 250 MW for 30 minutes), keeping the system stable while AEMO reroutes energy flows or arranges a new contingency plan.

The Victorian Government's primary objective in procuring the Services is to mitigate the impact, and reduce the frequency of, involuntary load shedding events during the Seasonal Period[1], in particular where load shedding is a result of high impact, low probability (**HILP**) events. By their nature, HILP events are difficult to foresee and can cause financial, security, safety and reputational damage to Victorian electricity consumers and the State of Victoria as a whole. High-profile HILP events have occurred on multiple occasions in Victoria during summer 2017-18, 2018-19 and 2019-20[2], primarily attributed to a combination of record high summer temperatures, prolonged unplanned outages at thermal generation (brown coal and gas) power plants, and insufficient solar and wind resource from variable renewable energy (**VRE**) generators during periods of peak demand. By procuring SIPS Services of up to 250 MW / 125 MWh during the Seasonal Period, events of involuntary load shedding and unserved energy (**USE**)[3] are forecast to reduce in frequency and magnitude, as detailed further within this Business Case.

The wider impact of the SIPS and the Facility upon Victorian consumers and participants in the National Electricity Market (**NEM**) has also been considered within this Business Case. Electricity market and reliability modelling undertaken by Ernst & Young (**EY**) at the request of DELWP[4] forecasts that, in addition to reducing USE in Victoria, the Facility is expected to have an impact on:

- Wholesale and retail electricity power prices;
- Demand side participation (**DSP**) payments to manage load shedding; and
- Dispatch costs relating to operating expenditure (**opex**), capital expenditure (**capex**) and fuel costs incurred by other generators in the NEM.

Collectively, the impacts above, in addition to the forecast avoided USE, are referred to within this Business Case as the **benefits**. While the Facility may be able to provide additional ancillary services in the NEM, such as Frequency Control Ancillary Services, these are not considered within the scope of this Business Case.

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1 Seasonal Period is defined as each period from 1 November to 31 March, in line with the SIPS Support Agreement

2 AEMO - Load Shedding in Victoria on 24 and 25 January 2019

3 USE occurs when the demand for electricity cannot be serviced by available supply, resulting in involuntary load shedding by consumers

4 EY - Impact on the electricity market from a facility used to provide a SIPS service

The SIPS Service will be procured by AEMO, at the request of the Victorian Government. A competitive tender process has been conducted by AEMO, resulting in the appointment of a preferred Tenderer as the Service Provider. The cost of the SIPS will be set by an annual Service Charge paid to the Service Provider (payable on a monthly basis) for the duration of the **Services Period**, being 1 November 2021 to 31 March 2032. This cost is assumed to be borne by Victorian electricity consumers through levies on electricity bills. The Service Charge, in addition to administrative, governance and management costs incurred by AEMO and DELWP, comprise the **costs** within this Business Case.

This comparison of benefits and costs forms the basis of the financial analysis within this Business Case. We also consider:

- the electricity bill savings to Victorian consumers expected to be delivered by the Facility (net of SIPS costs borne by Victorian consumers); and
- at a high level:
  - the potential impact of the Services on employment and the State of Victoria's reputation;
  - the Project's interaction with other developments in the NEM; and
  - potential Project key risks.

The purpose of this Business Case is to analyse the projected impacts of the SIPS, and provide supporting information to determine whether, on the basis of these impacts, the SIPS is a low regret solution to mitigate the impact of HILP events on Victoria's power system reliability.[5]

1.2 Key findings

Considering each of the benefits provided by the Facility in aggregate, the net present value (**NPV**) of the benefits provided by the SIPS Service is equivalent to $220.4m over the 11 financial years[6] that the Facility is active[7]. Of this, $201.9m accrues to Victorian consumers, and is passed on by way of avoided USE and electricity price savings. This analysis explicitly values savings to consumers through lower prices as benefits, rather than treating them simply as transfers between generators and consumers of no net economic value. Of the $220.4m total benefits, $18.5m of benefits accrue to generators and other participants within the Victorian electricity market by way of reduced dispatch costs and reductions in DSP costs. Within this Business Case, we classify each category of benefits depending on whether it will directly impact electricity bills or USE (a **consumer benefit**), or whether it is a benefit to market participants (a **market benefit**), such as dispatch costs and DSP. We consider avoided USE as a non-cash consumer benefit, quantified in accordance with the Australian Energy Regulator's (**AER's**) Value of Customer Reliability (**VCR**) analysis[8].

The Service Charge proposed by the preferred Tenderer is $12,504,000 (real, 1 July 2020) per contract year (i.e. the 12-month year commencing 1 November and ending 31 October). The annual Service Charge will be paid in 12 equal monthly instalments for the duration of the Services Period, with the annual Service Charge pro-rated for the partial years of FY 22 and FY 32. The Service Charge will be escalated by CPI on an annual basis.

The cost to Victorian consumers of the Service Charge is equal to $82.6m in NPV terms. Victorian consumers will also incur AEMO's management costs in relation to the Services, being $2.2m in NPV terms.

The benefit-to-cost ratio (**BCR**) of the Project is shown in Table 1 and Figure 1 below.

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[5] The analysis in this Business Case is not based on or in line with the AER's application guidelines for the regulatory investment test for transmission (RIT-T). Further, we do not contrast or compare the SIPS to other potential solutions or options, or consider whether the SIPS is the optimal or lowest regret solution or option

[6] The Facility is modelled as active from 1 November 2021 to 31 March 2032, although the benefits modelling encompasses the full 11 financial years from 1 July 2021 to 30 June 2032

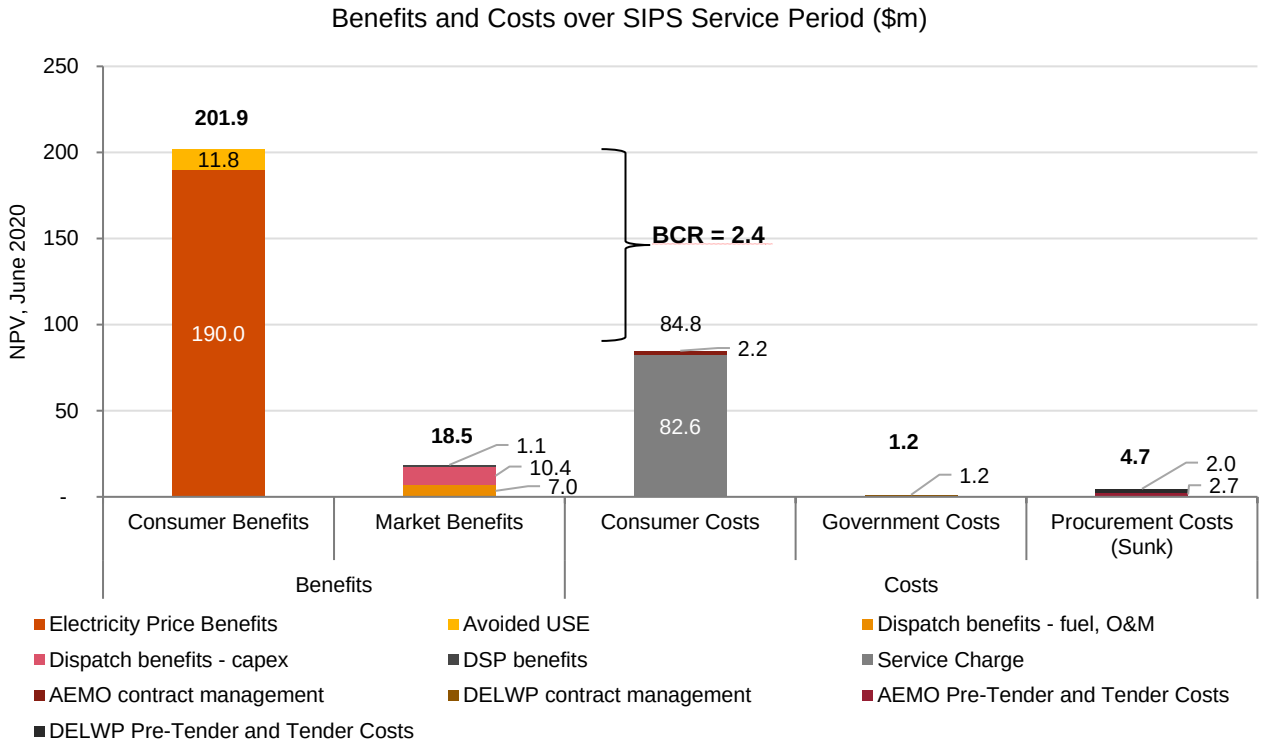
[7] Unless stated otherwise, all NPVs or PVs referred to within this Business Case have been discounted to a base date of 30 June 2020, using a real discount rate of 7.0% p.a., in line with the Victorian Government Department of Treasury and Finance's recommendation for sector discount rates when benefits are easily monetised

[8] AER - Values of Customer Reliability (December 2019)

Table 1 – BCR results[9]

($'000, real 2020 present value)	All Benefits (Consumer and Market)	Consumer Benefits only	Consumer Cash Benefits only
Benefits	220,417	201,873	190,032
Service Charge	(82,607)	(82,607)	(82,607)
AEMO contract management costs (pass-through to Consumers)	(2,242)	(2, 242)	(2, 242)
DELWP contract management costs (borne by government)	(1,205)	-	-
Net benefit	134,363	117,024	105,183
BCR	2.6	2.4	2.2

Figure 1 – Benefits and Costs over SIPS Services Period[10]



Sensitivity analysis has also been performed with respect to the realisation of benefits. There is inherent risk that forecast benefits may not materialise, due to a variety of factors, such as the effectiveness of the trading strategy of the Service Provider relative to the trading strategy modelled, the extent to which electricity retailers pass through wholesale price savings to consumers and other standard project execution and performance risks such as delay.

As Table 2 below illustrates, there is significant headroom within the BCR of the Project, based on the current benefit stack that accrues to Victorian consumers, and the SIPS costs borne by Victorian consumers, being the Service Charge and

[9] PwC Analysis

[10] PwC Analysis

AEMO's ongoing contract management costs. If only 50% of the modelled forecast benefits are realised, the Project will continue to achieve a BCR above 1.

Table 2 – Benefits realisation sensitivity (consumer benefits and costs)*[11]

		Percentage of Benefits Realised					
Real Discount Rate		100%	90%	80%	70%	60%	50%
	4% p.a.	2.2	2.0	1.8	1.6	1.3	1.1
	7% p.a.	2.4	2.1	1.9	1.7	1.4	1.2
	9% p.a.	2.5	2.2	2.0	1.7	1.5	1.2

* BCRs assuming consumer benefits equivalent to $201.8m, SIPS costs (including relevant AEMO/DELWP costs for the SIPS borne by Victorian consumers) of $84.8m (both NPV)

The analysis within the Business Case also considers the expected impact on electricity bills resulting from the Facility operations during the Services Period, on a gross and net basis, where net considers the impact of including payment for the SIPS Service Charge on electricity bills.

The results of the annual electricity bill analysis are shown in Table 3 below for each consumer type based upon assumed annual consumption profiles as provided by DELWP (the annual consumption is assumed to stay constant for each consumer type during the Services Period). The analysis below also assumes that, in each financial year of the Services Period, expected gross savings and SIPS costs will be fully realised and passed through to Victorian consumers in that financial year, and will be spread across consumers pro rata with their consumption (as a proportion of total Victorian demand for that year). With regards to potential impacts on specific consumers types, we are not privy to existing electricity supply agreements that may contain a fixed price or term that would limit the ability for price reductions to be realised by consumers at the point of occurrence.

Table 3 – Consumer electricity bill savings[12]

Consumer type	Typical electricity consumption (MWh p.a.)	Gross average annual electricity bill savings ($, 2020)	Average SIPS cost p.a. ($, 2020)	Net annual electricity bill savings ($, 2020)
Residential	4	2.35	(1.20)	1.15
Small business	20	11.8	(6.0)	5.7
Medium business	360	211.9	(108.7)	103.2
Large business	20,000	11,775	(6,024)	5,733
Industrial	1,000,000	588,727	(302,074)	286,653
Portland aluminium smelter	4,030,000	2,372,571	(1,217,359)	1,155,212

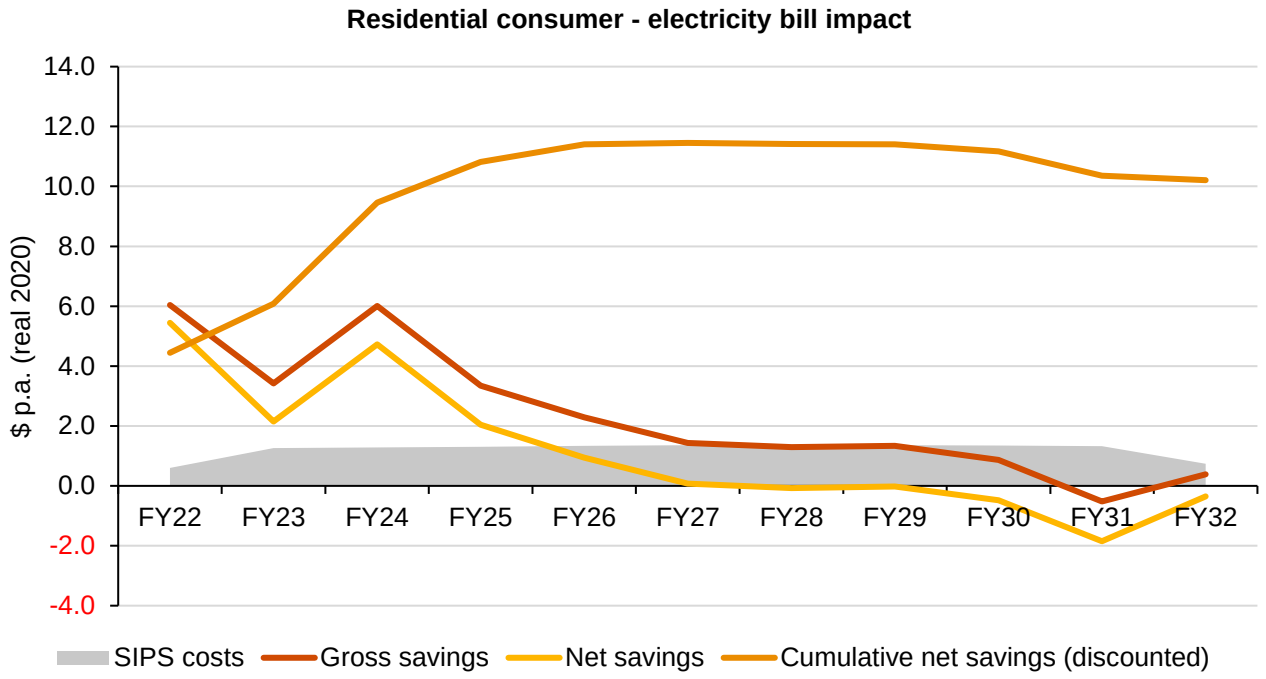
Figure 2 illustrates the gross and net impact on residential consumer electricity bills resulting from the SIPS for each financial year during the Services Period. The cost of the SIPS is assumed to be deducted from the gross bill savings and shown by the shaded grey area. For each consumer type in Table 3 above, the gross and net savings trend follows the

[11] PwC Analysis

[12] PwC Analysis. Refer to Appendix C for an annual breakdown of electricity bill savings by consumer type. Note that the averages presented are undiscounted simple averages i.e. the contribution of each financial year is equally weighted and no discount factor is applied to any amount

same as that shown in Figure 2, differing only for the order of magnitude as savings per MWh are scaled based on assumed consumer annual consumption.

Figure 2 – Residential consumer – Electricity bill impact[13]



Note: cumulative net savings shown above are discounted using a real discount rate of 7.0% p.a. to a base date of 30 June 2020. SIPS costs are inclusive of AEMO management and oversight costs as detailed further within Section 6.3.

The trend shown in Figure 2 represents the residential consumer savings from the SIPS Case versus the Base Case (i.e. no SIPS), with the following key observations:

- Price suppression impacts are front ended, where the ability of the Facility to capture intraday arbitrage for the benefit of consumers is at its greatest due to existing limitations on the VNI;
- The price benefit is reduced in FY 23 due to minor VNI transmission upgrades, with the benefit then increasing in FY 24 following the assumed Stage 2 retirement of Liddell Power Station;
- The wholesale price impact forecast by EY is initially around $0.9/MWh to $0.6/MWh for the first 4 years of the Services Period, before declining to marginally below zero (i.e. an increase in electricity prices relative to the Base Case of no SIPS) by FY 31, and then increasing upward;
- The decline in price suppression from FY 26 to FY 29 is attributed to the expansion of the VNI West Interconnector and the completion of the Snowy 2.0 project (both assumed to occur in FY 27), each of which results in an increased ability for peak demand to be met by generation from NSW and decreasing the amount by which the Facility can suppress prices relative to the Base Case (i.e. no SIPS);
- The price suppression converges to zero and slightly below zero in the last 3 years of the Services Period as result of small changes to the capacity mix under each case. As existence of the SIPS is assumed to incentivise marginally more investment in solar capacity than wind capacity (50 MW more solar relative to the Base Case), there is a slight increase to electricity prices in the SIPS case due to lower wind capacity to service overnight demand.

[13] PwC Analysis

1.3 Reduction in forecast USE

In addition to providing Victorian consumers and market participants with cash benefits in the form of reduced electricity bills, the Facility, and specifically the SIPS component, is projected to have a material reduction in the level of USE and involuntary load shedding incurred by Victorian consumers over its 11 Seasonal Periods in operation.

Reliability modelling undertaken by EY uses Monte Carlo simulation to forecast USE events. EY's modelling indicates that, for a year modelled prior to the commissioning of the new VNI West Interconnector (assumed in EY's modelling to occur by 1 July 2026), the SIPS Service reduces the occurrence of USE by allowing the existing VNI transmission lines to run closer to their maximum physical capacity. EY's reliability modelling results for FY 22 under a scenario in which Victoria experiences some prolonged thermal generator outage, as occurred at Loy Yang A and Mortlake during summer 2019-20, combined with peak demand, demonstrated that, on average, approximately 73 MWh of involuntary load shedding is expected to be avoided for that year if the SIPS is available during the Seasonal Period. Based upon the AER's Victoria-wide VCR value of $41,210/MWh, this equates to benefits of approximately $3.1m to Victorian consumers.

It is worth noting that the timing of VNI West is subject to decision rules as set out in AEMO's 2020 Integrated System Plan (**ISP**). Although the 2020 ISP plans for VNI West to be progressed for completion by FY 28, the outcomes on the decision rules could result in the development path for this significant network augmentation to be deferred (for instance, there are candidate development paths that have VNI West delivered by FY 36[14]). In this context, the assumption for commissioning of VNI West on 1 July 2026 adopted in the market modelling broadly aligns to the earlier forecast delivery pathway. Should VNI West be deferred or its delivery delayed (e.g. due to regulatory, technical or construction timeframes), we would expect both the insurance value and the BCR from the SIPS to be even higher than is reported in this Business Case.

In addition to reliability modelling undertaken on an average outcome basis, an individual HILP event was also modelled by EY, approximating such events as occurred in Victoria on 24 and 25 January 2019 as a proxy for extreme high USE days. The HILP event modelling found that the existence of the SIPS could reduce USE by 470 MWh from a single event lasting only 2 hours. This reduction in USE is equal to $19.4m in avoided USE benefits from a *single* HILP event (being significantly larger than the *average* ($3.1m) USE benefits for an entire financial year noted above). We note that avoided USE benefits with SIPS during a HILP event are not considered in the benefit stack used to calculate the BCR throughout this Business Case (we use average avoided USE outcomes for this purpose). Any occurrence of HILP events during the Seasonal Periods will drive even higher USE benefits to Victorian consumers.

1.4 Conclusion

The objective of SIPS 2020 is to procure the Services, the purpose of which is to increase the import capacity to Victoria of the VNI by up to 250 MW during peak demand periods. The standby generation capacity of the Facility will enable the VNI to be operated closer to its maximum physical capacity.

Based on the quantitative and qualitative analysis undertaken, utilising the electricity market modelling by EY as inputs to the analysis, this Business Case highlights:

- A total benefits stack of $220.4m, with benefits accruing to Victorian consumers representing $201.9m (or 92%) of the total. The balance of $18.5m represents benefits to generators and other participants within the Victorian electricity market.
- The costs of the Service borne by Victorian consumers, being the Service Charges and the ongoing AEMO costs, are expected to total $84.8m.
- A BCR in the range of 2.4 (from the perspective of Victorian consumers) to 2.6 (from the perspective of a broader stakeholder group, including NEM market participants and the Victorian Government). Sensitivity analysis demonstrates the 'headroom' in benefits realisation, with a BCR (from the perspective of Victorian consumers) of 1.1 if only 50% of the modelled benefits are realised. The BCR is also insensitive to a change in discount rates given the front-ended benefits profile.

[14] AEMO 2020 Integrated System Plan

- More broadly, the Project could support economic benefits in the form of job creation within the low-carbon and renewable energy sector (largely during the construction / commissioning period and, to a lesser extent, ongoing operational roles), and societal benefits to Victoria through increased business and consumer confidence that peak demand will be managed by the improved system reliability provided by the SIPS.

The quantitative outcomes illustrated in this Business Case are premised on two critical assumptions:

- Wholesale electricity cost savings are passed on in full to Victorian electricity consumers; and
- The trading strategy adopted by the Service Provider generates outcomes consistent with those modelled by EY.

Any risks not allocated to the Service Provider via the SIPS Support Agreement will need to be managed by the State (and/or AEMO on the State's behalf). There are possible upsides to the benefits stack, which might arise in the event of:

- Better than anticipated trading outcomes;
- A delay in the commissioning of VNI West beyond that modelled by EY (1 July 2026);
- Significant HILP events occurring during the Service Period, should they generate USE benefits exceeding the average avoided USE benefits that have been modelled.

The State is seeking a low regrets option to better manage forecast increased levels of USE in excess of the NEM's reliability standard. Ideally, this option would be able to be implemented quickly to start capturing the anticipated benefits. This Business Case, subject to the critical assumptions on which it (and the underlying modelling) is based, supports the SIPS as a viable low regrets option.

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