The Electricity Supply Industry Planning Council

- The Planning Council is a statutory corporation formed under the *Electricity Act*
- Operates under the control of a Board of 5 members
  - three members represent industry sectors;
  - the chair and one member are independent
- The Electricity Act and our Charter set out our functions and obligations
- A small corporation of 9 employees

AER Public Forum
ElectraNet Revenue Proposal

24 July 2007

Electricity Supply Industry Planning Council

Role of the Planning Council

The Planning Council was established to:

- review the development plans of the private industry participants against the forecast needs of the State;
- provide independent, expert advice to the Government and the Essential Services Commission of South Australia (ESCOSA); and
- fulfil a number of South Australian representative roles in the National Electricity Market.

Regulated Electricity Services

The Planning Council encourages efficient outcomes in the regulated network services sector of the industry by:

- liaising with state and federal regulators to ensure that network regulation is effective for SA;
- working with network service providers on the efficient, long term development of the power system and of specific network solutions;
- collaborating with NEMMCO and interstate planning bodies seeking to ensure efficient development of the national network; and
- understanding the inter-relationship between the competitive and regulated market sectors.

Reset Review

- The Planning Council has reviewed the network augmentations in ElectraNet's submission as a core part of work on regulated network services
- all augmentation to the transmission network proposed within the revenue reset is solely driven by the need to comply with reliability standards in the South Australia Electricity Transmission Code (ETC)
- potential augmentations driven by market benefits (eg interconnector upgrades) are only included as contingent projects

Reset Review

The Planning Council:

- produces the Statewide demand and energy forecasts and reconciles those with connection point forecasts developed by ETSA Utilities
- has applied the forecast loads for year 2011/12 to the current network and identified areas where standards in the ETC are expected to be breached
- cross checked identified reliability constraints with ElectraNet's proposed projects
- undertaken a number of analysis in regions to ascertain whether the proposed projects are likely to represent close to optimal network development

Electricity Transmission Code

- ETC reliability relates to the **agreed maximum demand** at a connection point
- The agreed maximum demand is set between ETSA Utilities and ElectraNet based on ETSA's connection point forecasts
- ESIPC produces statewide forecasts annually and reconciles the 10% probability of exceedance forecast with these connection point forecasts
- The Planning Council applied a new technique for forecasting summer peak demand for the first time this year

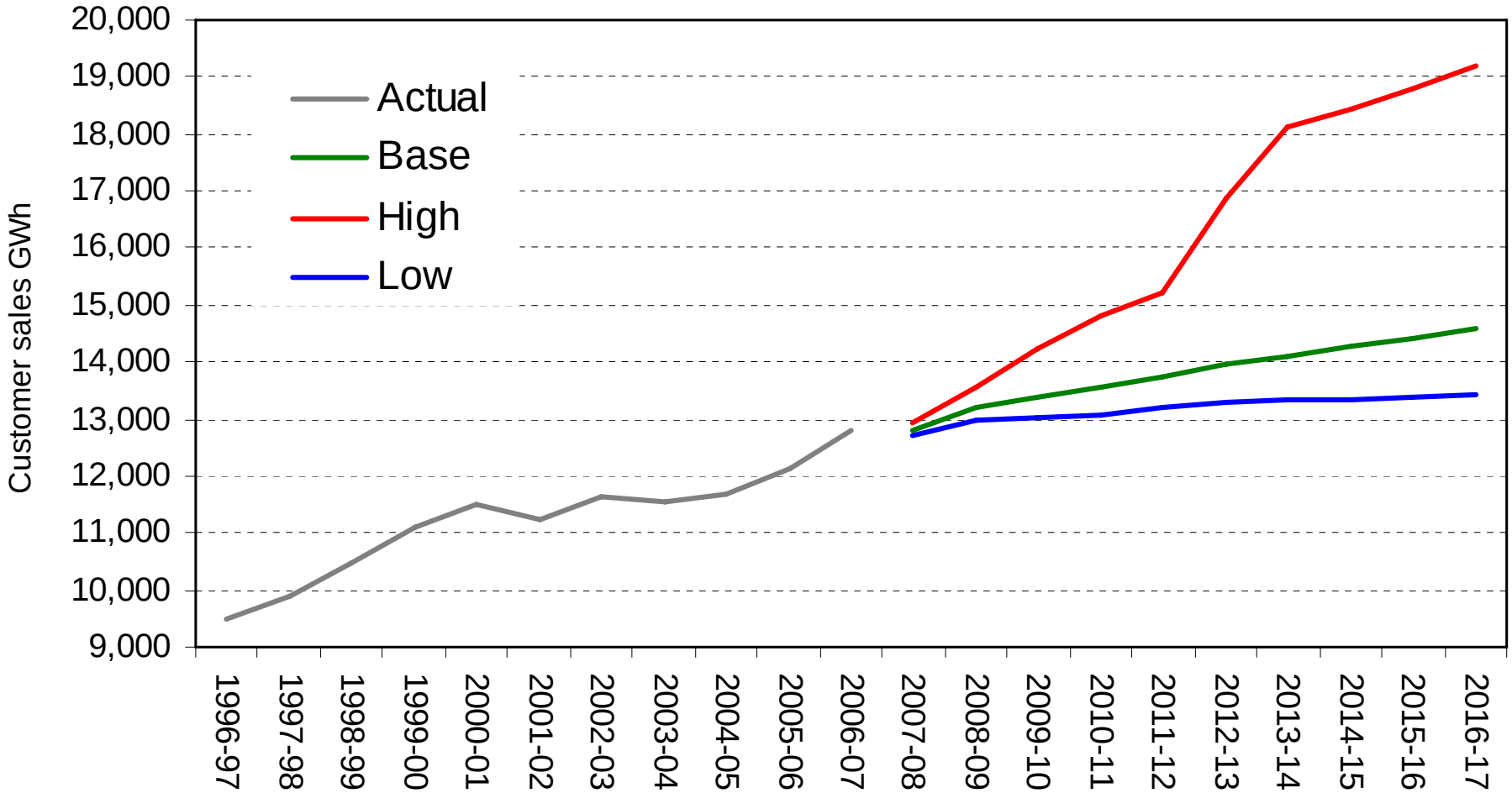
Sales and Demand Forecasts

- Sales and Demand forecasts
- Economic assumptions
- Transmission connection point forecasts

Customer Sales

- Sales have been growing strongly in the last two years
  - 5.3% growth in 06-07 and 9.1% over past two years
  - price response weakening; drought & pumping loads; weather effects on sales
- Lower growth expected in 07-08 – assumes return to average weather
- Average growth of 1.3% over next decade (base case economic outlook)
  - 0.9% for residential sector; 1.8% for business sales
  - forecasts assume carbon price signal from 12-13
- High case includes major expansion of Olympic Dam mining operation

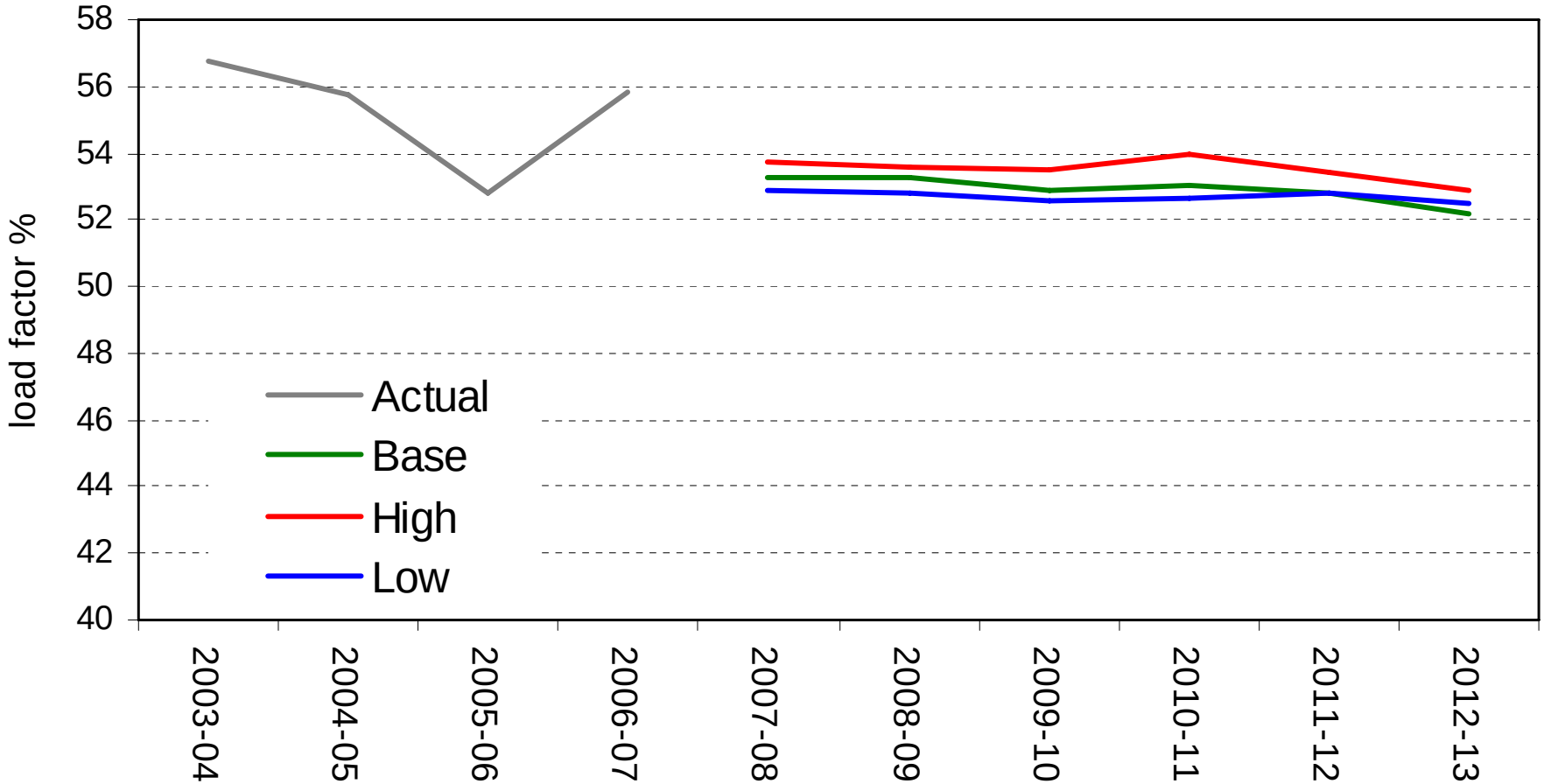
Customer Sales



System Load Factor

- Following shows system load factor based on 50% PoE outcomes and including wind generation
- Load factor projected to remain stable at around 53 % through the revenue reset period
- Low by industry standards but some improvement if Olympic Dam expansion proceeds

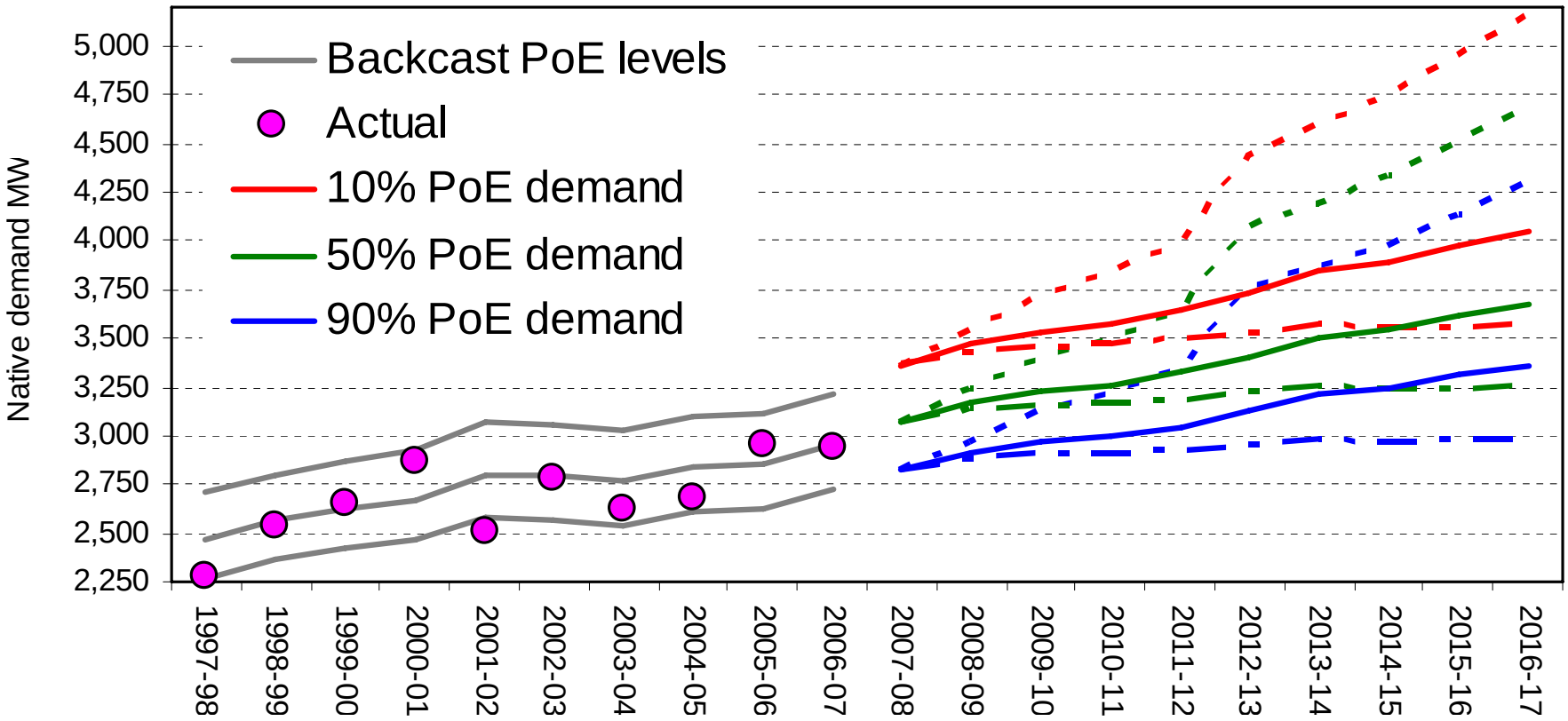
System Load Factor



Summer Peak Demand

- Following focuses on '*Native Demand' which includes:*
  - peak scheduled demand;
  - market non-scheduled generation;
  - wind generation; and
  - notified demand side participation
- Actual 06-07 peak of 2,942 MW on 16 Jan 07 (estimated 52% PoE outcome)
  - higher peak reached in 05-06 (2,953 MW, 20 Jan 06; 30% PoE outcome)
  - however last summer experienced 5 days with demand over 2,800 and record non-work day peak of 2,866 MW on 17 Feb 07

Summer Peak Demand



50% PoE Summer Peak Demand

Base case:

- forecast 50% PoE level for 07-08 is 3,069 MW
- compares with 2,942 MW last summer
- up by 119 MW on backcast 06-07 50% level,
- forecast average growth of 2.2% over next 10 years
- forecast for 2012/13 is 3,408 MW

10% PoE Summer Peak Demand

Base case:

- forecast 10% PoE level for 07-08 is 3,363 MW
- up by 143 MW on backcast 06-07 10% PoE level,
- average growth of 2.3% over next ten yrs
- forecast for 2012/13 is 3,736 MW

Low case:

- forecast for 2012/13 is 3,534 MW

High Case:

- growth of 4.9% pa based on strong growth in the resources sector and the SA economy
- forecast for 2012/13 is 4,441 MW

10% PoE Summer Peak Demand

Base case:

- forecast 10% PoE level for 07-08 is 3,363 MW
- up by 143 MW on backcast 06-07 10% PoE level,
- average growth of 2.3% over next ten yrs
- forecast for 2012/13 is **3,736 MW**

Low case:

- forecast for 2012/13 is **3,534 MW**

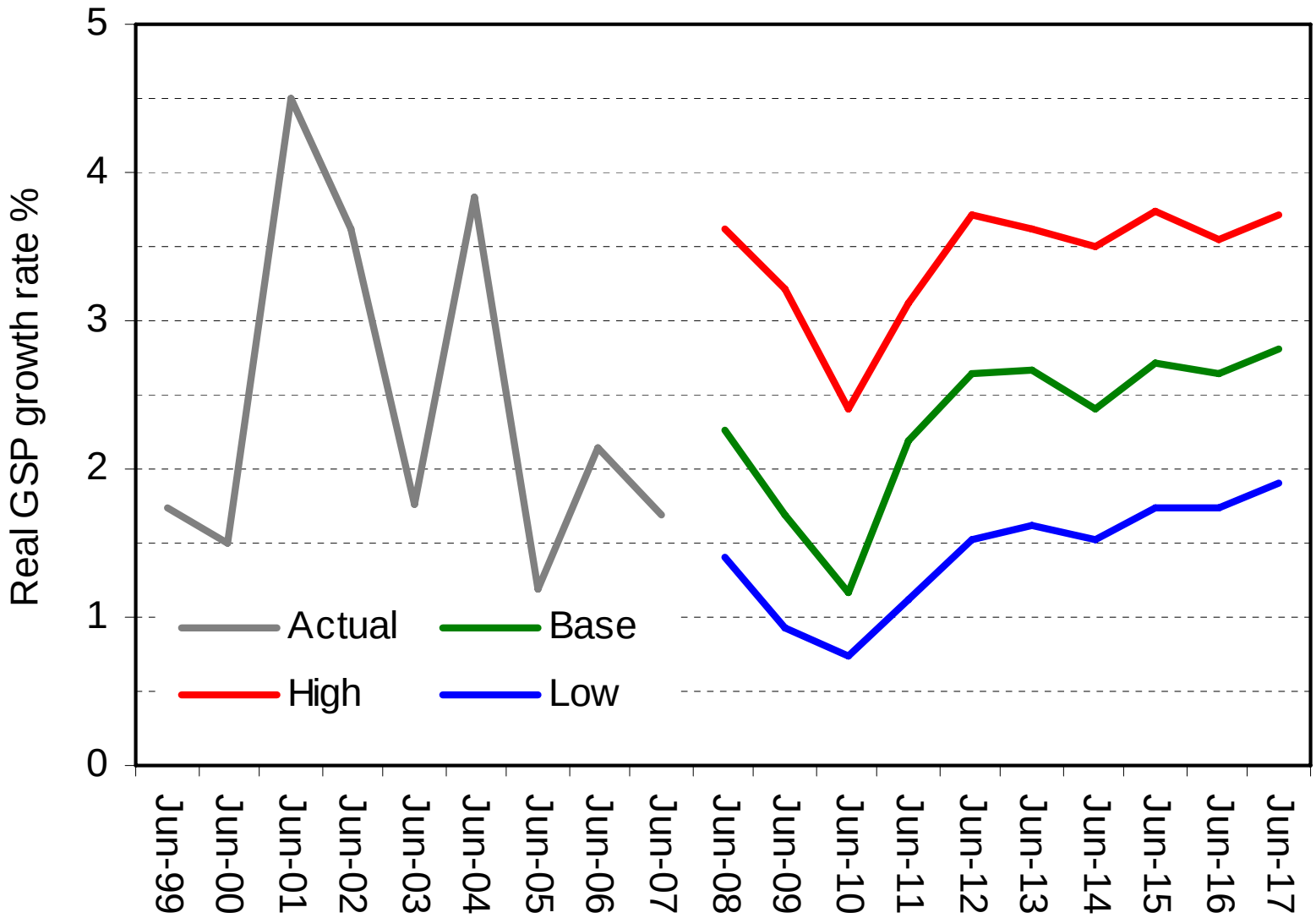
High Case:

- growth of 4.9% pa based on strong growth in the resources sector and the SA economy
- Forecast for 2012/13 is **4,441 MW**

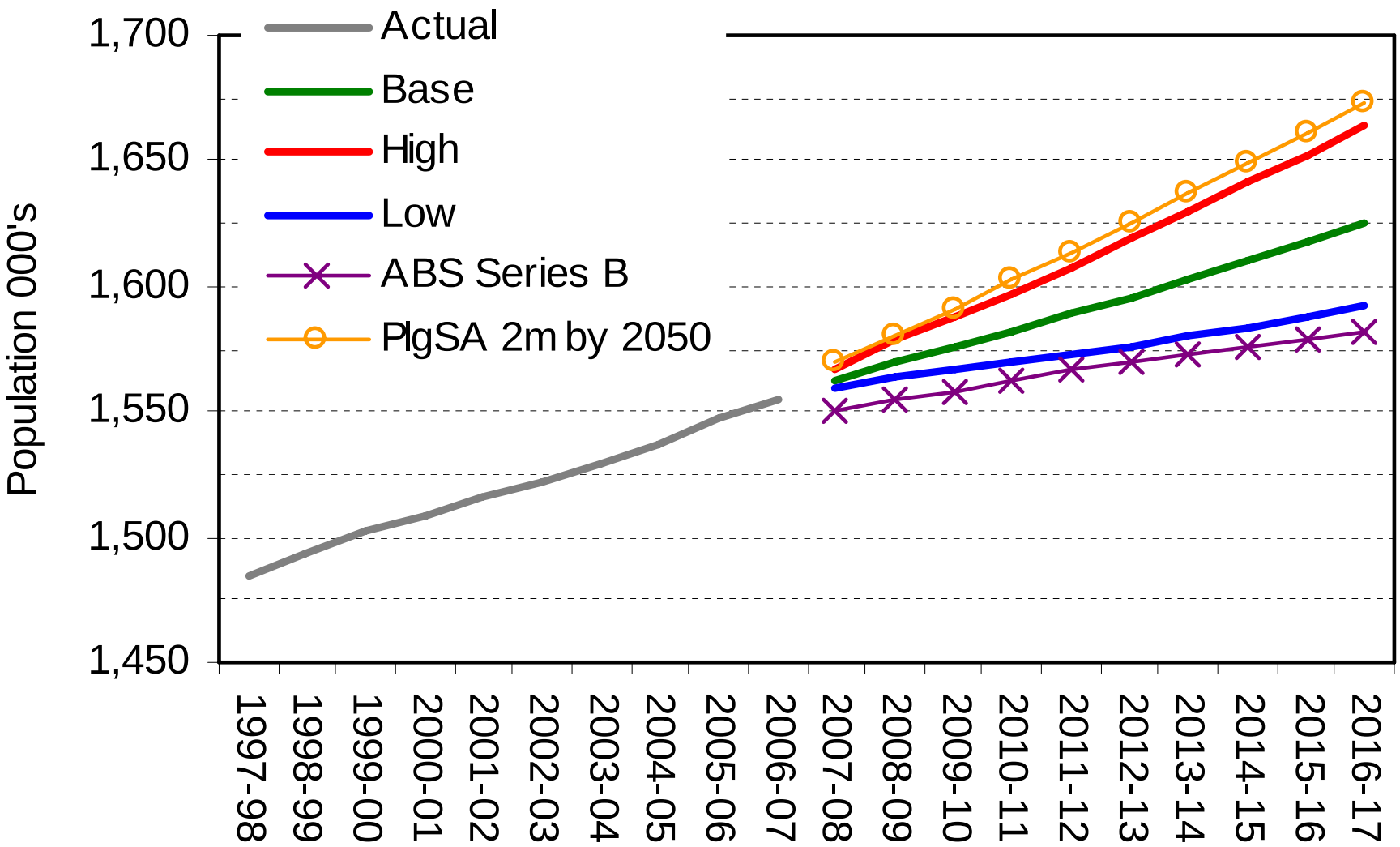
Economic assumptions

- Economic assumptions are those supplied by NIEIR for the 2007 Statement of Opportunities
- GSP
  - Base case assumes robust growth of 2.3% in 07-08 (up from 1.7% in 06-07)
  - slower growth in 08-09 & 09-10
  - medium term outlook assumes strong commodity prices and mining activity in Australia
- Population
  - Base case assumes average population growth around 0.5% annually
- Retail prices
  - Base case - $15/t carbon price signal phased over 5 years from 12-13

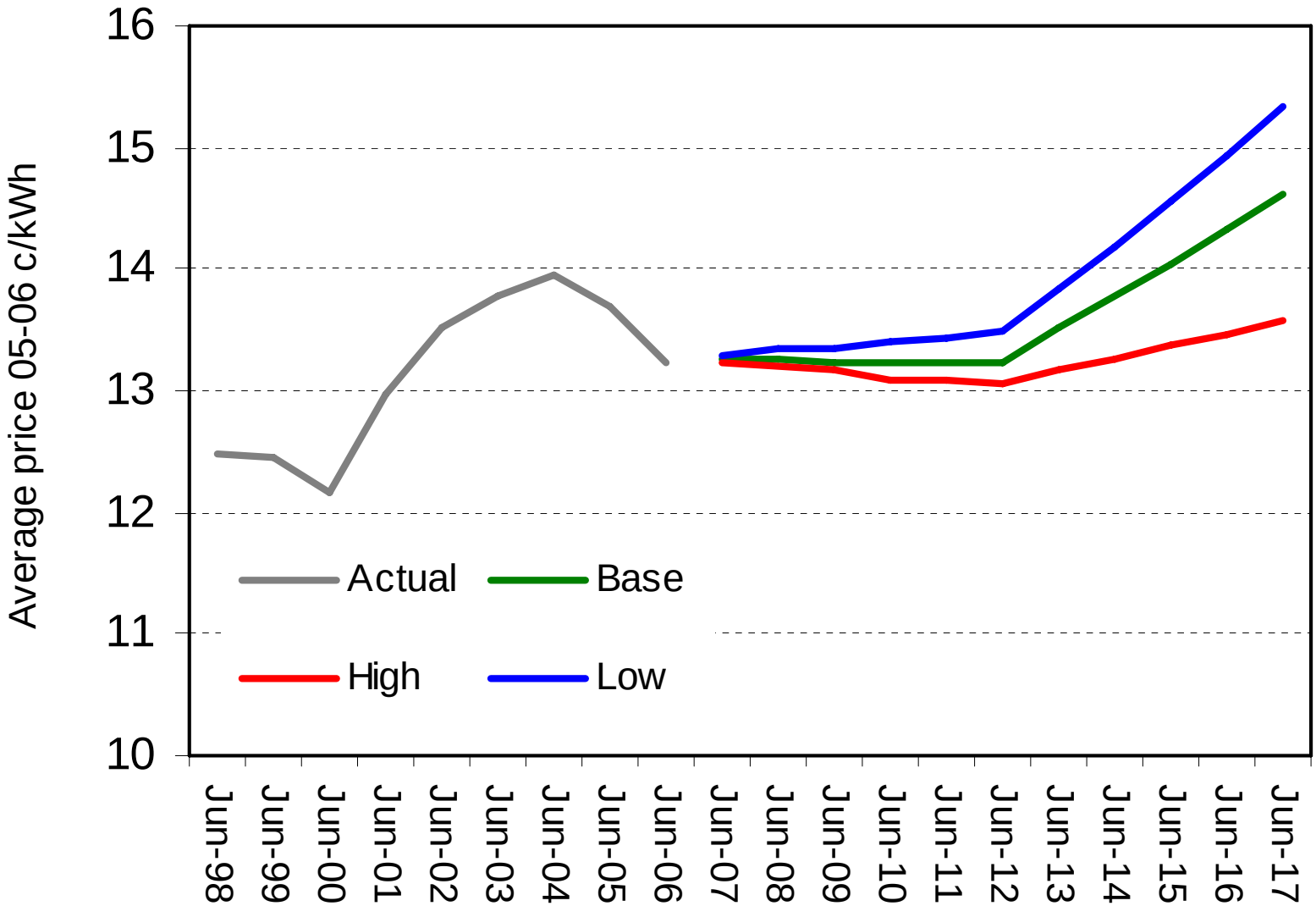
Economic assumptions - GSP



Economic assumptions - Population



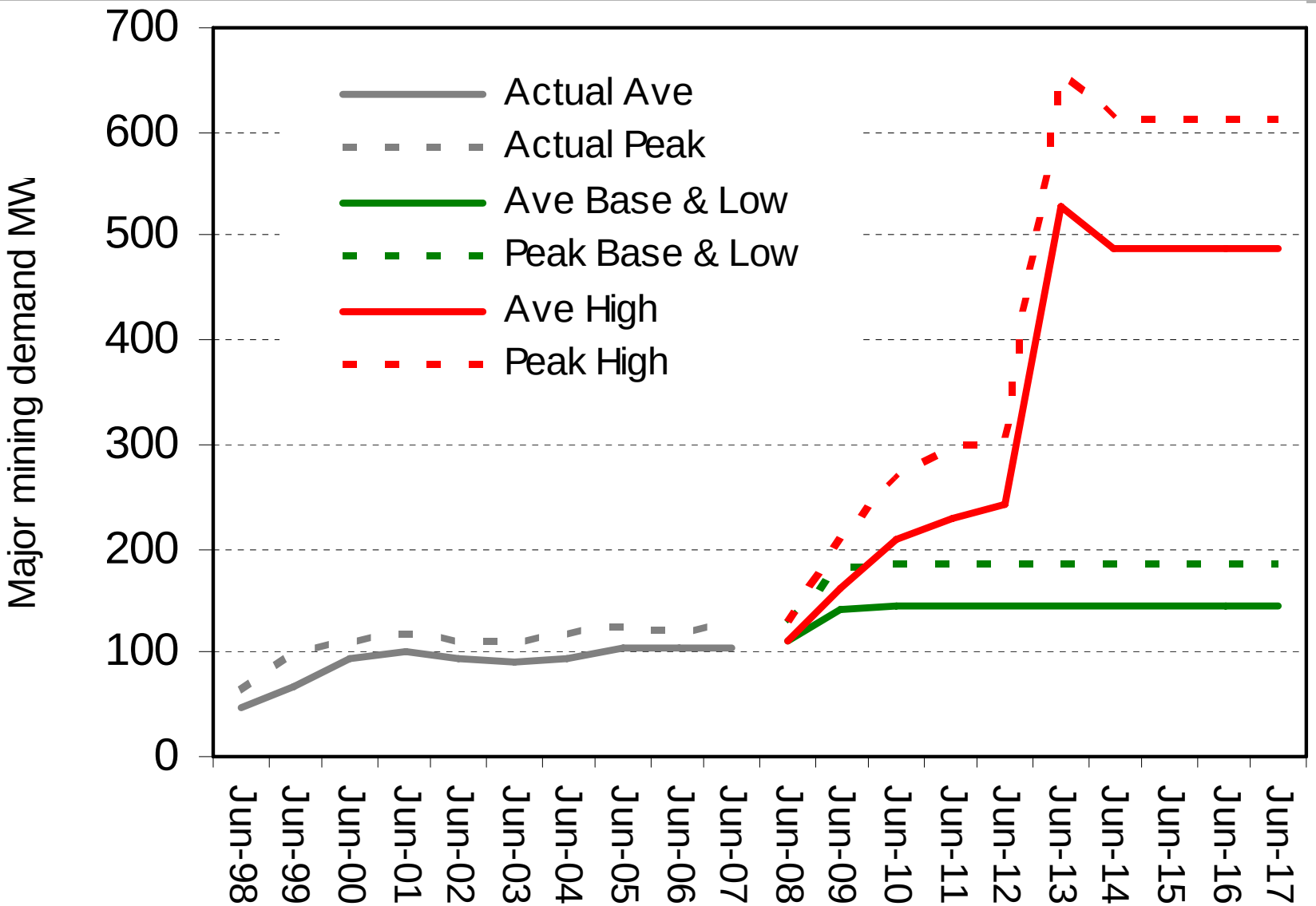
Retail price assumptions



Major mining loads

- Base & low case assumptions are the same
  - Prominent Hill operating from 2008 and some expansion at Roxby Downs
  - around 60 MW rise in peak demand and additional 360 GWh energy required
- High case assumes major expansion of operations at Olympic Dam
  - incremental increase of around 450 MW in peak and 3,000 GWh energy

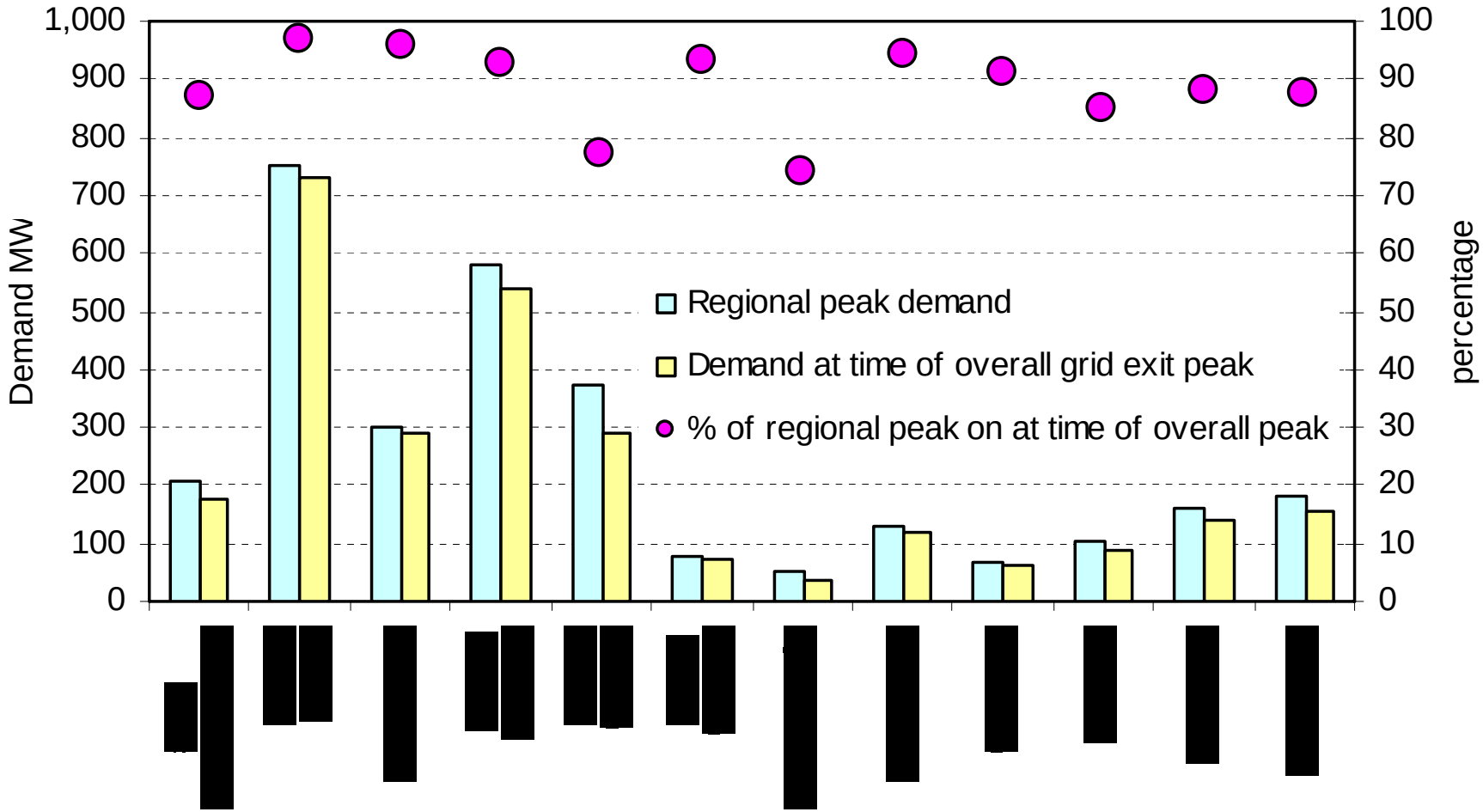
Major mining loads



Diversity of connection point loads

- Load diversity examined over first 3 quarters of 2006-07
- Individual connection point loads aggregated into regional loads across SA
- Regional load at time of State-wide peak on 16 Feb 2007 compared with outright maximum for each region
- Analysis shows that some loads can be considerably greater than at the time of the system peak – average difference was around 10%

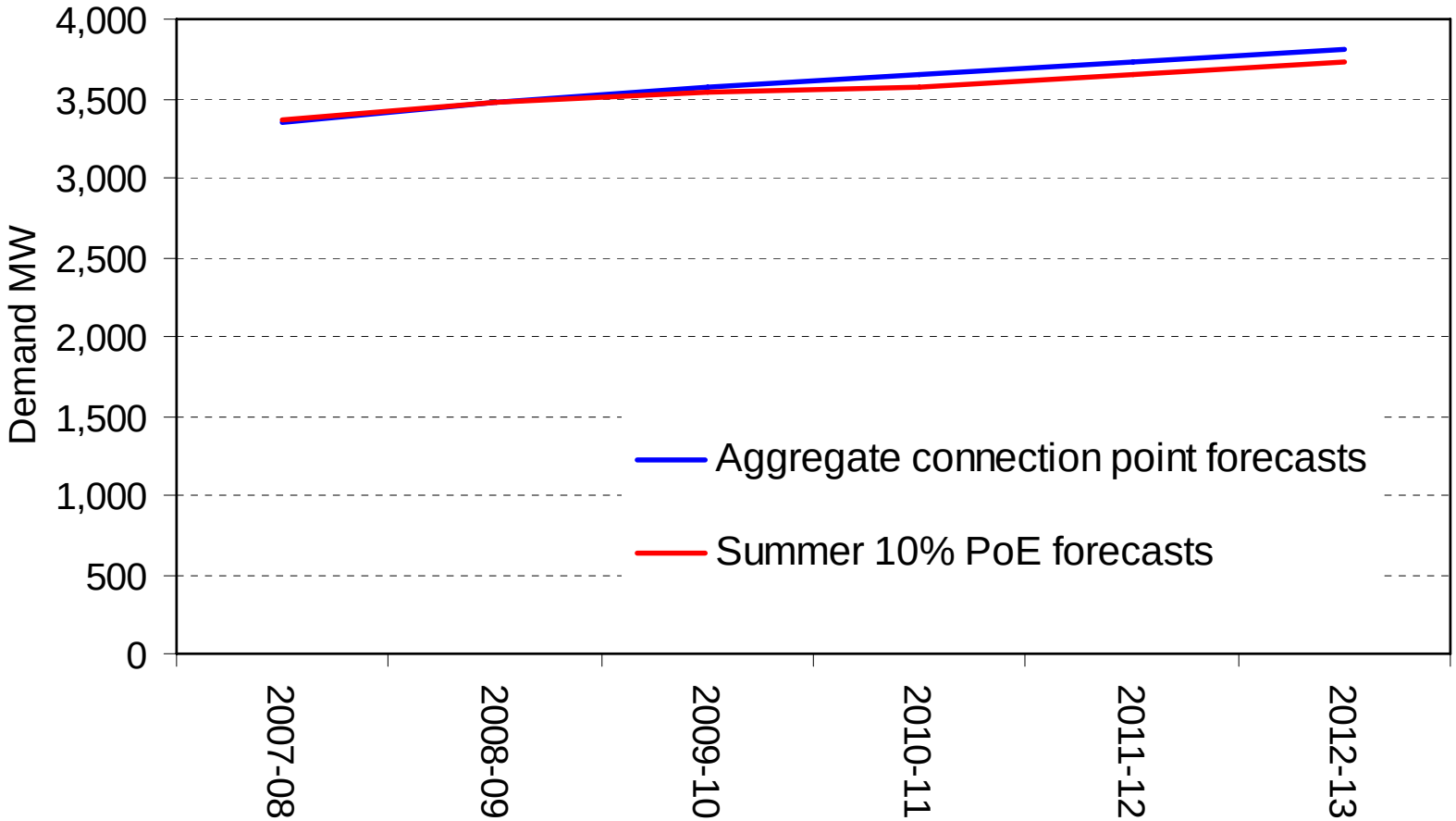
Diversity of connection point loads



Comparison with state-wide peak demand forecasts

- Connection point loads adjusted for 10% diversity factor, losses, generator loads and embedded generation then compared with State-wide 10% PoE demand forecasts
- High level of consistency in the near term, with connection point forecasts being up to 2% higher towards the end of the reset period
- Difference likely to reflect economic assumptions, particularly assumption of carbon price signal post 2012-13

Comparison with state-wide peak demand forecasts



Electricity Transmission Code

- Forward planning is required to identify when growth in the forecast maximum demand at a connection point or a group of connection points is unable to be delivered with the required reliability
- The NEM Rules require joint planning with ETSA Utilities and the application of the Regulatory Test to find the lowest total cost solution
- The ETC requires that ElectraNet must use its best endeavours to ensure that the capacity of the network meets the required reliability standard within 12 months.

ESIPC Network analysis

- The Planning Council undertook a series of loadflow analysis for 2011/12 to identify network limitations on both a system normal and n-1 basis
- Took a network model updated to include projects to be completed before commencement of reset period
- Applied connection point forecast loads for 2011/12
- Added estimated losses
- Estimated additional reactive power requirements

ESIPC Network analysis

- Balanced the system with sources of reactive and active power
- Active power was supplied by additional conventional generators located to minimise cost to the shared transmission network
  - APR and ElectraNet's Annual review provide information on options
  - market benefits case would have to be made to upgrade network to remove constraints on generator output
- Reactive power sources assumed as SVC's and capacity utilised checked against ElectraNet project proposals

Supply balance for 2011/12

Active Power (MW)

	2006/07	2011/12	Increase
Total Load	3492	4212	720
Losses	125	125	
Generation + Imports	**3617**	**4337**	**720**

Reactive Power (MVAr)

	2006/07	2011/12	Increase
DEMAND (MVAr)			
Total Load	1175	1408	470
Losses	1455	1692	
SUPPLY (MVAr)			
Generators + SVC	1180	1640	
Capacitors	705	715	
Transmission Lines	785	786	
Imports	-40	**-39**	
Total MVAr Requirement	**2630**	**3100**	**470**

Load flow study –System normal analysis

- Loaded the base case for 2011/12 into PSS/E – the industry standard loadflow analysis program
- Identified all cases where:
  - a transmission line was running over its rated capacity
  - a transformer was running over its rated capacity; or
  - a sub-station bus was running outside voltage limits

Load flow study –System normal analysis

Constrained Elements Identified

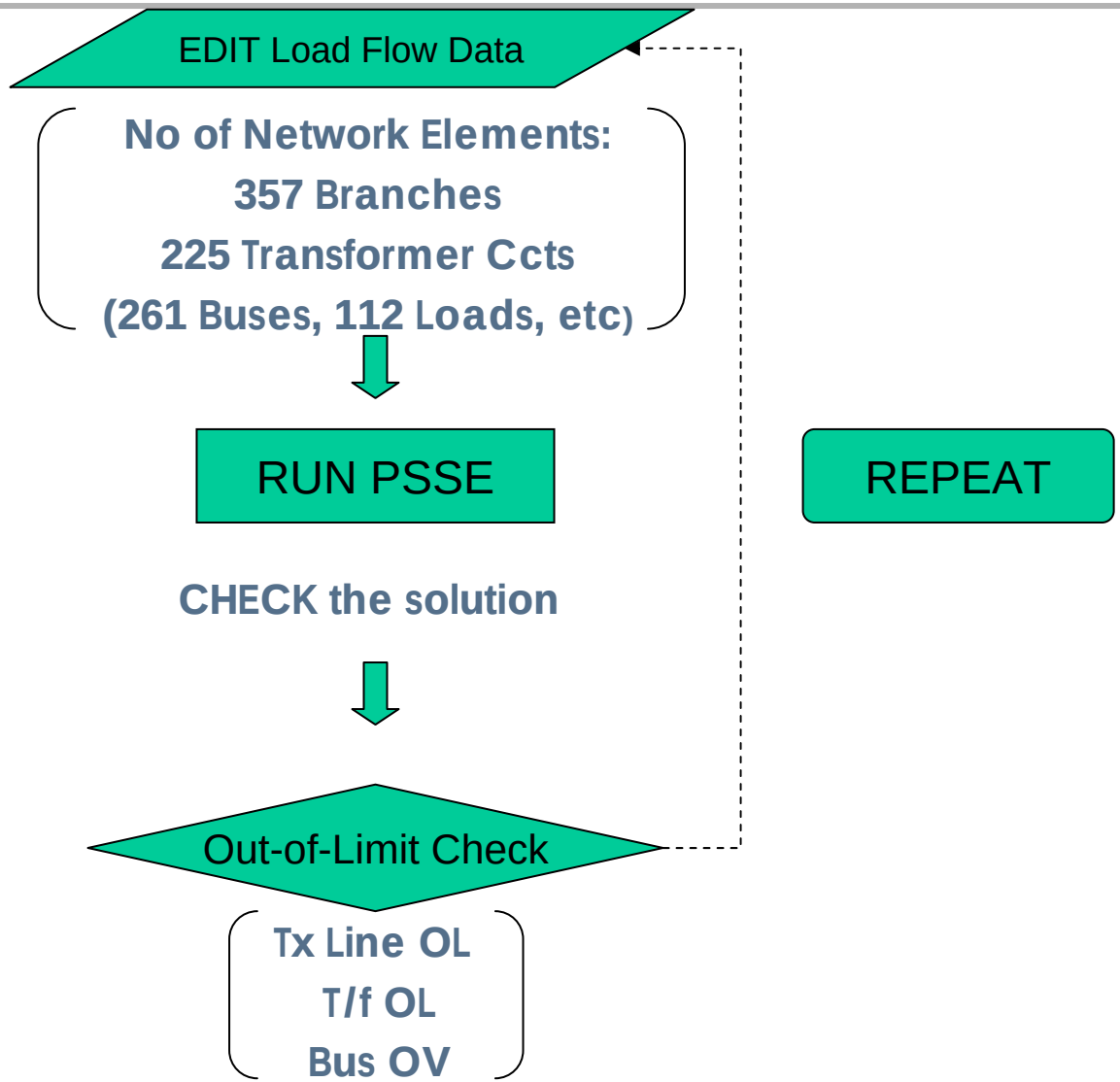
Bus Voltage (1.05pu < V < 0.95pu)			Transmission Line Over Load (> 100%)					Transformer Over Load (> 100%)					
Bus	kV	Vpu	From	To	kV	MVA	%	HV Bus	LV Bus	kV	Cct ID	MVA	%
56248 (WATL/2)	33	0.908	54025 (WHYL)	54028 (MIDL)	132	59	159	54250 (WATL)	56248 (WATL/2)	132/33	1	13	139
56249 (WATL/3)	33	0.907	54028 (MIDL)	54030 (YADN)	132	59	125	54250 (WATL)	56249 (WATL/3)	132/33	2	13	137
56351 (HUMM/2)	33	0.935	54030 (YADN)	54035 (PLIN)	132	33	140	54364 (KADE)	56364 (KADE)	132/33	1	28	107
56352 (HUMM/3)	33	0.935	54253 (TEMPLR/2)	54254 (DORN)	132	46	104						

Mid-North

Eyre Peninsula
&
Mid-North

Mid-North

Load flow study – n-1 Analysis



Load flow study – n-1 Analysis

Transmission Lines

From	To	kV	Cct ID	MVA	% Load	No of times the line got O/L
53005 (DAVN)	53144 (BRNK)	275		171	131	3
53770 (CGDN)	53700 (MVE)	275		463	109	1
54015 (CULT/1)	54025 (WHYL)	132		137	106	1
54010 (PLAY)	54016 (CULT/2)	132	2	85	136	1
54010 (PLAY)	54025 (WHYL)	132	1	91	114	1
54016 (CULT/2)	54025 (WHYL)	132	2	85	136	1
54107 (ODMN)	54106 (ODMN/1)	132	2 / 1	138	161	1
54155 (ROBT)	54170 (NWB)	132		111	168	1
54155 (ROBT)	54162 (MWP3)	132		144	123	1
54162 (MWP3)	54164 (MWP2)	132		144	119	1
54164 (MWP2)	54166 (MWP1)	132		144	116	1
54166 (MWP1)	54170 (NWB)	132		144	114	1
54170 (NWB)	54205 (MNSH)	132		111	129	1
54350 (HUMM)	54364 (KADE)	132		33	102	1
54253 (TEMPLR/2)	54254 (DORN)	132		46	237	1
54252 (TEMP)	54254 (DORN)	132		46	173	4
54842 (MOBL)	54834 (MANN)	132		69	116	3
54834 (MANN)	54832 (MAP2)	132		47	106	3
54822 (MILT)	54826 (ANGC)	132		73	121	5
54826 (ANGC)	54830 (MAP3)	132		52	132	4
54860 (TAIL)	54840 (MOBL)	132		144	118	2
54914 (MGAM)	54916 (BLAN)	132		107	101	1
54350 ((HUMM)	54364 (KADE)	132		32	100	1

Load flow study – n-1 Analysis

Transformers

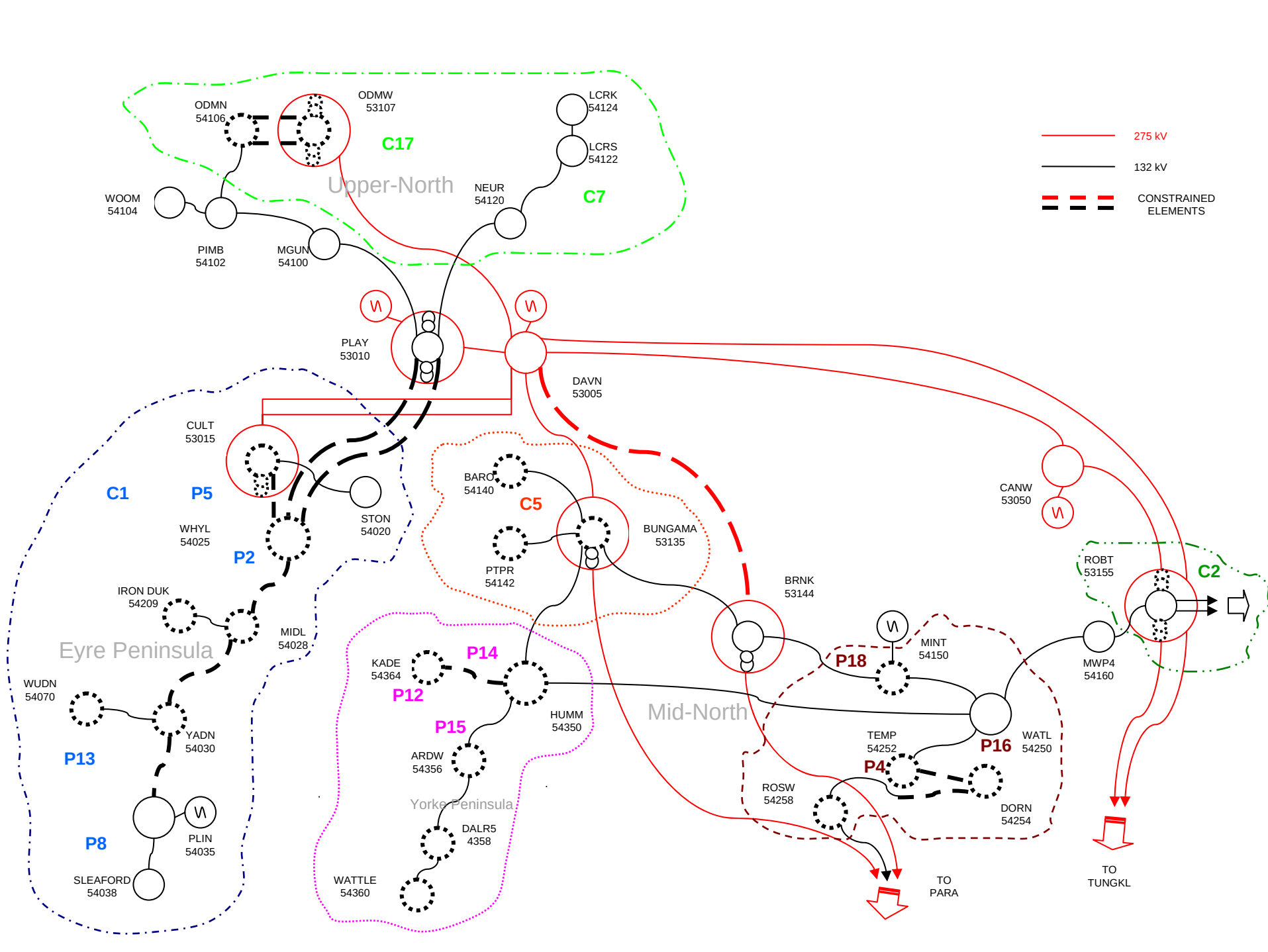
HV Bus	LV Bus	kV	Cct ID	MVA	% Load	No of times the t/f got O/L
53015 (CULT)	54015 (CULT/1)	275/132		160	101	1
53275 (PARA)	54275 (PARA)	275/132	8	160	109	1
53770 (CGDN)	54770 (CGDN)	275/132		160	102	1
53107 (ODMW)	54107 (ODMW)	275/132	1 / 2	140	281	1
53155 (ROBT)	54155 (ROBT)	275/132	1 / 2	160	116	1
53275 (PARA)	55275 (PARA)	275/66	1 / 2	120	174	1
53300 (PGW)	55300 (PGW)	275/66		180	114	1
53550 (MAGL)	55550 (MAGL)	275/66	1 / 2	225	142	1
53640 (HAVL)	55640 (HAVL)	275/66	2 / 3 / 4	180	125	1
53700 (MVE)	55700 (MVE)	275/66	3 / 1 / 4	225	169	1
54010 (PLAY)	56010 (PLAY)	132/33	1 / 2	26.3	139	1
54106 (ODMN/1)	57106 (ODMN)	132/11	1/2/3/4/5	36/33	161	1
54107 (ODMW)	57107 (ODMW)	132/11	4 / 6	36	281	1
54160 (MWP4)	58160 (MWP4)	132/3.3	2	6	106	1
54162 (MWP3)	58162 (MWP3)	132/3.3	2	5	134	1
54350 (HUMM)	56352 (HUMM/3)	132/33	1 / 2	12.6	134	1
54356 (ARDW)	56356 (ARDW)	132/33	1 / 2	13.4	134	1
54780 (MTBR)	55780 (MTBR)	132/66	1 / 2	71	149	1
54830 (MAP3)	58830 (MAP3)	132/3.3	1 / 2	6	161	1
54832 (MAP2)	58832 (MAP2)	132/3.3	1 / 2	6	161	1
54834 (MANN)	56834 (MANN)	132/33	1 / 2	20	106	1
54836 (MAP1)	58836 (MAP1)	132/3.3	1 / 2	8	125	1
54880 (KEIT)	56880 (KEIT)	132/33	1	29	104	1
54908 (KINC)	56908 (KINC)	132/33	1 / 2	27/29	112	1
54914 (MGAM)	59914 (MGAM/D1)	132/33	1	30	136	1

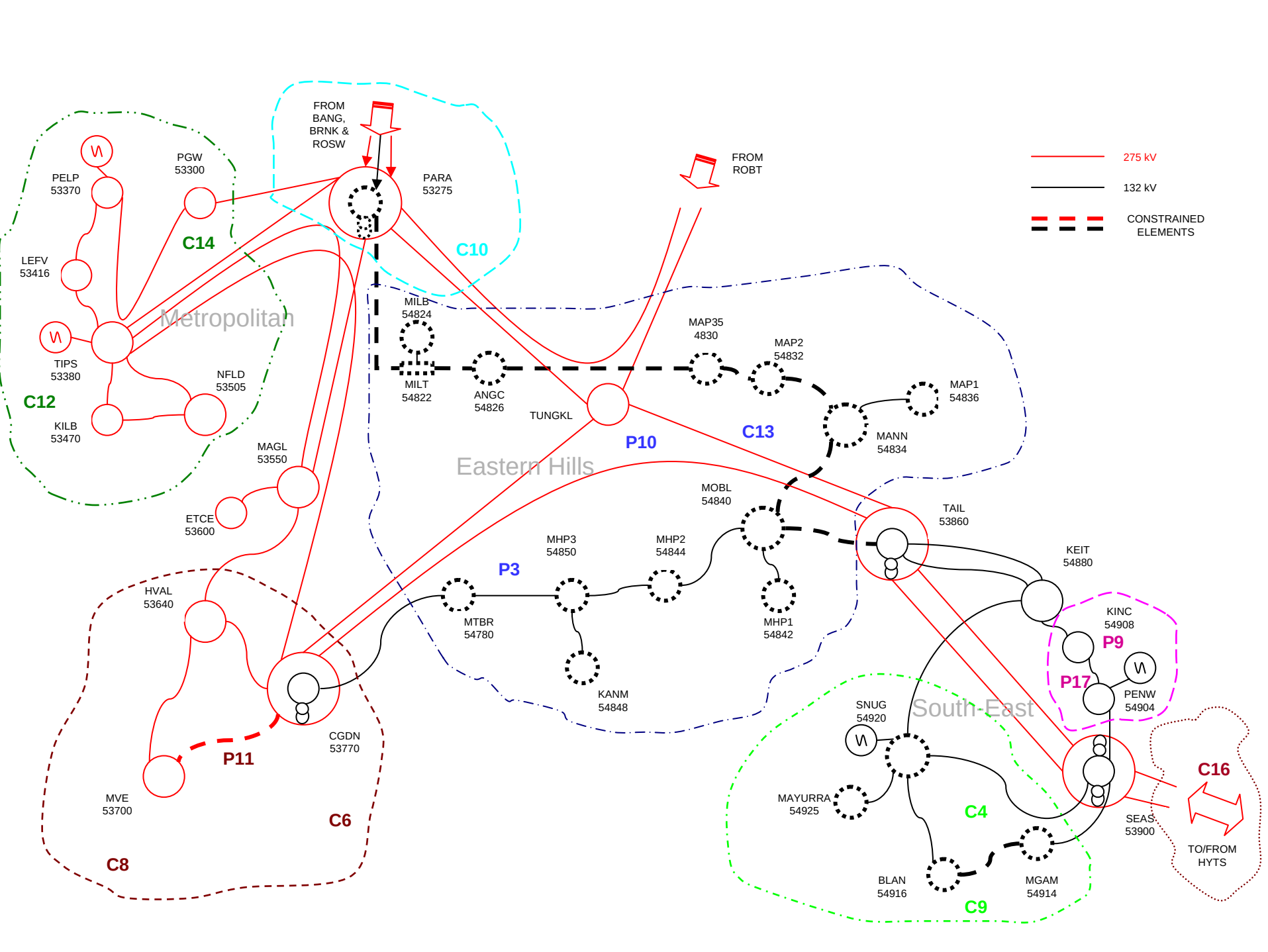
Bus Voltage

Bus	kV	Vpu	No of times it went out-of-limit	
			Vpu<0.95	Vpu>1.05
53050 (CANW)	275	1.054		1
54016 (CULT/2)	132	0.949	1	
54025 (WHYL)	132	0.934	1	
54028 (MIDL)	132	0.904	1	
54029 (IRON DUK)	132	0.897	1	
54030 (YADN)	132	0.922	1	
54032 (MT MILLR)	132	0.922	2	
54070 (WUDN)	132	0.904	1	
54106 (ODMN/1)	132	0.927	1	
54107 (ODMW)	132	0.934	1	
54135 (BUNG)	132	0.929	1	
54140 (BARO)	132	0.924	1	
54142 (PTPR)	132	0.925	1	
54150 (MINT)	132	1.059		1
54252 (TEMP)	132	0.926	6	
54253 (TEMPLR/2)	132	0.876	3	
54254 (DORN)	132	0.938	5	
54258 (ROSW)	132	0.843	2	
54275 (PARA)	132	0.904	1	
54350 (HUMM)	132	0.898	2	
54356 (ARDW)	132	0.947	6	
54358 (DALR)	132	0.935	11	
54360 (WATTLE)	132	0.935	12	
54364 (KADE)	132	0.947	6	
54700 (CGDN)	132	0.864	1	
54780 (MTBR)	132	0.861	2	
54822 (MILT)	132	0.909	2	
54824 (MILB)	132	0.909	2	
54826 (ANGC)	132	0.942	3	
54834 (MANN)	132	0.946	2	
54836 (MAP1)	132	0.946	1	
54840 (MOBL)	132	0.941	2	
54842 (MHP1)	132	0.940	2	
54844 (MHP2)	132	0.930	2	
54848 (KANM)	132	0.893	2	
54850 (MHP3)	132	0.893	2	
54914 (MGAM)	132	0.865	1	
54916 (BLAN)	132	0.880	1	
54920 (SNUG)	132	0.949	1	
54925 (MAYURRA)	132	0.949	1	
58830 (MAP3)	3.3	0.922	4	
58832 (MAP2)	3.3	0.916	4	
58836 (MAP1)	3.3	0.941	4	

Reconciliation with reset projects

- The projects in ElectraNet's submission have been reconciled with ESIPC analysis (summarised in the following)
- Feedback between ESIPC and ElectraNet over the past 6 months have refined the actual projects proposed
- Not all identified constraints need to be remedied. In various cases an inability to carry loadflow following a contingency
  - may be acceptable because of the reliability standard at the point
  - may be a matter for the market benefits test
  - may be the responsibility of others not ElectraNet and the shared network


275 kV
132 kV
CONSTRAINED ELEMENTS
ODMN 54106
ODMW 53107
C17
LCRK 54124
LCRS 54122
C7
Upper-North
WOOM 54104
NEUR 54120
PIMB 54102
MGUN 54100
PLAY 53010
DAVN 53005
CULT 53015
C1
P5
STON 54020
WHYL 54025
P2
IRON DUK 54209
MIDL 54028
Eyre Peninsula
WUDN 54070
YADN 54030
P13
P8
PLIN 54035
SLEAFORD 54038
BARO 54140
C5
PTPR 54142
BUNGAMA 53135
KADE 54364
P14
P12
P15
HUMM 54350
ARDW 54356
Yorke Peninsula
DALR5 4358
WATTLE 54360
BRNK 53144
Mid-North
P18
MINT 54150
TEMP 54252
P16
WATL 54250
P4
ROSW 54258
DORN 54254
TO PARA
CANW 53050
ROBT 53155
C2
MWP4 54160
TO TUNGKL


275 kV
132 kV
CONSTRAINED ELEMENTS
FROM BANG, BRNK & ROSW
PARA 53275
FROM ROBT
C10
PELP 53370
PGW 53300
C14
LEFV 53416
TIPS 53380
NFLD 53505
C12
KILB 53470
Metropolitan
MILB 54824
MILT 54822
ANGC 54826
TUNGKL
MAP35 4830
MAP2 54832
MAP1 54836
MANN 54834
C13
P10
Eastern Hills
MAGL 53550
ETCE 53600
MOBL 54840
MHP3 54850
MHP2 54844
MHP1 54842
P3
MTBR 54780
KANM 54848
TAIL 53860
KEIT 54880
KINC 54908
P9
P17
PENW 54904
HVAL 53640
CGDN 53770
P11
MVE 53700
C6
C8
SNUG 54920
South-East
MAYURRA 54925
C4
BLAN 54916
MGAM 54914
C9
SEAS 53900
C16
TO/FROM HYTS

Other projects

- Project 6 - CBD
  - Project is driven by new reliability standard
  - CBD is currently supported by transmission and sub-transmission not modelled in this work
- Project 7 - Southern suburbs
  - relieves Panorama sub-transmission overload (not modelled) in 66kV system supplying Southern suburbs
  - project leverages off new City west sub-station
- Project 19 - Coonalpyn West
  - relieves 33kV sub-transmission system overload
- Project 24 - RTU replacement
- Project 25 - weather stations

Contingent projects

- Planning Council supports the approach ElectraNet have taken with contingent projects
- Range of outcomes in probabilistic assessment is tighter and accountability better as a result
- Few potentially large contingent projects

Contingent projects

- Contingent Project 1 – Eyre peninsula
  - Major network upgrade contingent on major new loads on Eyre Peninsula – existing system is heavily loaded
- Contingent Project 2 – Riverland
  - support available from Murraylink is essential to Riverland reliability – complex question given constraints on Murraylink
- Contingent Project 17 – Northern transmission
  - contingent on BHP-Billiton and regulatory decisions
- Contingent Project 16 – Interconnector Upgrade
  - not justifiable at this time but market conditions could change quickly

Limitations of ESIPC analysis

- The Planning Council's analysis has been limited and focussed on network development
- Have not examined a number of important issues including:
  - estimated project costs
  - asset condition and refurbishment program and costs;
  - optimisation of contingent projects; or
  - other spending