GUIDE TO SCHEDULED LOADS

July 2021

Important notice

PURPOSE

The Australian Energy Market Operator (AEMO) publishes the Guide to Dispatchable Loads to provide information on the treatment of dispatchable loads in the National Electricity Market, as at the date of publication. The Rules and the National Electricity Law (Law) prevail over this document to the extent of any inconsistency. Information made available after this date may have been included in this publication where practical.

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VERSION CONTROL

Version	Release date	Changes
2.0	01/07/2021	• Updated to new AEMO template • Modified for 5-minute settlement

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1. Introduction

~~Dispatchable loads are herein referred to as scheduled loads~~[MS1]~~.~~ Under the Rules, scheduled loads are net consumers of electricity that register to participate in the central dispatch and pricing processes operated by AEMO.

For the purposes of economic scheduling of electricity to meet demand, scheduled loads are essentially treated on equal terms with scheduled generating units with no dispatch models designed to favour scheduling from one type of unit over another. In this document the models described for scheduled loads equally apply for scheduled generating units unless otherwise specified.

Furthermore, the same participant interfaces are available for the bidding, dispatch and market reporting of scheduled generating units and scheduled loads.

However, market participants with registered scheduled loads should specifically be aware of:

- The expected structure of their dispatch bids and how the central dispatch process interprets these bids;
- Market ancillary services offer data and how the central dispatch process interprets this data;
- The other data required by the central dispatch process;
- Modelling in the dispatch algorithm that is specific to scheduled loads;
- The interpretation of load dispatch instructions.

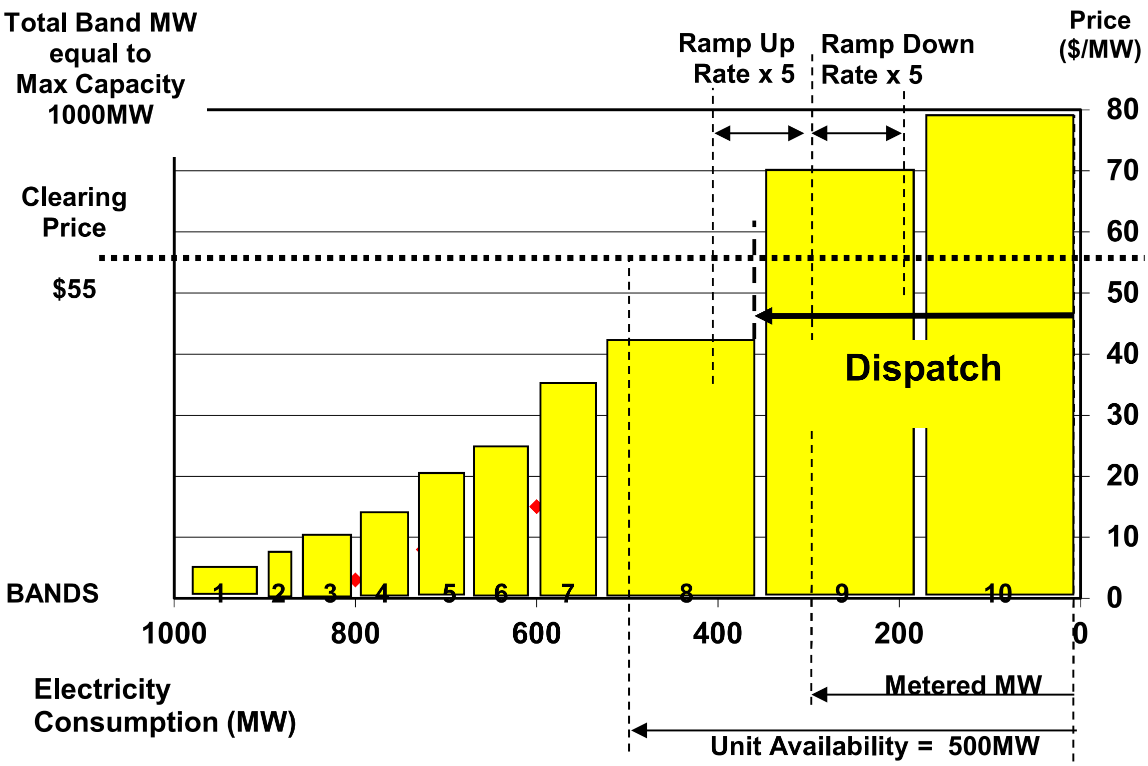
2. Dispatch Inputs

2.1 Energy Bids

Clause 3.8.7 of the Rules covers the structure of dispatch bids. A sample dispatch bid structure for a scheduled load is illustrated in Figure 1 below.

The components of a dispatch bid are described in the following sections. This is followed by a worked example explaining how the dispatch bid is used in the central dispatch process.

Figure 1 Typical Dispatch Bid for scheduled load



2.2 Energy Bands

~~In a schedule load's daily energy dispatch bid the~~A market participant must submit a ~~the maximum capacity registered for that~~ scheduled load's~~-~~ maximum capacity in ~~the form of~~ ten price bands in the daily energy bid. Each price band associates a quantity of electricity consumption at the load's local connection point with a local price for the scheduling of that quantity of electricity.

The price specified for a price band ~~(herein called bands)~~ for a normally-off scheduled load is interpreted in the central dispatch process as the market clearing price at or below which the scheduled load will increase electricity consumed by up to the MW increment specified in that price band. (For a normally-on scheduled load the converse is true: the band price is interpreted as the clearing price above which the scheduled load will reduce electricity consumption.)

Restated, each band price represents the maximum market clearing price that the market participant is willing to pay before decreasing the electricity consumption of their scheduled load by up to the MW increment in that band for the specified trading interval.

Under clause 3.8.7(h) of the Rules all band prices for scheduled loads (when referred to the relevant regional reference node via their transmission loss factor) must be:

- Less than or equal to the ~~VoLL~~Market Price Cap; and
- Greater than or equal to the Market Floor Price ~~Floor~~.

2.3 Energy Availability

The ~~bid~~ maximum electrical consumption by a scheduled load that can be scheduled for the specified ~~dispatch or~~ trading interval.

2.4 Energy Ramp Rates

The ~~bid~~ maximum rates (in MW/min) at which the electrical consumption by a scheduled load can be scheduled to increase (called the ramp up rate) or decrease (called the ramp down Rate) over the specified ~~dispatch or~~ trading interval.

2.5 Energy Fixed Loading

The ~~bid~~ fixed level of electricity consumption by a scheduled load (in MW) to be scheduled for the specified ~~dispatch or~~ trading interval.

2.6 Fast Start Inflexibility (On-line Dispatch only)

A scheduled load registered as a fast start unit ~~is required to~~may submit a fast start inflexibility profile (FSIP).

This FSIP mode time and minimum loading level data represents the desired consumption profile that the scheduled load wishes to be automatically committed to by the on-line dispatch algorithm if it is economic to do so, as determined in a first-pass fast start unit commitment dispatch calculation. This first-pass calculation assumes that all FSIP constraints that are normally applied to committed Fast Start units are ignored for the purposes of determining further unit commitments.

2.7 Daily Energy Constraint (Pre-dispatch only)

The ~~bid~~ maximum energy consumption by a scheduled load (in MW) that can be scheduled over the specified trading day.

3. FCAS Offers

A market participant may register a scheduled load to provide any of the frequency control ancillary services (FCAS).

Typically a scheduled load is only able to provide the fast (6 second), slow (60 seconds) & delayed (5 minute) frequency raise contingency services, providing a response to a sudden frequency increase through automatic under-frequency load shedding.

Once a market participant has registered a scheduled load for any of these FCAS, the market participant must submit a daily FCAS offer for that service, in a similar format to energy market dispatch bids.

The FCAS offer band price is the price (in $/MWh) that the market participant is willing to accept in return for enabling the amount of FCAS MW response within that FCAS offer band.

3.1 Interpretation of a Dispatch Bid - a worked example

Reference: Figure 1 above.

For this example, assume that the scheduled load 'X' belongs to a region 'R'. Also assume that the maximum capacity for load 'X' = 1000 MW.
The sum of band MW in all 10 bands must therefore equal 1000 MW.

The dispatch bid submitted for load 'X' has:

Bands 1 to 8 have 620 MW priced below $50/MWh

Band 9 has 190 MW at $70/MWh

Band 10 has 190 MW at $80/MWh

Availability = 500 MW

Ramp up & down Rate = 20 MW/minute

At the start of the dispatch run, the metered MW consumption of load 'X' = 290 MW.

The NEMDE solver algorithm then determines the upper and lower limits within which load 'X' can be scheduled to consume:

Upper limit = minimum of (Ramp Upper limit, Availability)

= minimum (390, 500)

= 390 MW

where;

Ramp upper limit

= Metered MW + ramp Up rate x 5 mins

= 290 + (20 x 5)

= 390 MW

Lower limit = Ramp lower limit

= Metered MW - Ramp down rate x 5 mins

= 190 MW

The NEMDE solver optimisation then calculates for the ~~dispatch~~ trading interval and determines that a market clearing price (~~dispatch~~ spot price) for region 'R' of $55/MWh.

As the price of Band 10 is greater than the~~>~~ ~~dispatch~~ spot price, this band is fully scheduled with ~~a~~ consumption ~~=~~of 190 ~~-~~MW. As the price of Band 9 is also greater than the~~>~~ ~~dispatch~~ spot price, a further 190 MW of consumption is scheduled.

At this stage the total consumption of Bands 9 and 10 = 380 MW which is still within the upper and lower limits determined above. However, the remaining bands are not dispatched at all, as their band prices are all below the ~~dispatch~~ spot price (that is, the market price was not low enough to justify consumption in those bands).

Therefore, the final scheduled consumption (dispatch target) of load 'X'= 380 MW.

The NEMDE solver algorithm has scheduled an increase in the consumption of the load from ~~zero~~ 290 MW, dispatching from the higher-priced to lower-priced bands until either the ~~dispatch~~ spot price falls below the price of the last band dispatched (as in this case) or the scheduled load is constrained to either its upper or lower operating limits.

4. Other data

4.1 SCADA metered energy consumption

Clause 3.8.2(d) of the Rules requires that certain facilities be provided before a load can participate in the central dispatch process as a scheduled load:

> "(d) Dispatch bids and market ancillary service offers will only be included in the central dispatch process by AEMO if it is satisfied that adequate communication and/or telemetry is available to support the issuing of dispatch instructions and the audit of responses."

The current~~ly~~ metered value of consumption of the scheduled load is required by the On-line dispatch process in order to determine the feasible dispatch target ~~consumption~~ at the end of each ~~dispatch~~ trading interval and to allow AEMO to verify conformance of the scheduled load to its dispatch target. These values are automatically captured from the AEMO SCADA database at the start of each on-line dispatch, 5MPD & pre-dispatch run.

A means of transmitting dispatch instructions to the scheduled load is also required.

There are similar requirements on scheduled generating units to provide currently metered outputs and data communications facilities.

5. Dispatch Process

The central dispatch process equitably applies the same dispatch rules and principles to both scheduled generating units and scheduled loads.

5.1 Co-optimisation of Energy and FCAS Dispatch

Under Clause 3.8.1(b) of the Rules:

> "(b) The central dispatch process should aim to maximise the value of spot market trading i.e. to maximise the value of dispatched load based on dispatch bids less the combined cost of dispatched

generation based on generation dispatch offers, dispatched network services based on network dispatch offers, and dispatched market ancillary services based on market ancillary service offers subject to:

(1) dispatch offers, dispatch bids and market ancillary service offers; … "

The value of dispatched load equals (dispatched load x dispatch bid band price, as referred to regional reference node), summed for all scheduled loads.

In accordance with the objective of maximising the value of spot market trading, the energy and FCAS bands of scheduled loads and scheduled generating units are jointly scheduled to determine the least cost/greatest value way of satisfying both the energy demand and FCAS requirements for all regions.

Note that the scheduled amounts of energy and FCAS are jointly limited to the FCAS offer trapezium constraints as defined in the relevant FCAS offer for that ~~dispatch or~~ trading interval.

The total FCAS enabled from a scheduled load is limited to the FCAS Maximum Availability in its FCAS offer.

Energy dispatch plus FCAS enabled from a scheduled load must be less than the FCAS Enablement Maximum in its FCAS offer.

Energy dispatch less FCAS enabled from a scheduled load must be greater than the FCAS Enablement Minimum in its FCAS offer.

5.2 Normally-on versus Normally-off status

A scheduled load is registered as either normally-on or normally-off. The classification by AEMO of whether a scheduled load is either normally-on or normally-off is based on whether the metered consumption of that load has been included as a component of the metered demand calculation for the associated region. If the metered consumption of the load has been included (as that load is typically consuming power), then this load is defined to be normally-on - otherwise it is normally-off.

The NEMDE solver algorithm schedules generation and load to meet the forecast non-dispatchable demand in each region. The pre-dispatch process uses the normal operating status information for loads in the adjustment of the pre-dispatch demand forecast to determine non-dispatchable demand. As it is assumed that the pre-dispatch demand forecasts provided by AEMO are based upon historical records which include the metered demand of normally-on scheduled loads, then for each trading interval the pre-dispatch process must firstly subtract the total bid availability of all normally-on scheduled loads in the region from the pre-dispatch demand forecast for that region. This adjustment assumes that the bid availability of a normally-on scheduled load closely reflects the metered demand of that load.

~~Apart from this adjustment, neither the On-line Dispatch, 5MPD nor Pre-dispatch processes pre-suppose any normal operating state for a scheduled load, and the calculation of consumption targets are based solely upon the bid prices submitted in the participant's dispatch bid. All loads then receive a dispatch target indicating their scheduled consumption of electricity. The bid structure for normally-on and normally-off scheduled loads has the same interpretation in both cases.~~

5.3 Energy Ramp Rates

Energy ramp up and ramp down rates are converted by the NEMDE dispatch algorithm into respective upper and lower constraints on the electricity consumption that can be scheduled on a scheduled load by the end of the ~~dispatch or~~ trading interval.

The upper bound is the initial consumption at the start of a ~~dispatch or~~ trading interval plus the maximum amount by which that initial consumption can increase over the interval, as indicated by the ramp up Rate multiplied by the number of minutes in the interval.

The lower bound is the initial consumption at the start of a ~~dispatch or~~ trading interval less the maximum amount by which that initial consumption can decrease over the interval, as indicated by the ramp down rate multiplied by the number of minutes in the interval.

5.4 Energy Band Price Tie-breaking

If two scheduled loads in the same region have the same referred band price and these two bands are marginally dispatched, then the price tie-breaking model calculates the sharing of load between the two bands. This is done by ~~applying to each band the calculated ratio of the~~pro rating the scheduled load band MW in proportion to the total MW available from ~~both~~ the price-tied bands.

It should be noted that there are limitations to this procedure. The bands must be in the same region and they must both belong to scheduled generating units or both belong to scheduled loads. Furthermore, there are no tie-breaking rules applied to price-tied FCAS offers.

5.5 Fast Start Commitment & Dispatch (On-line Dispatch only)

The fast start commitment, decommitment and inflexibility profile constraints are ~~only~~ applied in on-line dispatch and five-minute pre-dispatch. A fast start scheduled load is committed (that is, commences to follow its bid FSIP) on the first occasion that a non-zero energy consumption target is calculated by the first-pass fast start commitment calculation of the ~~On-line~~ central dispatch process.

The scheduled load then:

1. Prepares to be loaded over the ~~bid~~ T1 mode time (during which time the consumption targets are zero MW),

2. Ramps up its consumption to ~~a~~its ~~bid~~ minimum loading level over the ~~bid~~ T2 mode time, at the rate calculated as ~~(bid~~ minimum loading level / T2 time~~)~~,

3. Is constrained to consume at or above its ~~bid~~ minimum loading level over ~~bid~~ T3 mode time,

4. Is constrained to consume at or above a calculated minimum loading level which reduces from the ~~bid~~ minimum loading level down to zero MW over ~~bid~~ T4 Mode time.

On completion of T4 mode time the fast start scheduled load is decommitted on the first occasion that a zero energy consumption target is calculated by the ~~On-line Dispatch~~central process, and is then prepared to be re-committed in subsequent ~~On-line Dispatch~~central dispatch runs.

Note that a fast start scheduled load cannot set market energy price while operating in inflexible loading modes 0 (off-line), 1 or 2. Also note that a fast start scheduled load is subject to any overriding energy ramp rates while operating in Modes 3 or 4. Scheduled loads (both normally-on and normally-off) are treated in same way as scheduled generating units under this model.

Also note that the fast start design only provides for a minimum consumption time (T3 time), not a maximum consumption time nor a maximum or minimum off-time (all of which must be handled by the market participant through re-bidding).

The fast start dispatch process is designed to automatically send a unit commitment instruction to the owner of a fast start unit to advise that it is now economically viable for that scheduled load to commence upon a participant-specified pattern of electricity consumption (its fast start inflexibility profile) given the current market price and level of demand. Note however that the registered normal operating status of a scheduled load is not used in the fast start dispatch decision process, and both the normally-on and normally-off types of scheduled loads can participate equally in the fast start commitment decision and dispatch process.

Clearly if a market participant bids a scheduled load so that the resulting dispatch exhibits a scheduled consumption pattern similar to that of a normally-on load (that is, bids with at least one band price always greater than market price) then the current fast start model is not likely to ever be activated for that type of load.

5.6 Daily Energy Constraint (Pre-dispatch only)

Daily energy constraints are used only in pre-dispatch to limit the total amount of energy consumption that can be scheduled on an energy-constrained scheduled load from the start of the trading day onwards.

5.7 Market Pricing

As the price bands of scheduled loads can be marginally or partially dispatched by the NEMDE solver algorithm, bands so dispatched are able to set the market price (either energy or any FCAS) for a ~~dispatch or~~ trading interval.

6. Reporting

6.1 Energy Dispatch Target (Total Cleared)

Scheduled load energy targets scheduled by the on-line dispatch process represent the amount of electricity consumption (in MW) that is required for a normally-on or normally-off scheduled load for the specified ~~dispatch~~ trading interval. These targets are confidentially reported to the relevant market participant in electronically transmitted text files updated after every dispatch run.

Scheduled energy consumption profiles that are determined in 5MPD and pre-dispatch are indicative forecasts only.

Note that the NEMDE solver algorithm employs linear programming techniques to solve. Therefore the reported dispatch targets for both scheduled generating units and scheduled loads are of a continuous nature rather than being ~~quantised or~~ integer values.

This means that for a scheduled load that naturally exhibits a quantised loading response to dispatch instructions (such as a pump) it becomes more important to construct bids so that the dispatch process is unlikely to schedule partial loading within any bands of that unit. This can be achieved, for example, through pricing bands sufficiently away from the likely market clearing price.

6.2 FCAS Enabling Targets

Scheduled load FCAS raise enabling targets scheduled by the on-line dispatch process represent the amount of electricity consumption (in MW) on a normally-on or normally-off scheduled load that is required to be armed (enabled) and ready to automatically shed in the event of a defined power system frequency fall for the specified ~~dispatch~~ trading interval.

These targets are again confidentially reported to the relevant market participant in electronically transmitted text files updated after every dispatch run.

Scheduled FCAS enabling targets that are determined in 5MPD and pre-dispatch are again indicative forecasts only.

Table 1 REFERENCES TO DISPATCHABLE LOADS IN SPD FORMULATION

SECTION OR EQN	TOPIC	DESCRIPTION
2.7~~5~~	Quotes	Dispatchable load bids, represented by *LDOF*, are made by energy customers, which can be energy consumers or retailers.~~Quote, or Trade Type *tt*, is either *LDOF* (for a dispatchable load energy bid) or one of the FCAS market offer types, and are made by energy customers.~~
2.9~~7~~	Security Measures	Dispatchable loads are used in generic constraints.
3.1	Objective Function	There are Ramp Rate & Trader Bid constraint violation penalties defined for dispatchable loads. The objective function of the NEMDE bid/offer clearing model is described as follows: $$Min \sum_{(du,tt,t,ns)\in TBK} TBMW(du,tt,t,ns) * TBP(du,tt,t,ns) + MNSPObjective + ViolationPenalizingTerms \quad (3.1)$$ where *TBMW(du,tt,t,ns):* Band MW of band *ns* of quote type *tt* from dispatchable load *du* at time *t*. By convention, Band MW is negative for demand bids (for dispatchable loads) and positive for all the other quotes;
4.5	Pre-dispatch Demand calculation	The regional demand forecast of a region is adjusted by subtracting the total availability bid in for all normally-on dispatchable loads in the region.

SECTION OR EQN	TOPIC	DESCRIPTION
		$DB^{est}_{t,i}$: Estimation of demand that will be dispatched by NEMDE for interval *t*. Is equal to the sum of the capacity of normally on dispatchable loads.
4.5.2	~~Total Load dispatched~~Calculation of dispatched demand	$DB_{t,i}$ ~~:~~ is the total MW dispatched for consumption by dispatchable loads *du* in region *i* at time *t*, expressed as: $$DB_{t,i} = \sum_{(du)\in UL_i} DULD(du,t)$$ where $DULD(du,t) \geq 0$:
4.5.3	Load Dispatch Target =Sum(Energy Bands)	Total energy dispatched MW over all bands *ns* of a dispatchable load *du* at time *t*. $$DULD(du,t) = \sum_{(du,tt,t,ns)\in LDOF} TBMW(du,tt,t,ns) + DeficitOfferMW(du,t)$$ *DeficitOfferMW(du,t)>0* : Deficit MW demand offer for dispatchable load *du* at time *t*
4.6.3	Generic Constraint market node net flow	Generic constraints are ~~modeled~~modelled as linear functions of total regional generation MW, interconnector MW flows, and Net MW or FCAS at a connection point *cp* for a trade type *tt*. Net MW at a connection point equals dispatchable generating unit *DUGEN* output target minus dispatchable load *DULD* consumption target:

SECTION OR EQN	TOPIC	DESCRIPTION
		$NETMW(cp,tt) = DUGEN(cp,tt) - DULD(cp,tt)$
4.7	Generic Constraint Dynamic RHS Terms	Dispatchable load initial consumption can be used as a generic constraint dynamic RHS 'T' (Trader) term
4.8.1	Intervention Initial Conditions	For the first run of an Intervention Pricing period, dispatchable load initial consumption is used as the initial condition; in subsequent Intervention Pricing runs the previous dispatchable load consumption target is used.
4.9	Trader Energy Capacity constraint	The amount of dispatchable load scheduled, *DULD(du,t),* is constrained by its capacity as follows: $DULD(du,t) - DeficitTraderEnergyCapacity(du,t) \leq DULD^{\max}(du,t)$ where; $DULD^{\max}(du,t)$: maximum capacity (bid availability) for dispatchable load *du* at time *t.*
5	FCAS – General	Dispatchable loads are eligible to be enabled for FCAS Raise or Lower services, subject to their availability to do so.
5.6	Joint Energy/FCAS Upper Capacity constraints	Dispatchable load are jointly limited in providing energy consumption plus FCAS Lower5Min plus FCAS LowerRegulation, below the maximum of their offered FCAS Lower5Min or FCAS LowerRegulation Enablement Maximums.

SECTION OR EQN	TOPIC	DESCRIPTION
		$DULD(du,t))$ $+ L5UpperCoef(du,t) \cdot L5MW(du,t)$ $+ L5REUpperCoef(du,t) \cdot L5REMW(du,t)$ $- L5JointUpperDeficit(du,t)$ $\leq Max(L5EnablementMax(du,t), L5REEnablementMax(du,t))$
5.7	Joint Energy/FCAS Lower Capacity constraints	Dispatchable loads are jointly limited in providing energy consumption less FCAS Raise5Min less FCAS RaiseRegulation, above the minimum of their offered FCAS Raise5Min or FCAS RaiseRegulation Enablement Minimums. $DULD(du,t)$ $- R5LowerCoef(du,t) \cdot R5MW(du,t)$ $- R5RELowerCoef(du,t) \cdot R5REMW(du,t)$ $+ R5JointLowerSurplus(du,t)$ $\geq Min(R5EnablementMin(du,t), R5REEnablementMin(du,t))$
5.8	Joint Energy/Reg FCAS Lower Ramping constraints	In Dispatch, Dispatchable loads are jointly limited in providing energy consumption plus FCAS LowerRegulation below their SCADA ramp up rate x 5. $DULD(du,t) + L5REMW(du,t) - L5REJointRampDeficit(du,t)$ $\leq PreviousMW(du,t) + SCADARampUpRate_{du} \times \mathrm{TimePeriodConstant}$
5.9	Joint Energy/Reg FCAS Raise Ramping constraints	In Dispatch, Dispatchable loads are jointly limited in providing energy consumption less FCAS RaiseRegulation above their SCADA ramp down rate x 5.

SECTION OR EQN	TOPIC	DESCRIPTION
		$DULD(du,t)) - R5REMW(du,t) + R5REJoint\,RampSurplus(du,t) \geq PreviousMW(du,t) - SCADARampDnRate_{du} \times \text{TimePeriodConstant}$
8.4	Energy Ramp Up Rate	Ramp Up Rate constraints apply for dispatchable load *du* at time *t*: $(DULD(du,t) - DULD(du,t_0)) - DeficitRampRate(du,t) \leq UpRR(du,t) * DispPeriod$
8.5	Energy Ramp Down Rate	Ramp Down Rate constraints apply for dispatchable load *du* at time *t*: $(DULD(du,t_0) - DULD(du,t)) - SurplusRampRate(du,t) \leq DwnRR(du,t) * DispPeriod$
8	Energy Ramp Rates ignored	If the total MW value of its bid/offer bands is zero, ramp-rate constraints for the unit will be ignored. If the unit is a fast start unit and it is targeted to be in mode 0, 1 or 2 its ramp rate constraints are also ignored, as inflexibility profiles have to be observed.
9	On-line dispatch Fast Start Inflexibility Model	The description of the fast-start inflexibility model applies to both dispatchable generating units and dispatchable loads.
9.2	On-line dispatch Fast Start Mode 1	During Mode 1 the dispatchable load *du* will be synchronising over bid T1 time & therefore its energy target = zero MW: $DULD(du,t) - ProfileDeficitMW(du,t) \leq 0.000001$

SECTION OR EQN	TOPIC	DESCRIPTION
9.3	On-line dispatch Fast Start Mode 2	During Mode 2 the dispatchable load *du* will be ramping to minimum load over bid T2 time & therefore its energy target = $DULD(du,t) + ProfileSurplusMW(du,t) - ProfileDeficitMW(du,t) = T(du) \cdot MinLoading(du) / T_2(du)$
9.4	On-line dispatch Fast Start Mode 3	During Mode 3 the dispatchable load *du* will be constrained above its bid minimum loading level for bid T3 time: $DULD(du,t) + ProfileSurplusMW(du,t) \geq MinLoading(du)$
9.5	On-line dispatch Fast Start Mode 4	During Mode 4 the dispatchable load *du* will be constrained above its bid minimum loading level as ramped down to zero MW over bid T4 time: $DULD(du,t) + \text{Pro}fileSurplusMW(du,t) \geq \left(\frac{T_4(du) - T(du)}{T_4(du)}\right) \cdot MinLoading(du)$
11.3	Pre-dispatch Daily Energy Constraint Model	Under the Pre-dispatch energy-constrained model the energy target for dispatchable load *du* at time *t* is limited to the bid daily $EnergyAvailable^{max}$: $DULD(du,t) * DispPeriod - DeficitEnergy(du,t) \leq EnergyAvailable^{\max}(du,t)$

SECTION OR EQN	TOPIC	DESCRIPTION
13.1	On-line dispatch Demand calculation	The sum of metered regional initial MW generation values minus the sum of regional metered dispatchable load initial MW consumption values is used as the regional demand forecast against which NEMDE Dispatch schedules: $$PD_a = \max\left(\begin{array}{l}\sum_{(du)\in U_a} PG_{du}^{metered} - \sum_{(du)\in U_a} DP_{du}^{metered} \\ - InitialNetInterchange(a) \\ - RegionalLossEst(a) \\ - \sum_{mnsp \mid \substack{From Region(mnsp,a)\ or \\ To Region(mnsp,a)}} MNSPLossEst(mnsp,a) \\ + AggregateDispatchError(a) \\ + DeltaForecast(a)\end{array}, 0\right)$$ where: $DP_{du}^{metered}$ = actual metered initial MW consumption for dispatchable load *du*