ACIL Tasman

Economics Policy Strategy

The Impact of an ETS on the Electricity Supply Industry

Presentation to EESA

Adelaide 6 May 2009

Paul Hyslop, Director Development

+61 417 392 079

p.hyslop@aciltasman.com.au www.aciltasman.com.au

Disclaimer

The professional analysis and advice in this Presentation has been prepared by ACIL Tasman for the purpose of presenting general energy market projections. This report is presentation has been prepared in good faith and reflects the knowledge, expertise and experience of the consultants involved. The presentation must not be published, quoted or disseminated to any other party without ACIL Tasman's prior written consent. ACIL Tasman accepts no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on the presentation.

Some of the projections in the presentation were completed over 12 months ago. Over the intervening period, many key factors and inputs are likely to have changed.

ACIL Tasman does not warrant the accuracy of any forecast or prediction in the report. Although ACIL Tasman exercises reasonable care when making forecasts or predictions, factors in the process, such as future market behaviour, are inherently uncertain and cannot be forecast or predicted reliably.

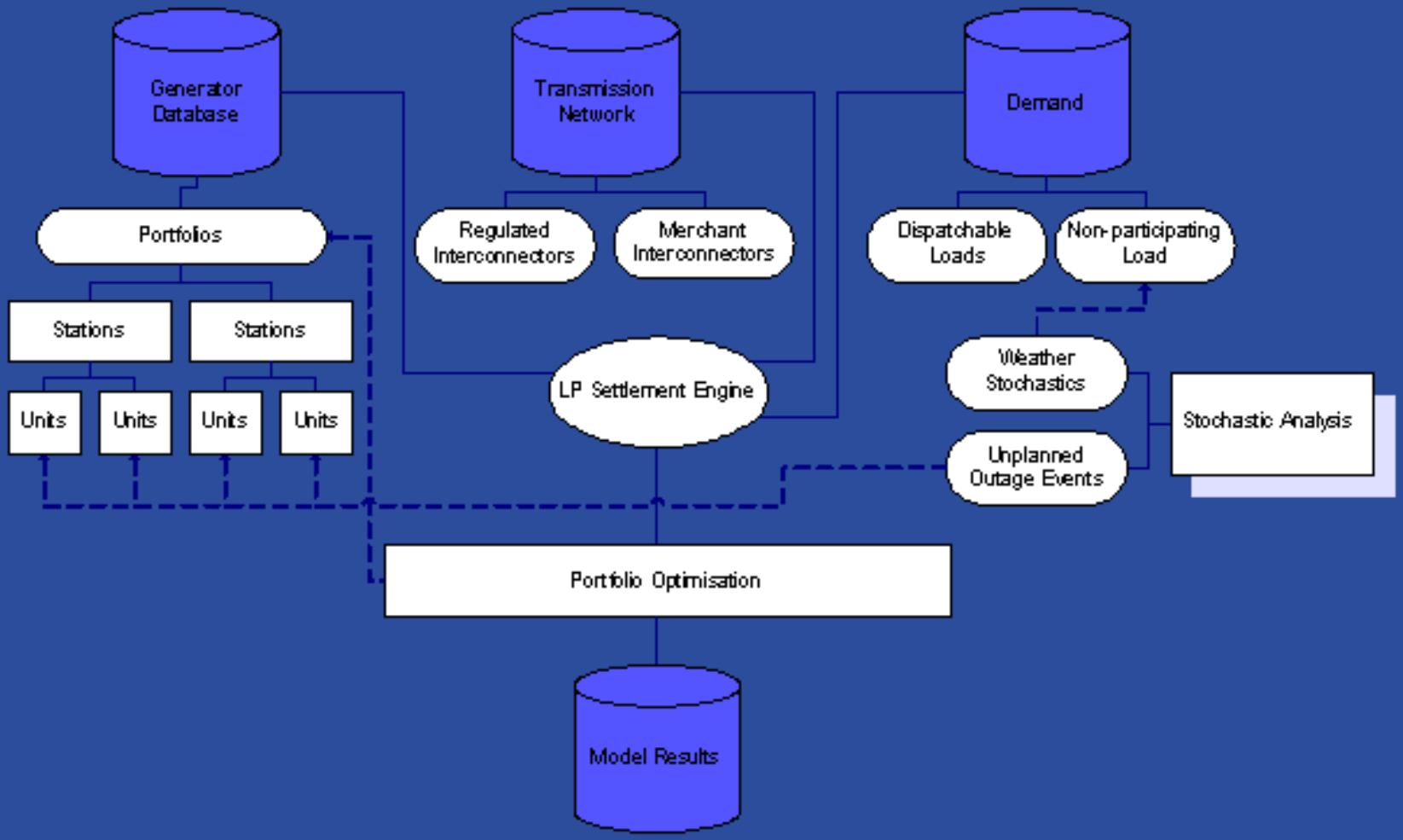
Scope of Presentation

- ACIL Tasman background
- Assumptions
- The ESAA report
  - 10% reduction over 2000 levels by 2020
  - 20% reduction over 2000 levels by 2020
- The CPRS5 case
- Major issues and impediments
  - Technical
  - Economic
  - Policy

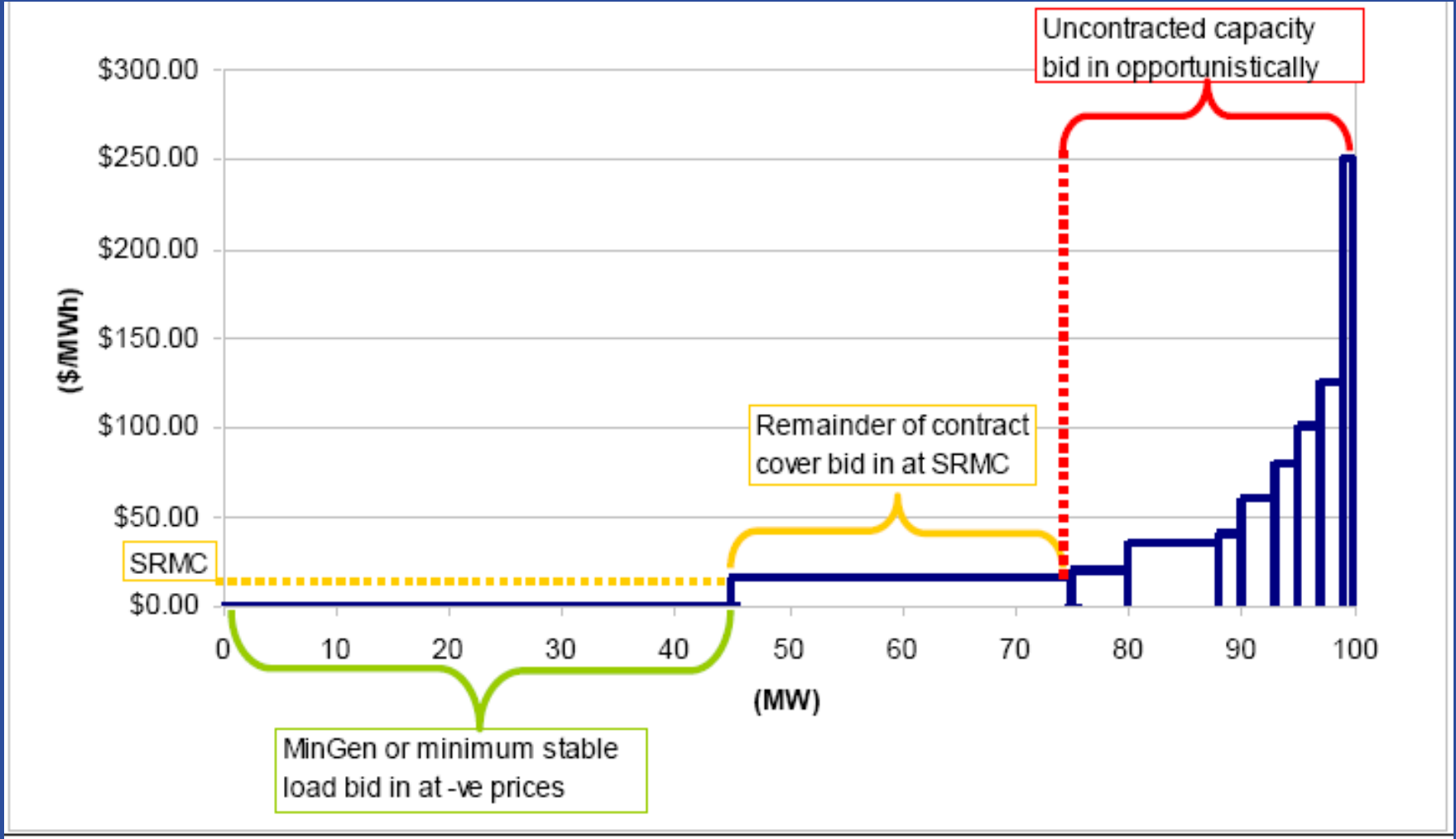
ACIL Tasman

- Leading Australian economics and modelling consultancy
- Advice to industry, governments and regulators
- Detailed economic modelling capability
  - PowerMark – detailed electricity market model
  - GasMark – detailed gas market model
  - Tasman Global (CGE)

PowerMark – conceptual framework



Typical offer curve



The Methodology

- Using NEM simulation modelling,
  - Firstly on 2020 alone, increased permit prices until reached required (10 and 20% of 2000 emissions) levels
  - Used electricity and permit prices, gas demand to estimate energy demand response, supply of permits from other sectors and gas prices and supply
  - Brought these results back to simulation modelling of NEM and SWIS and modelled every year (2008 to 2020) with changed inputs to get final prices, retirements and new generation

Findings – the ETS would work

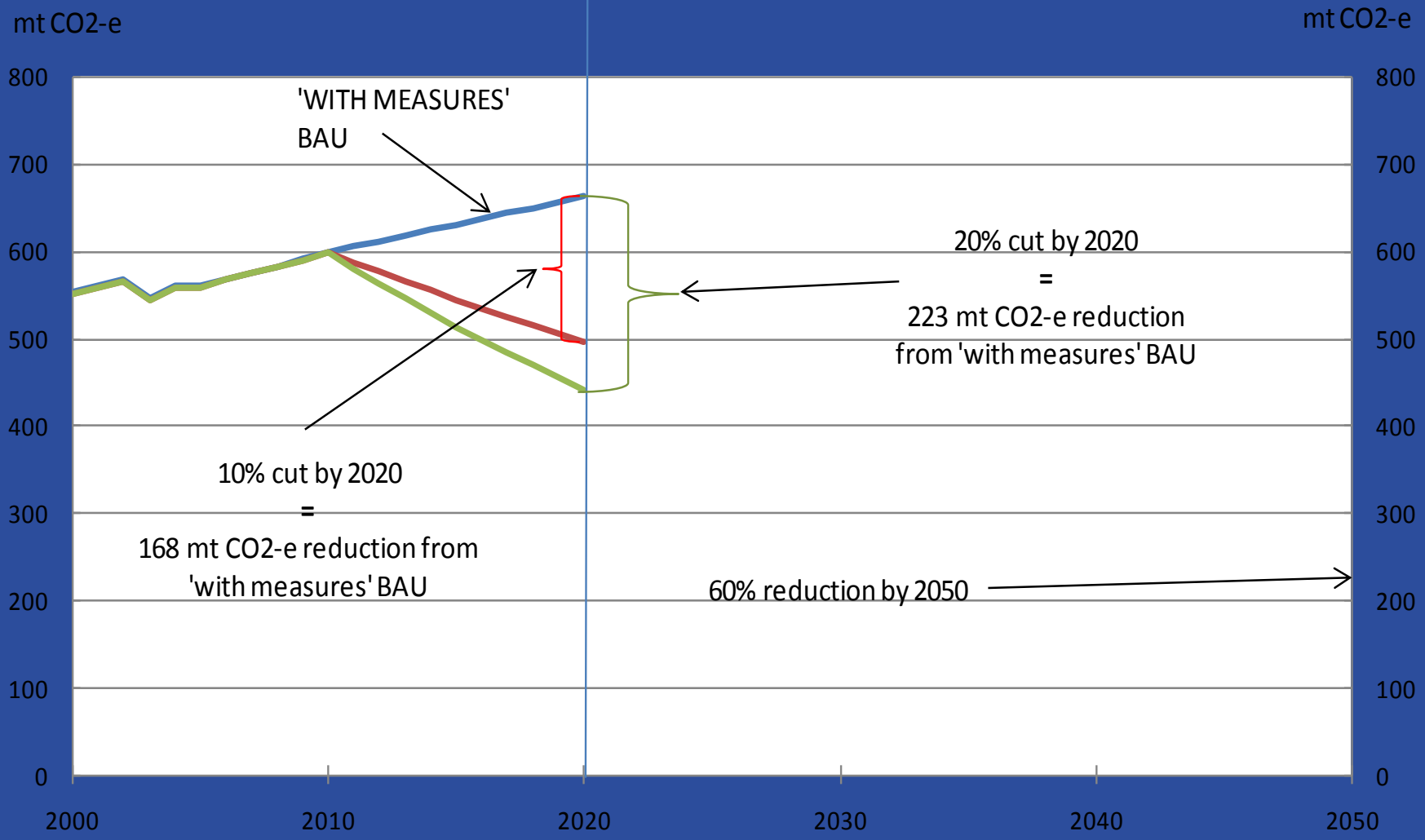
- An Australian ETS could work in lowering emissions to 90 or 80% of the 2000 level by 2020
- It works by forcing the retirement of firstly brown coal plant and then the more expensive black coal plant and replacing with gas fired generation
- Demand is reduced through conservation and demand response to higher prices
- Gas and later geothermal electricity provide new low or zero generation, other renewables are used but only because their use is mandated

ACIL Tasman

Economics Policy Strategy

ASSUMPTIONS

Emissions reductions required



10% reduction over 2000 levels is 23% reduction over BAU in 2020
20% reduction over 2000 levels is 32% reduction over BAU in 2020

New entrant generation technologies assumed

ACIL Tasman
Economics Policy Strategy

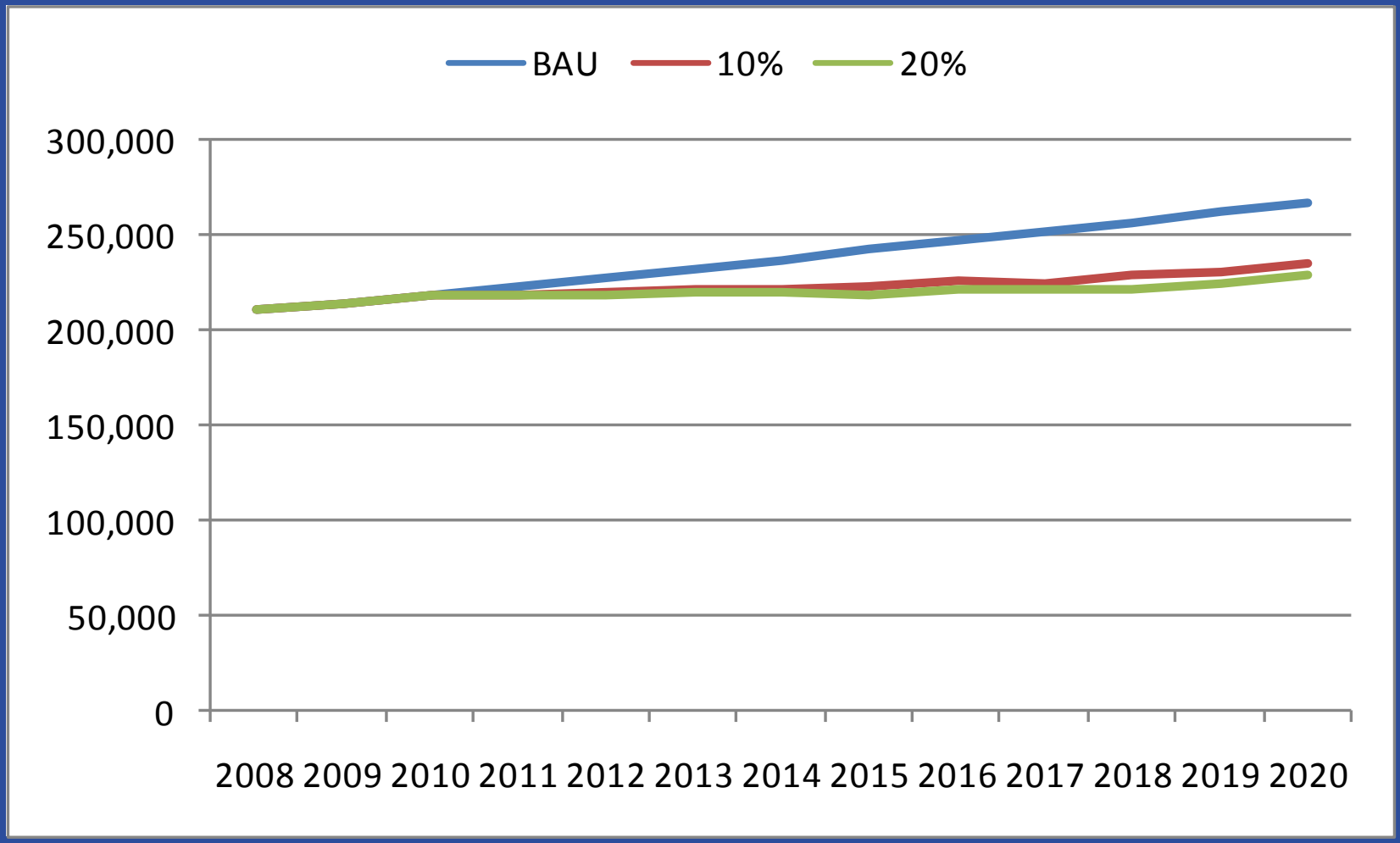
Technologies available

- Conventional coal and gas
- Wind
- Geothermal
- Hydro

Low or zero emission technologies we assume not available by 2020

- Nuclear
- IGCC with CCS (demonstration only)
- CCS (demonstration only)

Demand Reduction - BAU and 10% case, TWh



10% case – 12% reduction in 2020, 20% case – 14% reduction in 2020

New renewable electricity generation (GWh)

Year	Wind	Geothermal	Solar PV	Biomass	Total
2008	0	-		201	201
2009	2,105	-	0	753	2858
2010	2,840	-	66	955	3861
2011	4,014	-	407	1,586	6007
2012	6,310	-	648	1,787	8745
2013	8,193	-	905	1,989	11087
2014	10,251	399	1,075	2,190	13915
2015	12,135	797	1,318	2,829	17079
2016	13,257	3,321	1,493	3,031	21102
2017	14,194	4,986	1,663	3,224	24067
2018	14,964	6,657	1,822	3,416	20202
2019	15,630	7,665	1,997	3,627	28919
2020	16,184	10,013	2,335	3,828	32360

Other Assumptions

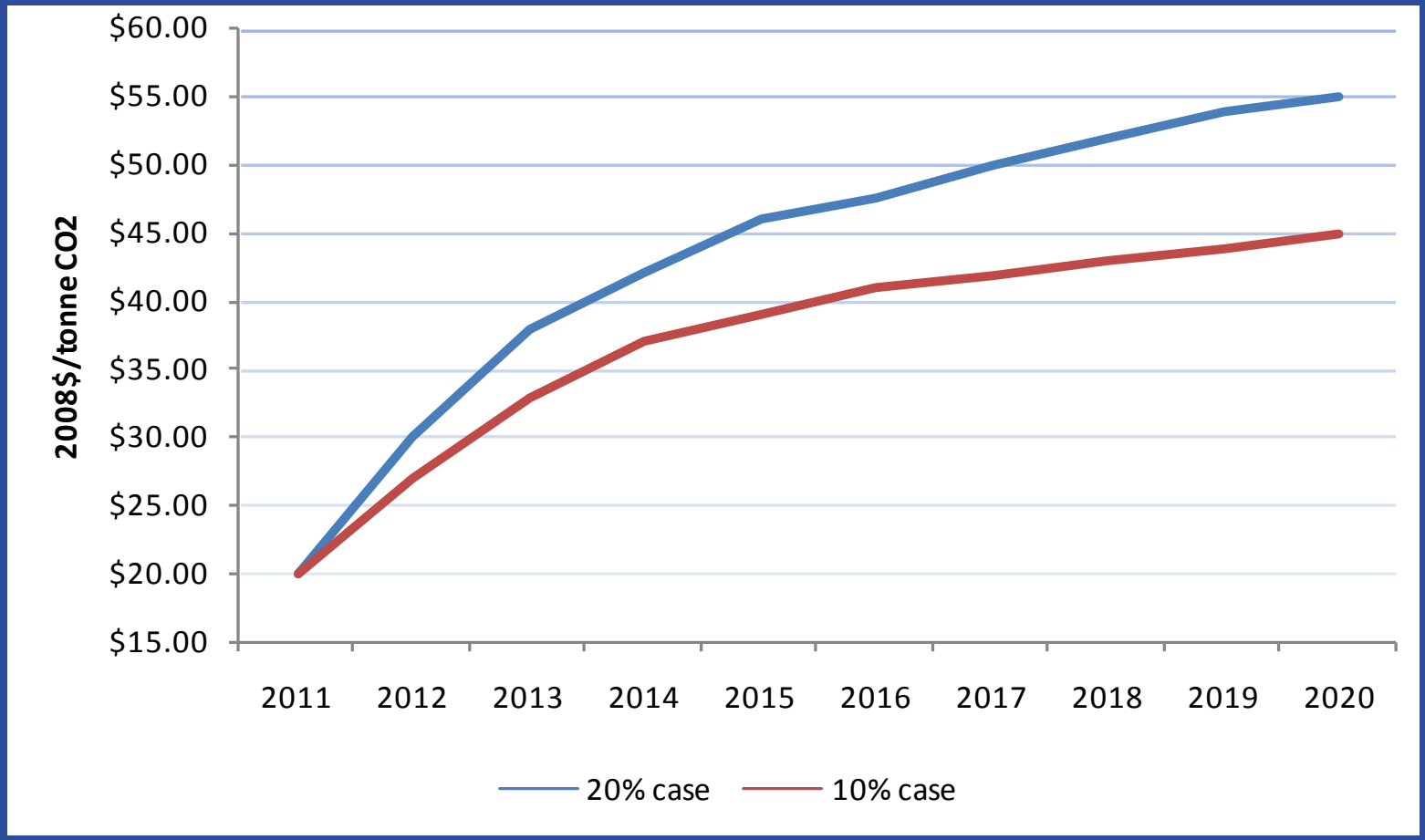
- Plant Costs
  - Operating costs based on fixed and variable O&M
  - Capital Costs – levelised based on ACIL Tasman LRMC Model
  - Coal Costs across NEM
    - Includes known contractual arrangements

ACIL Tasman

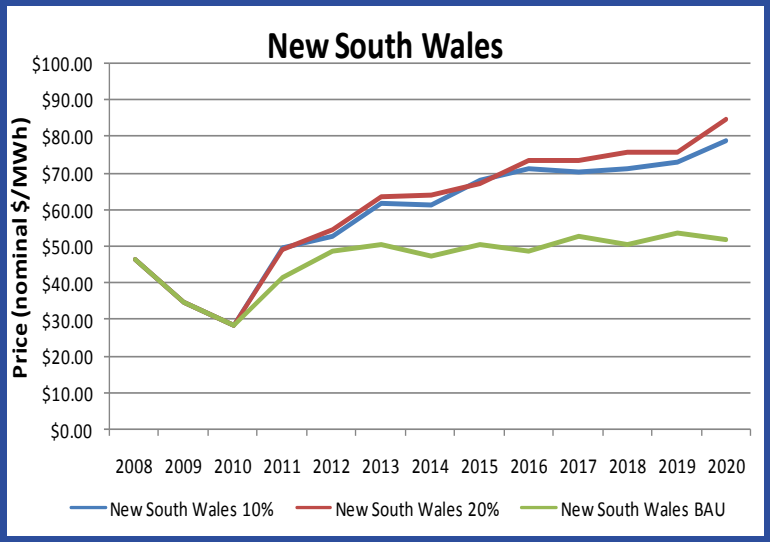
Economics Policy Strategy

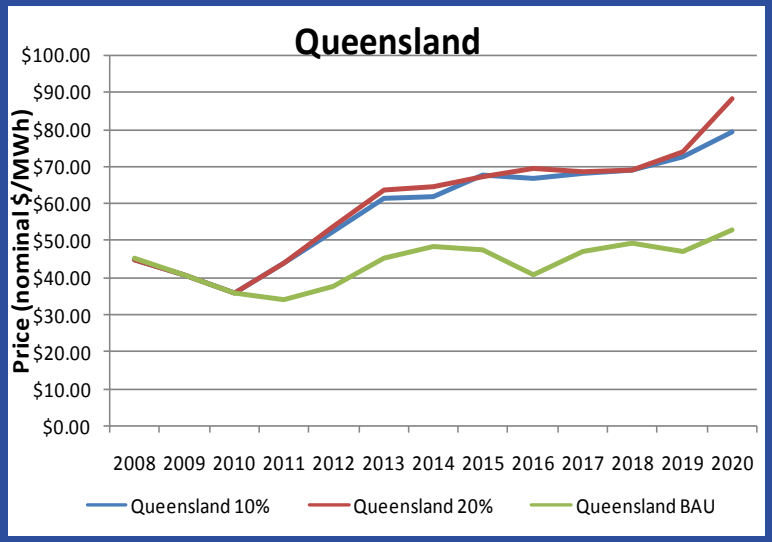
RESULTS

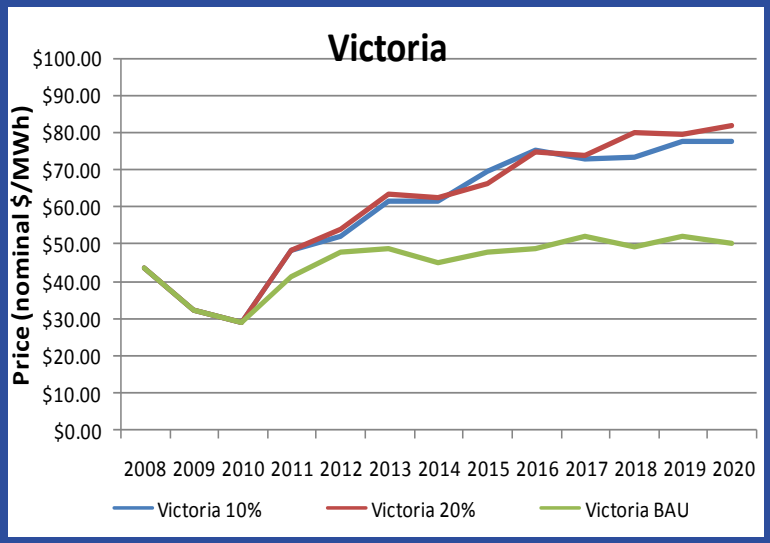
Modelled emissions permit prices (real $2008)

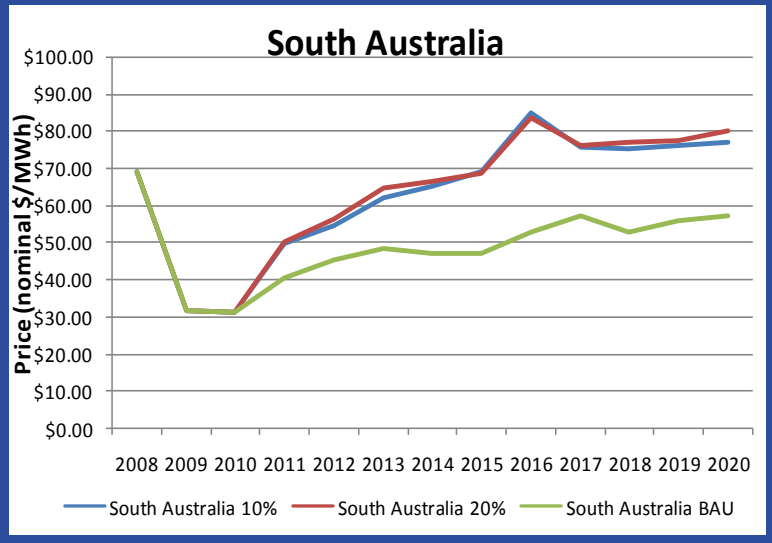


Electricity pool prices resulting from an ETS ($/MWh)





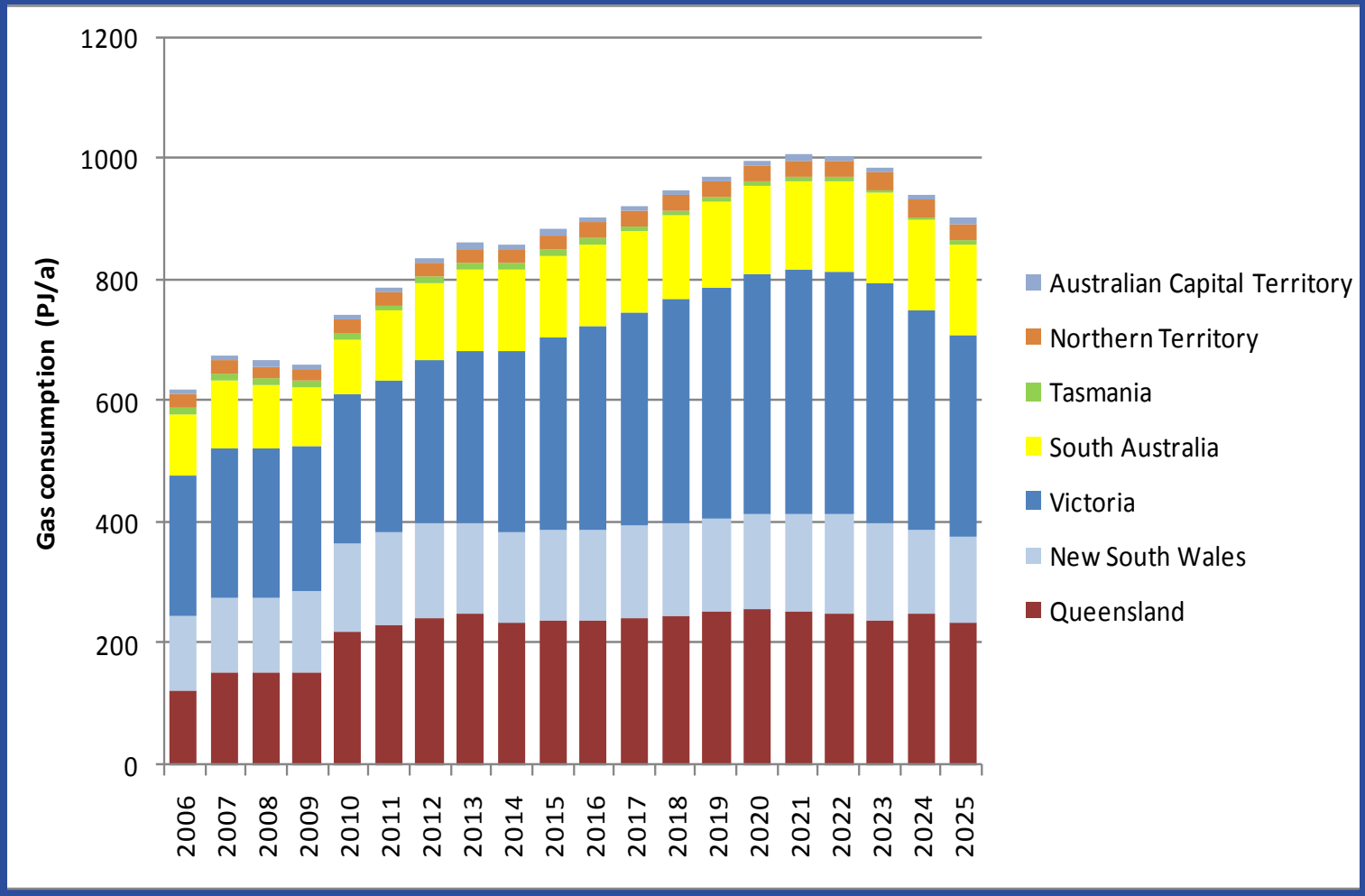




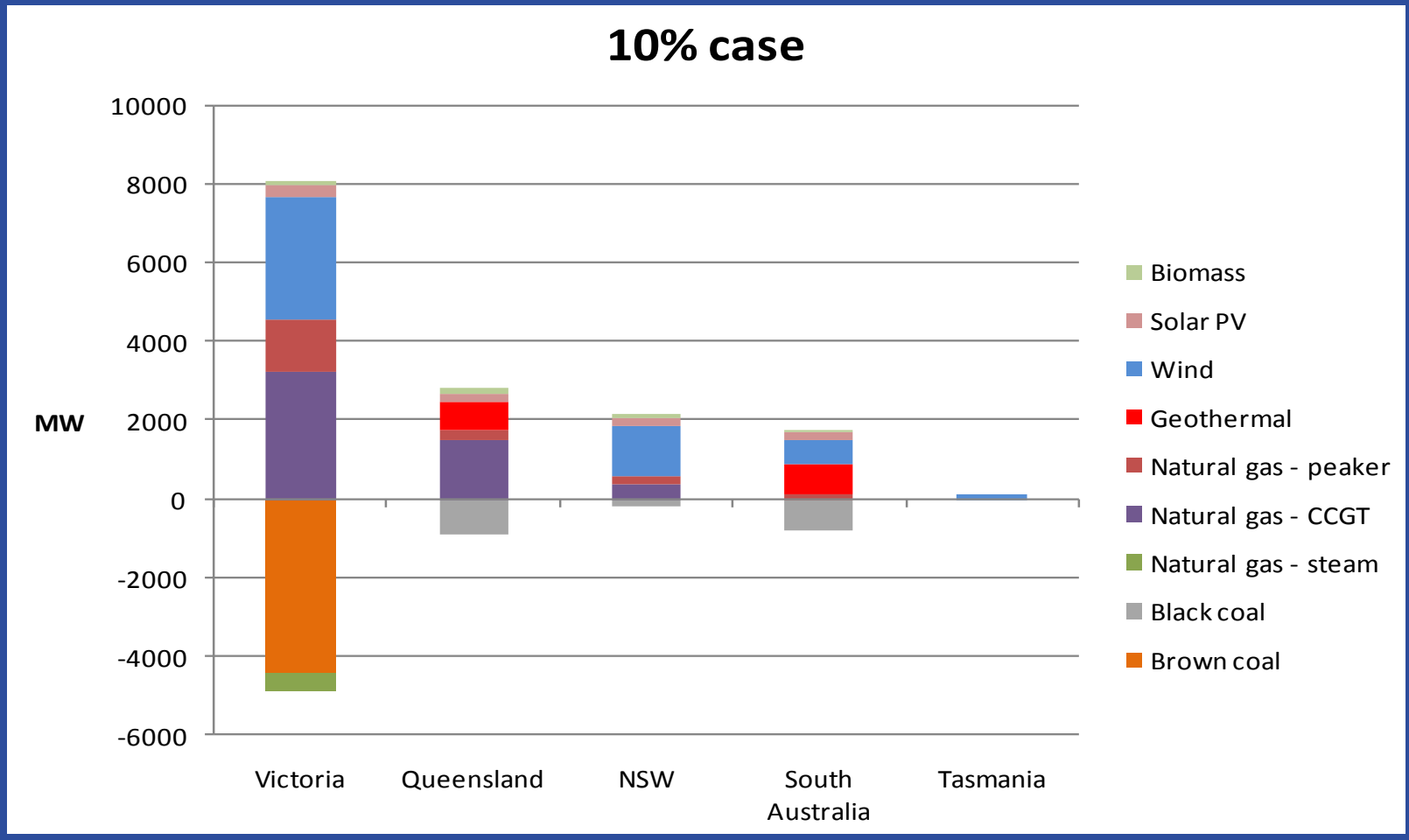
Indicative pass through to retail tariffs (cents per kWh)

	2008	2020		
		BAU	10% case	20% case
Cost of energy	5.8	7.3	9.4	9.9
Network costs	5.5	5.5	6.0	6.0
Retail margin	1.5	1.5	1.5	1.5
RET cost (20% by 2020 target)			0.9	0.9
Total	12.8	14.3	17.8	19.2

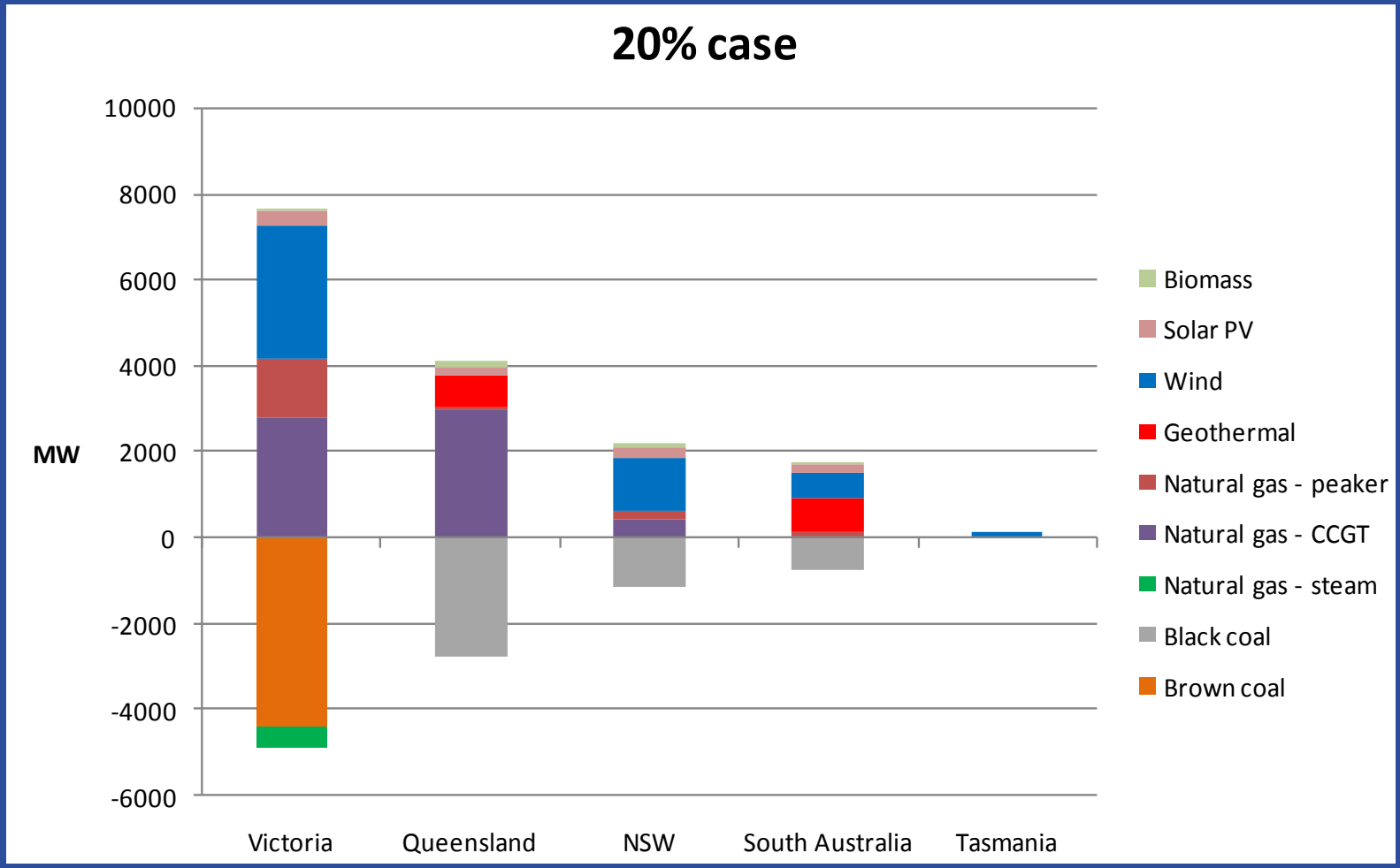
Modelled gas consumption by state



Plant new entry and retirement in the 10% case – most action in Victoria



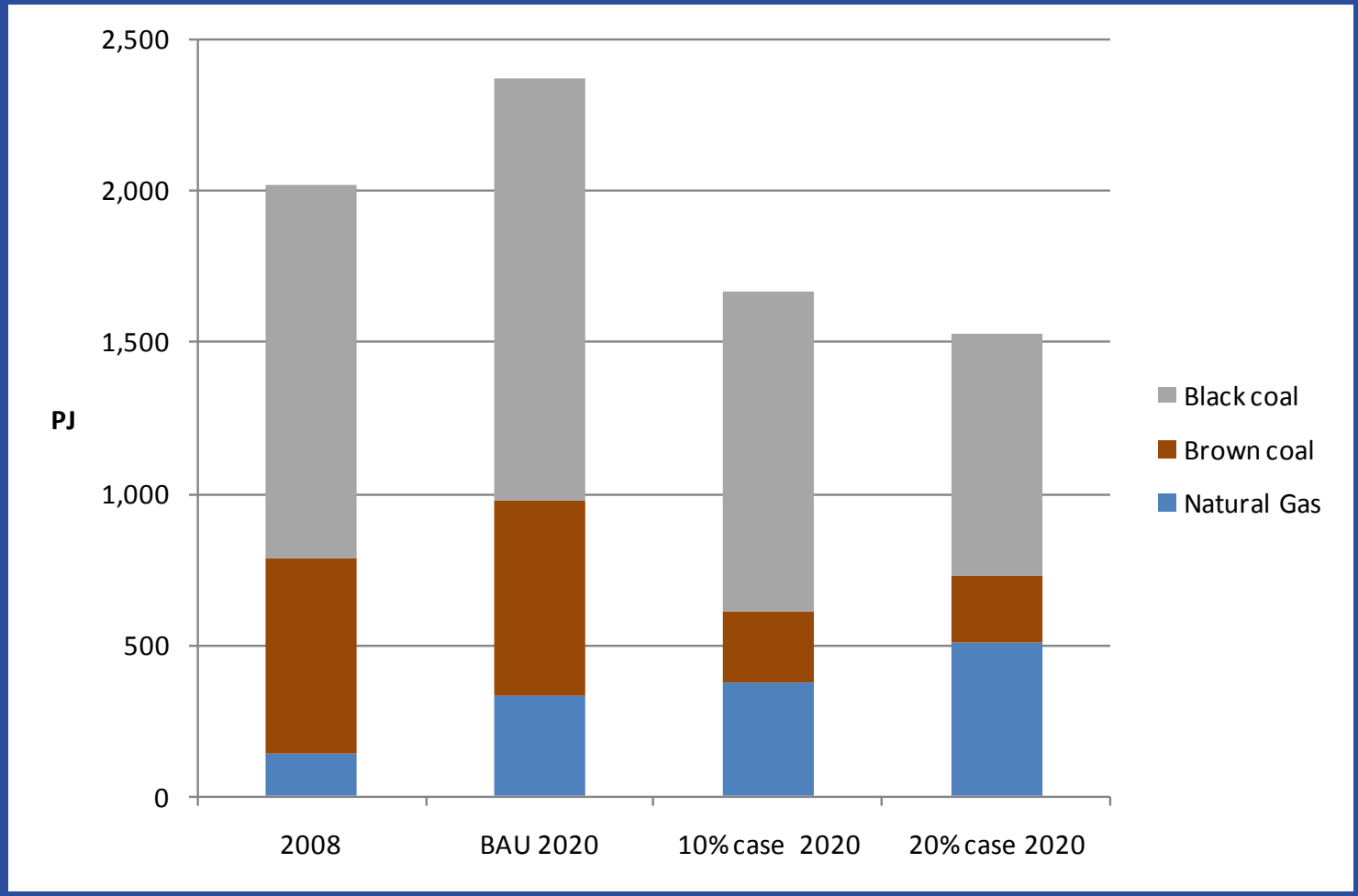
Plant new entry and retirement, 20% case, QLD and NSW are more involved



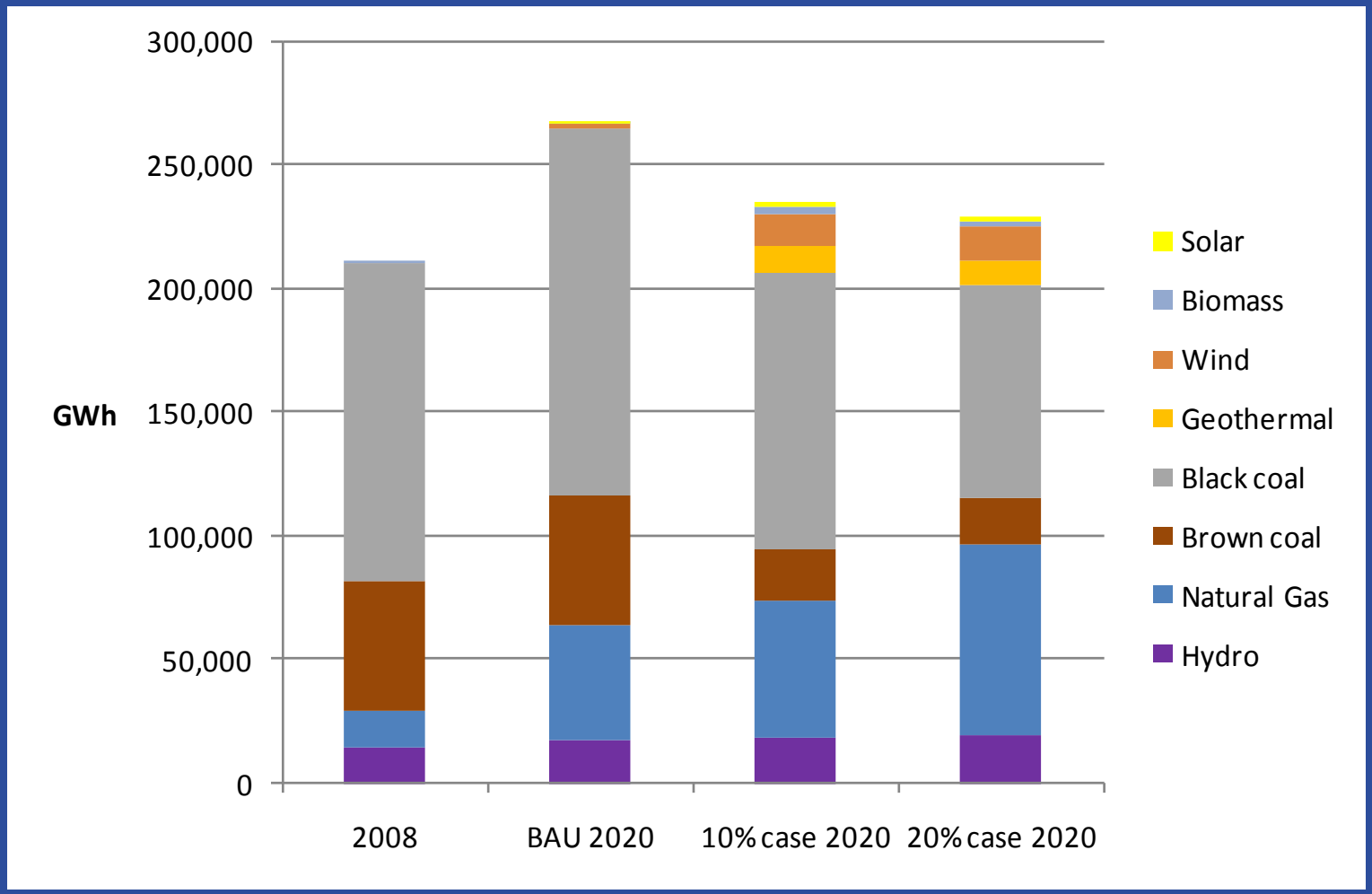
Capital expenditure on new generation – NEM ($2008)

NEM	BAU	10% case	20% case
2010	350	1,799	1,799
2011	$342	$1,755	$1,755
2012	$972	$4,401	$4,401
2013	$2,207	$7,243	$7,243
2014	$3,219	$10,011	$12,108
2015	$4,166	$13,079	$14,736
2016	$5,206	$16,638	$18,295
2017	$5,872	$20,439	$21,189
2018	$7,380	$23,335	$24,964
2019	$8,848	$26,636	$28,322
2020	$10,791	$30,300	$33,514

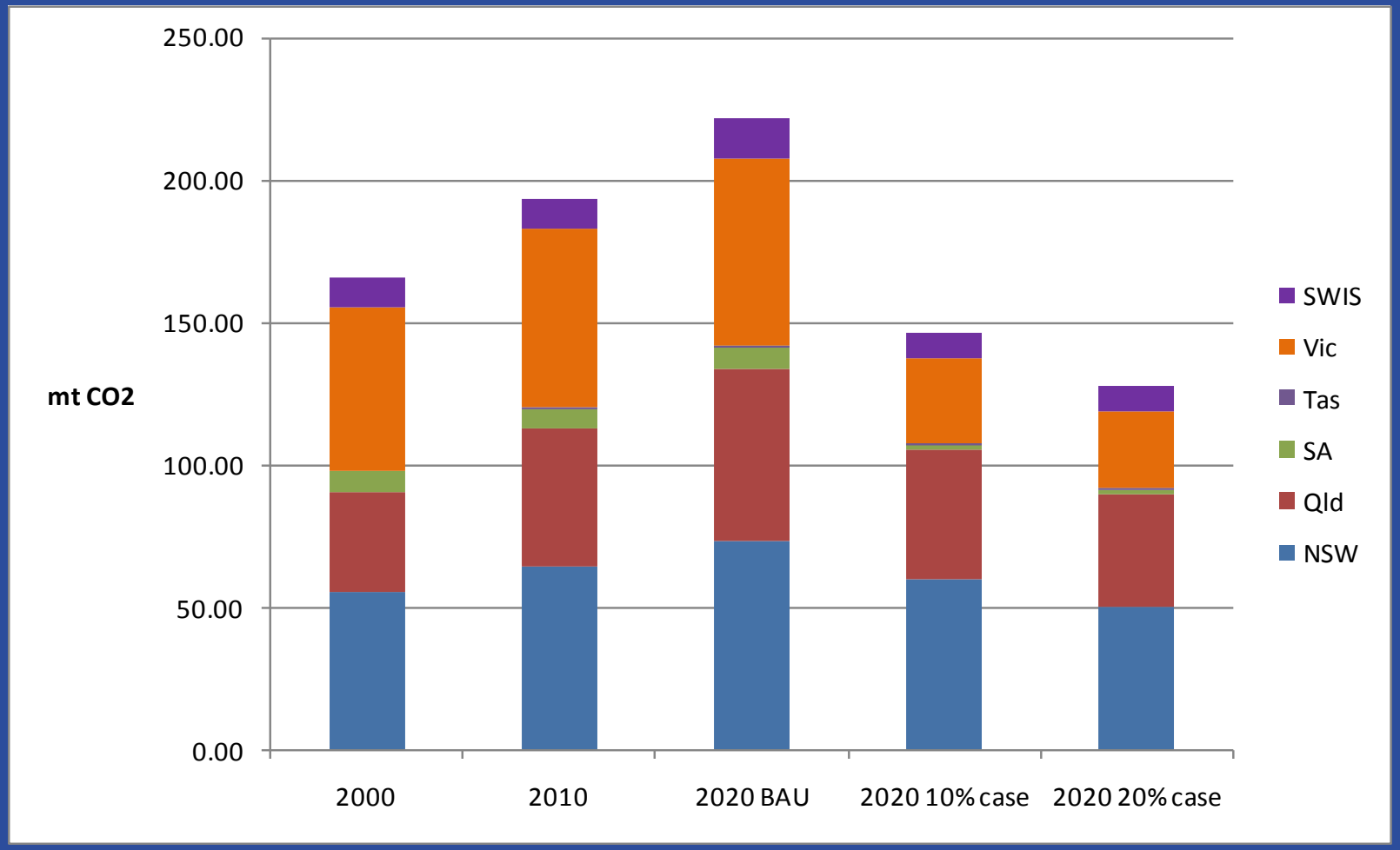
Fuel consumption in the NEM



NEM Generation by type of plant



CO2 emissions in the BAU, 10% and 20% cases



The cost of emissions savings

	LRMC $/MWh	Emissions tonnes CO_2–e /MWh	Cost of emissions saved ($/tonne CO_2–e)
Victoria			
Coal fired super critical plant (brown coal)	46	1.2	
Gas fired CCGT	54	0.4	10
Wind turbine	100	0	45
Solar thermal	200	0	128
Solar PV	240	0	162
NSW and QUEENSLAND			
Coal fired super critical plant (black coal)	44	0.75	
Gas fired CCGT	60	0.4	46
Wind turbine	100	0	75
Solar thermal	200	0	208
Solar PV	240	0	261

Modelled average emissions intensity in each NEM region and the SWIS (tonnes CO_2 per MWh)

	2000	2010	2020		
			BAU	10% case	20% case
NSW	0.85	0.82	0.77	0.74	0.65
Queensland	0.84	0.76	0.69	0.61	0.53
SA	0.78	0.68	0.67	0.16	0.16
Tasmania	0.02	0.03	0.04	0.03	0.03
Victoria	1.18	1.13	1.05	0.53	0.50
WA (SWIS)	0.70	0.64	0.69	0.51	0.50
Total	0.92	0.83	0.77	0.58	0.52

As emissions intensity falls emissions savings will become more expensive

ACIL Tasman

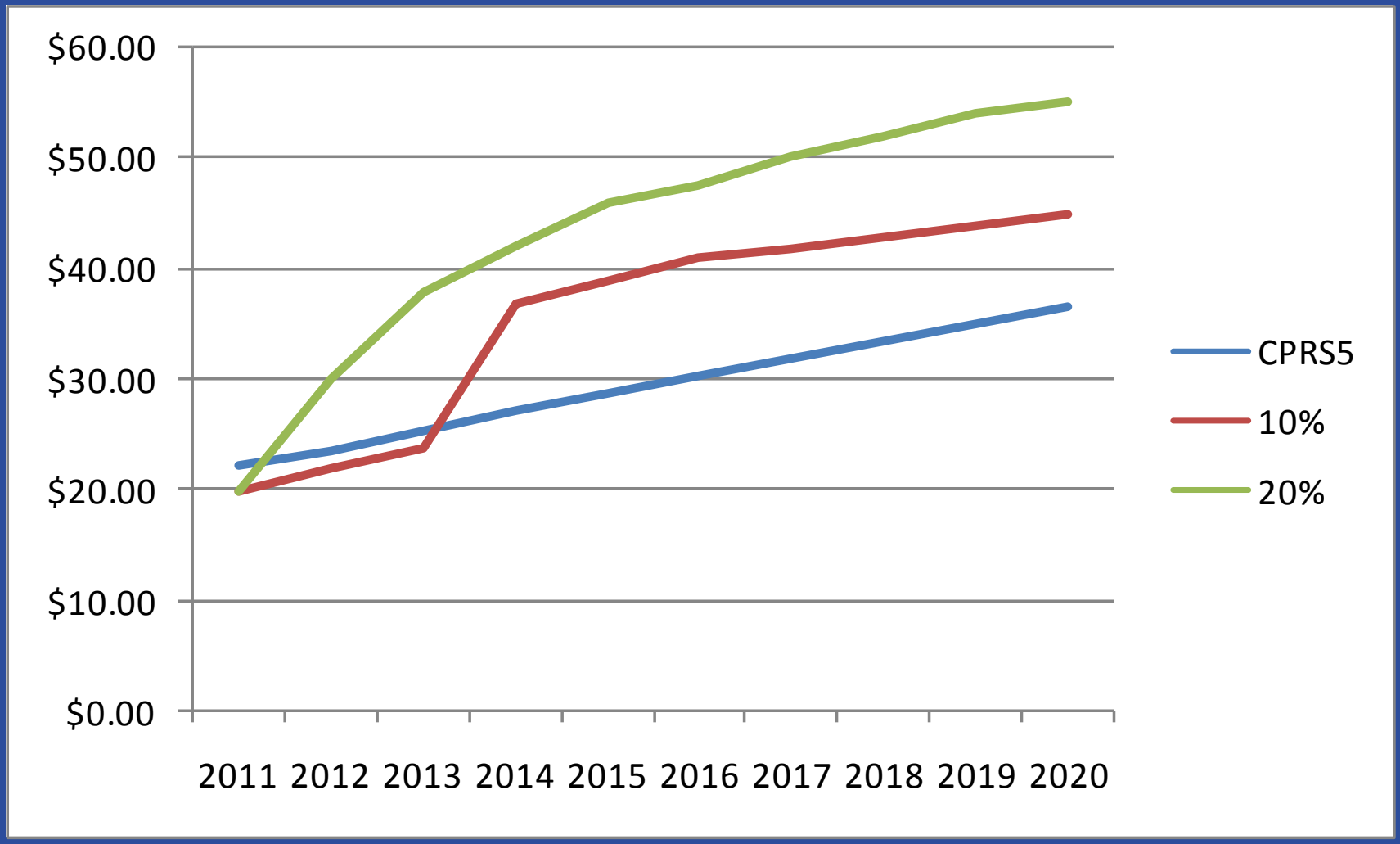
Economics Policy Strategy

CPRS5 CASE

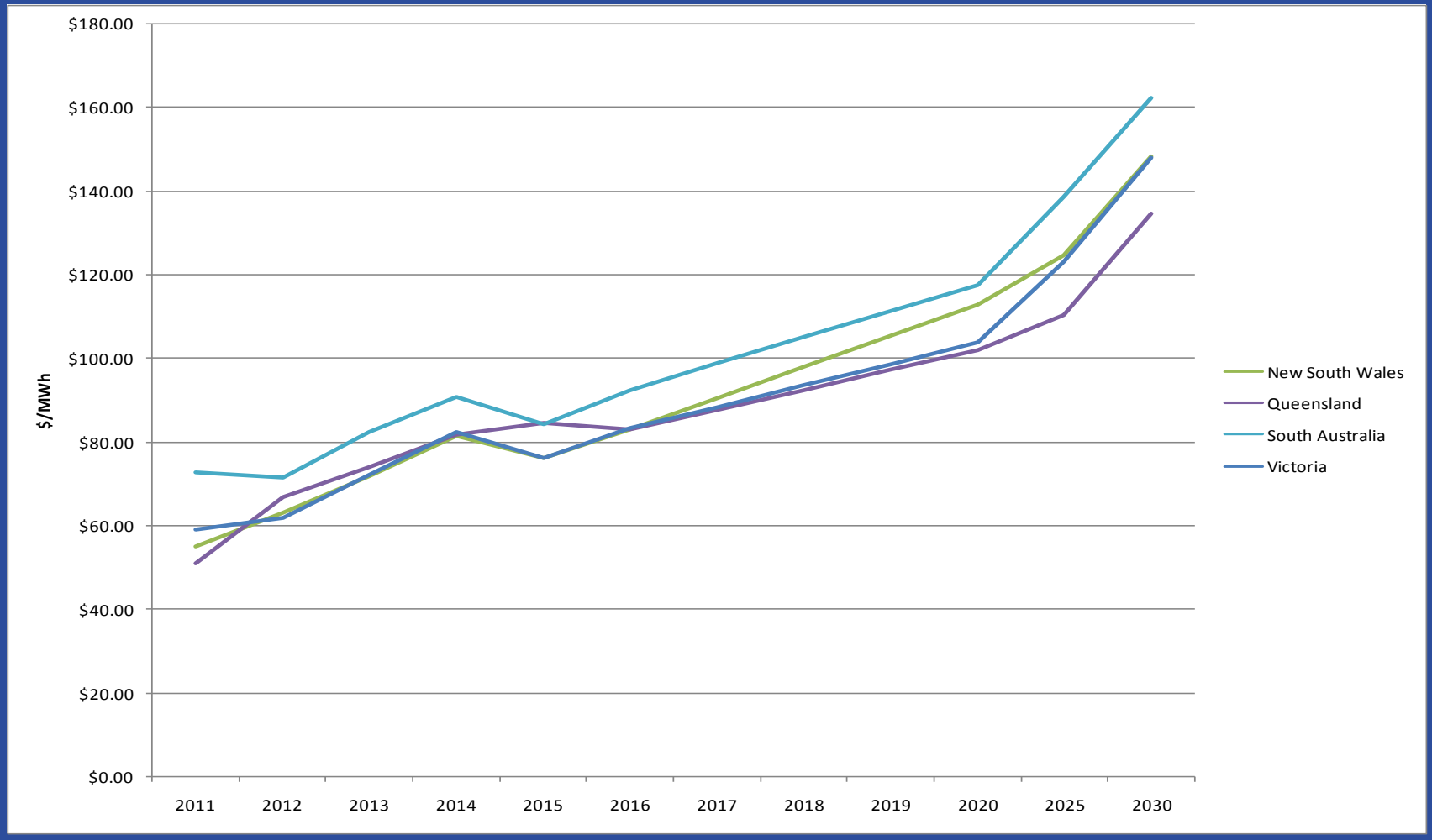
Differences in assumptions

- Lower carbon price
- Updated demand forecasts
- Higher new entrant LRMC
  - Higher gas prices
  - Higher new entrant capital costs

Carbon Prices



Electricity Prices

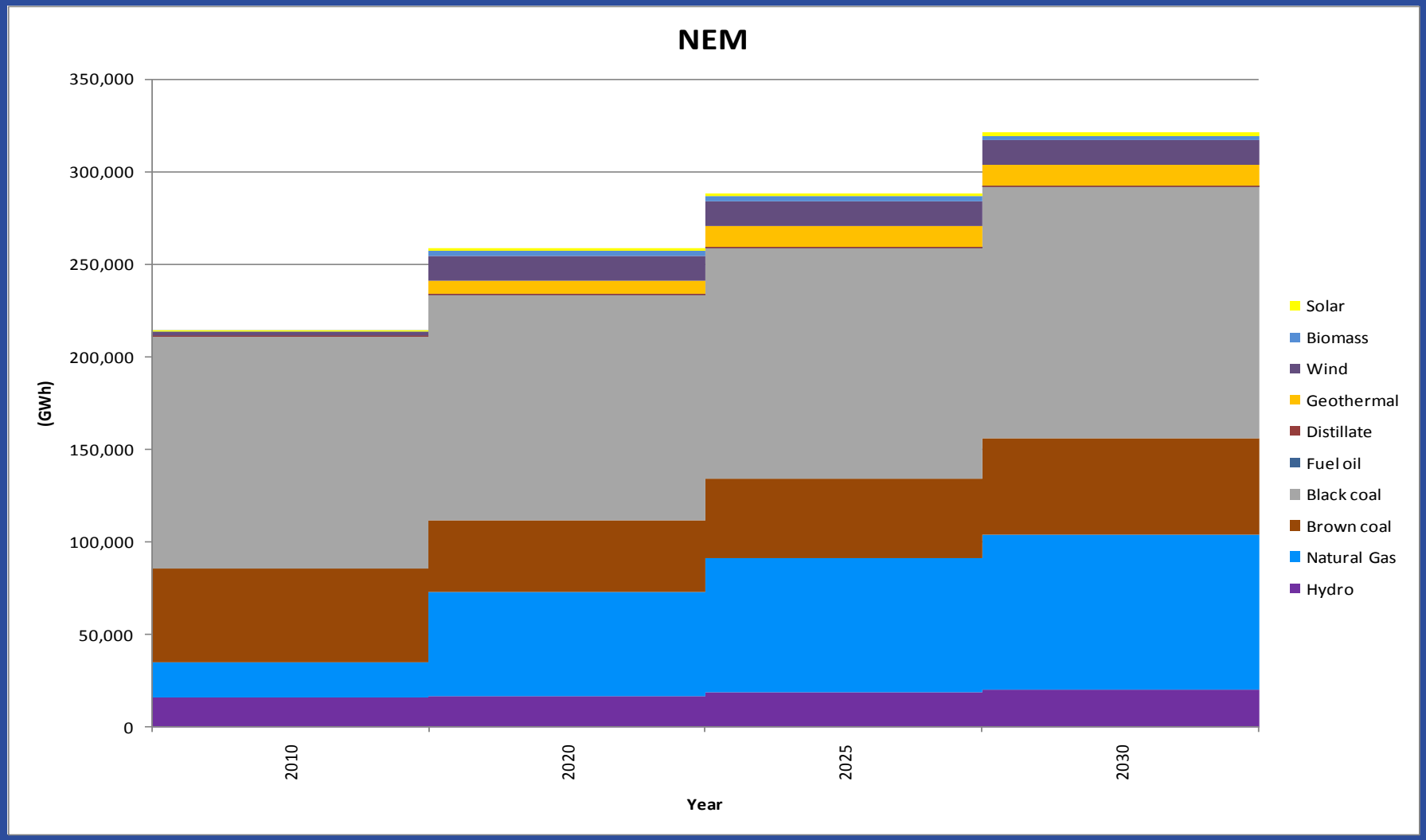


Plant new entry and retirement

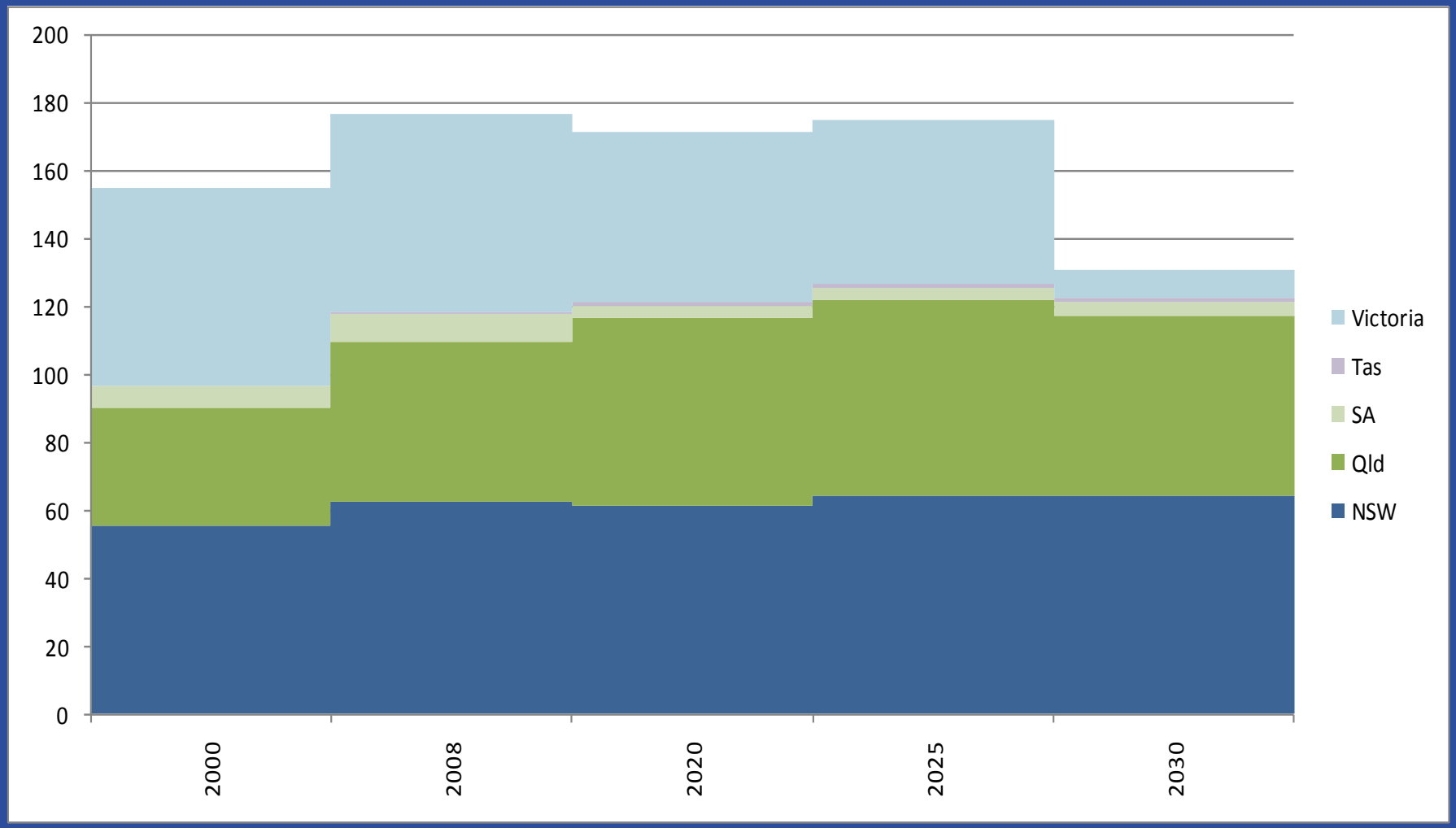
	NSW	Vic	Qld	SA	Tas	NEM
Retirements						
Brown coal		1,895				1,895
Black coal	600		1,120	770		2,490
NG steam		500		480		1,780
TOTAL	600	2,395	1,120	1,250		5,365
Non-renewable new Entry						
New	100	2,330	1,550	200	3,250	7,430

Remaining Vic brown coal, SA NG steam and NSW/Qld black coal under pressure from 2020 to 2030
8000 MW additional projected to close in 2020 to 2030 timeframe

NEM Generation by type of plant



CO2 emissions



ACIL Tasman
Economics Policy Strategy

Uncertainties…

- Technology, earlier or later and at lower cost (CCS, IGCC)
- At these prices for permits supply side response from sequestration opportunities (e.g. Forests)
  - Regional imports Potentially very large volumes from the Asian region – will they be certified?
- Oil prices continue to increase
  - international LNG prices and demand increase
  - more LNG export from Australia
  - higher eastern Australian gas prices increasing the cost of substitution and emissions savings

Impact of carbon

- New investments in gas pipelines
- Stranding of electricity transmission networks
- Expansion of distribution networks to support distributed wind and solar generation
- Development of sequestration technologies
- Infrastructure for carbon capture and storage
- Opportunities abound – but with great uncertainty and hence significant risk

Conclusion

- Carbon constraint means unprecedented changes in energy sector
- Many opportunities to invest
- Risk/reward profile suggests involvement of public funds
- Governments have poor record of picking winners – likely to lead to higher cost abatement