

PROGRESS REPORT – IMPLEMENTATION OF RECOMMENDATIONS FROM INDEPENDENT INVESTIGATION OF ALICE SPRINGS SYSTEM BLACK INCIDENT ON 13 OCTOBER 2019

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PURPOSE OF THE REPORT

On 15 October 2019, the former Treasurer requested the Utilities Commission (the Commission) to conduct an independent investigation into the Alice Springs System Black incident that occurred on 13 October 2019 (independent investigation) and report the findings and advice to the Minister.

Following the Commission's report to the Minister, which provided its findings and made 15 associated recommendations, on 9 December 2019, the *Northern Territory Government Response to the Independent Investigation of the Alice Springs System Black Incident on 13 October 2019* (Government response) was published.

The Government response to the independent investigation accepted 14 of the Commission's recommendations in whole, and one in-principle.

Consistent with that published in the Government response, on 8 December 2019, the former Treasurer wrote to the Commission requesting, pursuant to section 6(1)(h) of the *Utilities Commission Act 2000* (UC Act) that the Commission compile and publish a report on the implementation of the recommendations of the independent investigation and other major incident reports.

The former Treasurer requested that the first report on progress be published by the end of February 2020, with further reports every six months thereafter for a period of two years.

Subsequently, on 24 March 2021, the Minister for Essential Services requested the Commission continue to publish six-monthly reports until all outstanding Alice Springs system black actions are complete.

This is the Commission's fifth progress report.

COMMISSION OVERVIEW

There were 15 recommendations made by the Commission in its independent investigation, with 14 accepted in whole by the Territory Government and one in-principle. Within these recommendations, there are a total of 33 recommended actions to be progressed and reported on by the Power and Water Corporation (PWC) and Territory Generation (TGen), and one by the Commission in accordance with the Government response.

Of the 33 recommended actions for PWC and TGen to implement (which are set out in the next two chapters of this report with a summary and details of progress), the Government response¹ required one to be implemented immediately, seven by 31 December 2019, 11 by 31 January 2020, one each by the end of April and May 2020, 10 by 30 June 2020, one by 31 August 2020 and one by December 2020.

Based on the updates provided to the Commission by PWC and TGen, the Commission can confirm it has received evidence that 32 recommended actions are now complete or the initial task is complete (noting some recommended actions are on-going). There is one outstanding recommended action, which is underway.

PWC and TGen continued to actively work together over the six months since the Commission's August 2021 progress report, with three of the four outstanding recommended actions now complete. The three actions are in relation to the Jenbacher units (9d), the battery energy storage system (BESS) (10a), and jointly agreed responsibilities for advising vulnerable customers in the event of any unplanned electricity supply interruptions (15b).

The one outstanding recommended action, for PWC to undertake a review of the under frequency load shedding (UFLS) scheme (12), is underway. The Commission understands the action cannot be completed to optimise UFLS settings until TGen's models for the Jenbacher units and BESS are validated, with an industry-wide shortage of engineering modelling resources causing delays, and the BESS models dependent on recommissioning following improvements made to its performance. While the Commission agrees this is a valid reason for the delay, the work to optimise the UFLS settings is still considered necessary and should be completed as soon as possible.

As with previous progress reports, a further update on progress implementing the recommendations of other major reportable incidents since January 2015 is also included in this Report. In short, System Control has continued to make good progress in tracking, implementing and closing out recommendations across the Darwin-Katherine, Alice Springs and Tennant Creek power systems as appropriate. Pleasingly, PWC System Control has advised that when a recommendation is not related to a compliance issue, it now actively seeks to negotiate with the system participant/s to encourage action. The Commission is aware of examples where this negotiation has been successful, resulting in improvements and reducing potential risk to the power system.

As requested by the Minister, and given the importance of ensuring all Alice Springs system black actions are completed, the Commission will continue to publish six-monthly reports until the final outstanding action is complete.

¹ Includes approved extensions of time from the former Minister following the Government's response.

SUMMARY OF RECOMMENDATIONS AND PROGRESS

The Government response provided that the recommendations of the independent investigation be implemented within four timeframes as set out below:

- immediately, for those recommendations that can and should be implemented immediately
- 31 December 2019, for recommendations identified by the review as a high priority and for which the Government is particularly concerned that they be implemented swiftly
- 31 January 2020, for all other recommendations identified in the independent investigation to be of a high priority
- 30 June 2020, for all other recommendations identified in the independent investigation to be of a medium priority or are more complex to implement.

PWC and TGen requested extensions to the initial timeframes for a number of recommendations from the former Minister for Renewables, Energy and Essential Services. Where these extensions were requested, and whether the extensions were approved or not approved, is explicitly stated in this report.

Table 1 below provides a summary of the recommendations to be implemented, the party or parties responsible to action the recommendation, the due date (including any approved extension) and the progress status for each action as at close of business on 10 February 2022, as determined by the Commission based on a review of information reported by PWC and TGen.

The next chapter of this report provides more detail on the status of each of the recommendations as advised by PWC and TGen, and associated Commission comments.

Table 1: Summary of recommendations and status

ID	Recommendation	Responsible	Due date	Status
1	Modify the System Control operator screens at Hudson Creek control centre to improve their operational awareness:	System Control	31 Jan 2020	Complete
	a) add alarms that rapidly bring to their System Control operator's attention that a generator has come out of automatic generator control (AGC) control			
	b) track spinning reserve and regulating reserve separately so that it can be seen when the two are not equal.	System Control	31 Jan 2020 revised to 30 June 2020 ²	Complete
2	Jointly report to the Utilities Commission for advice to Government:	System Control and TGen	30 June 2020	Complete

² On 30 January 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 20 February 2020. A further extension was requested on 22 April 2020, and approved by the then Minister on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	Responsible	Due date	Status
	a) on a plan to implement improved solar forecasting			
	b) for the solar forecasting data to be held by the party responsible for maintaining spinning reserve.	System Control and TGen	30 June 2020	Complete
3	Review and amend communication protocols to clarify how System Control is to operate during a system black event:	System Control	31 Dec 2019	Complete
	a) prepare a complete plan for who may be in the control room during a major system event			
	b) modify the operating protocols such that the formal primary path for communication during major system events be directly between System Control and the power stations.	System Control and TGen	31 Dec 2019	Complete
4	Review and report to the Commission for advice to Government on whether the AGC system is fit for purpose, and if it is still determined to be necessary, how its function and reliability are to be improved.	System Control	30 June 2020 revised to 31 Aug 2020 ³	Complete
5	Complete a study outlining options to simplify the starting and loading procedures to reduce the risk of generators tripping due to reverse power during restoration. The outcomes of the study are to be provided to the Commission for advice to Government.	TGen	30 June 2020	Complete
6	a) Report to the Commission for advice to Government on the ramifications of TGen being responsible for determining which machines to place into service to meet the spinning reserve requirement and System Control's other system security requirements	System Control and TGen	31 Dec 2019	Complete
	b) Agree and submit to the Utilities Commission for advice to Government consistent operating protocols in relation to dispatch and load following	System Control and TGen	31 Jan 2020 revised to 30 June 2020 ⁴	Complete

³ On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

⁴ On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

ID	Recommendation	Responsible	Due date	Status
	c) Provide advice on the likely cost implications of implementing measures to avoid spinning reserve falling below 8 MW during the day for even for brief period, and recommended solution for implementation to the Utilities Commission for advice to Government. ⁵	PWC and TGen	31 Jan 2020	Complete
7	Other procedural recommendations include:	System Control	31 Dec 2019	Complete
	a) a System Control Black System Restart Procedure is to be prepared			
	b) PWC amend the Public Utilities Group (PUG) procedure to require that the PUG be convened within 90 minutes of system black for any future event	PWC	Immediately	Complete
	c) Owen Springs Power Station (OSPS) to be responsible for energising the 66 kV busbars	PWC and TGen	30 June 2020	Complete
	d) a formal set of black start procedures to be updated, harmonised, printed and stored prominently at all control room and power station sites	PWC and TGen	31 Dec 2019	Complete
	e) the OSPS operator is to be provided a higher level of autonomy to implement the Station's black start procedure	TGen	31 Jan 2020	Complete
	f) various system black procedures should be rehearsed at regular intervals, both individually and in coordination	PWC and TGen	31 Jan 2020	Initial complete Ongoing
	g) all technical staff should have a simple training record, potentially based on the Engineers Australia Continuing Professional Development model, to address views expressed in interviews that training for operational staff is limited.	PWC and TGen	30 June 2020 revised to Dec 2020 for PWC ⁶	Complete
8	Make engineering changes to avoid the Jenbacher units becoming overloaded during power system events:	TGen	31 Jan 2020 ⁷	Complete

⁵ This Government response recommendation is related to recommendation 6d in the Commission's independent investigation report, which Government supported in-principle.

⁶ On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

⁷ On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	Responsible	Due date	Status
	<ul style="list-style-type: none"> • modify OSPS control system so that AGC raise signals are not passed to Jenbacher machines that are operating above their de-rate limit • do not add a further power control loop outside of an existing power control loop • consider designing the outer control loop so that it automatically suspends its own operation, when the system frequency is a small margin below the UFLS stage 3 set point. 			
9	<p>Make further control changes and investigations of the performance of the Jenbacher units:</p> <p>a) investigate and address issues in relation to the need for Dia.ne control system reboot after a unit trip</p> <p>b) remove all power factor limiters and replace them with limiters that reflect likely mechanisms of damage to the machines</p> <p>c) review and adjust the under frequency settings to ensure that they are no more sensitive than is necessary to protect the machines from damage</p> <p>d) determine and address the source of an apparent inability of the Jenbacher machines to respond to sudden application of load exceeding 10% of their rating.</p>	TGen	31 Jan 2020 revised to 31 May 2020 ⁸	Complete
	b)	TGen	31 Jan 2020	Complete
	c)	TGen	31 Jan 2020	Complete
	d)	TGen	31 Jan 2020 revised to 30 April 2020 ⁹	Complete

⁸ On 28 January 2020 TGen requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 14 February 2020. On 2 June 2020 TGen requested an additional extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

⁹ On 28 January 2020 TGen requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 14 February 2020. On 2 June 2020 TGen requested an additional extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	Responsible	Due date	Status
10	a) Make engineering changes to ensure the battery energy storage system (BESS) does not become overloaded during power system events	TGen	31 Jan 2020 ¹⁰	Complete
	b) In relation to the inrush current of the BESS, undertake studies to determine how the BESS should be used during a system black event.	TGen	31 Jan 2020 ¹¹	Complete
11	Address issues adversely affecting system security. In particular: a) investigate and implement modifications to stop the Man units (or any other unit) coming out of AGC control without an operator command or unforeseeable fault condition	TGen	31 Jan 2020	Complete
	b) add alarms that rapidly bring to the Remote Operations Centre (ROC) operator's attention that a generator has come out of AGC control	TGen	31 Jan 2020	Complete
	c) Track spinning reserve and regulating reserve separately.	TGen	31 Jan 2020 revised to 30 Jun 2020 ¹²	Complete
12	Undertake the recommended review into the under frequency load shedding scheme (UFLS) and provide the review report to the Commission for advice to Government.	PWC	30 June 2020 ¹³	Underway
13	a) Prepare a spreadsheet tracking the recommendations from the independent investigation and the recommendations of any completed major incident reports since January 2015. The tracking spreadsheet is to be provided to the	System Control	31 Dec 2019	Complete

¹⁰On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

¹¹On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

¹²On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

¹³On 2 June 2020, TGen requested an extension of time to 31 December 2020 for elements of recommendation 12 that it is responsible for, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	Responsible	Due date	Status
	Commission and its adequacy assessed by the Commission			
	b) Complete all outstanding major incident reports and incorporate all recommendations into the tracking document.	System Control	30 June 2020	Complete Ongoing
14	Publish a report on the implementation of recommendations of the independent review and other major incident reports every six months for a period of two years.	Utilities Commission	29 Feb 2021	Initial and four further complete
15	a) In collaboration with relevant stakeholders, is to update communications protocols, response plans and procedures for the protection of vulnerable customers in the event of electricity supply interruptions	PWC	31 Dec 2019	Complete
	b) Liaise with the Department of Health and provide the portfolio Minister, Treasurer, Minister for Health and Utilities Commission with advice on jointly agreed responsibilities for advising vulnerable customers, including those requiring life support equipment in their homes, on emergency action and remedial plans in the event of any unplanned electricity supply interruptions.	PWC	31 Jan 2020 revised to 30 Jun 2020 ¹⁴	Complete

¹⁴On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

DETAIL OF RECOMMENDATIONS AND PROGRESS

Table 2 below provides a detailed summary on the status of each of the recommendations in the Government's response as advised by PWC and TGen as at close of business on 10 February 2022. Further, Table 2 includes the Commission's associated comments in relation to progress as necessary.

Table 2: Detail of implementation progress

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
1	<p>Modify the System Control operator screens at Hudson Creek control centre to improve their operational awareness:</p> <p>a) add alarms that rapidly bring to their System Control operator's attention that a generator has come out of AGC control</p>	<p>In its 7 February 2020 report to the Commission, PWC advised that alarm systems were updated and implemented as per the recommendation.</p>	n.a.	31 Jan 2020	Complete
	<p>b) track spinning reserve and regulating reserve separately so that it can be seen when the two are not equal.</p>	<p>On 17 August 2020, PWC advised that real time spinning reserve tracking was implemented and displayed on screen in the Control Room. The SCADA team had completed the calculations, display design and tests for tracking regulating reserve separately, and were loading it into production.</p> <p>On 12 February 2021, PWC advised the regulating reserve display is ready and that some of the necessary data has been received from TGen.</p> <p>On 16 June 2021, PWC advised regulating reserve</p>	n.a.	31 Jan 2020 revised to 30 June 2020 ¹⁵	<p>Complete</p> <p>(note: TGen is required to implement the same action (recommendation 11c), at its ROC)</p> <p>In February 2020, the Commission, with its technical advisor from Entura, provided clarification directly to TGen and PWC in relation to this recommendation.</p>

¹⁵On 30 January 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 20 February 2020. A further extension was requested on 22 April 2020, and approved by the Minister on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		tracking was implemented and displayed on screen in the Control Room and that System Control will continue to monitor the accuracy and reliability of the data and improve as business as usual. A screenshot from the Control Room display was provided as evidence.			
2	<p>Jointly report to the Utilities Commission for advice to Government:</p> <p>a) on a plan to implement improved solar forecasting</p>	<p>On 17 August 2020, PWC advised that it initially (in 2019) investigated the feasibility of developing a solar forecasting tool and sharing it with TGen, however due to licensing and ICT issues, the data cannot be readily transferred to TGen. PWC proceeded to develop its own self-learning forecasting model for behind the meter solar (System Control solar forecast tool).</p> <p>Further, PWC advised (in August 2020) it was separately progressing with other improvements, including developing a web-based 5 minute updated net system load forecast, to be available to all market participants,</p>	<p>On 30 June 2020, following advice from PWC that sharing its solar forecasting would not be possible, TGen advised it would procure its own solar forecasting and implement it into its control rooms over August and September 2020.</p> <p>Subsequently, on 18 November 2020, TGen advised it had implemented solar forecasting into its ROC and Ron Goodin Power Station control rooms, with the solution to be in place until System Control provides upgraded load forecasts that include offset of solar forecasting.</p> <p>On 16 February 2021, TGen advised it considers the best solution for all</p>	30 June 2020	<p>Complete</p> <p>PWC's Alice Springs System Demand Forecast tool provides the electricity system load forecast for Alice Springs, which takes into consideration behind the meter solar, and represents a significant improvement in the quality of data available to control room operators compared to what was available on 13 October 2019. This data is being shared with TGen and is updated on a five-minute basis. TGen confirmed in its joint report with PWC that it has implemented the forecast in its control room operations.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>including TGen by January 2021.</p> <p>On 12 and 16 February 2021, PWC provided further information on its System Control solar forecast tool, and its web-based solution.</p> <p>PWC and TGen's final joint report was provided to the Commission on 12 August 2021. Rather than a plan, the joint report advises that a solution has been implemented, being the Alice Springs System Demand Forecast tool, which includes solar forecasting. PWC and TGen report the calculation, communication and monitoring of forecast demand and solar irradiance have been incorporated into operational documents and are considered to be successfully deployed into day-to-day operations. Further, joint workgroups have been established to ensure further development and refinement of forecasting technologies for both solar irradiance and system load is part of</p>	<p>participants is for System Control (as the party holding all the information) to prepare a forecast detailing individual participant requirements to be transferred to each participant in real time (5 minute updates) to inform operational decisions</p> <p>PWC and TGen's final joint report was provided to the Commission on 12 August 2021. Rather than a plan, the joint report advises that a solution has been implemented, being the Alice Springs System Demand Forecast tool, which includes solar forecasting. PWC and TGen report the calculation, communication and monitoring of forecast demand and solar irradiance have been incorporated into operational documents and are considered to be successfully deployed into day-to-day operations. Further, joint workgroups have been established to ensure further development and refinement of forecasting</p>		

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		business as usual operations.	technologies for both solar irradiance and system load is part of business as usual operations.		
	b) for the solar forecasting data to be held by the party responsible for maintaining spinning reserve.	<p>On 16 February 2021, PWC advised the Commission that the agreed position is still that TGen is responsible for maintaining spinning reserve, and therefore should hold solar forecasting data.</p> <p>PWC and TGen's final joint report, provided to the Commission on 12 August 2021, confirms that TGen is responsible for maintaining spinning reserve in Alice Springs in accordance with an Agency Agreement between the parties, which was provided to the Commission as evidence.</p> <p>On 9 July 2021, PWC's Alice Springs Solar Forecasting tool was made 'live' on its Northern Territory Electricity System and Market Operator (ntesmo) website. The associated data is being shared with, and used by, TGen.</p>	<p>On 16 February 2021, TGen advised the Commission that it is agreed that TGen will maintain spinning reserve, and has implemented solar forecasting in its control rooms, including storage of data.</p> <p>PWC and TGen's final joint report, provided to the Commission on 12 August 2021, confirms that TGen is responsible for maintaining spinning reserve in Alice Springs in accordance with an Agency Agreement between the parties, which was provided to the Commission as evidence.</p> <p>On 30 July 2021, TGen advised that PWC developed forecasting capability that provides whole of system load forecast data (excluding Uterne solar power station) to TGen on the generation requirements that will be placed on them on a five minute increment and</p>	30 June 2020	<p>Complete</p> <p>The Commission notes that PWC's new Alice Springs System Demand Forecast tool provides the electricity system load forecast data for Alice Springs which takes into consideration behind the meter solar and is updated on a five minute basis. The data is, in effect, 'held' by PWC, TGen and any other person that accesses it on the ntesmo website. The Commission notes that the data does not include Uterne solar power station, which the Commission understands is accounted for in System Control setting spinning reserve requirements.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			update basis. The Commission understands Uterne solar power station is accounted for in System Control setting spinning reserve requirements.		
3	<p>Review and amend communication protocols to clarify how System Control is to operate during a system black event:</p> <p>a) prepare a complete plan for who may be in the control room during a major system event</p>	<p>PWC submitted the Control Room Major Incident Protocols (System Black) procedure to the Commission on 3 January 2020, which specifies, among other things, who should have access to the control room during a major event. The Commission reviewed the document and recommended it be updated to increase clarity.</p> <p>Following Commission feedback, PWC updated the procedure, with the latest version dated 2 February 2020.</p>	n.a.	31 Dec 2019	Complete
	<p>b) modify the operating protocols such that the formal primary path for communication during major system events be directly between System Control and the power stations.</p>	<p>PWC submitted its Alice Springs System Black Restart Procedure dated 27 December 2019 that sets out the communication protocol as per the recommendation.</p> <p>PWC submitted its Control Room Major Incident Protocols (System Black) to the Commission on</p>	<p>TGen submitted its Generation Black Start Procedures for the Alice Springs Power System (TGen Black Start Procedures) dated 30 December 2019 that sets out the communication protocol as per the recommendation.</p>	31 Dec 2019	<p>Complete</p> <p>Operating protocols and other relevant PWC and TGen documents have been reviewed by the Commission and are consistent with the recommendation.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>3 January 2020, which specifies, among other things, the primary path for communication during major events.</p> <p>On 11 February 2020, PWC advised that the Control Room Major Incident Protocols (System Black) document is being updated shortly, following commissioning of the radio system.</p> <p>Through discussions with PWC, the Commission was advised that the radio system had been implemented.</p>	<p>TGen advised on 19 February 2020 that it planned to have the updated ROC Principles of Operation document by end of March 2020.</p> <p>On 16 and 18 February 2021, TGen provided an updated ROC Principles of Operation document, TGen Operation Practices for Alice Springs Power System Generation document and ROC Control Room Protocol Procedure.</p>		
4	Review and report to the Commission for advice to Government on whether the AGC system is fit for purpose, and if it is still determined to be necessary, how its function and reliability are to be improved.	On 5 October 2020, PWC provided a report from its technical consultant dated 23 September 2020 which states the AGC system is fit for purpose, however several improvements are proposed to increase its reliability and further reduce operational risks, with some considered mandatory prior	n.a.	30 June 2020 revised to 31 Aug 2020 ¹⁶	Complete As PWC's technical consultant recommended improvements to increase AGC's reliability and reduce operational risks, mandatory recommendations will be tracked as subsequent actions (see the Subsequent Actions and

¹⁶On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		to placing Alice Springs generation back into AGC.			Implementation Progress section of this report).
5	Complete a study outlining options to simplify the starting and loading procedures to reduce the risk of generators tripping due to reverse power during restoration. The outcomes of the study are to be provided to the Commission for advice to Government.	n.a.	<p>On 30 June 2020, TGen advised it had received a consultant (Ekistica) report that considers the items raised in Recommendation 5. TGen advised it considered the report, and noted there were no urgent actions, with progress underway on the installation of a load bank at the Owen Springs power station.</p> <p>TGen provided a copy of the consultant report to the Commission. On 8 August 2020, the Commission provided feedback that further work and a follow-up report was necessary.</p> <p>On 21 December 2020, TGen emailed the Commission stating System Control advised the Brewer load, which was considered as part of the consultant report, had been recorded, on average, at approximately 1.2MW, and that TGen confirmed at least five Jenbacher units can maintain stable operation when operated against the</p>	30 June 2020	<p>Complete</p> <p>While the Commission considers TGen has completed the required study and put in place a solution to address the issue, it notes that without confirming the minimum stable load for the five Jenbacher units, it is not known if the combination of TGen's load bank and station load is the most cost-effective or beneficial solution.</p> <p>The Commission understands the load bank was installed primarily to enable online and offline generator testing and may not be a permanent addition to the Owen Springs power station. If the load bank is to be removed at some stage in the future, it is important that prior to its removal, TGen again investigate options and put in place a suitable solution to ensure the issues experienced on 13 October 2019 in relation to generators</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>load bank (which is now installed and commissioned) and station auxiliary loads.</p> <p>On 18 February 2021, TGen provided the Commission a letter from its consultant stating the combination of TGen's load bank and station load is a robust solution for supplying stabilising load, although finding the minimum stable load for five units may allow TGen to consider a more cost-effective avenue for supplying the required stabilising load (such as a smaller load bank).</p>		<p>tripping due to reverse power during restoration do not occur again.</p> <p>If it has not already done so, the Commission would expect TGen to appropriately update its relevant black start procedures to incorporate the use of its load bank in providing a stabilising load during a restoration.</p>
6	a) Report to the Commission for advice to Government on the ramifications of TGen being responsible for determining which machines to place into service to meet the spinning reserve requirement and System Control's other system security requirements	PWC wrote to the Commission on 3 January 2020 advising that PWC and TGen agree that the current operating state is to remain in place until further clarification is provided (presumably by Government). The high level ramifications for the current state and two other options were provided.	TGen wrote to the Minister on 24 December 2019, with a copy provided to the Commission, advising that TGen and PWC agree that TGen be responsible for selecting, and starting and stopping, its generation plant in accordance with System Control's Secure System Guidelines and Risk Notices, and that System Control is to be responsible for monitoring and compliance. TGen provided a dot point list of	31 Dec 2019	<p>Complete</p> <p>Through discussions with PWC and TGen in relation to the discrepancies in their reports, it appears that both PWC and TGen agree that the 'current approach' should continue whereby TGen be responsible for selecting, and starting and stopping, its generation plant in accordance with System</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>the benefits of this approach, which is the current operating mode, but states formalisation is needed.</p>		<p>Control's Secure System Guidelines and Risk Notices, and that System Control is to be responsible for monitoring and compliance, at least until there is a direction from Government that would require a change, such as the introduction of a wholesale electricity market and associated processes.</p> <p>The Commission has reviewed the high level ramifications listed by PWC and TGen and consider it reasonable that the 'current approach' continues (i.e. there is currently no good reason to change the current approach if it is working for PWC and TGen), subject to ensuring associated codes, operational procedures and agreements are in place and aligned with this.</p> <p>However, the Commission notes that the key benefits reported by TGen do not appear to contemplate the ramifications of the</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
					<p>'current' approach if a further (private) large scale generator connects to the Alice Springs grid, noting PWC's advice that TGen already lacks visibility of the Uterne solar photovoltaic (PV) power station (Uterne). While a solution to address this lack of visibility is likely to be relatively straight forward, noting Uterne has been operating on the Alice Springs grid since July 2015, it will be complicated if further (private) large scale generators decide to connect to the Alice Springs grid. For example, for TGen to maintain the spinning reserve through the dispatch of its machines, it would need to be able to monitor not only Uterne, but also the output of any other large scale generators to determine dispatch. This may require additional powers and/or obligations for TGen to access other generators' data and new or upgraded systems,</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
					<p>which may impact the cost of generation in Alice Springs, noting TGen would likely expect to be paid for providing these services in Alice Springs.</p> <p>Accordingly, if a new large scale generator intended to connect to the Alice Springs grid, the 'current approach' should be reviewed by PWC and TGen in consultation with Government prior to connection.</p>
	<p>b) Agree and submit to the Utilities Commission for advice to Government consistent operating protocols in relation to dispatch and load following</p>	<p>On 31 January 2020, PWC provided its current (at that time) operating protocol.</p> <p>PWC's report to the Commission on 7 February 2020 stated there remained some ambiguity on a consolidated and final set of operating protocols, which would be resolved by end February 2020.</p> <p>On 17 August 2020, PWC advised agreement had been reached that TGen is responsible for dispatch, load following and spinning reserve as outlined in its</p>	<p>On 31 January 2020, TGen submitted a Draft Operation Practices for Alice Springs document, which it stated was agreed with PWC.</p> <p>TGen advised on 19 February 2020 that it planned to have the updated ROC Principles of Operation document by end of March 2020.</p> <p>TGen advised on 19 February 2020 that it was in the process of updating its ROC Alice Springs Power System</p>	<p>31 Jan 2020 revised to 30 June 2020¹⁷</p>	<p>Complete</p> <p>Operational documents in relation to dispatch and load following are consistent between PWC and TGen as appropriate.</p>

¹⁷On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>operating protocol. Following a review of the operating protocols and agreement on content, a final updated version was issued on 27 May 2020.</p>	<p>General Operations Guide, with work anticipated to be completed by the end of April 2020.</p> <p>On 30 June 2020, TGen advised that following PWC's updated Operating Protocol for Alice Springs in May 2020, it had reviewed this document and was undertaking final consultation on its reciprocal operating practices.</p> <p>On 16 and 18 February 2021, the Commission received TGen's updated ROC Principles of Operation document, TGen Operation Practices for Alice Springs Power System Generation document and ROC Control Room Protocol Procedure.</p>		
	<p>c) Provide advice on the likely cost implications of implementing measures to avoid spinning reserve falling below 8 MW during the day for even for brief period, and recommended solution for implementation to the Utilities Commission for advice to Government.</p> <p>(Note: this Government response recommendation is related to recommendation 6d in the Commission's independent</p>	<p>On 30 January 2020, PWC requested the Commission, with its technical advisor, clarify, review and discuss this recommendation.</p>	<p>In February 2020, TGen provided a short fiscal and technical review report, which summarised indicative cost increases when increasing spinning reserve from 8 MW to 10 MW. However, no data was provided to enable verification of the findings.</p>	<p>31 Jan 2020</p>	<p>Complete</p> <p>In February 2020, to assist PWC and TGen in implementing this recommendation, the Commission, with its technical advisor from Entura, provided clarification in relation to</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
	investigation report, which Government supported in-principle)		<p>TGen stated it included a requirement to avoid spinning reserve falling below 8 MW during the day for even brief periods in operating documents for the Alice Springs system and designed alarms to prompt generation controllers to start additional generator/s at trigger points.</p> <p>TGen requested the Commission provide clarity on a number of matters in relation to this recommendation, which was provided in February 2020.</p> <p>In August 2020, TGen advised it was in the process of completing a review which includes consideration of various scenarios of spinning reserve.</p> <p>On 20 December 2020, TGen provided calculations on costs to provide spinning reserve across all regions under different scenarios, with explanation of the methodology used provided on 16 February 2021.</p>		<p>the intent of the recommendation.</p> <p>TGen's report, along with information provided by Entura, PWC and TGen in relation to this recommendation between February 2020 and February 2021, addresses the cost of increasing spinning reserve from 8 MW to 10 MW in Alice Springs and the intent of the recommendation more broadly. Based on the information provided to the Commission, it is appropriately clear to all relevant parties that a 'just in time' approach to the preservation of spinning reserve during predictable load events is not recommended, with TGen's role (under an Agency Agreement with PWC) to maintain spinning reserve requirements set by System Control.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			On 24 February 2021, TGen provided the underlying data from its assessment of the costs of increasing spinning reserve from 8 MW to 10 MW in Alice Springs based on its current dispatch model.		
7	Other procedural recommendations include: a) a System Control Black System Restart Procedure is to be prepared	PWC submitted System Control Alice Springs System Black Restart Procedure dated 27 December 2019.	n.a.	31 Dec 2019	Complete
	b) PWC amend the PUG procedure to require that the PUG be convened within 90 minutes of system black for any future event	PWC submitted an extract from the Emergency Operation Plan and Standard Operating Procedure on 3 January 2020 that sets out System Black Specific responsibility for PUG Leader to hold a meeting within 90 minutes as per the recommendation.	n.a.	Immediately	Complete
	c) OSPS to be responsible for energising the 66 kV busbars	In its 7 February 2020 report to the Commission, PWC requested the Commission, with its technical advisor, provide clarification on this recommendation.	In its 7 February 2020 report to the Commission, TGen stated that it does not agree with this recommendation and that this has been reflected in its TGen Black Start Procedures.	30 June 2020	Complete The Commission notes that Government's Response appears to have incorrectly copied or interpreted the UC's recommendation which was that the split of responsibilities should be at the <u>station</u> 66 kV

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
					<p>busbars, not all 66 kV busbars.</p> <p>The Commission has reviewed TGen's Black Start Procedures and PWC's Alice Springs System Black Restart Procedure and notes it appears the intent of the recommendation has been achieved, which is that TGen is allowed to start its machines and achieve stable operation, at its own discretion, according to its own procedures and with a minimum need to communicate with any external party including PWC (other than for coordination/confirmation purposes).</p> <p>While the Commission considers the status of this action complete, it notes PWC's request for clarification on the recommendation. Accordingly, the Commission, with its technical advisor from Entura, will provide clarification on this recommendation, as requested, directly to</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
					PWC (and to TGen for information).
	d) a formal set of black start procedures to be updated, harmonised, printed and stored prominently at all control room and power station sites	Email of 30 December 2019 provided as evidence stating these procedures have been placed/updated in the relevant document portal and hard copies placed in the control room, with operators notified.	A number of emails dated 30 December 2019 were provided as evidence stating hard copies of these procedures had been placed at Owen Springs and Ron Goodin power station control rooms and the ROC and communicated to staff.	31 Dec 2019	Complete
	e) the OSPS operator is to be provided a higher level of autonomy to implement the station's black start procedure	n.a.	TGen Black Start Procedures dated 30 December 2019 submitted, which stated control will be handed back to local station level to manage station black events as per the recommendation.	31 Jan 2020	Complete
	f) various system black procedures should be rehearsed at regular intervals, both individually and in coordination	<p>In its 7 February 2020 report to the Commission, PWC advised a desktop exercise was undertaken in January 2020 and that System Control would determine the appropriate time to complete a 'real time' exercise based on system risks.</p> <p>In August 2020, PWC advised it was waiting for the load bank installation and commissioning at the Owen Springs power</p>	TGen advised the first drill (desktop exercise) was held on 20 January 2020, and provided a copy of the signed attendance sheet, agenda and minutes, including recommendations to update the TGen Black Start Procedures to make improvements.	31 Jan 2020	<p>Initial complete</p> <p>Ongoing</p> <p>The Commission will track and report further black start exercises, and separately under the Subsequent actions and implementation progress section of this report, the inclusion of exercise recommendations in future TGen Black Start Procedures, as considered appropriate.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		station in order to conduct a system black restart practical exercise.			
	g) all technical staff should have a simple training record, potentially based on the Engineers Australia Continuing Professional Development model, to address views expressed in interviews that training for operational staff is limited.	<p>On 17 August 2020, PWC advised it budgeted to establish a technical training framework in 2020-21 and recruited a dedicated team to ensure training is developed in line with industry best practice. PWC stated the review of training modules was in progress and an auditable training records system will be established.</p> <p>On 2 February 2021 PWC provided the Commission a copy of its comprehensive 'System Control Training Framework,' which was approved by PWC on 30 November 2020. Evidence of implementation was provided to the Commission on 10 February 2021, including a copy of information provided to staff and a training record.</p>	<p>On 30 June 2020, TGen advised its Learning & Development team had reviewed training planning, documentation and process in the context of a continual professional development framework.</p> <p>On 2 October 2020, TGen provided the Commission a copy of its training plan for 2020-21, a screen shot of a training record taken from its MyHub system and a Training Compliance Strategic Project document, including associated milestones for implementation.</p> <p>On 16 February 2021, TGen advised its Training Compliance Strategic Project document was scheduled for final review by the Executive Leadership Team on 24 February 2021. TGen provided its draft Compliance Training</p>	30 June 2020 revised to Dec 2020 for PWC ¹⁸	Complete

¹⁸On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>Procedure and advised a review of the Skills Matrix had been completed and approved. TGen advised once the Skills Matrix was updated in MyHub a gap analysis report would be generated to identify any additional training that is required as a result of changes to the matrix.</p> <p>On 30 April 2021, TGen provided evidence that its Skills Matrix was updated in MyHub, with its final approved Compliance Training Procedure and Training Compliance Strategic Project document provided on 30 July 2021.</p>		
8	<p>Make engineering changes to avoid the Jenbacher units becoming overloaded during power system events:</p> <ul style="list-style-type: none"> • modify OSPS control system so that AGC raise signals are not passed to Jenbacher machines that are operating above their de-rate limit • do not add a further power control loop outside of an existing power control loop • consider designing the outer control loop so that it automatically suspends its own operation, when the system frequency is a small margin below the UFLS stage 3 set point. 	n.a.	<p>In its letter of 31 January 2020 to the Commission, TGen stated it had implemented a modification that ensures AGC raise signals that would trigger the Jenbacher units to operate above their de-rate limits are not passed onto the machines.</p> <p>In its 2 June 2020 letter to the former Minister for</p>	31 Jan 2020 ¹⁹	<p>Complete</p> <p>In February 2020, the Commission, with its technical advisor from Entura, provided clarification directly to TGen in relation to this recommendation.</p>

¹⁹On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>Renewables, Energy and Essential Services, TGen advised the current outer control loop was effective in most situations, however when the Jenbacher units are operating in a de-rated state there remain limitations to their performance.</p> <p>On 4 February 2021, TGen advised it was working actively with the supplier of the Jenbacher units to implement further controls required by System Control at the unit control system level and the unit level. This includes testing in November, December and January, with further testing being undertaken in February 2021.</p> <p>On 30 July 2021, TGen advised a software update to the unit control system, applied to all Jenbacher units by 30 June 2021 was tested as effective at limiting the output of the Jenbacher units such that they will not operate above their de-rate limit.</p>		
9	Make further control changes and investigations of the performance of the Jenbacher units:	n.a.	In correspondence of 28 January 2020, TGen	31 Jan 2020	Complete

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
	a) investigate and address issues in relation to the need for Dia.ne control system reboot after a unit trip		<p>stated it had commenced investigation, with its contractor and the manufacturer of the Jenbacher units.</p> <p>TGen requested approval from the former Minister for additional time (31 May 2020) to undertake the investigation and risk assessment prior to implementation of any change. This was approved by the former Minister.</p> <p>In its 26 May 2020 progress report, TGen advised detailed investigation, analysis, and potentially design and implementation work is required by the supplier of the Jenbacher units. TGen stated that as the supplier is the only authorised Australian agent for the units, it is not able to get support from another source.</p> <p>In its 4 February 2021 report to the Commission,</p>	revised to 31 May 2020 ²⁰	

²⁰On 28 January 2020 TGen requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 14 February 2020. On 2 June 2020 TGen requested an additional extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>TGen advised updated versions of the Dia.ne control system have been developed, with the manufacturer / supplier onsite for testing in November, December and January. TGen advised the most recent revision tested in late-December 2020 has been effective, however further testing is being undertaken in February 2021 to ensure there are no unintended impacts on the operation of the units.</p> <p>On 11 August 2021, TGen advised that the software update applied to all Jenbacher units on 30 June 2021 was tested as effective at resolving the need to reboot the Dia.ne system following a trip to enable the unit to re-synchronise with the power system.</p>		
	b) remove all power factor limiters and replace them with limiters that reflect likely mechanisms of damage to the machines	n.a.	In its 7 February 2020 report to the Commission, TGen stated the action is complete, tested and verified. TGen provided a copy of the Generation Outage/Testing Request submitted, to and processed by, System	31 Jan 2020	Complete

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			Control on 1 November 2019 as evidence.		
	c) review and adjust the under frequency settings to ensure that they are no more sensitive than is necessary to protect the machines from damage	n.a.	TGen provided as evidence on 7 February 2020 a summary of its review which concluded that no adjustment is necessary.	31 Jan 2020	Complete
	d) determine and address the source of an apparent inability of the Jenbacher machines to respond to sudden application of load exceeding 10% of their rating.	n.a.	<p>In its 28 January 2020 correspondence, TGen stated the issues encountered during the restoration following the Alice Springs System Black on 13 October 2019 were subject to an ongoing investigation, and it was evaluating options to enable testing of the Jenbacher units without risk to the stability of the grid.</p> <p>TGen requested approval from the former Minister for additional time (30 April 2020) to undertake this work, which was approved.</p> <p>On 9 October 2020, TGen confirmed it completed physical connection of a</p>	31 Jan 2020 revised to 30 April 2020 ²¹	Complete

²¹On 28 January 2020 TGen requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 14 February 2020. On 2 June 2020 TGen requested an additional extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>load bank at the Owen Springs power station and was completing protection settings and commissioning. A load bank was required, among other reasons, to test the Jenbacher units.</p> <p>On 18 November 2020, TGen provided an investigation report stating testing of the units indicated they are able to accept load application of up to 20 per cent within their ISO.</p> <p>However, on 16 February 2021, TGen stated to ultimately demonstrate the capability it was seeking to undertake tests agreed with System Control to confirm the capability of the units on the power system in a Black Start situation including the addition of extra load. The test was conducted on 10 September 2021.</p> <p>The Commission received written confirmation from PWC System Control on 17 December 2021 that it agrees with TGen that the Alice Springs Jenbacher machines demonstrated</p>		

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			they can respond to a sudden application of ~ 10% of their rating.		
10	a) Make engineering changes to ensure the BESS does not become overloaded during power system events	<p>This action is not for PWC, however PWC provided comment in its August 2020 report to the Commission on this recommendation.</p> <p>On 17 August 2020, PWC advised that TGen had implemented the initial agreed changes to the BESS limiters as an interim solution. Further, PWC considered TGen was required to provide analysis on the initial mal-operation of the BESS and provide a report demonstrating that the BESS will operate correctly and the root cause has been resolved.</p> <p>On 28 January 2022, PWC System Control advised it is of the opinion that TGen has met the requirements of the recommended action.</p>	<p>In correspondence on 31 January 2020, TGen stated this action was completed on 15 October 2019. An extract from a TGen report into the BESS was provided as evidence in its 7 February 2020 report to the Commission.</p> <p>In August 2020, TGen advised that while its solution makes allowance for any overshoot of the 7 MW limiter, it was considering System Control suggested improvements and continuing to work with the supplier of the BESS, and other expert OEM consultants to identify the root cause of the overshoot and further improvement to the operation of the BESS.</p> <p>On 4 February 2021, TGen advised that it had applied and tested a 5 MW cap to the output of the BESS,</p>	31 Jan 2020 ²²	Complete

²²On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>and while an overshoot of the cap still occurred during testing, the cap was shown to be effective at preventing overloading of the BESS during generation trips up to and including 11 MW.</p> <p>Further, TGen advised it is still undertaking the additional work, including investigating the possibility of further changes, and confirmed it will address the root cause.</p> <p>On 30 July 2021, TGen advised it is continuing investigations on the performance of the BESS and options for changes to BESS settings to improve its operation. Further testing is expected to be completed over August and September 2021.</p> <p>On 2 December 2021, TGen provided a report indicating the root cause of the issue had been identified and resolved.</p>		

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
	b) In relation to the inrush current of the BESS, undertake studies to determine how the BESS should be used during a system black event.	n.a.	<p>In correspondence of 31 January 2020, TGen stated the inrush current of the BESS had been determined and data shared with System Control, which would be considered in the assessment of any future black start modelling.</p> <p>On 19 February 2020, TGen advised studies to determine how the BESS should be used during a system black event would be undertaken as part of addressing Recommendation 5, which was due on 30 June 2020. TGen expected to have a draft report by the end of March 2020.</p> <p>The Commission reviewed the report provided in relation to Recommendation 5 and did not consider it sufficiently covered how the BESS should be used during a system back event.</p>	31 Jan 2020 ²³	<p>Complete</p> <p>The Commission accepts TGen's advice as the BESS owner that the BESS should not be used at all during system restorations following a system black event.</p>

²³On 2 June 2020 TGen requested an extension of time to 31 December 2020, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
			<p>On 30 June 2020, TGen advised that TGen and PWC would consider the benefit of upgrades to the capability of the BESS, including the possibility of implementing a grid forming capability.</p> <p>In August 2020 TGen advised, following discussions between TGen and PWC, System Control confirmed that it will make the decision if, and when, the BESS would be used as part of system black recovery procedures.</p> <p>On 16 February 2021, TGen advised its view that the BESS should not be used at all during system restoration following a system black event, noting the BESS control philosophy was never intended to assist with system restoration. TGen stated that in future work, in collaboration with System Control, it will consider the benefits of potentially changing the operating mode</p>		
11	Address issues adversely affecting system security. In particular:	This action is not for PWC, however PWC provided comment in its report to the	In correspondence of 31 January 2020, TGen stated the issue was	31 Jan 2020	Complete

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
	a) investigate and implement modifications to stop the Man units (or any other unit) coming out of AGC control without an operator command or unforeseeable fault condition	Commission on this recommendation. In August 2020, PWC provided a report from a TGen consultant which provided evidence that the issue was identified and rectified. Further, PWC provided confirmation that AGC testing was conducted in May 2020 and the issue was resolved.	investigated and an update had been implemented to rectify the issue. TGen stated final testing of the solution was being planned with System Control. In its 30 June 2020 progress report, TGen stated testing of the AGC system was completed in May, and TGen was waiting on advice on the outcomes from the testing.		
	b) add alarms that rapidly bring to the ROC operator's attention that a generator has come out of AGC control	n.a.	TGen advised that it implemented the recommended alarms on 24 October 2019 and provided evidence of implementation.	31 Jan 2020	Complete
	c) Track spinning reserve and regulating reserve separately.	Implementation of this recommendation is the responsibility of TGen, however it is related and linked to recommendation 1b, which is the responsibility of PWC.	On 9 August 2021, TGen advised it is tracking spinning reserve and regulating reserve separately. A screenshot of the Alice Springs control screen used in TGen's control room was provided as evidence.	31 Jan 2020 revised to 30 June 2020 ²⁴	Complete (note: PWC is required to implement the same action (recommendation 1b), at its Hudson Creek control centre) In February 2020, the Commission, with its technical advisor from Entura, provided clarification directly to

²⁴On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020. On 1 July 2020, PWC requested a further extension to 31 October 2020, however on 23 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
					TGen and PWC in relation to this recommendation.
12	Undertake the recommended review into the UFLS scheme and provide the review report to the Commission for advice to Government.	<p>On 17 August 2020, PWC advised studies had commenced on the implementation of revised UFLS settings. However, further information and clarity was required from TGen on the Jenbacher generator and BESS models to complete this task, which was reliant on TGen installing a load bank at Owen Springs Power Station.</p> <p>On 31 December 2020, PWC advised the models received from TGen were 'preliminary' and estimated validated models from TGen may be delivered in two to three months, following testing and potential generation unit control system upgrades.</p> <p>On 12 February 2021, PWC advised that TGen was progressing with testing and model</p>	n.a.	30 June 2020 ²⁵	<p>Underway</p> <p>The Commission understands the review of the UFLS scheme cannot progress until TGen's models for the Jenbacher units and BESS are validated.</p> <p>The Commission notes PWC's previous advice that the current UFLS scheme is in service and has demonstrated performance through major system events. Notwithstanding, and recognising there is an industry-wide shortage of engineering modelling experts impacting the prerequisite validated models, the Commission considers work to optimise UFLS settings is still necessary and should be completed as soon as possible.</p>

²⁵On 2 June 2020, TGen requested an extension of time to 31 December 2020 for elements of recommendation 12 that it is responsible for, however on 13 July 2020 the former Minister for Renewables, Energy and Essential Services deferred a decision on the extension until after the Commission's August 2020 Progress Report. Subsequently, the Minister did not 'approve' or 'not approve' the requested extension.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>validation and that it continues to work with TGen to complete the work at which time PWC can commence the UFLS review.</p> <p>On 11 August 2021, PWC advised it was still actively working with TGen to obtain and validate all the necessary models, including converting the format for historical Ron Goodin power station models to the current format given Ron Goodin power station is to continue operations for longer than originally planned. The BESS model was still outstanding.</p> <p>On 28 January 2022, PWC advised that a review of TGen's models for the Jenbacher units is underway and once validated, the final component for UFLS improvements are validated BESS models. These are dependent on recommissioning of the BESS following improvements to performance.</p>			

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
13	a) Prepare a spreadsheet tracking the recommendations from the independent investigation and the recommendations of any completed major incident reports since January 2015. The tracking spreadsheet is to be provided to the Commission and its adequacy assessed by the Commission	PWC System Control provided an updated working version of its recommendation tracking spreadsheet to the Commission in July 2020, which the Commission considers meets the intent of the recommendation.	n.a.	31 Dec 2019	Complete The Commission notes that updating of the recommendation tracking spreadsheet is an ongoing task and that it has provided feedback in relation to the design and use of the spreadsheet, however considers this is part of a continual improvement process.
	b) Complete all outstanding major incident reports and incorporate all recommendations into the tracking document.	System Control met its commitment to submit to the Commission all outstanding major incident reports older than six months old by 31 December 2019.	n.a.	30 June 2020	Complete Ongoing
14	Publish a report on the implementation of recommendations of the independent review and other major incident reports every six months for a period of two years, with the first report by the end of February 2020.	n.a.	n.a.	29 Feb 2020 The fifth Progress Report (this report) is due by end February 2022.	Initial complete This Progress Report is the fifth report published as requested.
15	a) In collaboration with relevant stakeholders, is to update communications protocols, response plans and procedures for the protection of vulnerable customers in the event of electricity supply interruptions	PWC submitted an extract from the Emergency Operation Plan and Standard Operating Procedure on 3 January 2020 that sets out System	n.a.	31 Dec 2019	Complete

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>Black Specific responsibility for the PUG Leader to hold a meeting within 90 minutes as per recommendation 7b.</p> <p>On 14 August 2020, PWC provided a published Life Support Procedure and associated Life Support Unplanned Outage Notification Instruction, which includes the notification of life support customers and the Department of Health.</p> <p>Following the Commission's feedback, an updated version of the Life Support Procedure and associated Life Support Unplanned Outage Notification Instruction was provided to the Commission on 31 December 2020.</p>			
	<p>b) Liaise with the Department of Health and provide the portfolio Minister, Treasurer, Minister for Health and Utilities Commission with advice on jointly agreed responsibilities for advising vulnerable customers, including those requiring life support equipment in their homes, on emergency action and remedial plans in the</p>	<p>On 22 April 2020, PWC advised this activity was delayed due to the COVID-19 situation.</p> <p>On 1 July 2020, PWC advised the Department of Health had provided the</p>	n.a.	31 Jan 2020 revised to 30 June 2020 ²⁶	<p>Complete</p> <p>Based on the information provided by PWC and the circumstances whereby an MOU with the Department of Health was not able to be</p>

²⁶On 22 April 2020, PWC requested an extension of time. This was approved by the former Minister for Renewables, Energy and Essential Services on 26 May 2020.

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
	<p>event of any unplanned electricity supply interruptions.</p>	<p>on-call contact number for Tennant Creek and Alice Springs Health Services.</p> <p>On 31 December 2020, PWC advised it had drafted a proposed Memorandum of Understanding (MOU) to reflect PWC and Department of Health responsibilities in relation to managing life support customers during extended power outages.</p> <p>On 12 February 2021, PWC advised the Department of Health requested amendments to the proposed MOU and further engagement with Department of Health is required, noting COVID-19 is currently the Department of Health's priority. PWC also advised that it is investigating alternative approaches, such as a dedicated phone number for life support customers to call.</p> <p>On 16 June 2021, PWC provided the Commission a copy of its letter to the Department of Health CEO advising the steps it has implemented to address concerns in relation to</p>			<p>achieved, it appears that PWC has taken all reasonable steps to ensure premises registered as having persons requiring life support equipment (including those residing in aged care facilities) and the DoH Emergency Management Team/s, are appropriately advised in the event of any significant unplanned electricity supply interruptions.</p> <p>Notwithstanding, where PWC has gone 'above and beyond' its formal obligations, it should be noted that PWC could choose to 'pull back' its commitment at any stage. Further, PWC's approach focusses on customers reliant on life support equipment and may not capture all persons the government considers are vulnerable and should be contacted in the event of any unplanned electricity supply interruptions. As such, the Commission still recommends that</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		<p>vulnerable customers requiring life support equipment in the event of an extended power outage.</p> <p>On 11 and 13 August 2021, PWC advised it identified 15 aged care facilities in the Territory, and provided evidence that it wrote to the associated aged care facility operators advising that where there is a customer residing or intending to reside at a premises requiring life support equipment, they may register as a life support equipment customer and that in the event of an unplanned outage, PWC advises registered life support customers to enable them to enact their Emergency Medical Management Plans and make alternative arrangements should the outage continue. PWC's letter also advises that in the event of an unplanned outage, it also contacts the Department of Health Emergency Management Team/s.</p> <p>On 2 November 2021, PWC provided evidence</p>			<p>government consider allocating explicit, formal responsibility to an appropriate party to advise a defined group (or groups) of vulnerable customers in the case of a system black or other significant unplanned interruption.</p>

ID	Recommendation	PWC/System Control	TGen	Due date	Status/UC Comment
		that it had communicated the steps it has taken to the Treasurer and Minister for Health.			

MAJOR INCIDENT REPORTS – RECOMMENDATIONS AND PROGRESS

Consistent with recommendation 13a, PWC System Control provided a version of its recommendation tracking spreadsheet to the Commission in July 2020, which the Commission considered met the intent of the recommendation.

PWC System Control has continued to refine its major incident recommendation tracking spreadsheet to improve the relevance and usefulness of the document, and has developed associated indicators for analysis and reporting of recommendations, which the Commission has reviewed and is satisfied with the adequacy.

Following PWC System Control's detailed review of outstanding recommendations in the period following the system black in Alice Springs, it has continued to make good progress in tracking, implementing and closing out recommendations across the Darwin-Katherine, Alice Springs and Tennant Creek power systems. As an example, in relation to Alice Springs, PWC System Control reported 14 fewer outstanding recommendations in February 2022 compared to its August 2021 report, with the majority of those completed related to longer term outstanding recommendations (24+ months).

As stated in previous progress reports, it would be unrealistic to expect the number of incidents and associated recommendations to ever be zero, noting power system incidents happen in all power systems and unless a recommendation is in relation to a non-compliance with a code or other legislative obligation, the system participant is not obliged to implement PWC System Control's recommendation.

PWC System Control has advised that when a recommendation is not related to a compliance issue, it now actively seeks to negotiate with the system participant/s to encourage action. PWC System Control provided examples where this negotiation has been successful, resulting in improvements and reducing potential risk to the power system.

Notwithstanding, the Commission understands there are (and will likely be in the future) some PWC System Control recommendations that system participants may not agree to action, such as recommended 'improvements' where a financial or other resource commitment is needed and the recommendation is not linked to a regulatory obligation. These will be more difficult to close out, and where PWC System Control considers the matter puts power system security and or reliability at risk, consideration should be given to strengthening obligations in the System Control Technical Code or other relevant legal instrument, subject to consideration of the costs and benefits and thorough stakeholder consultation.

Through this report and other relevant Commission reports, the Commission will continue to monitor PWC System Control's progress and tracking of major reportable incident recommendations, and report and take action as appropriate.

SUBSEQUENT ACTIONS AND IMPLEMENTATION PROGRESS

The Commission intends to monitor and report the full end-to-end process of implementing recommendations from the Government response.

For example, where there is a Government accepted recommendation to consider an issue and a recommended solution, the obligation does not stop once a recommendation has been made. Once accepted, the recommendation becomes another action to be implemented and reported. This approach will ensure the original issues identified are fully addressed.

Table 3 below provides a list of subsequent actions for implementation and an update on progress.

Table 3: Subsequent actions and status of implementation

ID	Subsequent action	Responsible	Status
S1	The Commission, with its technical advisor will provide clarification directly to PWC and TGen in relation to Government response recommendations 1, 6, 7 and 8.	Utilities Commission	Complete Letter providing clarification sent to PWC and TGen with an embargoed copy of the Progress Report on 27 February 2020.
S2	Following the desktop exercise held in January 2020 in relation to Government response recommendation 7f, TGen to update its Black Start Procedures and submit to System Control for approval in late February 2020, following investigation of the more technical recommendations from the exercise.	TGen	Complete On 24 February 2021, TGen advised that it continues to have an approved Black Start Procedure in place, has undertaken further consultation with System Control and in August 2020, completed internal review of its procedure. TGen stated it and PWC, including operators, have been updating their procedures to ensure they are aligned and it is confident that the current draft documents incorporate the best information available to PWC and TGen. TGen stated final review and approval of the updated procedure is underway and once signed off, it will be forwarded to System Control. The final approved Owen Springs Black Start procedure was provided to the Commission on 10 February 2022.

ID	Subsequent action	Responsible	Status
S3	<p>Implement improvements recommended by PWC's technical consultant to increase AGC's reliability and reduce operational risks:</p> <ul style="list-style-type: none"> a) System Control identify, record and monitor AGC performance for all operating areas on at least a monthly basis (PWC Reference 1) b) System Control conduct a unit limit data verification process and, where possible, include telemetered limits into the control function of AGC to improve dispatch reliability (PWC Reference 4) c) System Control consult with TGen to identify, where possible, appropriate increases to the 'normal' and 'emergency' ramp rates for OSPS and RGPS units (PWC Reference 5) d) System Control implement an alternative Darwin to Alice Springs communications pathway, or another suitable solution, such that it is consistent with the N-1 criteria applied to other parts of the SCADA communications network core (PWC Reference 7) e) System Control implement an alternative Darwin to Alice Springs communications pathway, or another suitable solution, such that it is consistent with the N-1 criteria applied to other parts of the SCADA communications network core (PWC Reference 7) f) System Control further investigate and address the root-cause of the intermittent application communication failures (PWC Reference 8). 	PWC	<p>Action no longer considered necessary given current circumstances.</p> <p>On 12 November 2021, PWC advised the Commission in writing that the AGC will not be used in Alice Springs in the foreseeable future, noting TGen currently provides the Alice Springs generator control function for PWC System Control under a services agreement.</p> <p>While the Commission agrees there is no need to implement AGC improvements if it is not to be used, if PWC ever intends to implement AGC in Alice Springs in its current form, it is imperative that PWC allocates sufficient time and resources to increase AGC's reliability and reduce operational risks prior to relying on it.</p>