NEMOC Briefing Notes 19 February 2015

Agenda Item 5: Var Scheduler Project

Following the November 2014 Board approval, AEMO engaged Alstom for this project on 15 December 2014.

Alstom is developing the central application which determines required voltage control actions. , AEMO is developing the capability to send the electronic instructions to the Reactive Plant Operators and is also developing a Var Dispatch Compliance Monitor.

A further meeting of the Stakeholder Focus Group will be held shortly. Following this AEMO will put in place a process to engage directly with each individual reactive plant operator.

The project schedule is tight. However at this early stage the project is proceeding to schedule.

Key milestones are:

- 1 August 2015 – Delivery of system to Dispatch Training Simulator for tuning
- 29 October 2015 – System available in Pre-Production to allow testing of reactive plant operator interfaces
- 9 December 2015 – Start of system live trial – provided readiness checks satisfied
- 11 March 2016 – Expected end of live trial and if successful control room operating positions would move from 5 to 4 shortly afterwards.

Agenda Item 6: AEMC, Reliability Panel, and AEMO's VCR study

- AEMO published the findings of its Value of Customer Reliability (VCR) review in October 2014, together with a draft Applications Guide which aims to provide stakeholders with information on how to use the results of the VCR review. Consultation on the Applications Guide has now been finalised – 8 submissions were received, and the final document is available together with the submissions on the AEMO website.
- The Reliability Panel has commenced its routine 3-yearly review of the Generator Compliance Template (Template). The Template sets out guidance to generators on good electricity industry practice in relation to monitoring the compliance of their generating plant with the generator performance standards. Submissions to the consultation paper have now closed - the Reliability Panel is planning an industry workshop in February to discuss submissions.

Agenda Item 7: Power System Security Working Group

The PSSWG last met in Brisbane at the Powerlink offices on Wednesday 26 November 2014. The next meeting is scheduled for March 2014 in Hobart. Items discussed by the PSS WG were as follows:

2014/15 Summer Readiness

- Generation reserves and water situation improved over previous summer.
- All preparedness works are either in progress or completed. NSPs have indicated that that they are prepared for this summer.
- Long range weather forecast indicated warmer and drier than normal this summer. Bushfires are expected to be more active and severity worse this summer due to increase dryness of soil and vegetation.

Bushfires

The group discussed request from NEMOC for a review of bushfire risks and policies, report being prepared. Discussion identified differences between TNSPs around reclose policies and patrolling of lines following bushfire related trips.

- ElectraNet don't reclose lines following bushfire trips, and are currently unable to use helicopters to survey lines at short notice due to OHS concerns.
- Powerlink leave auto-reclose enabled during fires, and can use helicopter surveys at short notice.

All NSPs reported good links with relevant fire services. Some differences noted around use of own staff and contract staff as fire spotters around transmission easements. Discussion of challenges of patrolling easements before restoring tripped lines.

Solar flares/geomagnetic induced currents/coronal mass ejection/geomagnetic disturbances

Report outlining modelled GICs was discussed. Noted that the simulations generally correlate in time with measurements, but magnitude of simulated currents often much higher than measured.

- Powerlink noted that construction of the new approximately east-west aligned EHV lines to serve gas plants increases exposure to GICs, which are most material for lines with this alignment.

System Restart

- AEMO continuing with the Review of SRAS Arrangements (SRAS Review).

Emerging risks and issues

The group identified and discussed a number of current matters as well as emerging risks and issues:

- Reducing demand has taken some stress out of the system and improved ability to schedule network outages.
- Discussion of voltage control issues under load demand conditions. All NSPs reported varying difficulties with maintaining voltage within required ranges under low load conditions. Operational responses such as de-energising lines and widening target voltage ranges have generally been sufficient to date.
- Noted that these operational problems may not be fully on the radar of the planners or regulators. Still a focus on voltage control under high, not low load conditions. New plant such as reactors, SVCs or synchronous condensers could help operators, but unclear how investment for min load conditions could be justified.
- Inertia reduction. AEMO and ElectraNet are carrying out studies of the South Australian region.

Sustainable Communications

- AEMO has decommissioned its current satellite phones system used in the control rooms as the system was near end of life and is dependent on the public phone network. AEMO has indicated that alternate systems could be used but only if they work directly on a Satellite Network and NEM participants could also be using the same systems. Systems are available and AEMO has proposed to investigate some options with costs. TNSP PSSWG support this approach.
- AEMO has agreed to raise the issue of emergency communications and reliability of public telephone networks with the TISN organisation.

Dynamic Ratings

- Tasmania and Victoria are well established on this subject. South Australia is progressively increasing the number of areas where dynamic ratings apply particularly in the vicinity of wind farms. Queensland is also increasing the number of areas where dynamic ratings apply. Key issue for TNSPs is the use of reasonability limits for dynamic ratings prior to submitting the data to AEMO. No new developments in the area of dynamic ratings.
- B2B process for ratings and Network Outage Scheduler (NOS)

AEMO has completed the required IT development to enable the TNSPs to utilise the B2B process.

- Currently TransGrid are utilising the 2 way B2B communication for the Network Outage Scheduler (NOS). THEOS system working well.

With the exception of TransGrid TNSPS are experiencing delays or issues with B2B projects.

Work Health & Safety

- AEMO is required to consult, co-operate and co-ordinate with Other Duty Holders. This occurs where it has a shared health and safety responsibility and it is reasonably practicable for it to do so. This involves AEMO and all Other Duty Holders working together in a proactive and reciprocal way, so that the risks associated with an activity in which it is involved, are eliminated or controlled. AEMO must discharge this duty to the extent to which it can influence and control the matter.

G20 Summary

Powerlink provided a briefing on the 9 months of preparations involved in securing the electricity supply to Brisbane for the Nov 2014 G20 meeting. Whole of QLD industry involved.

- Physical and cyber security of electricity assets were both significant areas of work inside and outside Powerlink. Additional backup control centres developed by some electricity NSPs. Aim was to have a “no embarrassment’s” summit, which was achieved.

Agenda Item 8: Interconnector Projects NSW - QLD

- There is no change in the QNI limits since last report:
    - The maximum southward limit on QNI will be approximately 1078 MW and this will be set by either transient stability for loss of a Boyne Island potline or a fault on the Armidale to Dumaresq 330 kV line.

- The maximum southward limit on QNI is 1,200 MW (changed on 25 July 2013), based on oscillatory stability and conditional on the availability of Phasorpoint equipment. The limit with Phasorpoint out of service and major prior outages is 1078 MW. AEMO is reviewing the impacts of these prior outage cases on power system damping.
- The maximum northerly limit on QNI and Terranora (combined) is approximately 300 MW, set by voltage stability limitations for loss of the largest unit in Queensland. While this limit can be above 300 MW, depending on system conditions, flows are typically limited to 300 MW or below.

- TransGrid and Powerlink are currently investigating upgrades to QNI. See:

http://www.powerlink.com.au/Network/Network_Planning_and_Development/QNI_upgrade_study.aspx

VIC – NSW

- There is no change in the VIC-NSW limit since last report:
  - The southerly limit on the VIC-NSW interconnector is projected to be up to 1,600 MW due to:
    - Oscillatory stability and conditional on the availability of Phasorpoint monitoring equipment.
    - Voltage collapse for loss of the largest Victorian generating unit or Basslink (AEMO is currently reviewing this limit).
    - Thermal limit on a Murray to Dederang 330 kV line or Dederang to South Morang 330 kV line.
  - The northerly limit on the VIC-NSW interconnector is projected to be up to 1,800 MW due to:
  - Thermal limit on the South Morang (F2) transformer or South Morang to Dederang 330 kV line.
  - Transient stability for trip of a Hazelwood to South Morang 500 kV line.

VIC - SA

- There is no change in the VIC-SA limit since last report:
  - 680 MW (Vic to SA) on the combined Heywood and Murraylink interconnectors, based on 460 MW thermal limit for the Heywood transformers and 220 MW thermal limit on Murraylink.
  - 580 MW (SA to Vic) on the combined Heywood and Murraylink interconnectors, based on oscillatory stability and conditional on the availability of Phasorpoint equipment. The limit with Phasorpoint out of service is 420 MW (total transfer on both interconnectors).
  - The maximum transfer capability from SA to Vic on Heywood alone has increased from 300 MW to 460 MW based on thermal limitations. The maximum transfer capability from SA to Vic on Murraylink alone is still 220 MW.
  - AEMO and ElectraNet have proposed an upgrade to increase the limit on the Heywood AC link to 650 MW in both directions. The projected is proposed to be completed by July 2016. See:

http://www.aemo.com.au/Electricity/Planning/Regulatory-Investment-Tests-forTransmission/Heywood-Interconnector-RIT-T

TAS – VIC (Basslink)

- Basslink capability is normally up to:
  - 594 MW (TAS to VIC, measured at Loy Yang), depending on dispatch conditions, mainly due to voltage control issues in Tasmania.
  - 478 MW (VIC to TAS, measured at George Town), depending on dispatch conditions, due to fault level and frequency control limitations.

Agenda Item 9: Operations Planning Working Group

The most recent OPWG meeting was held on 3 December 2014. At the meeting a number of issues were discussed including:

- Penetration of renewables – Outcomes of the AEMO and ElectraNet joint investigation on potential issues for SA, particularly under conditions when the SA power system is or could become separated from the NEM were discussed.

  Changes to ensure security of SA region when there is a credible risk of separation:

  AEMO is progressing two changes to handle outages that result in credible risk of SA separating from the NEM. (These include 500 kV outages between Sydenham and Heywood, and Heywood transformer outages and Heywood – South East on the SA side. There are some rare SA outages, such as reclassification of loss of both South East –Tailem Bend lines as credible, or CBs at Tailem Bend, which can also create a credible separation risk.)

  The two changes are:
  - Checking the availability of Regulation FCAS in SA when assessing power system security so that the power system frequency of the separated SA can be maintained within the frequency operating standard
  - Limiting the Rate of Change of Frequency (RoCoF) in SA following a separation event

  These changes will help ensure that SA survives an actual separation event with minimum disruption in SA, and that SA can be securely operated as an islanded region post-separation.

- **NEMOC Future Directions**

  Immediate work-stream for PSS WG, OPWG, PMWG - Maintaining power system security during minimum load periods

  With reduction in base load there is likely to be a reduction in minimum demand levels which may create operational issues such as covering the contingency of the loss of load such as a potline. Need to understand at what point this would become a significant operational issue.
  Following specific actions are being undertaken by AEMO representatives of OPWG and PSS WG. The outcomes of these actions will be endorsed by OPWG and then reported to NEMOC (a separate report will be provided).

- Identify current challenges to maintaining power system security under normal operation

  Action: Contingency Lower FCAS is the key to this question. AEMO NEM RTO and Operations Planning will collect the relevant information and present to respective working groups for discussion and their input.

- Identify any additional challenges to maintaining power system security where minimum demand may be lower than normal such as loss of a potline over minimum demand period.

  Action: AEMO NEM RTO and Operations Planning will collect the relevant information and present to respective working groups for discussion and their input.

- Consider development of a process to monitoring the difference between the regional daily minimum demand and the sum of technical minimums of in service generation in the region (known as Load Rejection Reserve).

  Action: AEMO Operations Planning will develop a possible process and present outcomes to the working groups for discussion and their input.

Procurement of SRAS

An update was provided to OPWG on the procurement of SRAS. AEMO is progressing dynamic modelling of the system restart process using PSCAD. Modelling include nonlinearities during restart, protection relay operation and harmonic responses etc. AEMO informed that they are happy to share the study outcomes with TNSPs.

NEM Under-frequency Load Shedding (UFLS) arrangements:

2014 NEM UFLS review is progressing well. Received required information from regional Coordinating Bodies. There will be some changes to UFLS blocks in Victoria because a smelter load participated in UFLS shut down. Review of the UFLS settings is expected to be completed by the end of January 2015.

Heywood interconnector upgrade project

ElectraNet and AEMO gave a presentation to OPWG on the Heywood interconnector upgrade project covering the timing of the project as well as the technical details.

Further discussions:

Following topics were also discussed in the OPWG meeting on 3 December 2014:

- Potential improvements to the process of publishing 13 month outage plans
- Further streamlining of providing information on power system augmentations to AEMO

Next OPWG meeting

The next OPWG meeting will be held on 18 March 2015.

Agenda Item 10: System Incidents 1 November 2014 – 31 January 2014

The table below provides information on power system incidents that AEMO has deemed reviewable in accordance with NER clause 4.8.15.

Date of Incident	Incident	Primary Reason for Incident	Status
Mon 24 Nov 2014	Trip of 220 kV transmission lines at Mt Beauty	Mt Beauty-Dederang No.1 and 2 220 kV lines tripped due to lightning. At this stage, unknown why Mt BeautyMackay and Mt Beauty-West Kiewa 220 kV lines also tripped	Report being prepared
Wed 10 Dec and 16 2014	Trip of Basslink and Tasmanian transmission lines	Basslink trips unexpected. Root cause yet to be identified.	Report being prepared
Thu 11 Dec 2014	Trip of Mullumbimby-DunoonLismore 132 kV lines (9U6 and 9U7)	Initially thought to be a lightning strike. Following a line patrol most likely cause was airborne debris.	Report being prepared
Sun 28 Dec 2014	Trip of Trip of Cherry GardensTorrens Island 275 kV line at Torrens End	A protection mal-operation at the Torrens Island end. The protection was rectified before the line was returned to service.	Report being prepared
Fri 2 Jan 2015	Trip of Keith -Tailem Bend 132 kV line at Keith End	A faulty capacitor voltage transformer (CVT) caused the trip.	Report being prepared
Tue 13 Jan 2015	Trip of Robertstown-Tungkillo 275 kV line at Robertstown end	Incorrect secondary isolation during on-site maintenance work at Robertson substation	Report being prepared
Fri 16 Jan 2015	Trip of Ross-Chalumbin and Chalumbin-Woree	Lightning strike on 275 kV lines followed by voltage collapse on 132 kV at Tully	Report being prepared
Sat 24 Jan 2015	Trip of Keilor-South Morang 500 kV line at the Keilor end	Unknown at this stage	Report being prepared
Sat 24 Jan 2015	Trip of Bayswater- Regentville (31) and Bayswater-Sydney West (32) 330kV lines	Line 32 tripped due to a defective insulator which has now been replaced, and line 31 tripped due to a maloperation of the DEF scheme which has now been disabled	Report being prepared

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Agenda Item 11: Emergency Exercises and Communications NEM Emergency Management Forum (NEMEMF) Meeting:

The last NEMEMF meeting was held on Wednesday 19 November 2014 at the Park Royal, Melbourne Airport.

Items of interest included:

- Cyber security presentation from AEMO
- Information needs of Jurisdictions during a black system event presentation from Alex Archer (DEWS)
- Power System Emergency Management Plan (PSEMP) Annual Review
- Emergency Protocol review
- 2013/2014 summer readiness

The next NEMEMF meeting will be held on Thursday 23 April 2015 in Sydney. Planning will commence for the 2015 NEMEMF exercises in March and an exercise briefing note will be on the April meeting agenda.

Agenda Item 12: Plant Modelling Reference Group

Since the last NEMOC meeting the PMRG has met three (2) times, the last meeting was 20/01/2015. The following items of note were discussed at past meetings, with the next meeting scheduled for 17/02/2015:

1. SA Phasor Measurement Exercise

- AEMO and the PMRG are in the process of establishing the modelling requirements for wind farms in oscillatory stability limits. Similarly, AEMO is looking to validate the effectiveness of PSS' in inter-regional damping of electromechanical oscillations.
- During December and January AEMO arranged for Powerlink to transport their portable prototype PMU device to SA, and in coordination with ElectraNet, took measurements at a number of sites, including two thermal power stations and a wind farm.
- In conjunction with TransGrid AEMO has carried out spectral analysis of the results and notes that preliminary results indicate that there is no participation of Type 3 wind turbines (DFIG) in inter-area modes of oscillation. Concurrently, analysis of synchronous generator data is underway.
- Further measurement of SA wind farms is planned for February and March to substantiate the findings and obtain further data for Type 2 (variable rotor resistance induction generator) wind turbines.

2. University of Adelaide Mudpack research agreement

- Research and maintenance agreement for Mudpack has 4 months remaining. Adelaide Research Institute (ARI) is seeking an extension to support ongoing developments for oscillatory stability models and further refinements to the software functionality.
- The PMRG has received a detailed proposal for a three year extension of the current R&D agreement. The member corporations of the agreement will now review the proposal and revert with a combined response by March 2015.

3. Member Changes

- Removed David Francis (AEMO) as a RG member
- Added Luke Robinson (Western Power) as a member.

4. Heywood Interconnector Testing

- Milestones for Interconnector testing include commissioning of the third Heywood transformer in September 2015, and the Blackrange Series Capacitor in June 2016. In the lead up to commissioning and following commencement of active operation the PMRG will be supporting AEMO and Electranet in developing test procedures and completing pre-test simulations to allow commissioning and establish secure upper transfer limits.
- A draft test program is being developed by AEMO and Electranet to assess the material impact of the upgrade on the transfer capability (see clause 5.7.7. of Rules for more detail).
- A project kick-off meeting was held between AEMO and ElectraNet in January 2015, discussing and agreeing a division of works, critical resource requirements and project milestones.

5. PMRG Proposed Priorities List for 2015

- Extension of the ARI R&D agreement to finalise Mudpack software and complete a number of oscillatory stability investigations for the NEM.
- Complete NEMOC directives regarding the low demand modelling evaluation of the NEM.
- Resolve renewables small signal modelling requirements.
- Progress Heywood Interconnector upgrade work (Test procedures, pre-test simulations, complete tests and establish upper limit of transfer).
- Develop frequency and voltage dependant load models for the NEM.

Agenda Item 13: Modelling of Solar Storms

Some time ago the BoM proposed a project with the University of Newcastle to better understand the impact of solar storms on the Australian power system

The aims of this project are to:

1. Assess the vulnerability of the Australian electricity supply networks to GICs during extreme space weather events.

2. Determine the most vulnerable parts of the Australian power network to space weather.

3. Develop appropriate warning mechanisms of impending solar extreme events to enable the electricity industry to respond appropriately.

4. Design strategies to minimise the risk to the Australian electricity industry from extreme solar events.

5. Develop system security and integrity procedures for electricity supply engineers to minimise adverse consequences of large GICs in the grid.

The required deliverables would be a model consisting of the network topology and impedances at very low frequency and the ground conductivity. Such a model would allow:

- identification of the areas of the NEM most likely to be impacts by GICs without the need for significant expansion of the current network of CIG monitors. This will allow us to produce more focussed contingency plans and procedures.
- use of this model to translate forecasts of impending solar storm and their magnitude into forecasts of expected power system impact to better ensure appropriate responses.
- use of this model in a study mode to be able to translate estimated risk levels of future solar storms into risk levels for the transmission network in order to better understand the level of investment that would be justified to address these risks

This project failed to get off the ground due to issues regarding confidentiality of data and liability for participants. AEMO has been advised that the BoM believes that these issues can be addressed and seeking support to relaunch this project.

AEMO is seeking input from the NEMOC as to the value of this project and whether members would be willing to consider supporting this project.
