



# RC\_2017\_02: Aggregate ramping impacts – frequency of occurrence

October 2019  
For the RCP Workshop

## Background: Aggregate ramping issues with gate-closure

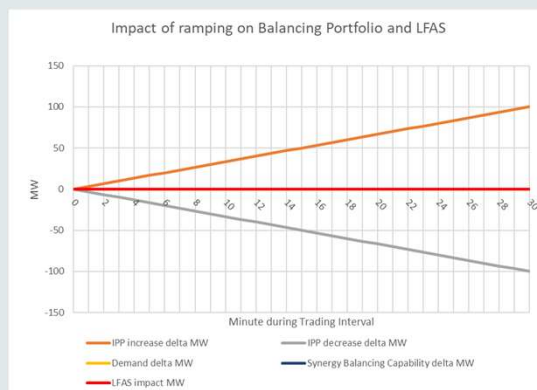
- The WEM Rules ensure that generation equals the demand forecast at the last second of the Trading Interval
  - Balance means the SWIS frequency is maintained
- However, during the Trading Interval there is always imbalance
- All movements of Facilities during the Trading Interval can affect that balance, whether that movement is scheduled or unscheduled
- The Load Following (LFAS) requirement is set to cover unscheduled movements in load or generation to maintain the balance
  - Ramping is a scheduled movement
- Any scheduled movement will impact the balance if not offset
  - And therefore, LFAS Facilities will automatically react to cover the imbalance and maintain the SWIS frequency – this is unavoidable
- When LFAS Facilities respond to scheduled movements, the ability to respond to unscheduled movements decreases
  - As effective LFAS is less than the requirement
  - This has consequential impacts on Spinning Reserve and Load Rejection Reserve
- The variability and frequency of unscheduled movements is increasing due to increasing quantity of Non-Scheduled Generation and residential solar PV

## Background: Aggregate ramping issues with gate-closure (2)

- To avoid impacting LFAS, Balancing Portfolio Facilities providing LFAS should not be used to respond to scheduled movements
- The Balancing Portfolio ramp rate is limited once Facilities providing LFAS are excluded
  - Easy for the Balancing Portfolio ramp rate to be exceeded when the aggregate Non-Synergy ramp rate is high or several Facilities ramp at once
- Currently, AEMO responds to Non-Synergy scheduled movements by:
  - Dispatching the Balancing Portfolio to offset the movement as it occurs, where the Balancing Portfolio ramp rate is sufficient
  - Dispatching the Balancing Portfolio in advance to limit the impact on LFAS
    - For situations where the difference in ramp rate is not excessive
  - Otherwise, issuing Dispatch Instructions to Non-Synergy Facilities
- A 60 minute gate-closure will preclude the option of dispatching the Balancing Portfolio in advance
- The remainder of this presentation indicates the frequency that linear dispatch could occur

## Resolution – issue Dispatch Instructions at a linear ramp rate

- Non-Synergy Facilities must ramp according to the ramp rate in AEMO's Dispatch Instruction
- Currently all Dispatch Instructions default to the Ramp Rate Limit
  - The ramp rate indicated by the Participant in the Balancing submission
- AEMO currently varies the Dispatch Instruction ramp rate as a last resort
- A linear ramp rate would require the Facility to ramp evenly throughout the interval (linear ramping)
  - The ramp rate may be less than the Ramp Rate Limit
  - Determined by: change in BMO quantity / minutes remaining in Trading Interval
  - The Facility's energy output during the ramping Trading Interval would vary
- Linear ramping would mitigate any imbalance during the Trading Interval caused by scheduled movements
- Expectation is that WEM Reform will require linear ramping at all times

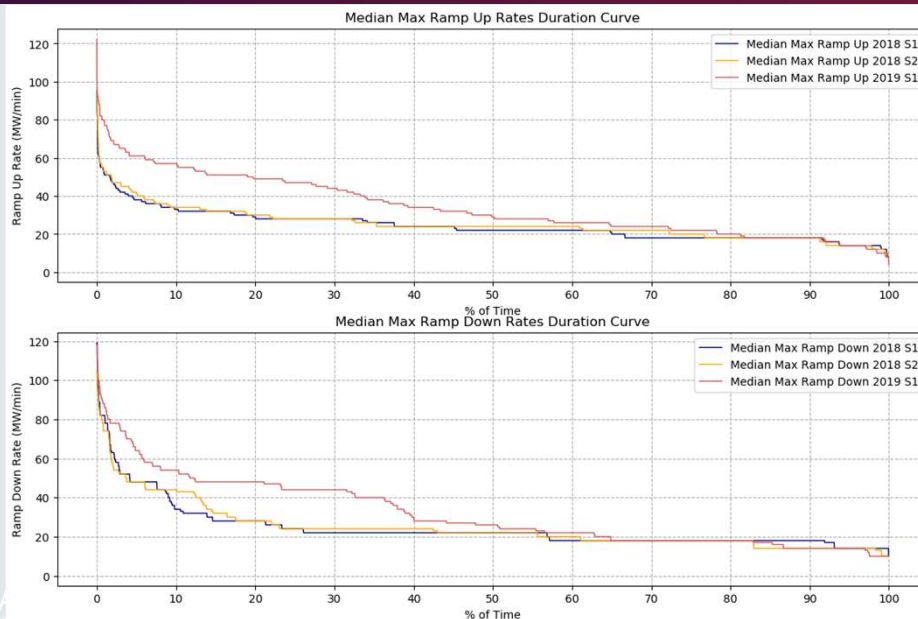


## Assessment and formula

- AEMO identified the Trading Intervals in 2018/19 that would have required linear ramping by taking into account ramp rates of demand, offsetting IPP movements, and Synergy (which may vary depending on gate-closure)
- AEMO assessed the ability of the Portfolio to dispatch in advance by assuming a 20% higher ramp rate
  - This provides an indication of outcomes where the gate-closure is 90 minutes or greater
- Linear dispatch formula
  - Step 1 - determine parameters using polarity (positive numbers indicate increasing generation and negative indicates decreasing generation)
  - Step 2 - summate all non-Synergy positive and negative movements within each Trading Interval to determine aggregate movement
  - Step 3 - offset forecast demand and determine the remaining ramp rate
    - When demand is increasing, non-Synergy ramping up movements assist
  - Step 4 - determine when Synergy can offset the remaining movement
    - As each non-Synergy movement needs to be offset, the polarity is opposite
      - That is, non-Synergy ramping up must be offset by Synergy ramping down
    - As Synergy ramp down rates are generally less than ramp up rates, linear dispatch should be required more often when non-Synergy Facilities ramp up
  - Step 5 - where Synergy is unable to offset the movement, set the ramp rate in each relevant Dispatch Instruction to linear
    - Restricting ramp up movements is constraining-off
    - Restricting ramp down movements is constraining-on



## Synergy Trading Interval ramp rates excluding LFAS Facilities over time



# Results

Gate closure	Number of intervals requiring linear ramping	Constrained-off		Constrained-on		Total Intervals %	Total MWh constrained
		Count of Facilities constrained	MWh constrained	Count of Facilities constrained	MWh constrained		
60 minute	1807	3790	9529	2665	7974	10%	17503
90 minute	1262	2753	7658	1967	6430	7%	14088
Difference	545	1037	1872	698	1544		3415
% diff	30%	27%	20%	26%	19%		20%



## 60 minute gate closure results by month and time of day

Row Labels	0	2	4	6	8	10	12	14	16	18	20	22	Grand Total
<b>OFF</b>	238	300	419	60	81	246	408	608	791	383	207	290	4031
<b>2018</b>	111	93	128	18	26	72	173	372	569	263	99	149	2073
7	2	16	13	5		9	13	40	82	6	6	3	195
8	8	14	45			1	25	63	99	3	3	7	268
9		2	12	4	1	11	53	79	112	10	2	4	290
10		6	14	1	4	24	39	52	100	78	9	8	335
11		22	17	10		10	10	23	68	48	74	45	361
12		73	30	48	8	11	17	20	70	128	92	34	624
<b>2019</b>	127	207	291	42	55	174	235	236	222	120	108	141	1958
1	73	118	108	27	36	48	29	56	68	89	92	117	861
2	28	14	14	5	7	16	10	6	32	13	11	21	177
3	1	8	11	2	7	38	59	43	3	3			175
4	9	15	35	1	5	39	52	71	50	9	3	2	291
5	11	34	71	4		22	61	40	41	4			289
6	5	18	52	3		11	24	20	28	2	2		165
<b>ON</b>	171	184	63	186	526	692	558	150	45	60	80	126	2841
<b>2018</b>	27	54	21	71	236	400	313	71	22	34	34	46	1329
7	5	16	5	1	22	56	27		4	7		11	154
8	6	20	6		14	69	22	1	1	3	7		149
9	10	5			34	55	54	6	4	2	4	3	177
10	2	1		4	36	58	58	17	9	7	8	4	204
11	4	3	10	52	85	52	18	1	8	10	3		246
12	4	8	7	56	78	77	100	29	3	7	5	25	399
<b>2019</b>	144	130	42	115	290	292	245	79	23	26	46	80	1512
1	42	42	21	90	167	127	87	24	9	8	27	50	694
2	7	7		11	39	22	39	16	5		1	1	148
3	7	13			43	31	26	13		7	4	11	155
4	32	26	11	14	34	50	47	18	5	3	4	5	249
5	35	31	7		5	40	41	7	3	1	3	8	181
6	21	11	3		2	22	5	1	1	7	7	5	85
<b>Grand Total</b>	409	484	482	246	607	938	966	758	836	443	287	416	6872

