New Zealand Steel

Participant Rolling Outage Plan

17 Feb 2022

Contents

Definitions

AUFLS	Automatic Under Frequency Load Shedding
Authority	The Electricity Authority
Code	The Electricity Industry Participation Code 2010
Developing event	An event that evolves over time, e.g. as the result of a period of unseasonably low inflows to hydro catchments
EMP	The System Operator's Emergency Management Policy. Current version effective from 19th June 2016
GXP	Transpower Grid Exit Point at which the NZS Glenbrook load is connected
GEN	Grid Emergency Notice
Immediate event	An event that occurs with little or no warning, e.g. as a result of a transmission or major power station failure
NZS	New Zealand Steel
PROP	Participant Rolling Outage Plan (this plan)
Rolling outages	Planned electricity disconnections spread over different parts of the electricity system at differing times to avoid prolonged outages at any one location.
SOROP	System Operator rolling outage plan
Supply shortage declaration	Declaration made by the System Operator under Part 9 sub part 2 of the Code.
System Operator	Operator of the national electricity transmission grid (Transpower)
Transpower	Transpower New Zealand Limited
Transmission line	A high voltage supply line owned and operated by Transpower New Zealand Limited

Associated documents

1. Emergency Management Policy published by the System Operator, effective from 19th June 2016
2. System Operator Rolling Outage Plan – published by the System Operator and effective from 19th June 2016
3. New Zealand Steel operational procedures

Purpose of this plan

4. Part 9 of the Electricity Industry Participation Code (the Code) relates to security of supply and includes provisions relating to the System Operator rolling outage plan (SOROP) and participant rolling outage plans (PROPs).

5. This plan was written to satisfy the requirements of the Code that relate to PROPs. Clause 9.8 of the Code requires that each PROP must

   a) be consistent with the System Operator rolling outage plan; and

   b) comply with the requirements specified in the notice sent under clause 9.6(2)(a); and

   c) specify the actions that the specified participant will take to achieve, or contribute to achieving, reductions in the consumption of electricity (including any target level of reduction of consumption of electricity in accordance with criteria, methodologies, and principles specified in the system operator rolling outage plan) to comply with a direction from the system operator given under clause 9.15.

6. This PROP covers the following site:

Site name	Physical location	GXP
New Zealand Steel Limited	Glenbrook, South Auckland	GLN0331 and GLN0332

7. This PROP provides details of how New Zealand Steel (NZS) will respond to a supply shortage declaration issued by the System Operator and how the System Operator (Transpower) should communicate any requests for reductions in demand.

8. The outage plan provides details of the main energy saving measures that can be called on and how these are structured and implemented.

Supply shortage declaration

9. Part 9 Sub part 2 of the Code sets out how supply shortage situations will be managed.

10. Under the provisions of the Code, the System Operator has powers to direct outages following a supply shortage declaration. As a specified participant, NZS must comply with any direction given by the System Operator following a supply shortage declaration.

11. A supply shortage declaration may apply to:

    a) All of New Zealand; or

    b) Regions specified in the declaration

12. When a supply security declaration is made, NZS must comply with a direction given by the System Operator in accordance with this PROP.

13. The System Operator may, at any time in the period during which a supply shortage declaration is in force, direct NZS to contribute to achieving reductions in the consumption of electricity by implementing outages or taking any other action specified in the direction.

14. A direction may be communicated through the information system operated by the System Operator.

15. The System Operator will notify NZS when a supply shortage declaration has been revoked

16. This PROP sets out the actions that NZS will take, who is responsible for implementing the actions and how communications will be managed between NZS and the System Operator.

Background

The Electricity Authority

17. The Electricity Authority (Authority) is a Crown entity set up under the Electricity Act to oversee New Zealand's electricity industry and markets. The Authority's objective is to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.

18. The core functions of the Authority are:

    a) make and administer the Electricity Industry Participation Code 2010 (Code) governing the New Zealand Electricity Market;

    b) undertake market facilitation measures (such as providing education, guidelines, information and model arrangements) and monitor the operation and effectiveness of market facilitation measures;

    c) monitor and enforce compliance with the Code, various regulations and the Act;

    d) proactively monitor the performance of the electricity industry in regard to competition, reliable supply and efficient operation; and

    e) contract service providers to operate the New Zealand electricity system and market in accordance with the Code

Transpower

19. Transpower is a State Owned Enterprise, tasked with owning and operating New Zealand's National Grid - the network of high voltage transmission lines and substations that transports bulk electricity from where it is generated to distribution line companies and directly (grid) connected major electricity consumers.

System operator

20. As System Operator, Transpower manages the real-time operation of New Zealand's electricity transmission system by matching supply (generation dispatch) with demand.

21. A function of the System Operator under the Electricity Act is to use reasonable endeavours to ensure the security of electricity supply. The System Operator's activities include forecasting supply and demand, developing and publishing guideline hydro levels for security of supply and improving the ability of consumers to manage price risks in the market

New Zealand Steel

22. NZS is the only integrated steelmaker and manufacturer of flat rolled steel products in New Zealand and is situated at Glenbrook in South Auckland. Locally mined ironsand and coal deposits are converted into a variety of flat steel products, both for the domestic and export markets.

23. The Company's annual gross usage is ~1075GWh (average of 123MW) with ~625GWh (average of 71MW) being generated on site via two waste heat power generation schemes. The Company's annual net usage is therefore ~450GWh (average of 52MW) and this includes the electricity used by BOC Gases.

Security of supply events covered by this plan

24. In its Emergency Management Policy, the System Operator provides the steps that the System Operator will take and the circumstances that will need to exist for a supply security declaration to be made. Those steps provide for a series of last resort emergency measures, which would not be implemented unless there was a significant risk that it would not be possible to meet the demand for electricity on a sustained basis.

25. The types of event likely to require the implementation of the EMP include an extended period of extremely low inflows to hydro catchments, a major asset outage that was expected to be sustained for a long period, or some combination of these events.

26. The EMP describes two categories of events that could lead the System Operator to make a supply shortage declaration these are:

- **Developing Event** – Events that evolve over time – for example as the result of a period of unseasonably low inflows to hydro catchments; and
- **Immediate Events** –. Events that occur with little or no warning – for example as a result of a transmission or major power station failure, the impact of which are expected to extend over a period of weeks rather than days.

27. Rolling outages under a supply shortage declaration are a last resort measure the System Operator may initiate, after consultation with the Authority, only if there is a shortage of electricity supply (generation) or transmission capacity if the System Operator considers:

a) that the normal operation of the wholesale market is, or will soon be, unlikely to facilitate the adjustment of supply and demand necessary to ensure that supply matches demand; and

b) that, if planned outages are not implemented, unplanned outages are more likely than not.

Full information and partial information PROPS

28. The System Operator's Rolling Outage Plan sets out the following requirements for direct connect PROPs.

***Full information plans**: These plans must contain sufficient information for the system operator to make a decision on the most appropriate savings target for the direct-connect user.*

A direct-connect user's full information plan must inform the system operator about:

- the nature of the load on site;

- *whether any load is used to provide other services to the electricity sector such as interruptible load;*
- *the extent to which different levels of savings can be achieved;*
- *the nature of the measures that could be implemented; and*
- *the cost associated with different levels of savings.*

***Partial information plans**: These plans may contain some of the information required for full information plans. If the System Operator sets a savings target for a region where there is a direct-connect user with a partial information plan, their savings target will likely be set to achieve the same percentage saving as distribution companies in that region.*

What this PROP contains

29. This PROP includes procedures for managing both developing and immediate category of event.

Section	Content
Communications	Contact details for communications during a supply shortage declaration
Description of Load	A description of the NZS load
Site response	How the site will respond to different types of event including a plan of possible savings
Coordination with the System Operator	Sets out how NZS will coordinate with the System Operator
Monitoring and reporting	How NZS will monitor and report savings made

30. This PROP contains all the information required for Partial Information Plan.

Communications

All urgent operational communications should, in the first instance, be made to:

Contact: Energy Balancing Duty Officer

If unable to be contacted, then try

Contact: Melter Supervisor

It should be noted that only operational communications directly related to an imminent supply shortage event requiring urgent load reduction should be made to the Energy Balancing Duty Officer or the Melter Supervisor.

The Energy Balancing Duty Officer or Melter Supervisor will communicate with the System Operator for operational communications using the following details:

Transpower National Control Centre
Energy Desk Duty - 0800 535 123
Security Desk Duty - 0800 488 500
Email: OperationsManager@transpower.co.nz

Communications from the System Operator about a supply shortage declaration should be made to:

Contact: Energy Manager

If unable to be contacted, then try:

Contact: Energy Balancing Duty Officer

If unable to be contacted, then try:

Contact: Contract Electrical Engineer

Please refer to an email from NZS to the System Operator regarding NZS contact details.

The NZS person responsible for reporting to the System Operator on performance against savings targets is either:

Contact: Energy Manager

or:

Contact: Contract Electrical Engineer

Please refer to an email from NZS to the System Operator regarding NZS contact details.

The person who the System Operator should notify for revocation of the shortage declaration is:

Contact: Energy Manager

If unable to be contacted, then try:

Contact: Energy Balancing Duty Officer

If unable to be contacted, then try:

Contact: Contract Electrical Engineer

Please refer to an email from NZS to the System Operator regarding NZS contact details.

Administrative communications with the System Operator (relating to supply shortage declarations, directions to save energy, acknowledgement of receipt of a direction to save energy, rolling outage monitoring, direct consumer load/load shedding forecasts and media/public communications) should be directed (preferably by email) to:

System Operator
Transpower
Waikoukou
22 Boulcott Street
PO Box 1021
Wellington 3215

Telephone: 04 590 7000
Email: system.operator@transpower.co.nz

The NZS person who is responsible for communicating with the media (if required) is:

Contact: Manager External Affairs

Please refer to an email from NZS to the System Operator regarding the manager's contact details.

Description of site load

31. The NZS site at Glenbrook is the 2nd largest industrial user of electricity in the country with an average gross load of ~123MW with daily average gross loads up to 147MW. The individual industrial processes at NZS are largely continuous with the balance being batch-type. As a whole, most of the processes are in series i.e. the output of one process is the input to the next process.

32. The major electricity loads on site are:

- Iron Plant – 19MW on average – comprises the Raw Materials Handling facility plus the four multi-hearth furnaces and the four kilns. The site has two fully embedded waste heat power generation schemes (owned and operated by Alinta ENZ Ltd) which average a total of 71MW (with peaks up to 100MW) and they are located in this area. In the Iron Plant, ironsand and coal are converted into reduced primary concentrate and char (RPCC) prior to being fed to the melters.

  The Iron Plant is a continuous operation.

- Melters 1&2 – total of 74MW on average with peaks occasionally up to 90MW. The melters convert the RPCC from the Iron Plant into liquid iron. NZS offers the melters' load (normally 70MW) into the Reserves Market both as FIR and SIR.

  The melters are both continuous operations.

- Steel Plant – 3MW on average. In the Steel Plant, the liquid iron from the melters is converted into liquid steel and then cast into slabs and billets. Vanadium is extracted as a byproduct from the liquid iron. The Ladle Metallurgy Furnace is part of the Steel Plant.

  The Steel Plant is a series of batch operations.

- Rolling Mills – 11MW on average. In the Rolling Mills, the Hot Strip Mill rolls the slabs into flat strip and the Cold Mills (4Hi and 6Hi) roll the strip to its final thickness and improves its surface quality. The Hot Strip Mill is the largest of these loads, averaging ~8MW.

  The individual plants in the Rolling Mills are a series of batch operations.

- Finishing Plants – 10MW on average. The Finishing Plants comprise the Metal Coating Line and the Colour Coating Line which produce Zincalume and Colorsteel respectively. All these products are then sold to others. The Metal Coating Line is the largest of these plants, averaging ~8MW.

  All these plants operate continuously.

- BOC Gases – average of 8.5MW. BOC Gases' Air Separation Unit (ASU) is situated next door to NZS at Glenbrook and NZS purchases approximately 70% of the plant's gaseous oxygen and nitrogen output. NZS purchases electricity on behalf of BOC Gases for its ASU and for this exercise, it is considered to be part of NZS' load.

  This plant operates continuously. As well as NZS, it supplies gases to other customers.

33. At the time of writing, NZS has an exemption from providing AUFLS at the GLN0331 and GLN0332 grid exit points. This will expire when the current North Island AUFLS scheme transitions from a two to a four-block system. This transition is expected to occur over the next few years. The way that NZS may be able to meet its new extended reserve obligations has yet to be agreed.
34. On-site generation is provided by three generation units which average a total of 71MW between them. Due to this generation, the expected normal net demand seen on the transmission grid is 52MW. However, the peak net demand seen on the grid can be approximately 120MW for a few trading periods when the largest generation unit fails unexpectedly (in practice, extremely rarely).

How the site will respond to different types of event

Immediate & Developing Event

35. The System Operator is responsible for making a supply shortage declaration and for directing NZS to implement rolling outage savings.

36. If a load reduction is required for any reason, Kilns Cogen is always fired with extra natural gas first with a resultant Company net load reduction of nominally 9MW (or ~17% of the site net load), the actual amount is uncertain and is dependent on Iron Plant production conditions at the time. Over the period of a week, the average net load reduction should be also approximately 9MW or 1.5GWh if full iron production is maintained and sufficient natural gas is available. Requesting this can be carried out in minutes and once gas firing starts, the maximum increase in generation usually takes 10-15 minutes to achieve. There may be some delay while revised offers are made and accepted in the electricity market.

37. NZS has 2 x 2.4MW emergency diesel generating sets whose primary purpose is to provide power to essential loads on site in the event of a site-wide power outage (usually a grid failure). In an immediate or developing situation, consideration will be given to starting either one or both sets depending on conditions at the time.

38. In the past, NZS has trimmed the melters' load to effect a load reduction but usually for not longer than 4 hours at a time. The trimming is usually of the order of 10-15MW to take the melters' total load down to ~60MW. This figure has been chosen because then the Company does not have to reoffer its melter load into the Reserves Market. It also means that the Iron Plant (the upstream plant) can keep running at full capacity while the surplus RPCC is diverted into a storage hopper ready for subsequent processing. The storage hopper has about 4 hours' capacity and when it is full, RPCC either has to be removed from the process flow or one of the kiln/multi-hearth streams has to be turned off with a resulting slightly larger loss in on-site generation than power reduction in the melters.

39. It should be mentioned here that NZS uses less net electricity when the Iron Plant and melters are running at rated capacity because, under these conditions, maximum waste heat is produced which means that on-site generation is at a maximum. If the melters have to power down for more than about 6 hours, this affects the level of operation of the kilns and multi-hearth furnaces and the decrease in load is more than offset by a slightly larger decrease in generation (ie the Company's net load increases). NZS does not plan to offer any more load reduction initiatives in the Iron Plant and melter areas other than those mentioned above.

40. Also in the past, NZS has turned off its Hot Strip Mill (HSM) to effect a load reduction of nominally 6MW but normally for no longer than 6 hours at a time. Note that in section 32 (4th bullet point), the HSM average load is stated as being ~8MW. When turned off, ~6MW load reduction occurs as ~2MW of auxiliaries keep on going. The HSM is not normally a bottleneck plant and when this is the case, it can turned off for load reduction purposes.

41. Also in the Rolling Mills complex, NZS has two Cold Mills each rated at ~1.5MW. Each mill has provision for material storage upstream . Relatively speaking, these loads are quite small and have never been used for load reduction purposes in the past.

42. The BOC ASU plant is fully integrated, that is the Oxygen, Nitrogen and Argon processes are all driven by the single main air compressor, thereby limiting the ability to discretely shed load. However, BOC is able to shed part loads from the facility to achieve partial load reduction as follows: H_2 Plant 1MW and NZS Nitrogen Pipeline Compressors (2 x 0.39MW). These loads may only be shed provided there is sufficient Nitrogen stock levels in storage and if the Hydrogen buffer storage vessels are at maximum pressure to maintain critical supplies to NZS. Please note that at these times, BOC normally offer their entire plant into the Reserves Market as IL.

43. A plant in the Finishing Plants complex is the Colour Coating Line. Relatively speaking, its load is very small, averaging ~1MW. Its value adding capability is very high and it and is not available for load reduction purposes.

Comments on Other Plants at NZS

44. The Steel Plant is a bottleneck plant and has a load of ~3MW on average. In relative terms, its load is small. There is basically no capability to store liquid iron produced by the melters upstream of the Steel Plant. If the Plant stops working, liquid iron has to be plated (tipped over a bank and allowed to cool and can be sold as plated iron later on) or the melters have to stop (along with the kilns and multi-hearth furnaces) with the ensuing modest net load rise (as described earlier). NZS does not plan to offer the Steel Plant into its load reduction plan.

45. About three years ago, a Ladle Metallurgy Furnace (LMF) was added to the Steel Plant's operations. It is basically a small arc furnace having three graphite electrodes connected to a transformer and is used for heating and stirring the liquid steel and for finalising its chemical properties prior to casting into billets. It has a 30-minute MD of ~14MW, operates for approximately 40% of the time and has an average load of ~1.25MW. As can be seen, the LMF is a very intermittent and, on average, low load.

46. The Steel Plant makes slabs for further processing on site at Glenbrook and billets which are made for further processing at our Pacific Steel site in Otahuhu. The LMF only operates during the billet-making process. Should an immediate or developing event be communicated to NZS, the Company will actively consider moving away from billet production (which needs an operating LMF) to slab production (which does not). Any such move will be dependent on the Steel Plant's operations at the time of the immediate/developing event communication.

47. In the Finishing Plants, the largest load in this area is our Metals Coating Line. Its average load is ~8MW and it is a continuous plant. This plant has always been a bottleneck plant. NZS does not plan to offer the Metal Coating Line into its load reduction plan.

48. As mentioned earlier, BOC Gases Ltd operates an Air Separation Unit (ASU) at Glenbrook. The plant averages 8.5MW and operates continuously. Comments on partial load shedding have been made previously in section

40. If the ASU is shut down completely, NZS and other BOC customers will be completely reliant on finite stored gases in liquid gas storage facilities. A complete interruption to NZS supply (particularly Nitrogen) immediately causes emergency shutdowns of all NZS production plants. BOC is also the major supplier of pharmacopeia grade and aviation grade gases to the New Zealand market. NZS does not plan to offer a complete shutdown of the existing ASU into its load reduction plan.

Savings Plan

49. Following the receipt of a properly-given supply shortage direction from the System Operator, NZS will issue a directive to all staff to reduce all discretionary electricity use. Discretionary means electricity use that does not impact on production and the health and safety of staff and the security of the site.

50. For any shortage, the first action the Company would take is to instruct Alinta to fire extra natural gas into Kilns Cogen and nominally an extra 9MW can be generated, thereby reducing the Company's net load on the grid by the same amount. The amount actually generated depends on the Iron Plant's production conditions at the time. Firing extra natural gas has been used extensively in the past to reduce NZS's net load on the grid, both short and long term. It has always been the Company's first action as it has no effect on production and, relatively speaking, the cost is not large, especially if the spot price is high at the time.

51. As mentioned earlier in section 37, the next action the company would consider is turning on either one or both 2.5MW emergency generating sets depending on the conditions prevailing at the time.

52. The next load that NZS would consider turning off is the Hot Strip Mill (as explained in section 40) which will reduce the Company's load by nominally 6MW.

53. Other loads which the Company would consider reducing should it be necessary to do so (not necessarily in order) are the Cold Mills, BOC Gases and the Melters (see earlier sections 41, 48 and 38 respectively for the loads involved).

54. As generally explained earlier in sections 37 and 38, reducing the load of the Iron Plant (Multiple Hearth Furnaces and Kilns) and/or the Melters will have an effect on the amount of cogeneration, resulting in a small increase in the Company's net load. Short term load decreases (especially by the melters) are able to be done at peak North Island load times but longer load decreases will see the Company's net load increase.

55. Any MW savings figures depend on the production conditions of the various plants at the time the request to reduce load is given. The cost figures for the various plants depend on the demand for and the selling price of various finished products that the Company makes.

56. Should NZS be contacted by the System Operator to reduce load, NZS can provide up-to-date $/MWh cost and production status information on a confidential basis.

57. If NZS has already reduced load due to high spot prices when contacted by the System Operator, then this reduction shall form part of the response to the total reduction requested.

58. A table summarising the Company's proposed load reductions is shown below. It should be noted that the first two mechanisms will not provide 25% savings between them, so the balance will be provided by either or both of the 3rd and 4th mechanisms. It should also be noted that the expected weekly % savings (cumulative) are based on the Company's net average demand of 52MW.

Mechanism	Expected MW demand (BAU)	Expected weekly GWh demand, pre-savings (GWh)	Target weekly GWh savings	Expected weekly % savings (cumulative)
Firing extra nat gas in Kilns Cogen (9MW)	0MW	0GWh	1.5GWh	17%
Starting one emergency diesel generator (2.5MW)	0MW	0GWh	0.4GWh	22%
Either: Reduce operation of Hot Strip Mill	8MW	1.3GWh	0.5GWh	>25%
Or: Reduce operation of melters	74MW	12.4GWh	2.4GWh	>25%

Disconnecting and Restoring Load

59. If a melter is turned completely on or off during a Rolling Outage period, the demand change will most probably exceed 25MW over a 5-minute period. If the reason is for load reduction, the System Operator will be consulted before any planned change takes place. Please note that NZS performs regular business-as-usual melter inspections where each melter is turned off for normally 5-10 minutes and then turned on again, and these will most probably exceed 25MW over a 5-minute period. These inspections are notified ahead of time as part of the Company's energy bids.

60. All other planned load changes will not exceed 25MW in any 5-minute period.

61. NZS will use its best endeavours to minimise the impact of load changes on frequency and voltage stability and, if requested by the System Operator, will minimise the changes during times when load is typically ramping up or

down in the region affected by the supply shortage (ie either side of morning or evening peaks).

Coordination with the System Operator

62. Communications from the System Operator for coordination of NZS operations will be made in the first instance to the Energy Balancing Duty Officer. If the Energy Balancing Duty Officer is unable to be contacted, then the Melter Supervisor should be rung. Contact details are contained in a separate letter sent by NZS to the System Operator.

63. As required under Section 6.13(a) of the SOROP, the receipt of a direction to save energy will be acknowledged. Such acknowledgements should be sent by email to the System Operator (system.operator@transpower.co.nz).

64. A documented procedure that provides instruction and guidance to the Energy Balancing Duty Officer and the Melter Supervisor for supply shortage events has been developed. This procedure includes how coordination with the System Operator is achieved during implementation of savings and restoration of loads.

65. As already mentioned in section 33, NZS currently has an exemption from providing AUFLS. If this situation changes, this plan assumes that any load connected to an armed AUFLS relay will remain eligible for inclusion in planned load reductions provided for in this PROP.

66. In the event that a Grid Emergency is coincident with a request for savings under this PROP, it is assumed that the Grid Emergency requirements made by the System Operator will take precedence over the PROP savings plan. The level of savings available under this plan will, therefore, be reduced by the level of any load reductions made in response to a Grid Emergency. It is expected that this will be taken into account in the levels of savings required by the System Operator. NZS must take steps to ensure it meets the level of savings directed by the System Operator.

67. It should be noted that, in the event of a Grid Emergency (especially the Developing Event variety), NZS may already have taken some net load reduction actions before being contacted by the System Operator to do so under this Plan.

Monitoring and reporting

68. For major loads, NZS internal SCADA data will be used to produce daily or weekly reports of savings achieved.

69. Increased generation output from the Kilns Co-generation plant will be recorded on existing data logging metering and daily or weekly reports will be produced.

70. For unmetered loads, savings will be calculated by comparison with an average energy consumption profile and the observed actual loading reductions for during a supply shortage event.

71. Monitoring and reporting is the responsibility of the Energy Manager.

72. If required, reporting to the Electricity Authority will be undertaken as requested.