Independent Expert Report - Compensation for Direction 16 November 2019

Final Report

3 March 2020

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Executive Summary

Synergies Economic Consulting (Synergies) was appointed by the Australian Energy Market Operator (AEMO) as an independent expert to determine the fair payment price for services provided by the participant as per National Electricity Rules (NER) clause 3.15.7A(b1). The services in question relate to the period when the directed participant was directed for one of its non-scheduled generating units ("the generating unit") to restore and maintain power system security by reducing output from that unit to zero and disconnecting at 19:35 on 16 November 2019.

In accordance with the NER, Synergies made its draft determination and issued a draft report on 22 January 2020. Synergies received no submissions on the draft determination but has carried out further research into questions bearing on the determination. Our further research clarifies some of the technical details of the operation of the system but has not changed our view since we gave our draft determination.

We consider the direction to the directed participant was a direction to unbind a constraint acting on the output of the generating unit. On this basis, Synergies does not regard the direction as a direction for other services and we consider that the directed participant did not "provide services under the direction" as required by 3.15.7A(a1). On this basis, we conclude that no compensation is payable to the directed participant. Our reasoning can be summarised as follows:

- A direction to a generator to reduce its output to zero and disconnect to stop a constraint acting upon that generator from binding should not be regarded as a direction to provide "other services";
- For generators participating in the dispatch process, the set of constraint types that can validly form the basis of a direction regarded as a "dispatch instruction" is limited by clause 3.8.1(b);
- The system strength constraint SA_ISLE_STRENGTH_LB is of a type that may not be accommodated in the set of constraint types listed in 3.8.1(b), although it is expressly identified as a requirement that AEMO must ensure is met as part of maintaining system security as per clause 4.2.6(g);
- For a non-scheduled generating unit, a direction of the type in question should not be interpreted as a dispatch instruction and, therefore, a wider set of constraint types could be validly considered by AEMO without resulting in the direction being characterised as a direction for services;

- the generating unit is to be regarded as having been constrained off because the constraint in question was of a type provided for within the system security framework of Chapter 4 of the NER; and
- Given the above, the direction should not be regarded as a direction to provide services and, therefore, the directed participant is not entitled to compensation as a result of the direction.

Synergies is issuing this final report on 3 March 2020. The Directed Participant has been notified of our final determination, the reasons for our conclusion and the compensation payable.

Synergies
ECONOMIC CONSULTING

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1 Introduction

1.1 Context

Synergies Economic Consulting (Synergies) was appointed by the Australian Energy Market Operator (AEMO) as an independent expert to determine the fair payment price for the services provided by a market participant directed pursuant to direction issued on 16 November 2019 (the directed participant) as per NER clause 3.15.7A(b1). The services in question relate to the period when the directed participant was directed for one of its non-scheduled generating units (the generating unit) to restore and maintain power system security by reducing output to zero and disconnecting.

AEMO is required by the NER to use reasonable endeavours to complete all obligations, including final settlement, such that the final determination of all total amounts payable or receivable by AEMO for each intervention event are reflected: "in the routine revised statement issued approximately 30 weeks after the relevant billing period" (3.12.1(a)). The intervention timetable requires that a final determination be delivered no later than 6 March 2020. This will allow AEMO to complete the intervention settlement process by the required deadline of 11 June 2020.[1]

Synergies made its draft determination and issued a draft report on 22 January 2020. Synergies received no submissions on the draft determination but has carried out further research into questions bearing on the determination. Our further research clarifies some technical details of the operation of the system but has not changed our view since we gave our draft determination.

1.2 Structure of this report

In the remainder of this report, we set out the basis for our final determination of compensation for the directed participant as a directed participant under the NER.

- Section 2 summarises the circumstances of the direction, Synergies appointment and the requirements of the independent expert;
- Section 3 sets out our analysis of the issues;
- Section 4 gives our conclusion as to compensation payable and summarises our reasoning.

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1 AEMO (2019) *Intervention Settlement Timetable - SA other direction -16 Nov 2019*, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Settlements_and_Payments/Prudentials/Settlement-Timetables/2019/Intervention-Settlement-Timetable-SA-other-direction-16-Nov-2019.xlsx.

2 Background

2.1 Circumstances of the direction

According to AEMO, between 1806 hrs and 2259 hrs on 16 November 2019, South Australia (SA) was separated from the rest of the NEM due to a non-credible outage of Heywood – APD – Mortlake 500kV transmission line and Heywood – APD – Tarrone 500kV transmission line. Following the separation, constraint sets were invoked to manage the outage of the 500 kV transmission lines. Between dispatch intervals ending 1820 hrs and ending 2000 hrs on 16 November 2019, a number of Frequency Control Ancillary Services (FCAS) constraint equations and a system strength constraint equation violated.

The system strength constraint is the relevant constraint for the purposes of this determination, expressed in equation SA_ISLE_STRENGTH_LB, which sets the maximum limit to 0 MW for Lake Bonney (1, 2 and 3) and Canunda Wind Farms when the South Australian region is operating in an islanded state. AEMO requested these wind farms to reduce their output to zero and disconnect, with one of the generators complying with this direction. AEMO then directed the directed participant to limit the generating unit to zero and disconnect between 1935 hrs and 2300 hrs – see Table 1. Hereafter, we refer to this direction as "the directiondirection".

Table 1 Summary of the South Australia direction on 16 November 2019

Direction	Directed Participant	Issue time	Cancellation time	Explanation
the generating unit	the directed participant	1935 hrs, 16 November 2019	2300 hrs, 16 November 2019	To remove all turbines from service at the generating unit.

Source: AEMO (2019) Preliminary Report Non-Credible Separation Event South Australia – Victoria on 16 November 2019, December.

2.2 Appointment of Independent Expert

The direction was given to a non-scheduled generator, separate from the dispatch processes and not concerned with the provision of energy and ancillary services. On this basis, any services provided fall under the scope of clause 3.15.7A, which provides:

> (a) Subject to clause 3.15.7(d) and clause 3.15.7B, AEMO must compensate each Directed Participant for the provision of services pursuant to a direction other than energy and market ancillary services, at the fair payment price of the services determined in accordance with this clause 3.15.7A.

Pursuant to clause 5.15.7A(b), AEMO has determined that an independent expert could reasonably be expected to determine a fair payment price for the services provided in the case of the direction to the generating unit of 16 November and appointed Synergies under clause (b1) to provide this determination.

2.3 Requirements of Independent Expert

In making its determination in accordance with 5.15.7A(c)(1) Synergies must:

- take into account other relevant pricing methodologies in Australia and overseas, including but not limited to:
  - other electricity markets;
  - other markets in which the relevant service may be utilised; and
  - relevant contractual arrangements which specify a price for the relevant service; and
- disregard the disinclination of the provider to provide the services and the urgency with which the services were needed;
- treat the directed participant as willing to supply at the market price that would be expected to prevail for the service under similar supply and demand conditions; and
- deem the fair payment price to be that which would prevail in a market for the service under similar supply and demand conditions.

Synergies confirms that for the purposes of this determination we have disregarded any disinclination by the directed participant to provide any services. We have treated the directed participant as having been willing to supply any services actually supplied at the market price that would be expected to prevail for the service under similar supply and demand conditions.

The Rules require that Synergies prepare and publish a report:

- describing the services provided by the directed participant (if any) as a result of the direction 5.15.7A (c)(2)(i);
- providing our assessment of the fair payment price of any service(s) provided; and
- setting out our methodology and assumptions.

3 Analysis

3.1 A constrained off generator should not be compensated

The question to address in this determination is whether the direction can properly be regarded as a direction to the directed participant to provide "other services" for the purposes of clause 3.15.7A(b). At a high level, this question has a straight-forward answer. Where a generator is constrained off because its operation violates a pre-determined constraint recognised under the NER, then any direction to that effect should not be construed as a direction to provide other services. This was our position in a previous determination we prepared on directions of 1 December 2016 (published in June 2017)[2].

Under the NER, generators only have a qualified right to output and be paid for their energy (and hence to be compensated if they cannot). The central qualifier on generator's rights to output energy is that their operation must not violate constraints, in which case they must change their output such that the constraints cease to be violated. No financial compensation is payable in the NEM where generators are forced (for instance, by a direction) to change their output to prevent their operation from violating a constraint.

The constraint equation SA_ISLE_STRENGTH_LB has the result that, when the South Australian region is operating in an islanded state, the generating unit's output must be zero. Thus, so long as the generating unit continued to output above zero, it was causing the constraint equation to be violated. As such, the direction issued by AEMO to the directed participant involved the generating unit being constrained off. This interpretation points to the conclusion that the directed participant was not directed to provide services and, therefore, should not be compensated pursuant to clause 3.15.7A.

The facts surrounding the direction differ in some respects from those of our earlier determination in relation to directions of 1 December 2016. In the analysis that follows, Synergies has explored the nature of a system strength constraint and the relevant provisions of the NER in some depth. Our purpose in doing so is to test our *prima facie* interpretation that the generating unit was indeed constrained off for the purposes of the NER and therefore was not directed to provide services.

2 Synergies (2017) *Final report on compensation related to directions that occurred on 1 December 2016*, June, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Market_Event_Reports/2017/Final-Determination-of-fair-payment-price-additional-AGL-claims.pdf, accessed 15/01/2020.

3.2 Basis of the direction and status of directed party

Section 116 of the NEL and clause 4.8.9 of the NER establish that AEMO may direct a Registered Participant to take relevant actions to maintain or restore the security or reliability of the power system. This is clearly what has occurred in the case of the AEMO direction to the generating unit of 16 November 2019. Synergies confirmed that the generating unit is registered as a market generator by reference to AEMO current registration list[3]. Consequently, the directed participant Pty Ltd was a directed participant on 16 November 2019 for the purposes of clause 3.15.7A.

3.3 Services provided

3.3.1 Potential interpretations of the direction

When the directed participant complied with the direction to reduce its output to zero, this was the last in a series of actions that allowed AEMO to operate the South Australia island in a secure operating state for the rest of the islanded period. Thus, the action clearly provided a security benefit to the system, and in that sense, may be said to have provided a "service".

An alternative understanding of the nature of the action taken by the generating unit is that the binding of pre-specified system operating constraints prevented the generating unit from being able to continue to send out electricity. That is, the direction was not a direction to the generating unit to begin to provide a service, but rather a direction to cease violating a constraint.

3.3.2 Previous interpretation of similar direction

In our Final Report for AEMO on directions of 1 December 2016 (published in June 2017)[4], Synergies considered a direction to a Victorian generator to reduce output to zero and disconnect because its operation resulted in certain system constraints becoming binding or being violated[5]. In that instance, we characterised the direction as being as "a

[3] https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Participant-information/Current-participants/Current-registration-and-exemption-lists

[4] Synergies (2017) *Final report on compensation related to directions that occurred on 1 December 2016*, June, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Market_Event_Reports/2017/Final-Determination-of-fair-payment-price-additional-AGL-claims.pdf, accessed 15/01/2020.

[5] The constraints in question were F_S++HYSE_L5, F_S++HYSE_L6_1, F_S++HYSE_L6_2, and F_S++HYSE_L60 all of which related to the provision of FCAS Lower in SA at the time.

direction to ensure system security alone"[6] and, on this basis, we concluded that the directed participant did not "provide services under the direction".

In the related, earlier determination on the same directions, we had concluded that the NEM does not compensate generators that are constrained off in accordance with the provisions of clause 3.8 governing the dispatch process. We further concluded that there was no clear exception to this principle whether the instruction to reduce output or shut down results from a direction or from the process of implementing central dispatch.

However, the facts in the case of the directions of 1 December 2016 were different. The generator in that case was a scheduled generator and the binding constraints were of a type expressly provided for in rule 3.8 of the NER[7]. We did not consider the possibility of a constraint that could not be neatly characterised as a network constraint. Nor did we consider the implications of a direction to a non-scheduled generator where the dispatch process provided for by rule 3.8 might not be determinative as to the types of constraints able to be considered.

In view of these differences, determining whether the direction was (a) a direction to unbind a constraint acting on the output of the directed generator or (b) a direction for other services, first requires us to consider the nature of the constraint that AEMO sought to manage by issuing the direction.

3.4 The constraint

3.4.1 Summary

Prior to the direction, AEMO applied a formalised system strength assessment framework and established which combinations of generating units can be supported by the South Australian transmission network while maintaining adequate fault levels across the network. It then documented these combinations as part of its operational procedures in the Transfer Limit Advice – System Strength[8].

This document specifies that the generating unit must disconnect when the SA region is operating as an island. Synergies considers this constraint to be a system constraint as opposed to a being exclusively a network or a generation constraint. It reflects

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6 Synergies (2017) *Final Report on additional compensation claims arising from AEMO directions on 1 December 2016*, August, page 13 https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Market_Event_Reports/2017/Final-Determination_Additional-comp-claims_01-Dec-2016-Direction.pdf

7 See clause 3.8.1(b)(9) which provides for "constraints imposed by ancillary services requirements" to be among the factors accounted for in the central dispatch process.

8 AEMO (2019) *Transfer Limit Advice – System Strength*, version 22, 24 October.

limitations in both the capacity of any given combination of generators to supply fault current and of the transmission network to transfer this fault current to critical nodes in the network. This type of limitation is not explicitly provided for in the NER definition of a constraint.

3.4.2 What is system strength?

The AEMC explains the terms system strength and fault level as follows:[9]

> System strength is an inherent characteristic of a power system and it relates to the size of the change in voltage for a change to the load (or generation) at a connection point. When the system strength is high at a connection point the voltage changes very little for a change in the loading, however, when the system strength is lower the voltage would vary more with the same change in load.
>
> In addition, when a fault occurs at a connection point the current that flows into the fault is higher when the system strength is higher. This is why the system strength at a point in the power system is often referred to as the fault level.

3.4.3 Managing system strength

Framework for managing system strength

Following changes to the NER in 2017[10], the South Australian region faces system strength issues facing the South Australian region with system strength that are being, or will be, and/or will be principally managed by:

- AEMO identifying fault level shortfalls at critical nodes in the network;
- TNSPs performing the role of system strength service provider, which will procure system strength services, including from scheduled generators, to address fault level shortfalls as determined by AEMO; and
- AEMO constraining constraining-on scheduled generators that have been nominated to provide system strength services as required.

While these arrangements may in time prove sufficient to ensure system strength requirements are met in the future, the process of TNSPs procuring system strength

9 AEMC (2017) *System Security Market Frameworks Review, Directions Paper*, 23 March, page 65.

10 AEMC (2017) *National Electricity Amendment (Managing power system fault levels) Rule 2017*, 19 September.

services remains ongoing[11]. In the meantime, AEMO has been ensuring adequate fault levels are maintained by applying operational procedures regarding permissible combinations of generators.

Additional background on the development of arrangements for managing system strength is provided in Appendix A.1.

Transfer Limit Advice – System Strength

In September 2017, AEMO added the Transfer Limit Advice – System Strength to its suite of limit advice documents, which it uses to describe some of the more complex constraints it manages (see https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Congestion-information/Limits-advice).

On 13 September 2019, AEMO released version 20 of the Transfer Limit Advice – System Strength, which included the following summary of what the version updated:

> "Added Victorian system strength combinations, renamed document, revised the limit values for the SA LOW combinations and added SA risk of islanding and islanding limits."

Of particular relevance to the current assessment, version 20 of the document added the sentence:[12]

> "For SA operating as an island Total Generation at Lake Bonney (1, 2 and 3) and Canunda limited to zero MW and disconnected."

This is the source of the constraint equation that AEMO applied in issuing the direction.

Operational effect of limit advice

The operational effect of the Transfer Limit Advice – System Strength is that some generators may need to be directed to operate out of merit or be excluded from dispatching altogether. For any given system state, where the inclusion of a given generator in the set of generators dispatching in South Australia would displace (or threaten to displace in the case of a credible contingency) another generator and result

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11 For instance, in South Australia, ElectraNet plans to commission the first two of four planned synchronous condensers the Davenport substation in mid-2020 and a second two at the Robertstown substation by the end of 2020. They will be commissioned by early 2021. See https://www.electranet.com.au/what-we-do/projects/power-system-strength/.

12 AEMO (2019) *Transfer Limit Advice – System Strength*, version 22, 24 October.

in a non-permissible combination of synchronous generating units, that generator cannot be permitted to dispatch.

3.4.4 Nature of the constraint

The generating units named in the SA_ISLE_STRENGTH_LB constraint equation are electrically remote from the main generation centre in South Australia. Generators operating in the Victorian region are an important source of fault current to these connection points, provided this current can be transferred via the interconnector. AEMO's simulation studies have established that, under islanded conditions, fault currents at these connection points may be inadequate, which increases the risk that these generating units may disconnect unexpectedly in response to a credible contingency. In turn, the sudden loss of these generating units could jeopardise system security for the South Australia region.

The underlying constraint reflected in the SA_ISLE_STRENGTH_LB constraint equation and the Transfer Limit Advice – System Strength is neither exclusively a network constraint or a generation constraint. This may be significant for the purposes of determining whether the direction was a direction for services.

System strength is a characteristic of the combined transmission and generation system, as opposed to being particular to either one[13]. Generators can be said to supply fault current, insofar as, when a short circuit occurs, they can inject additional power. The transmission network can also be said to supply fault current, insofar as when the additional power is injected, it transfers it in the direction of the fault. Thus, permissible dispatch combinations reflect (1) the fault levels required at critical parts of the network (fault level nodes), (2) the ability of generators to supply these amounts of fault current and (3) the ability of the network to transfer the fault current.

In certain circumstances, we consider that it might be possible that a constraint based on minimum fault levels could be construed as specifically a network constraint (see reasoning in Appendix A.2). However, for present purposes, we consider that the constraint reflected in the relevant constraint equation SA_ISLE_STRENGTH_LB is neither purely a network nor a generation constraint for the purposes of the NER.

3.4.5 Relevance to determination

Synergies considers that the nature of the constraint may be relevant to this determination. Where a generator's dispatch instructions are over-ridden by AEMO by

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[13] AEMC (2016) *System Security Market Frameworks Review Interim Report*, 15 December, Page 34.

reference to a constraint of a type not recognised within the rules governing the dispatch process, this would be an important piece of evidence suggesting that the direction was in fact seeking to have the generator provide some other type of service. If the direction is not to be regarded as part of the dispatch process, this limitation wouldn't apply.

Relevance in the case of the dispatch process

If the directed participant were a scheduled generator or a semi-scheduled generator and AEMO wished to over-ride a dispatch instruction for the generating unit determined by NEMDE, then the NER would allow AEMO to take account of a specific set of constraint types in determining whether the dispatch level was valid, in the sense of not causing any constraints to bind. These permissible constraint types are prescribed by clause 3.8.1(b) which lists:

- constraints due to generator availability and commitment[14];
- constraints due to the resource forecast relevant to any given semi-scheduled generators[15];
- network constraints[16];
- constraints consistent with dispatch bid and dispatch offer data[17];
- constraints imposed by ancillary service requirements[18]

The types of constraints listed do not explicitly extend to a system constraint (arising from the combination of network and generation factors), which is the type of constraint applicable in the case of fault current levels.

To be clear, the constraints listed in clause 3.8.1(b) are merely those types of <u>constraints</u> that the NER explicitly authorises AEMO to take into account <u>for the purposes of dispatch</u>. The clause does not preclude AEMO taking a different kind of constraint into account for purposes other than dispatch. Further, it clearly contemplates that AEMO may overlay other types of considerations (that is, considerations besides constraints) onto the dispatch process in order to ensure power system security requirements are met[19].

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14 See clause 3.8.1(b)(2)(i)

15 See clause 3.8.1(b)(2)(ii)

16 See clause 3.8.1(b)(5) and 3.8.10

17 See clause 3.8.1(b)(7)

18 See clause 3.8.1(b)(9) and 3.8.11

19 See clause 3.8.1(b)(4)

The key point made here is simply that some considerations properly included factored into the dispatch process might not be interpreted as "constraints" for those purposes. This, in turn, would be relevant to the question of whether the direction should be regarded as a direction for services or a direction to give effect to a constraint.

The Directed Participant is not a scheduled or semi-scheduled generator and whether the direction should be interpreted as part of the dispatch process requires further consideration of the rules (see Section 3.5).

Relevance outside the dispatch process

For the purposes of decisions taken and implemented beyond the scope of the dispatch process, Synergies does not consider that the particular nature of the constraint in question should be relevant. In particular, Synergies notes that the NER clearly authorise AEMO, indeed require AEMO, to take account of other types of constraints or risks for the purposes of maintaining system security, including those relating to system strength[20].

3.5 Non-scheduled generators in the dispatch process

In previous expert determinations which Synergies has undertaken, we considered directions to scheduled generators and semi-scheduled generators that could be interpreted as a kind of manual dispatch instruction, over-riding the normally automated dispatch instructions issued by NEMDE. With the direction to the directed participant, this characterisation is at least problematic and, we think, not appropriate. An important factor suggesting that the direction did not represent an extension of the dispatch process is that the appropriate level of output from the generating unit was not determined by NEMDE.

AEMO advised Synergies that, when the islanding event occurred, the constraint equation SA_ISLE_STRENGTH_LB was among the set of constraints invoked by AEMO in the System Outlook for the Market Management System (SOMMS). In turn, this constraint set was provided to NEMDE for the purposes of optimising dispatch and NEMDE returned an alert as part of the dispatch process to advise the system operators that the SA_ISLE_STRENGTH_LB constraint had been violated. Notwithstanding NEMDE's notional involvement in determining that the constraint had been violated, we do not regard these facts as significant, since:

[20] See clauses 4.2.6(g) and 4.3.1.

- the alert merely restated the previously known fact that the generating unit's output must always be zero when the constraint is invoked;
- the alert did not reflect the outworkings of the dispatch optimisation process, because the constraint bound as a result of variables that the dispatch process cannot control and, further, no combination of those variables that the dispatch process does control could have produced a different result; and
- the system operators would have already known to issue the instruction to the generating unit even if the constraint equation had not been introduced into NEMDE.

Synergies interprets the direction to the directed participant as a direction for system security purposes and not a direction to be regarded as forming part of the dispatch process. That is, we do not interpret the direction as a kind of manual dispatch instruction as we did in the case of previous determinations concerning scheduled or semi-scheduled generators. Our different interpretation in the present case addresses any argument that the constraint reflected in the constraint equation SA_ISLE_STRENGTH_LB needs to fit into any one of the constraint categories listed in rule 3.8. In turn, we interpret the direction as one necessary to unbind a constraint acting on the output of the generating unit and, thus, we do not regard the direction as a direction for other services.

AEMO had determined that the generating unit could not remain in operation without violating a system constraint of a type explicitly contemplated in Chapter 4 of the NER[21]. The direction was therefore issued to prevent the generating unit from continuing to violate that system constraint.

3.6 Relevant pricing methodologies

We have also considered other pricing methodologies as required by clause 5.15.7A(c)(1). None of these considerations has affected our conclusions.

21 See clause 4.2.6(g)

3.6.1 Pricing methodologies overseas

In our final report for AEMO on directions of 1 December 2016[22], we reviewed different pricing paradigms operating in some overseas electricity markets and identified two broad approaches to compensation for generators that are constrained off namely:

- Compensate generators that are constrained off based on foregone profits; and
- Leaving generators to bear the risk of being constrained off without compensation.

Following our review, we concluded that there was no good case for compensating generators in Australia that are constrained off as a result of directions, the following reasons:

- there is ample evidence that electricity markets can and do operate well without paying compensation to generators that are constrained off;
- Australia has adopted a system based generally on not compensating constrained off generation, and there is no compelling evidence that the alternative would be superior at this time;
- where compensation is paid, it is important that other measures are in place to minimise the extent of the compensation, not all of which are currently in place in the NEM; and
- we would be concerned that paying compensation for generation that is constrained off due to a direction could widen the scope for generator gaming in ways that are difficult to predict.

For the purposes of the present compensation determination, Synergies remains of the view that pricing and compensation approaches used in other jurisdictions do not suggest a strong case for compensating constrained off generators in the NEM.

3.6.2 Other types of markets in which the relevant service may be utilised

There are no other markets in which the service of a generator reducing its dispatch level of energy could be utilized.

[22] Synergies (2017) *Final report on compensation related to directions that occurred on 1 December 2016*, June, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Market_Event_Reports/2017/Final-Determination-of-fair-payment-price-additional-AGL-claims.pdf, accessed 15/01/2020.

3.6.3 Relevant contractual arrangements

Synergies is not aware of any contractual arrangements in Australia that set out the price that a generator should be paid for reducing its output or shutting down.

4 Conclusions

We consider the direction to the directed participant was a direction to unbind a constraint acting on the output of the generating unit. On this basis, Synergies does not regard the direction as a direction for other services and we consider that the directed participant did not "provide services under the direction" as required by 3.15.7A(a1). On this basis, we conclude that no compensation is payable to the directed participant.

This conclusion is consistent with a more detailed review of the NER provisions which can be summarised as follows:

- A direction to a generator to reduce its output to zero and disconnect to stop a constraint acting upon that generator from binding should not be regarded as a direction to provide "other services";
- For generators participating in the dispatch process, the set of constraint types that can validly form the basis of a direction regarded as a "dispatch instruction" is limited by clause 3.8.1(b);
- The system strength constraint SA_ISLE_STRENGTH_LB is of a type that may not be accommodated in the set of constraint types listed in 3.8.1(b), although it is expressly identified as a requirement that AEMO must ensure is met as part of maintaining system security as per clause 4.2.6(g);
- For a non-scheduled generating unit a direction of the type in question should not be interpreted as a dispatch instruction and, therefore, a wider set of constraint types could be validly considered by AEMO without resulting in it being characterised as a direction for services;
- the generating unit is to be regarded as having been constrained off because the constraint in question was of a type provided for within the system security framework of Chapter 4 of the NER; and
- Given the above, the direction should not be regarded as a direction to provide services and, therefore, the directed participant is not entitled to compensation as a result of the direction.

Synergies is issuing this final report on 3 March 2020. The Directed Participant has been notified of our final determination, the reasons for our conclusion and the compensation payable.

A. Additional background on system strength

A.1 A developing framework

The vulnerability of South Australia's network to shortfalls in fault current under certain conditions has been assessed and discussed at length in recent years. On 13 November 2016, a single synchronous generating unit was operating within the South Australian region for several hours, which AEMO later concluded was not a secure operating state[23]. That is, under these conditions, AEMO was not satisfied that the system would continue to operate satisfactorily following a credible contingency[24]. Such a contingency could include the loss of the single synchronous generator, in which case, AEMO considered that the non-synchronous generation online within the region would be unable to supply sufficient fault current.

AEMO immediately changed its operating procedures to mitigate this system strength risk and ensure that at least two large synchronous generating units (or equivalent) were required to be on-line at all times in South Australia[25]. It refined these requirements following additional studies, implementing what it called additional constraints on 2 July 2017, based on information and analysis summarised and published in its South Australia System Strength Assessment on 6 September 2017[26].

In 2017, the NER were amended to include new regulatory arrangements for:[27]

- Assessing system strength requirements;
- Identifying fault level shortfalls; and
- Requiring TNSPs to maintain system strength as a prescribed transmission service.

As required under the revised NER since the AEMC rule change, AEMO maintains a system strength impact assessment guideline[28] and a system strength requirements methodology[29] to determine the minimum required fault level at fault level nodes in the transmission network required to maintain power system security. Its identification of

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[23] AEMO (2016) *Power system not in a secure operating state in South Australia on 13 November 2016 - reviewable operating incident report*, 6 April, page 4.

[24] See clause 4.2.4.

[25] AEMO (2016) *Power system not in a secure operating state in South Australia on 13 November 2016 - reviewable operating incident report*, 6 April, page 6.

[26] AEMO (2017) *South Australia System Strength Assessment*, 6 September.

[27] AEMC (2017) *National Electricity Amendment (Managing power system fault levels) Rule 2017*, 19 September.

[28] AEMO (2018) *System Strength Impact Assessment Guidelines*, 1 July.

[29] AEMO (2018) *System Strength Requirements Methodology*, 1 July.

fault level shortfalls is reported as part of the annual National Transmission Network Development Plan where it informs the regulatory requirements (and hence investment plans) of TNSPs.

As a result of these changes, TNSPs will from time-to-time invest in network assets to increase system strength and make fault level shortfalls less likely to emerge. However, TNSPs may also contract with generators to provide system strength services when required. In the latter case, AEMO will be able to constrain on such generators without allowing them to set the clearing price. Thus, the generators will be providing system strength as an explicit service, pursuant to a bilateral contract with a TNSP, with this role also explicitly recognised within the dispatch process.

AEMO's assessment of system strength and fault level shortfalls also informs its operational practice. That is, AEMO operates the system to prevent fault level shortfalls either until network strengthening investments can be delivered or to manage shortfalls during events of sufficiently low probability that the risks may not warrant new transmission investments to mitigate them.

A.2 Fault levels may represent a network constraint in certain circumstances

Synergies considers that it may be possible under some circumstances to characterise the requirement for some generators to disconnect under the Transfer Limits Advice – System Strength as specifically a transmission network constraint. However, the chain of reasoning necessary to support this characterisation is somewhat speculative and should be given limited weight.

In a hypothetical transmission network of unlimited transfer capacity and zero impedance, the fault currents available at all parts of the network would be equal. In such a network, a single synchronous generator with sufficient nameplate capacity and inertia would be able to supply adequate fault current to all fault level nodes. Further, and still assuming such a network, for many of the generator combinations listed in the Transfer Limit Advice – System Strength, it is very likely that a subset of generating units within that combination would be sufficient to meet the fault level requirement at all nodes.

It follows that, for some of the generator combinations, at least one of the generating units included in a given combination might be included to account for the fact that, in practice, the network has a finite fault current transfer capacity and/or non-zero impedance. This generator (or generators) could be thought of as being required to provide a kind of network support service – to compensate for the network's inadequate capacity or excessive impedance.

If it were shown that generators providing the quasi-network support service described above were the particular generators within permissible generator combinations at risk of being displaced (unless the generators within the constraint equation disconnect), then it would be reasonable to characterise the constraint as a transmission constraint. That is, we could say that the network would be unable to accommodate dispatch from these generating units because its capacity to do so within its technical envelope was contingent on the continued operation of those generators providing a quasi-network support service (which the wind farms were deemed at risk of displacing).

The difficulty with the above chain of logic is that there is no evidence to support the assumption that the scheduled synchronous generation that might be at risk of being displaced by the specific generating units cited in the constraint equation under islanded conditions was of this character.