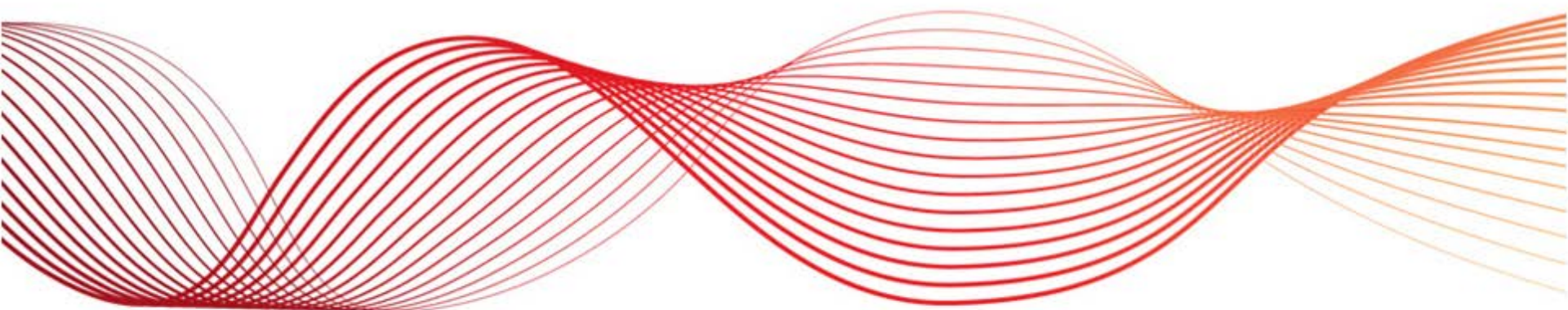


OPERATIONAL SYSTEMS OVERVIEW



OPERATIONAL SYSTEMS OVERVIEW – GRID SYSTEMS (SCADA)



- AEMO uses an Energy Management System with functionality similar to that used by Western Power (and other TNSP's). It is a GE system called e-Terra.
- The e-terra provides the following key functionality
 - SCADA telemetry and controls
 - AGC for frequency control
 - Network models for state estimation, contingency analysis, fault level analysis and voltage stability analysis
 - Dispatch instruction implementation
 - Constraint automation in dispatch timeframe
 - Data for 5-minute dispatch forecasts
 - Historical data retention for compliance monitoring (and settlement where SCADA data is used instead of metered data)

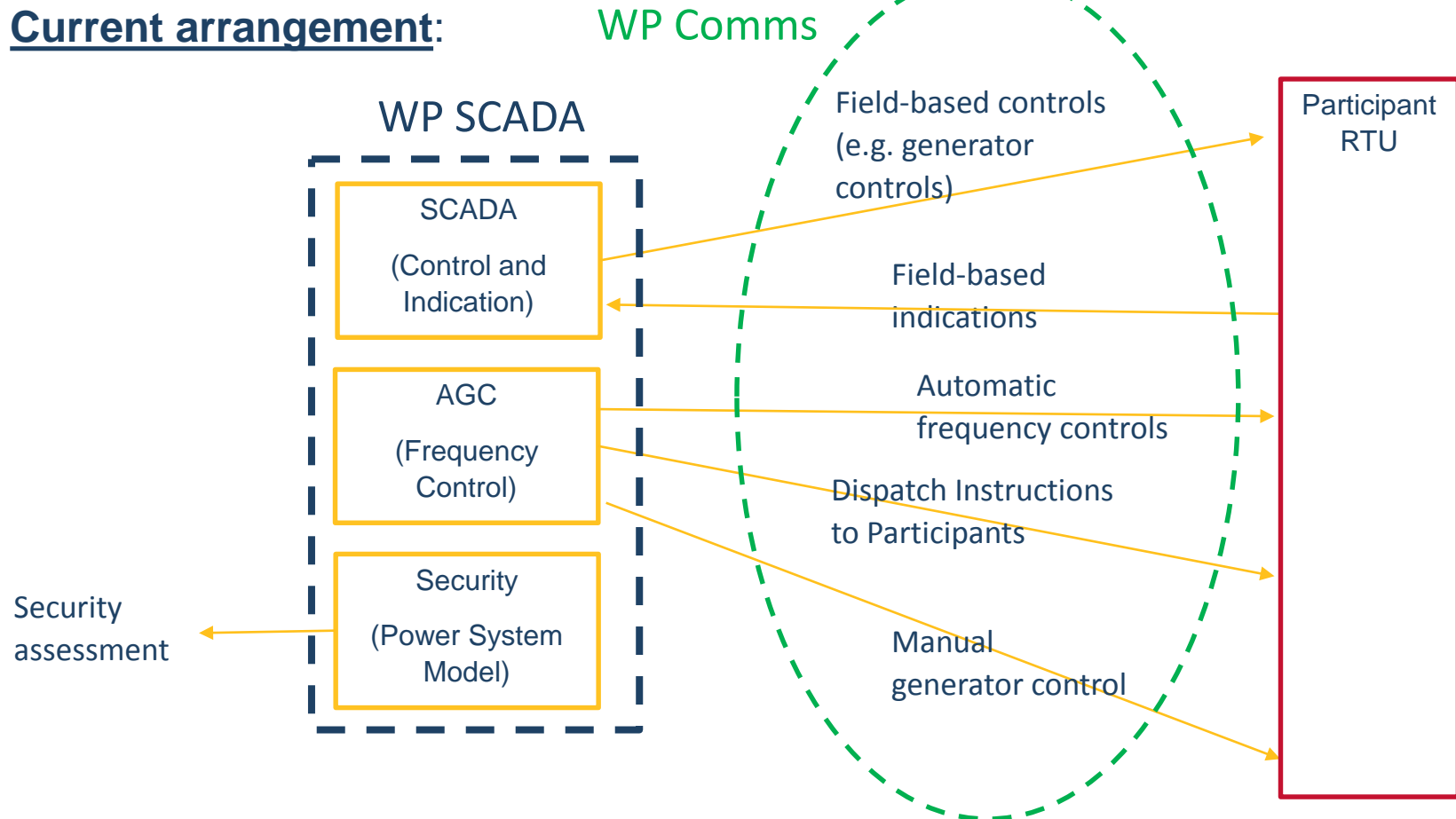
OPERATIONAL SYSTEMS OVERVIEW – GRID SYSTEMS (SCADA)



- The existing RTU connections to the Western Power SCADA systems will remain in place, and a new link between the Western Power control system and the AEMO e-terra will be established (ICCP link).
- This will allow for dispatch instructions to be re-directed from the e-terra system, out through the Western Power SCADA and to participant facilities without having to re-commission RTUs and communications links to AEMO.
- Ownership and management of the RTUs and field connections will remain the responsibility of Western Power. Ownership of the ICCP link will be AEMO's.
- AEMO and Western Power will create a shared data library to map and manage all the necessary SCADA points between systems.

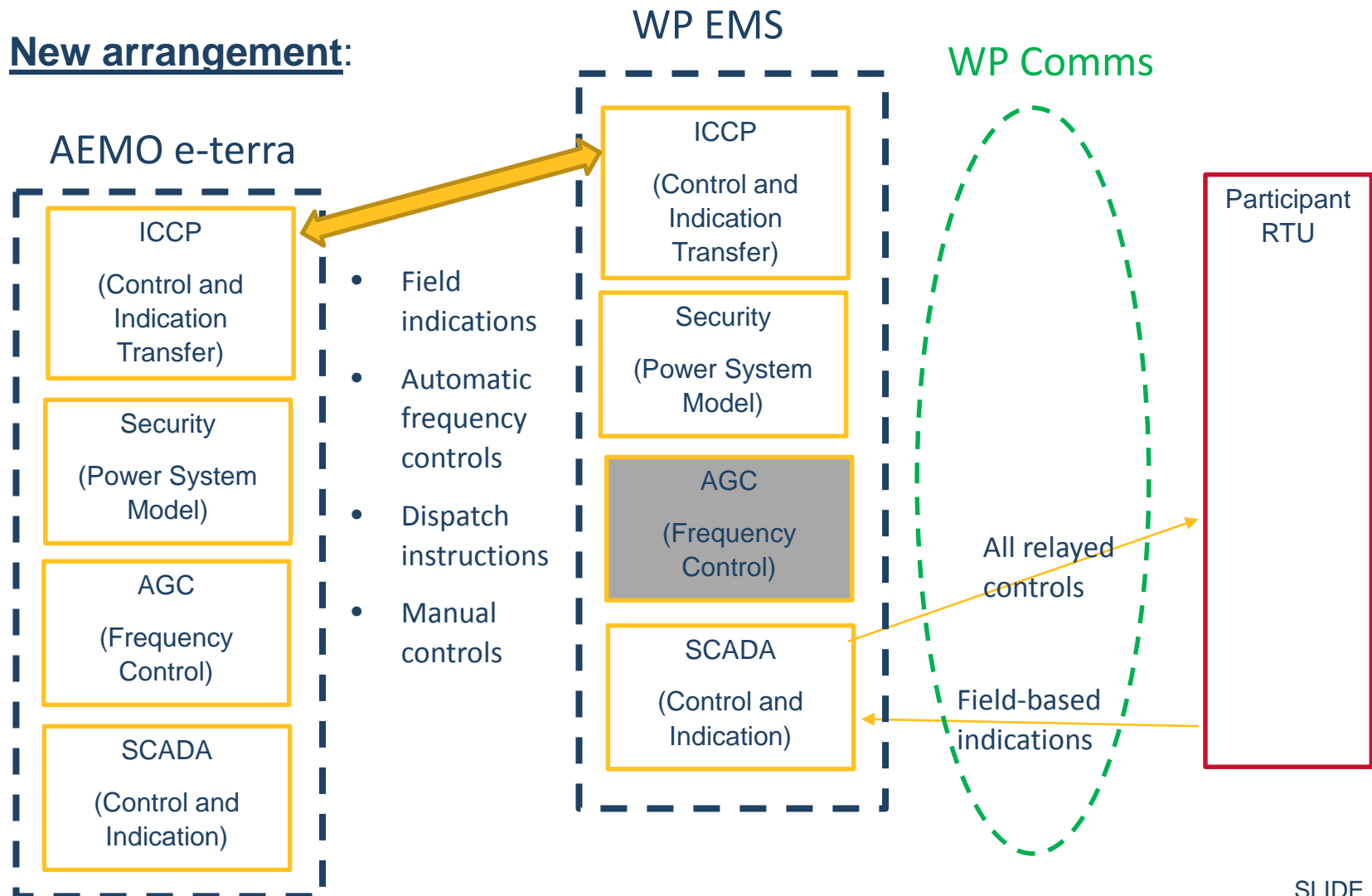
OPERATIONAL SYSTEMS OVERVIEW – GRID SYSTEMS (SCADA)

Current arrangement:



OPERATIONAL SYSTEMS OVERVIEW – GRID SYSTEMS (SCADA)

New arrangement:



Network Outages

- Network Operators will be able to submit network outage requests through the Network Outage Scheduler (NOS).
- Access is provided through MarketNet, either via a web portal, or via a B2B mechanism.

The network outage assessment rules have not yet been finalised by the PUO, AEMO's current understanding is that there is likely to remain a similar submit/approve approach to the existing WEM arrangement, although the terminology may change to align more with NEM concepts.

OPERATIONAL SYSTEMS OVERVIEW – OUTAGE SYSTEMS



Network Outage Scheduler

PD+ST+MT AEMO Issues/UTP

Outage Diary ---- Tue 19-Jul-2016 to Wed 20-Jul-2016

19/07/2016 12:19

WELCOME
nemlink
nemlink
Powerlink

OUTAGE
Library
Assessment
History

BOOKING
New
Update
Copy To New
Acknowledged

EQUIPMENT
List
Submission
Review

REPORTS
Menu

USER
Preferences
Password
List Users
Add User

LOGOUT

Co.Ref.	Co.	I/S	Equipment Affected Summary	CST	Start	Finish	Status
h36 Blackw	Plink	CAP	Blackwall 5 275kV CAP		30/03/2015 10:36	31/10/2016 08:00	C PTP
Q15S/0909	Plink	CB	h36_bikw. Cplr 5042 cb		17/04/2015 17:35	18/10/2016 17:00	C PTP
Q15S/1288-	Plink	CB	h36_bikw. Fdr 8382 cb		26/06/2015 12:59	11/11/2016 16:00	C PTP
Q15S/1876	Plink	BUS	Moura 1 132kV BUS		15/08/2015 08:30	30/11/2016 16:00	C PTP
Service Affected HV plant BUS Moura 132kV HV plant BUS Moura 132kV							
Q15S/2133	Plink	SVC	Braemar 1 275kV SVC		29/09/2015 12:50	26/08/2016 17:00	C PTP
Q15S/2297	Plink	CAP	Molndnr275 5 110kV CAP		14/10/2015 07:03	29/07/2016 12:00	C PTP
Q15S/2299	Plink	CB	h36_bikw. Svc 5812/1 cb		25/11/2015 10:25	22/07/2016 16:00	C PTP
Q16S/0152	Plink	CB	r2_brae. Fdr 88152 cb		22/01/2016 09:15	01/08/2016 17:00	C PTP
Q16S/0578	Plink	CB	h11_nebo.fdr 8342 cb		11/02/2016 14:08	05/10/2016 17:00	C PTP
CA-2016-02	Plink	LINE	Tennyson-Corinda 768 110kV LINE		28/02/2016 17:11	26/08/2016 18:00	C PTP
Q16S/0418a	Plink	LINE	Algester-Runcorn 7293 110kV LINE		29/03/2016 07:52	29/07/2016 17:00	C PTP
Q16S/0418b	Plink	LINE	Belmont-Algester 749 110kV LINE		31/03/2016 10:32	30/09/2016 17:00	C PTP
16MK2201	Plink	XFMR	Moranbah 3 132/66kV XFMR		01/04/2016 14:50	30/09/2016 17:00	C PTP
Q16S/0714	Plink	CB	Strathmore 1 Tfmr 5412 275kV CB		07/04/2016 11:44	30/09/2016 17:00	C PTP
Q16S/0713	Plink	CB	h35_athm. Fdr 8792 cb		07/04/2016 11:44	30/09/2016 17:00	C PTP
Q16S/0712	Plink	CB	Strathmore 88452 275kV CB		07/04/2016 11:44	28/10/2016 17:00	C PTP
Q16S/0994	Plink	LINE	Abermain-Upr Kedron 7258 110kV LINE		22/04/2016 16:47	10/10/2016 12:30	C PTP
Q16S/1020	Plink	CAP	Gin Gin 2 132kV CAP		29/04/2016 10:28	15/08/2016 11:59	C PTP
16NQ7271	Plink	XFMR	Alan Shrrft 1 132/11kV XFMR		04/06/2016 11:12	29/07/2016 18:00	C PTP
Q16S/0691	Plink	LINE	Stan PS Stanwell 862 275kV LINE		26/06/2016 08:25	18/09/2016 17:00	C PTP
Q16S/0691-	Plink	LINE	Stanwell-Calvale 8874 275kV LINE		26/06/2016 16:27	08/08/2016 10:00	C PTP
Q16S/1125	Plink	XFMR	Pioneer Vly 1 132/66kV XFMR		28/06/2016 07:32	22/07/2016 17:00	C PTP
Q16S/1132	Plink	LINE	Chalumbin-Woree 876 275kV LINE		28/06/2016 12:23	16/08/2016 08:00	C PTP
H036 8272/5022 track	Plink	CB	h36_bikw. Fdr 8272 cb		01/07/2016 16:16	21/07/2016 12:00	C PTP
H036 CB 8752 track	Plink	CB	h36_bikw. Fdr 8752 cb		01/07/2016 16:16	15/08/2016 12:00	C PTP

Hide Filter Reset Filter Outage Diary Filter Refresh Diary Refreshed Tuesday, 19 July 2016 12:19:36

Companies
☐ Show all
☒ show only
☐ Powerlink
☐ Transgrid
☐ AusNet
☐ ElectraNet
☐ TasNetworks
☐ APT
☐ Essential E
☐ Endeavour E
☐ TOA
☐ ACTEW - AGL
☐ Ausgrid
☐ CitiPower
☐ Energex
☐ Ergon E
☐ Jemena
☐ Powercor
☐ SA Pwr Netwk
☐ AusNet Dst
☐ United E
☐ AEMO

Outage Status
☐ Show all
☒ OR show only
☒ RESUBMIT
☒ STLTP
☒ POLTP
☒ WD REQ
☐ WDRAWN
☐ COMPLETE

Time Period
 Begin Date: 19/07/2016
 Period Days: 2

Primary Plant
☒ Out of Service
☒ In Service
☐ Information Only

Assessment
☒ Issues to resolve
☒ No Issues to resolve
☒ Required
☒ Not required

Constraints

Co.Ref. % Scope Of Work %

Restrict to outages with changes made to:
 AEMO ☐ Status ☐ Issue ☐ Note
 COMPANY ☐ Submission
 since: [Date] [Time]

Changes

Sorting
 #1 Start
 #2 Finish

All Equipment OR by: Type: All Station: % Name: % Find

OPERATIONAL SYSTEMS OVERVIEW – OUTAGE SYSTEMS



https://nos.prod.nemnet.net.au/nos/NOSHHomeWithDiaryFrameSet.htm Network Outage Scheduler

Create New Booking for Powerlink

WELCOME
nemlink
nemlink
Powerlink

OUTAGE
Diary
Assessment
History

BOOKING
New
Update
Copy To New
Acknowledge

EQUIPMENT
List
Submission
Review

REPORTS
Menu

USER
Preferences
Password
List users
Add user

LOGOUT

Company Booking Id: 1_20160719122107
Company Ref Code: Q15S/2133
Certainty: Outage scheduled

Information Only ☐ Affected DNSPs aware ☐
Affected TNSPs aware ☐
Affected Generators aware ☒

Select Primary Plant Out of service Reason HV equpt commissioning Scope Of Work Line/Substn

Outage - Services Affected					Add Service Affected
Service Affected	Type	Station(s)	kV	Equipment Description	
X HV plant	SVC	Braemar 330kV/275kv	275.0	Braemar 1 275kV SVC	
X HV plant	CB	Braemar 330kV/275kv	275.0	r2_brae. Cplr 5042 cb	
X HV plant	CB	Braemar 330kV/275kv	275.0	r2_brae. Svc 5812 cb	

Outage Period Type: Daily/Continuous
Recall Day: No Recall (selected) / Not Applicable
Recall Night: No Recall (selected) / Not Applicable

Outage Periods		
Company Ref Code	Plan Start	Plan Finish
Q15S/2133	29/09/2015 08:00	26/08/2016 17:00

Close New Copy To New Save to file Restore from file Submit to AEMO

Booking Details Booking Notes Booking Errors

Generator Outages

The generator outage principles and rules have not yet been finalised by the PUO, however current policy positions are that there will remain a requirement for generator participants to lodge outage requests in the WEM and for AEMO to approve or reject those requests.

- AEMO is currently considering options for which systems would best suit generator outage processing, options include
 - Modifying the NOS to incorporate generator outage requests
 - Modifying the bidding portal to allow for outage requests
- The solution will need to allow for participants to record outage data at the appropriate temperature (based on Reserve Capacity rule requirements)
- The solution will need to allow for Forced Outages to be lodged
- The solution *may* involve participants entering “available capacity” figures, as opposed to “outaged MW” figures as is currently the case

OPERATIONAL SYSTEMS OVERVIEW – OTHER SYSTEMS



- Forecast systems (to be discussed later in this presentation)
- PASA systems (ST and MT)
 - Reports to be published via MarketNet to participants, as well as on the public AEMO website (forecast processes to be discussed later in this presentation)
- Pre-Dispatch data
 - Reports to be published via MarketNet to participants every 30 minutes
- Demand Side Management dispatch
 - *The rules around DSM dispatch have not yet been finalised by the PUO, however indications so far are that a Non-Balancing Dispatch Merit Order will still be used and so AEMO will need to build the appropriate mechanisms to display this to the operator and allow them to dispatch programs in the necessary order.*
- Other control room user interfaces to support dispatch, reporting and compliance monitoring

- May we please ask for any feedback on the items presented above:
 - Information clarity
 - Content
- Any key items that you would like us to focus on for additional information?