Work Package 3 Report "Assessment of FCS and Technical Rules" (21/5/10) - REGWG Comments			
Issue	**Comments**		
	Verve Energy		
page 3	"this indicates that wind penetration of around 500 MW is likely to be achievable without system-wide effects". We would argue that deleterious effects are seen much earlier. In fact they are being seen now.		
Table 7.1 for Scenario 1	and tables for other scenarios appear to have Collgar commencing operation later than the 2009 Reserve Capacity Auction results indicate. This could be because Collgar was included in Work Package 1 scenarios later than when it would be commissioned. The load following requirement should thus be higher than suggested in the tables.		
Table 8.1	It should be noted that the decommitment merit order is not necessarily the reverse of the dispatch merit order. Maybe a separate table should be established documenting the expected decommitment merit order.		
Footnote #16	it is suggested that Collgar would increase the load following requirement by 150 MW as reported by MMA. This is not accurate – the MMA report was saying that the load following requirement would increase from 60 MW to 150 MW		
ROAM Consulting dispatch model	Cogen plant running at minimum loads - are the minimum loads the same as the steam requirement loads? Does this dispatch model consider fuel supply balances – gas contract take-or-pay, maximum contract quantities, pipeline limits and coal contract limits? The start up and shutdown cost for thermal plant in Table 8.2 could be flawed. We feel that the shut-down/start-up cost discount of $44/MWh for thermal plant is flawed (Section 8.2). It appears to be estimated as if the thermal plant would be running at full load. The costs need to be spread over a much smaller volume probably the expected STEM/Balancing volume that results in a shut-down or start-up being incurred or avoided. This is likely to be somewhere between 0 MW and the facilities' minimum load. The more accurate formula should be: Start up cost each time/(5 hours run if not shutdown x loading). This challenges a key assumption of the report, namely that thermal plant will be shut-down in preference to curtailing wind. Further work may be required to understand the implications of this assumption not holding true.		
Minor issues	The dates in section 10.1.1 are probably not 2010 The table reference in the line above Table 11.2 should be Table 11.2 rather than Table 11.4 Table A2 seems to have some discrepancies (looks like the maximum capacity numbers have got out of kilter somewhere in the table - shifted up one maybe).		
Page 84	The doubling of Margin_Peak in the ERA recent determination from 15% to 30% does not mean doubling of availability cost. MCAP was projected to be lower in the review period of 2010/11 to 2012/13.		
	The report recommends that wind generators bear only the additional load following requirement on top of what load would have to bear if there were no wind generators on the system. We are not sure that this is appropriate from an economic efficiency consideration. Could this be a distortion in the price signal for wind generators?		
Section 12	The cycling of all non-cogeneration base load plants (eg Collie, Muja) is impractical and will impact significantly on system security. The impact of wind penetration on overnight dispatch will therefore become a significant issue well ahead of the timelines indicated in Figures 12.1-12.4. Including minimum base load generation in these figures would assist participants' understanding of this issue. Also, with increased cycling of thermal plant, delayed unit return to service is inevitable. This will lead to increased use of fast start machines for energy requirements and the potential that insufficient capacity is available to meet load following requirements.		
Section 14.7 & 14.8- Costs	whilst the accuracy of forecast cost increases are questionable (ROAM admits there is significant uncertainty in the input parameters), our feeling is the costs are of the right order of magnitude. Load following plant tends to be provided by higher cost OCGTs whereas lower cost thermal plant can contribute to spinning reserve. Thus as the load following component of the ancillary service requirement rises, OCGT cost becomes more significant		

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Tables 14.8-14.11 -	Figures quoted under the column heading Availability Cost of Load Following ($ pa) appear to actually be Total Availability Cost, which includes spinning reserve.		
We generally agree with the conclusions except:	Intermittent Generators should pay the marginal cost of load following" - as discussed above, it is not clear that this is not economically inefficient. Further consideration is needed in this area. "Dispatch Priorities at time of minimum load" - as mentioned above, this will be an issue much earlier than 2020/21, and indeed is already an issue for Verve Energy which will be significantly exacerbated after Collgar wind farm enters service.		
We agree with the recommendations except :	"The Methodology in the Rules for the determination of the costs of load following and spinning reserve should be updated as a priority" - we agree but have concerns that the proposed equations in section 14.3 still appear to allocate 50% of the load following requirement to generators. Load following contributes to covering generators spinning reserve requirement, so there is an argument they should contribute to its cost, (hence its inclusion from day one of the market). However an arbitrary 50% allocation is inappropriate, and further consideration is required. As above, we are not yet convinced that wind farms should only contribute to the marginal cost of load following above that required for load variability. It is unclear what is the lack of transparency in dispatch merit order priorities. Is it referring to a lack of transparency for IPPs when they are moved off their Resource Plans by System Management? Curtailment of Intermittent Generators - the Market Rules require this. Recommendations on cost allocations and overnight dispatch need to be given a high priority particularly with the imminent arrival of Collgar wind farm		
Western Power			
P ii Timeframe dictates whether load or wind variability dominates	Is ROAM able to comment on the accuracy of predicting load changes compared to the accuracy of predicting variations in wind output?		
P2 The frequency must also……………………………..or a sudden transmission fault.	A sudden transmission fault will also cause a reduction in the load level, due to the voltage depression, even if no substations are disconnected as a result of the fault		
P5 System frequency modelling (fast response)	In the modelling were all the changes in output assumed to occur over a 1 minute time period? Does fast response dynamics consider changes over less than 1 minute?		
P11 5.1) b.	Is this measure still appropriate with increased wind penetration? Are changes that occur in less than 1 minute likely to be an issue?		

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P17 5.5) Fast response service Discard largest 1% (99th percenbtile).	Why is the largest 1% discarded? Is this a data validity issue?		
P25 6.2.1) Wind farm correlations	Has any correlation been considered for the wind resource at Merredin? The largest wind farm in the state will be installed in the Merredin area.		
P46 Where $P_{Gen}(t)$………, and H_{Gen} is the generator inertia in MWs.	In this case H_{Gen} is the inertia of the generator, turbine and all other connected rotating plant and not just the generator.		
P49	The governor droop is normally 4% for most units. Also there are some times when the governors are set on isochronous control to manage frequency.		
P87 Incentives for provision of inertia	Has a market approach been considered elsewhere for the provision of inertia? This may also be an issue for OCGTs that are providing frequency keeping services. The increased use of aero derivatives to replace industrial gas turbines and steam units combined with the increased penetration of wind will have a significant impact on system inertia.		
P89 Provision of load following service during curtailment	Curtailment of the wind output could be as a result of network restrictions in which case the wind farm could not provide a load following service. They will however be able to better regulate their output so that it is less likely to vary.		
P91 Wind exhibits correlation within three distinct zones in the SWIS	Has consideration been given to the Merredin area?		
P91 The timeframe dictates whether load or wind variability dominates	I would expect that both variability and predictability need to be considered. If the output is predictable then less of an issue.		
LGP			
General	Noting the comments on the inaccuracy and inappropriateness of the existing ancillary services payments, I perceive the focus should be on the "First Principles" dispatch modeling. The First Principles dispatch modeling should not tie itself to the Availability Payment concept, which seems to me to share the impairment described for the current method of reimbursement. I'd prefer an approach based on capacity payment plus energy payment according to merit stack.		
Table 14.3	the capacity cost seems to be $138,000 for al future years, despite a reasonable expectation of a blow-out in from 2012-13		
Table 14.8	scenario 1, 3rd row seems to be wrong		

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S14.8	Suggest reconcile the gas prices with the recent Gas Pricing paper		
Figure 14.4	Is the stated gas price increase a forecast or a fact? If a fact, this will have important consequences for MCAP?		
Page 93	Would welcome justification of the assertion that a carbon price would decrease Verve's costs		
Recommendations 1, 4, 5 and 6	These al seem to be pretty much the same thing.		
	System Management		
General	System Mangement agrees with the major findings in the report. In particular the tradeoff between curtailment of windfarms and daily cycling of coal-fired thermal generation has been identified and should be emphasised in the conclusions of the report. System Management believes that market design changes should be sought which provide a technically feasible least cost outcome to resolve this tradeoff question. The report indicates that an increasing demand for load following will be driven primarily by increasing windfarm penetration and that intermittent generation should pay a proportion of the cost of the provision of the load following service. System Management is also aware that technologies which can help meet the load following and energy balancing demand are available to SWIS but are not currently commercial. Market design changes which encourage these technologies should be considered as part of the market cost regime.		
Recommendation - Consider reviewing the definition of load following service	System Management agrees that the technical rules do not breakdown explicitly the definitions of load following - this is implicitly done in the specification of load following. System Management examines the spectrum of 1 minute, 5 minute and 15 minute load/wind movements and converts this to ramp rate requirements of different quantities. The time frames are about right. Fast response (governor/inertia response times), below 30 seconds is really not in the AGC regime, it should be noted that most non-service providing units (non verve plant) have control systems that counteract the governor controls in this time frame. Regulation response is also about right as this is an ideal re balancing (new economic dispatch allocation) timeframe as per NEM. Slow Response is also about right. System Management uses 30 minutes as this is the trading interval (and generally new setpoints for non Verve units)		
Recommendation - Consider commissioning a detailed wind correlation study	This is not new but lack of willingness to share data has previously has prevented this outcome. This recommendation is only effective if sharing of hub height 1 minute readings can be achieved.		
Recommendation - Consider introduction of an efficient market for the provision of ancillary services	System Management is seeking to do this but it will also require rule changes. System Management would welcome the opportunity to share its work so far with the REGWG and the report authors and System Management's views on how this work should be progressed further.		
Recommendation - If the load following service is explicitly split into different components, different participants should be responsible for the costs of each.	This appears consistent with the market objectives.		

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Recommendation - Arduous requirements for wind farms to provide system inertia should not be applied	This is generally not applicable to load following but may be required for contingency frequency control.		
Recommendation - Intermittent generators must be able to curtail if necessary	It is important that sufficient installed intermittent generation (of consequence) has the facilities to curtail output if required. This is true of all generators but the challenge is to determine the curtailment order in the various timeframes in accordance with the market objectives.		
Recommendation - Consider implementing more transparent dispatch merit order priorities in the SWIS	The current dispatch merit order priorities in the SWIS are far from a free and transparent market. This is likely to become a very significant issue in the near future, and should be addressed as a priority. This goes to the heart of market design. It seems clear that the priority is Verve decommit first and then redispatch non-Verve plant. That is the order is based on ownership rather than an economic outcome. System Management is pleased to note that the MAC's Market Rules Working Group and the Oates review committee are looking at the economic, commercial and technical issues associated with an efficient market driven dispatch mechanism.		
Recommendation - The methodology in the Rules for the determination of the costs of load following and spinning reserve should be reviewed as a priority.	The existing equations are likely to become insufficient within the next few years. Alternative equations are proposed in the body of this report that address these immediate issues.		
Recommendation - An efficient market for frequency control ancillary services should be established	The establishment of an efficient market for load following and spinning reserve services would avoid determining the costs of providing these services via arbitrary equations with the need for constant revision of calibration factors. It would also facilitate their provision from the most cost effective source, minimising costs to participants. System Management agrees and notes that the current market rules do not always reflect an efficient market price.		
Recommendation - Investigate ways of minimising the increase in cost of load following	Introduction of an efficient market for sourcing frequency control ancillary services from the most cost effective source is likely to be an effective way of minimising the cost increase in the load following service. Methods for minimising the increase in the load following requirement should also be explored, such as methods of operating wind farms that minimise their aggregate variability. The first sentence seems a repeat of the above. System Management agrees with second sentence but would add that there are mature technologies available (other than operating windfarms in a way that minimises their aggregate variability) which are technically feasible in SWIS but not commercially viable under the current market arrangements.		
Recommendation - Intermittent generators should pay the marginal cost of the provision of the load following service, above that required for load variability	This appears consistent with the market objectives. This would represent a major increase in costs for the intermittent generators from the existing MWh pro rata.		

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Recommendation - Ramp limits should not be applied to intermittent generators individually.	It may be effective to control aggregate ramping of intermittent generation, but this would be best achieved on a case-by-case basis by System Management as required. System Management has observed that whilst major ramp ups can occur across the windfarm fleet they are reasonably rare and normally occur when a front crosses the coast causing a high wind shutdown and a bit later a large ramp up when the wind starts to fall below the cut out level.		
Recommendation - Consider investigating the various ways in which load following requirements could be reduced or managed more effectively	This could include analysis of the effectiveness and costs of the following individually, or in combination: 1. Limiting aggregate maximum ramp-up rates for wind farms 2. Varying the load following requirement depending upon the current output level of intermittent generation 3. Varying the load following requirement by time of day 4. Capping maximum output of intermittent generators 1 – System Management agrees that this suggestion is worthy of further investigation 2,3 Currently System Management normally does this by estimating the amount of gustiness over the next few hours and increasing the load following accordingly. The windfarm forecasting tool currently in use has been found to assist in this process. 4 – System Management would be concerned that this suggestion may not be in line with the market objectives		
Page 3 para 2 Load Following in the SWIS	"The existing load following Rules in the SWIS require that sufficient plant (mostly open cycle gas turbines (OCGTs)) be online to meet fluctuations in wind and demand in 99.9% of all periods." The load following is governed by two components of which only one is covered by the report. a. the Market Rules *"the capacity sufficient to cover 99.9% of the short term fluctuations in load and output of Non-Scheduled Generators and uninstructed output fluctuations from Scheduled Generators, measured as the variance of 1 minute average readings around a thirty minute rolling average. "* b. the Technical Rules *"Frequency* operating standards for the *South West Interconnected Network* 49.8 to 50.2 Hz for 99% of the time" It is the second component that provides the sufficiency test as it is an output measurement as opposed to an input measurement. The determination of "cover" is problematic in the first definition.		
Section 5, pages 11 to 21 – Metrics for Assessing Load Following Requirements	In the current and alternate modelling there is no mention of the frequency metrics which is an essential element. This is an essential follow on from the thoughts above. The essential metric is the frequency histogram rather than the load following capacity.		
Section 1.1, page 1 – Ancillary Services	System Management's understanding is that the following definitions apply in WEM. 1. Frequency control service as it is called in the report is called Frequency Keeping in the Market Rules. It is also referred to as Load Following in the Market Rules. Frequency Keeping ancillary service is part of the Spinning Reserve ancillary service which also provides coverage for contingency trip of a generator. 2. Network control is not an ancillary service. It is defined as a separate service called Network Control Service in the Market Rules.		
Sections 5.6 pages 17 to 21 – Slow Following Service	It appears to System Management that the magnitude and frequency of large load changes in the Slow Following, Regulation and Fast Response services may be reduced significantly if System Management's short term windfarm output forecast is used as an input.		

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Section 6.1.1 pages 22 to 24 – Calibration of WEST	The section on calibration of ROAM's Wind Energy Simulation Tool (WEST) indicates that significant variance between the actual output of a windfarm and the simulated data can occur. It may also be relevant to judgement of the MMA studies into windfarm capacity credits where due to lack of actual data much of the analysis was based on simulated windfarm output.		
Section 6.2 and 7.1 pages 26 to 35 – Load Forecasting and Load Following Requirements Results	System Management notes that the 2007-08 historical 1 minute basis loads were used as input to the load forecasting algorithm. Could ROAM please provide an explanation about the forecasting methodology used to forecast the variation in the load alone (in the absence of wind), and the wind alone (in the absence of demand variation) and how these components were combined to produce the total load and wind variation		
Section 7.2 pages 32 to 42 – Proposed Alternative Definition	Could ROAM also please provide an explanation about how the forecast has been applied to the proposed alternative definitions for the slow response, regulation and fast response services.		
Section 10.1.1 and 10.1.2, pages 52 to 54 – Calibrating the System Frequency Model	System Management endorses ROAMS comments on the variation between model outcomes and actual SWIS response beyond the 8 second period. A known feature of many generator facility control systems is a wind back to resource plan that takes place quickly after governor action has occurred. This is observed to cause a second stage of frequency decline some 10 or more seconds after the initial decline is arrested by the governors.		
Section 12, page 60 paragraph 1, and page 63 – Issues Associated with the Provision of Ancillary Services	Currently System Management is required to leave 2 Muja units on overnight (in addition to Collie at between 160 MW and 200 MW depending on flue gas temperatures) to provide critical restart oil heating in case one unit trips. As "must run" generation increases (including windfarms) there is an increasing likelihood that must run plant may need to be unloaded. This is likely to test the definition of "must run" plant in SWIS and could force windfarm output reduction.		
Section 13.1 and subsections, page 64 – Systems with Significant Interconnection	System Management notes that Germany and Denmark with high penetrations of windfarm have very strong transmission interconnections over which they balance windfarm energy changes and from which they draw load following capability. There are no interconnections in SWIS with frequency keeping capability. We also note that windfarm output forecasting at local and system level is becoming a critical management tool in determining balancing service requirements in both systems. System Management is moving in a similar direction and has received approval from the ERA for a windfarm forecasting tool to be integrated into SMMITS.		
Section 13.2.1, Page 67 – Markets with Low Interconnection (South Australia)	The last sentence suggests that AEMO (NEMMCO) may increase the cost to the market for procuring FCAS. Is it AEMO that would increase the cost to the market or would the price naturally rise as bid prices increased due to short supply? The report does not appear to make reference to AEMO's ANEMOS windfarm forecasting system which we understand has a role in pre-dispatch and semi-dispatch. Could ROAM please describe how this forecast is integrated into the AEMO's and windfarm operator's processes.		
Section 13.2.2, page 68 (see also Section 14.3, page 71) – Markets with Low Interconnection (EIRE)	The report indicates the importance of developing an active ancillary services market to manage extensive penetration of wind. System Management feels that the report would be more balanced by the inclusion of some comment about the mechanisms involved and implications of implementing market based schemes in WEM/ SWIS.		

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Section 14.3, page 72 – Revised Cost Calculation	The report notes that it is possible for spinning reserve requirement to exceed the load following requirement in peak periods, but not off-peak periods. Currently in SWIS spinning reserve (70% of largest loaded unit) dominates in all intervals (peak about 220 MW less SILs, off-peak about 140 MW less SILS). It is expected that as windfarm capacity increases load following will become dominant during off-peak periods and eventually as windfarm capacities increase further as a result of MRET/ CPRS the load following requirement may be dominant over the both peak and off-peak periods.		