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The proposed Herons Creek Power Station: *Some issues for community consideration*

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Community Seminar, Laurieton, 12/6/08

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Outline

- Director General's Requirements for Herons Ck
- Project proponent's response
- How the electricity industry works
- The Australian National Electricity Market
- Generation investment in the NEM & in NSW
- Transmission issues, Stroud – Port Macquarie:
  - Combustion turbines & network support
- Conclusions
- Background:
  - Fuel prices & climate change

Director General's requirements for Heron's Creek application

- To be discussed in this presentation:
  - Strategic justification (need, scale, scope & location)
  - Greenhouse gases
- Other matters:
  - Air quality, Noise impacts, Flora & fauna, Road & traffic, visual amenity, environmental risk analysis
- If matters of national environmental significance, then EPBC Act would also apply

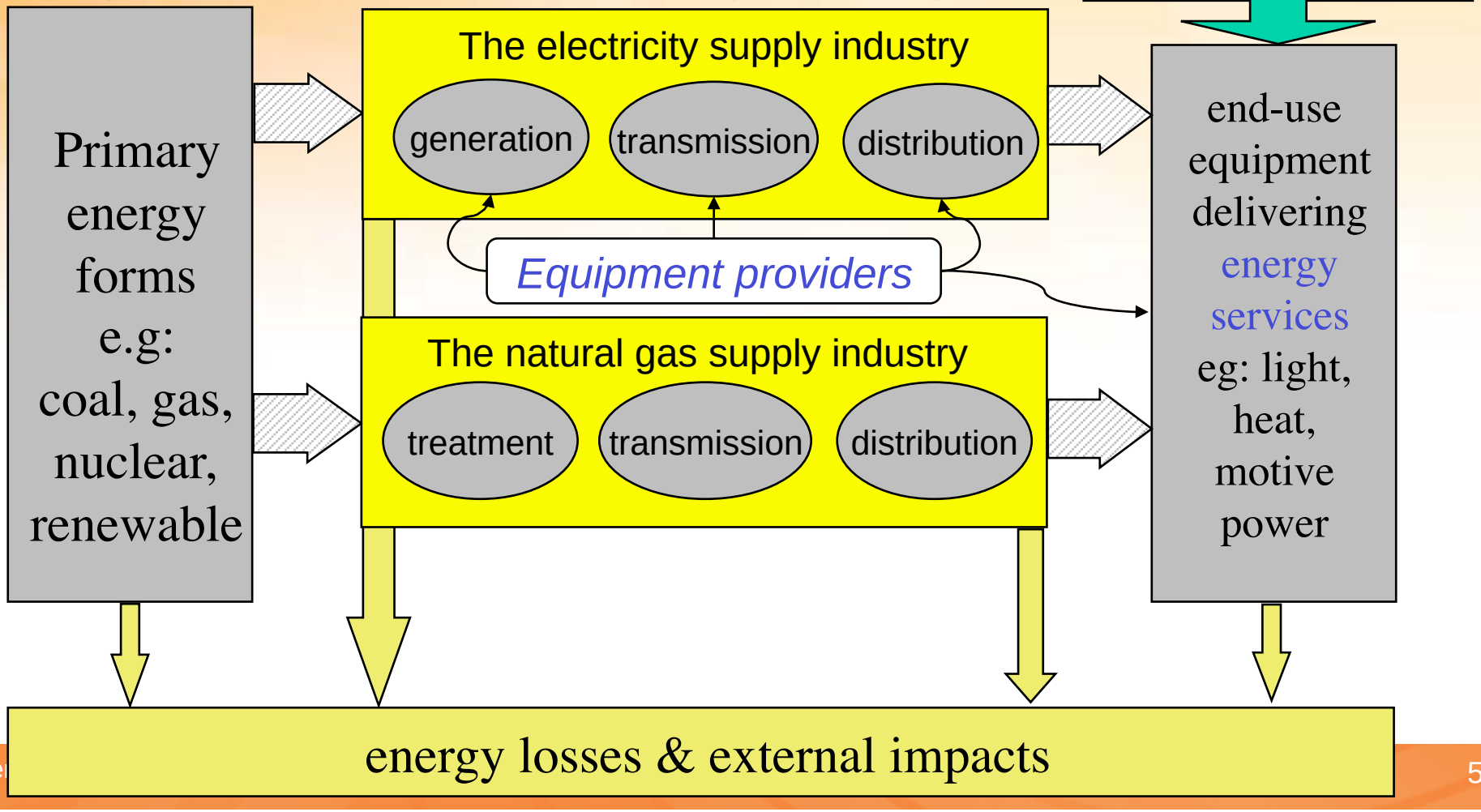
Proponent's project justifications

(URS Environmental Assessment, 2008)

- Operation to provide:
  - NEM & NEMMCO support at times of high inter-regional demand and/or constraints
  - Transmission network support to ensure reliability and quality of supply
  - Security of local electricity supply at times of system (planned or accidental) shut-down
- Herons Creek PS offers:
  - Significant mitigation of growing NSW peak demand
  - Significant regional reinforcement in the event of extensive transmission problems

Energy service delivery in the stationary energy sector

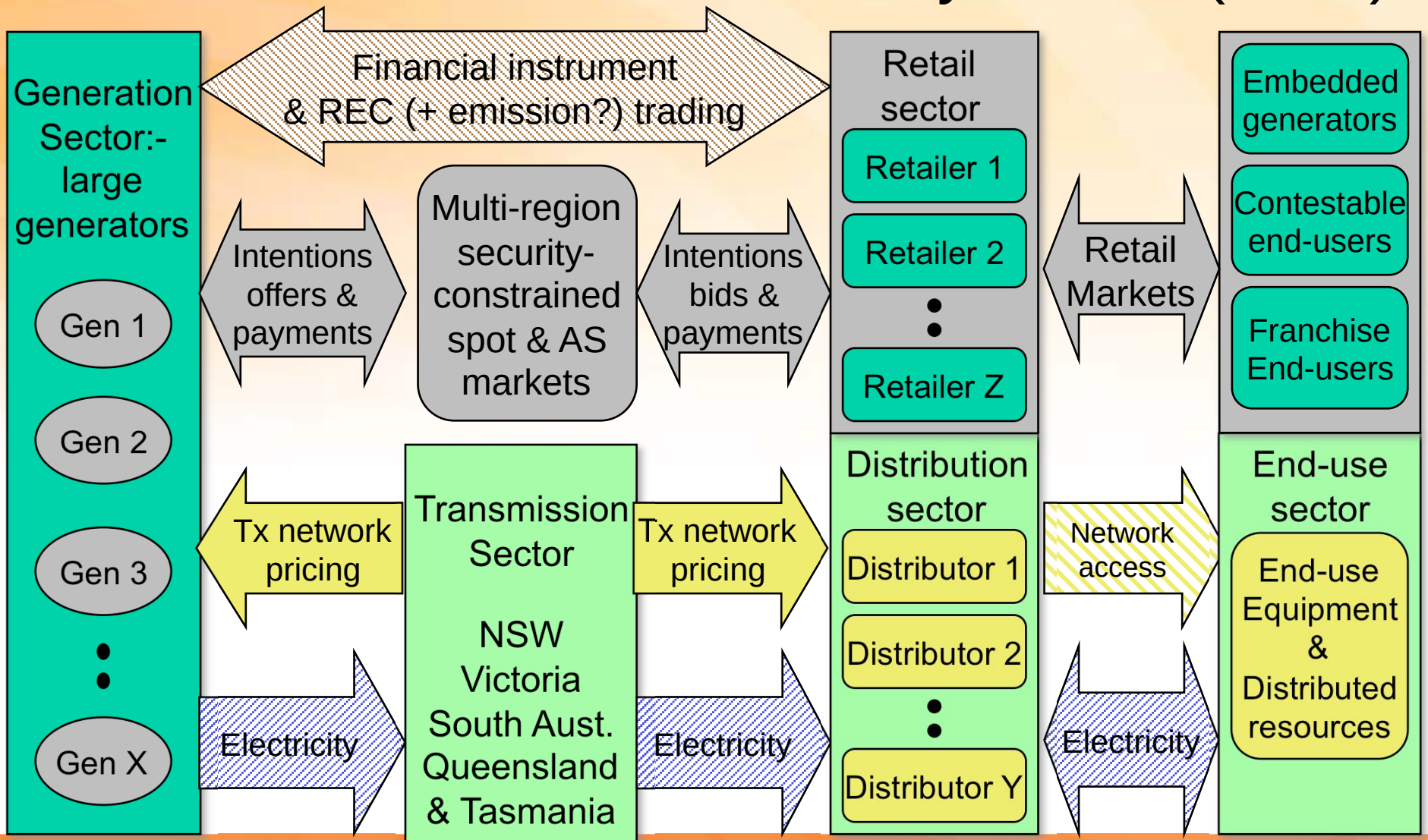
(many decision-makers & objectives)



Electricity industry characteristics

- Complex & fragile energy conversion chain:
  - Continuous flow from primary to end-use energy forms
  - Mix of base-load, intermediate & peak power stations
  - Network flow constraints
- Societal infrastructure role:
  - Electricity supply regarded as an “essential service” for residential, commercial & industrial use
- Climate change impacts:
  - Electricity generation from fossil fuels, particularly coal

The Australian National Electricity Market (NEM)



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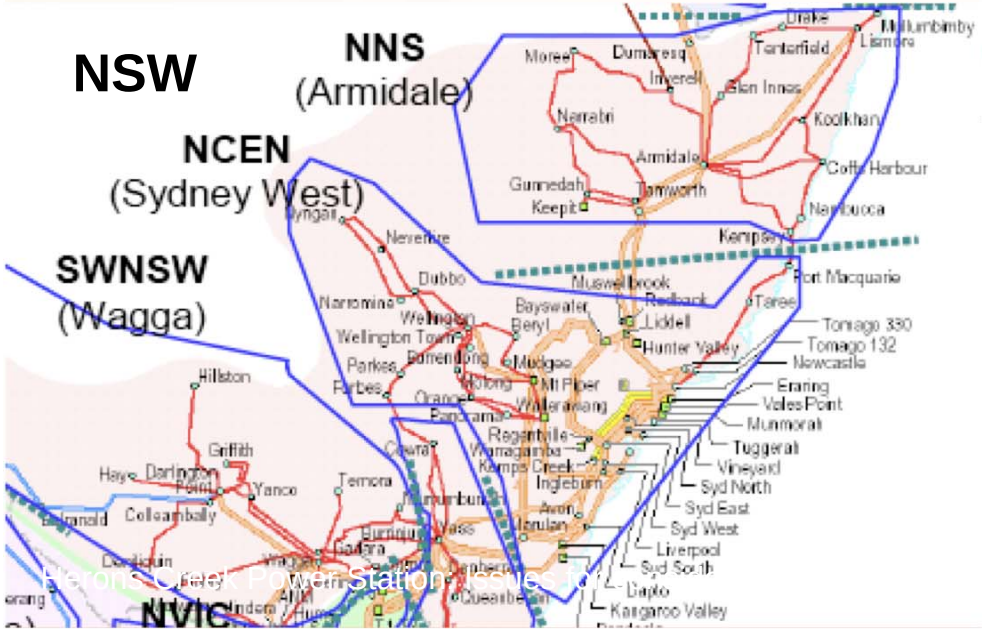
National Electricity Market

- Serves nearly 20m people
- Network length ~4,000 km
- Uniform National Electricity Rules for market & operation
- NEMMCO operates the power system & the market
- Transmission zones shown



Eraring Coal Power Station (Vales Point)

17 zone arrangement

Queensland

NQ
(Ross)

CQ
(Boulder combe)

SEQ
(Southpine)

SWQ
(Tarong)

South Australia

NSA
(Davenport)

New South Wales

NNS
(Armidale)

NCEN
(Sydney West)

SWNSW
(Wagga)

ADE
(Torrens Island)

CVIC
(Red Cliffs)

NVIC
(Dederang)

CAN
(Canberra)

SESA
(South East)

SNY
(Murray)

MEL
(Thomastown)

LV
(Hazelwood 500kV)

Victoria

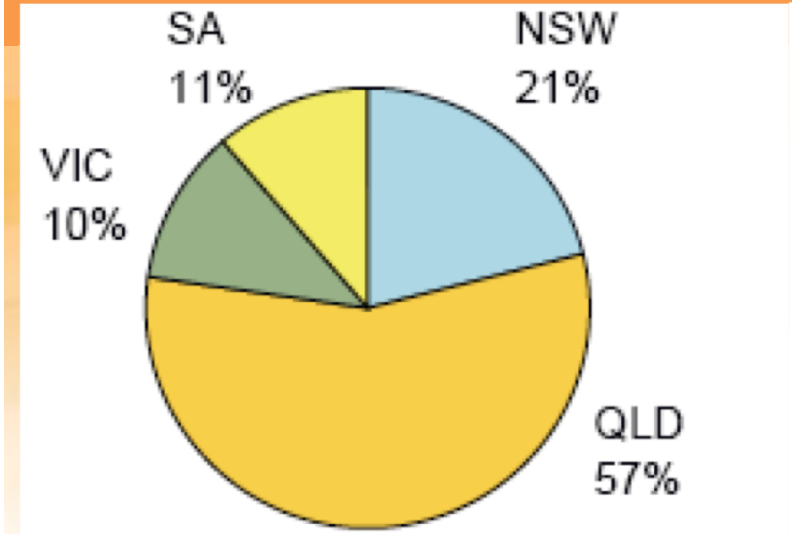
MEL-CVIC Cutset
Geelong- Keilor line
Moorabool Transformer

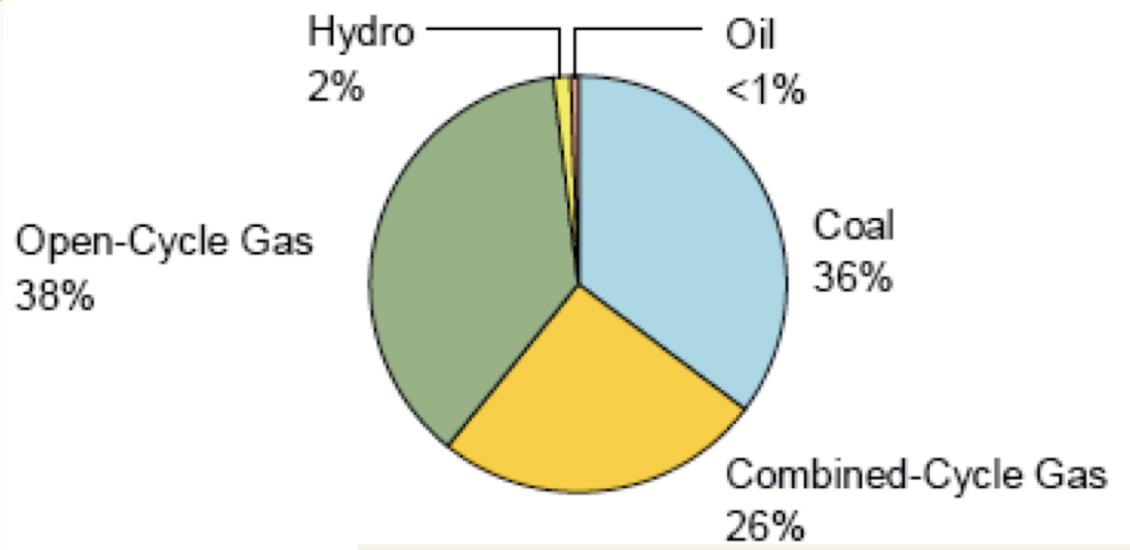
TAS
(George Town)

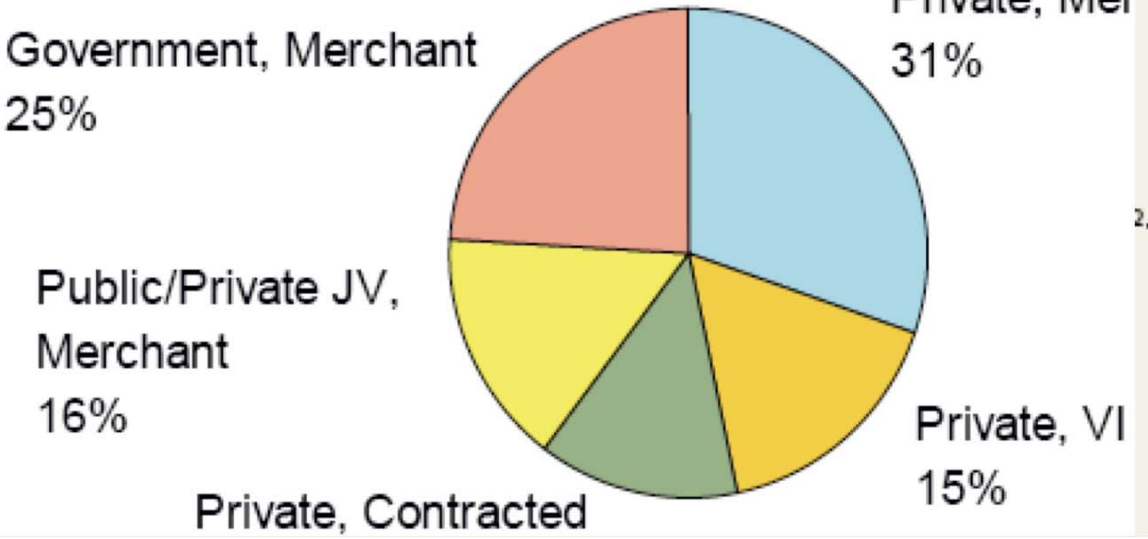
Tasmania

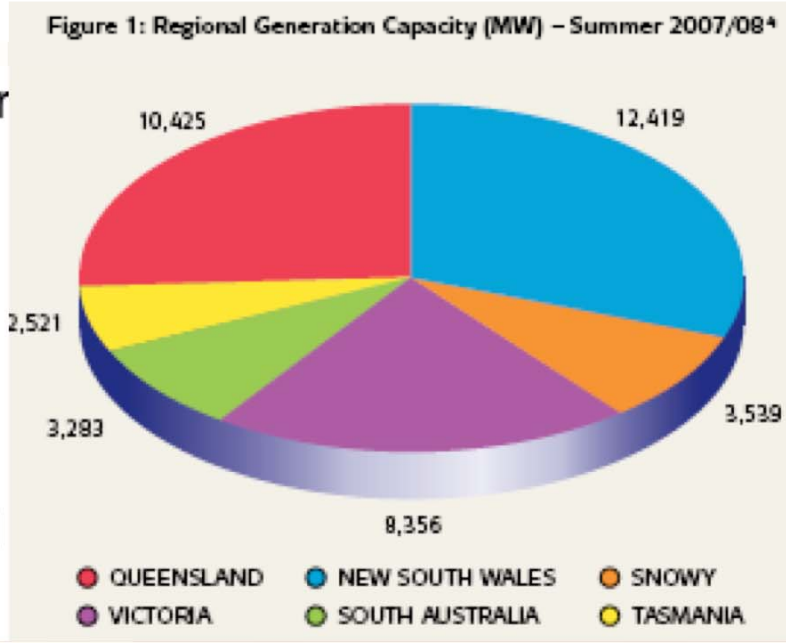
Generation investment in NEM 2000-2007

(~9GW plus ~1GW wind not shown) (Morgan Stanley, 2007)









Generation in NEM by zone & fuel type (ACIL 2007)

Zone	Black Coal	Brown Coal	Gas	Oil	Hydro	Total
Capacity available in 2006/07 summer (MW)						
North Qld	187		232	322	148	889
Central Qld	4720		49			4769
South East Qld	480		350		500	1330
South West Qld	2703		780			3483
North NSW						
North Central NSW	10068		162	44	2060	12334
South West NSW					80	80
Canberra						
Snowy					3426	3426
Northern Vic			70		509	579
Latrobe Valley		6124	686			6810
Melbourne			925			925
Central Vic		156				156
Tas			336		2173	2509
South East SA			70	51		121
Adelaide			2296	40		2336
North SA	765			38		803
Total	18923	6280	5956	495	8896	40550

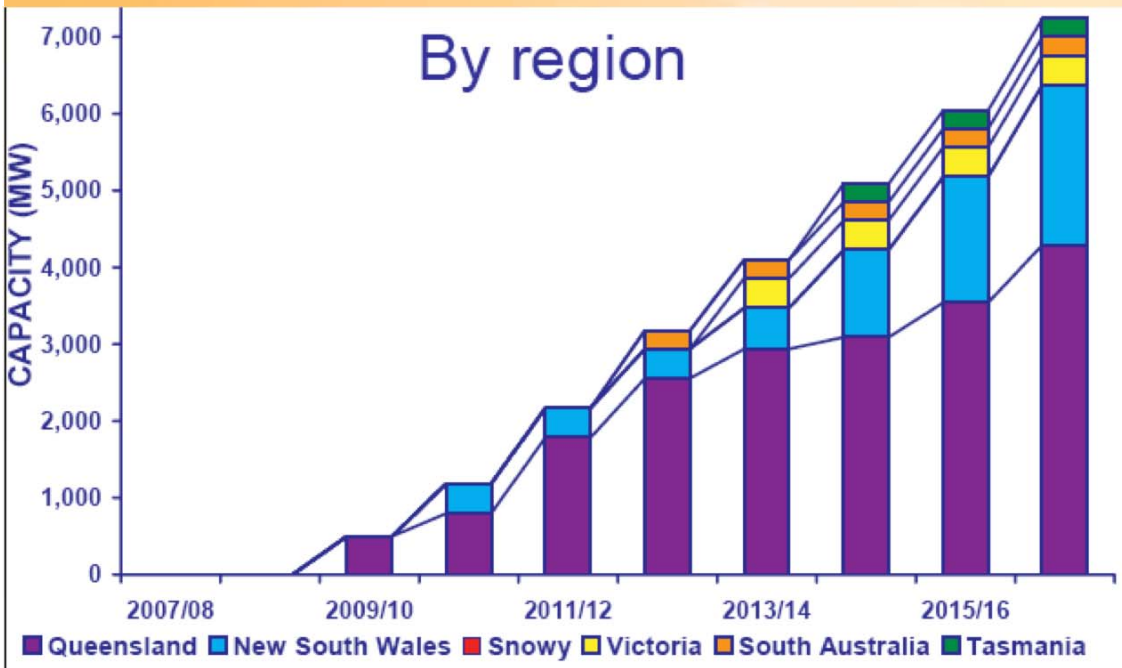
Generation capacity factor by zone & fuel (ACIL, 2007)

Zone	Black Coal	Brown Coal	Gas	Oil	Hydro	Total
North Qld	35%		77%	1%	38%	35%
Central Qld	70%		32%			70%
South East Qld	55%		49%		1%	33%
South West Qld	92%		0%			70%
North NSW						
North Central NSW	75%		73%	0%	0%	62%
South West NSW					58%	58%
Canberra						
Snowy					17%	17%
Northern Vic			8%		10%	10%
Latrobe Valley		88%	1%			78%
Melbourne			8%			8%
Central Vic		99%				99%
Tas			31%		49%	47%
South East SA			48%	0%		27%
Adelaide			25%	1%		25%
North SA	67%			0%		65%
Total	75%	88%	22%	1%	20%	57%

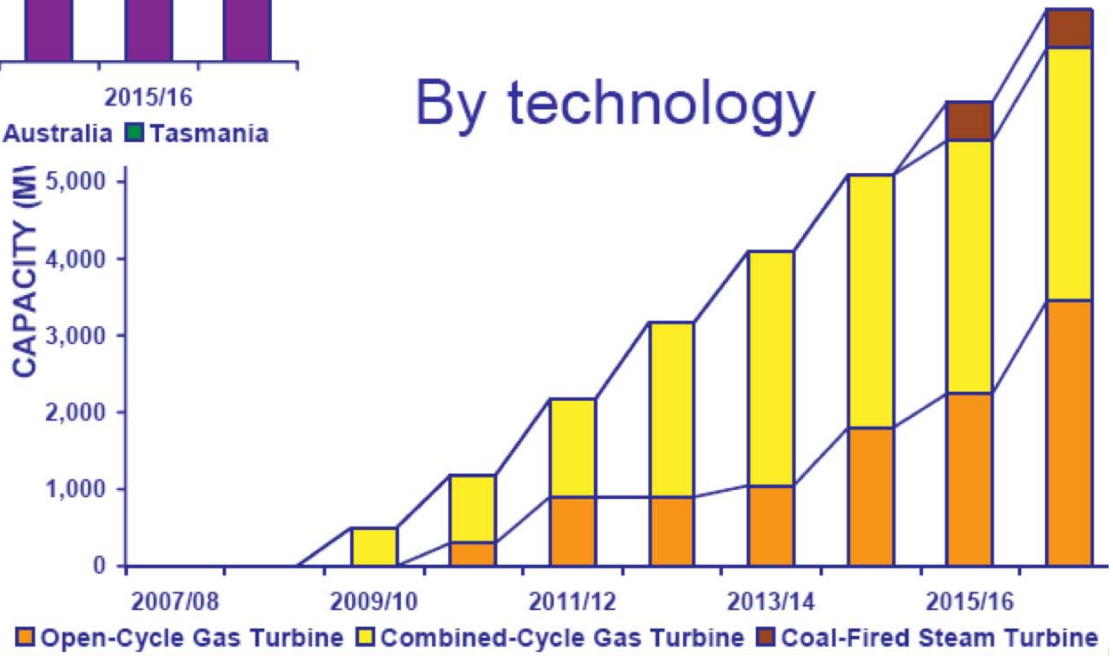
Share of energy generated in 2005-6 (ACIL, 2007)

Zone	Black Coal	Brown Coal	Gas	Oil	Hydro	Total
North Qld	0.3%		0.8%	0.0%	0.2%	1.3%
Central Qld	14.3%		0.1%			14.4%
South East Qld	1.1%		0.8%		0.0%	1.9%
South West Qld	10.7%		0.0%			10.7%
North NSW						
North Central NSW	32.8%		0.5%	0.0%	0.0%	33.4%
South West NSW					0.2%	0.2%
Canberra						
Snowy					2.5%	2.5%
Northern Vic			0.0%		0.2%	0.2%
Latrobe Valley		24.4%	0.0%			24.5%
Melbourne			0.2%			0.2%
Central Vic		0.7%				0.7%
Tas			0.3%		4.6%	4.9%
South East SA			0.2%	0.0%		0.2%
Adelaide			2.7%	0.0%		2.7%
North SA	2.2%			0.0%		2.2%
Total	61.5%	25.1%	5.6%	0.02%	7.8%	100%

NEMMCO SOO 2007: Simulated Expansion



~1GW pa total,
~40% OCGT,
~30% NSW
Hence ~120MW OCGT pa in NSW



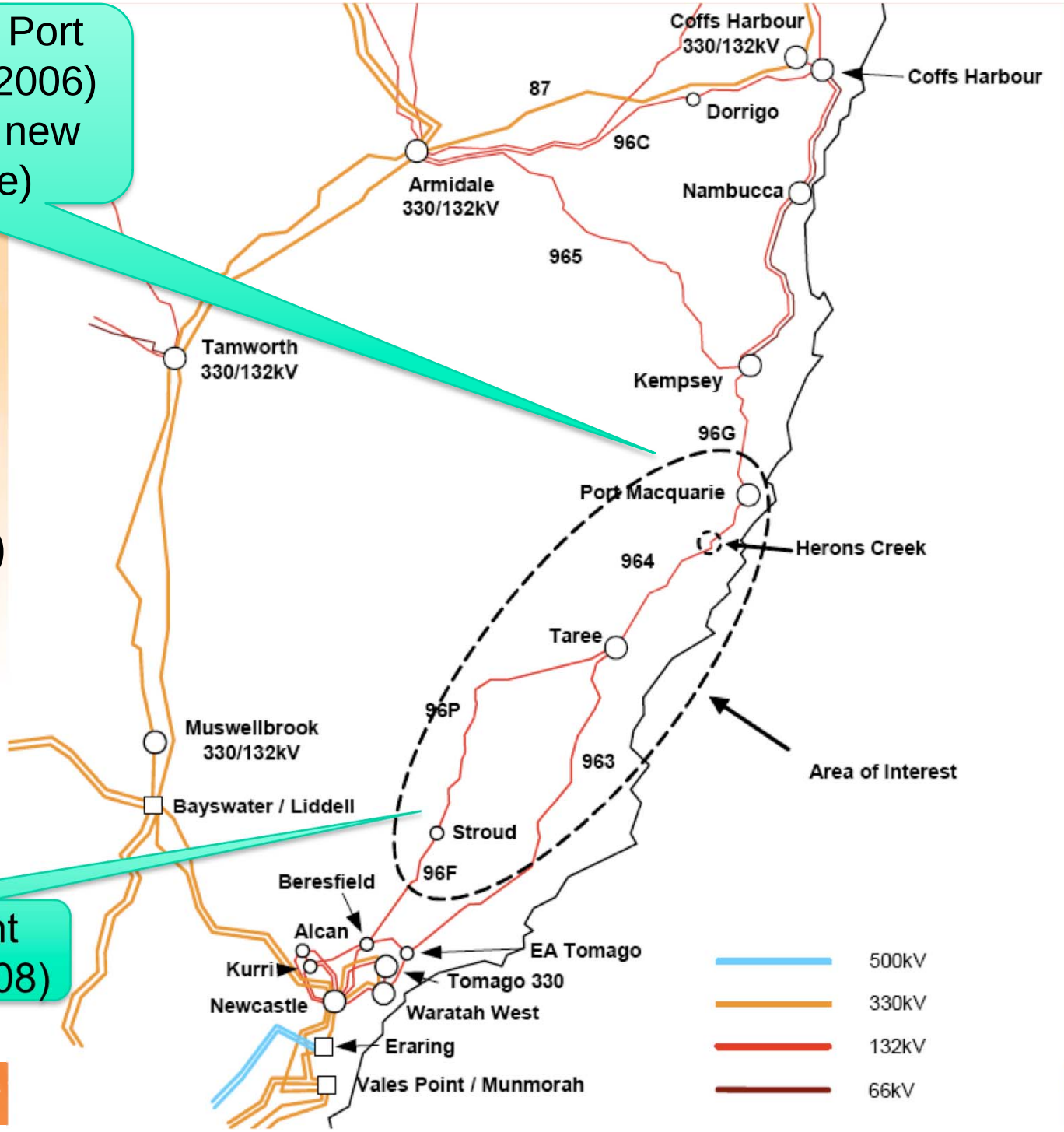
Other generation projects in NSW

(less firm towards the bottom of the table)

Project	MW
Tallawarra stage A Gas CCGT (stage B also possible) (TruEnergy)	440
Colongra OCGT (Delta)	660
Uranquinty OCGT (NewGen)	600
Bamarang OCGT (Delta) (also Bamarang stage 2 400MW & Marulan) Hunter Valley CCGT plus CSM pipeline (Qld Gas)	300 600
Wellington OCGT (ERM)	600
Other IPRA OCGT projects	300
Silverton wind farm (Epuron)	1000
Other Epuron wind farm projects in NSW	600
Sydney Water Desalination Plant wind farm tender	130
Moree Solar Thermal Baseload?	200
Total (only some may proceed)	**5430**

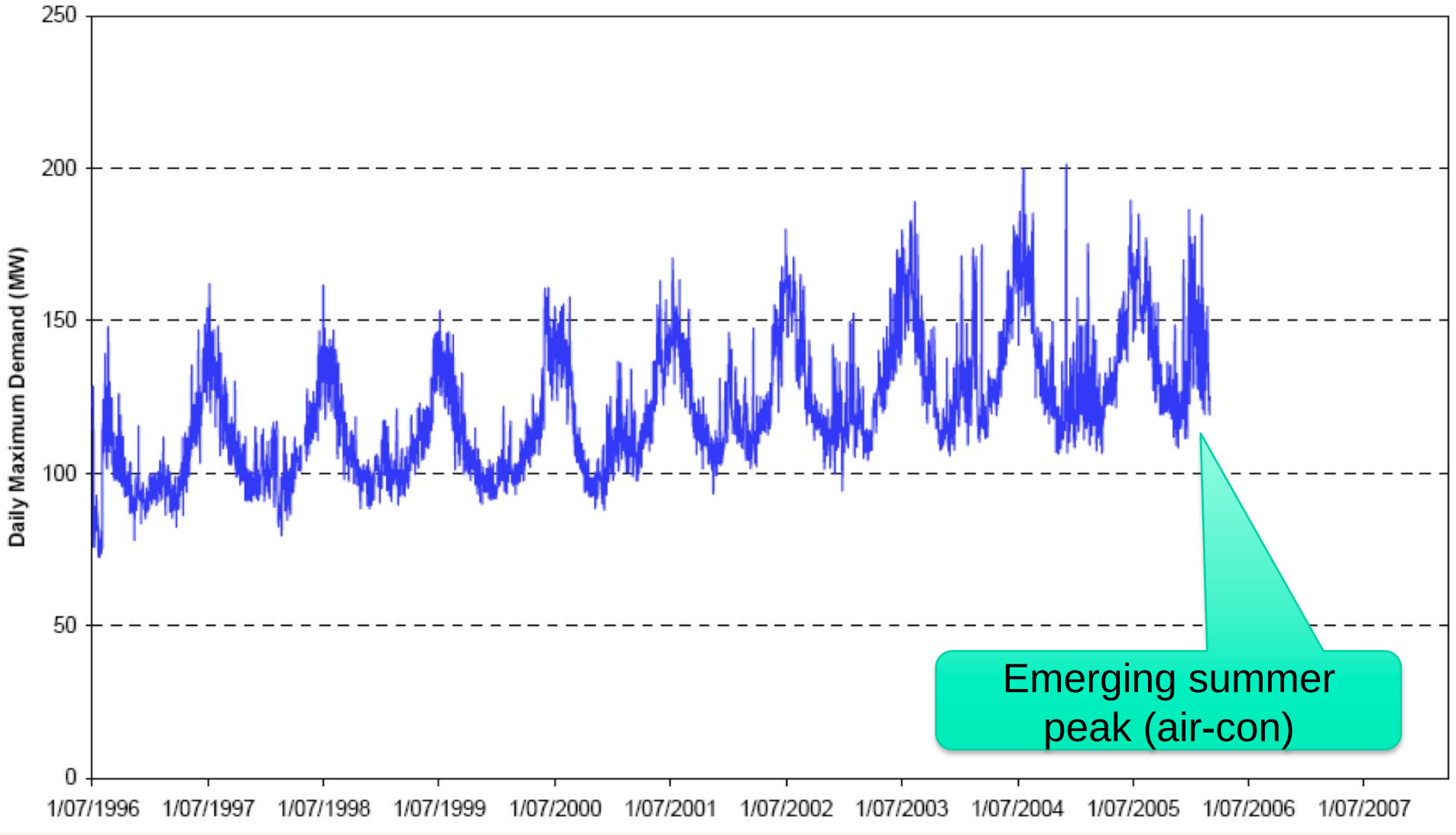
Existing constraint Port Macquarie region (2006) (to be resolved by new transmission line)

Transmission Network Mid North Coast (Transgrid, 2007)

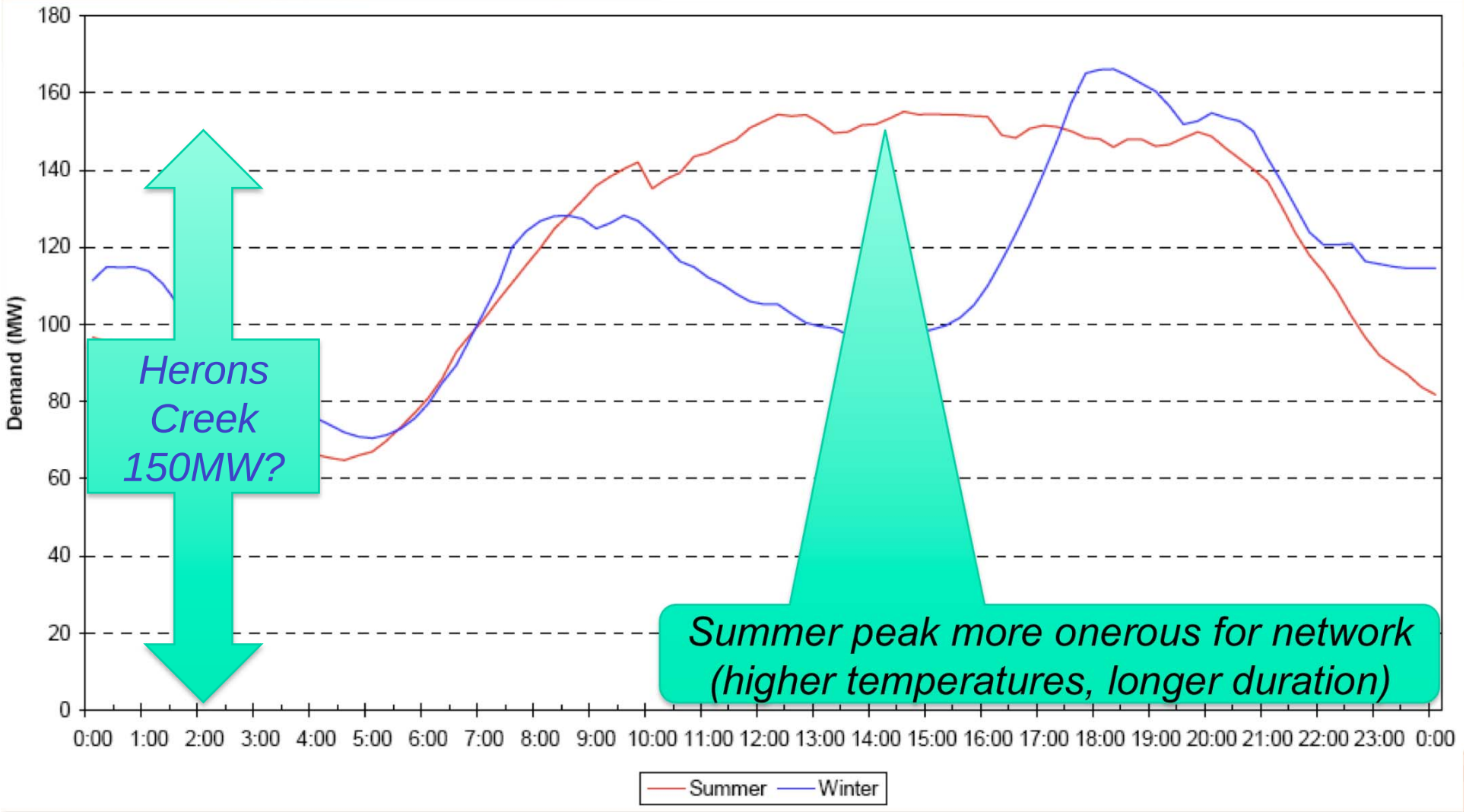


Emerging constraint Beresfield-Taree (2008)

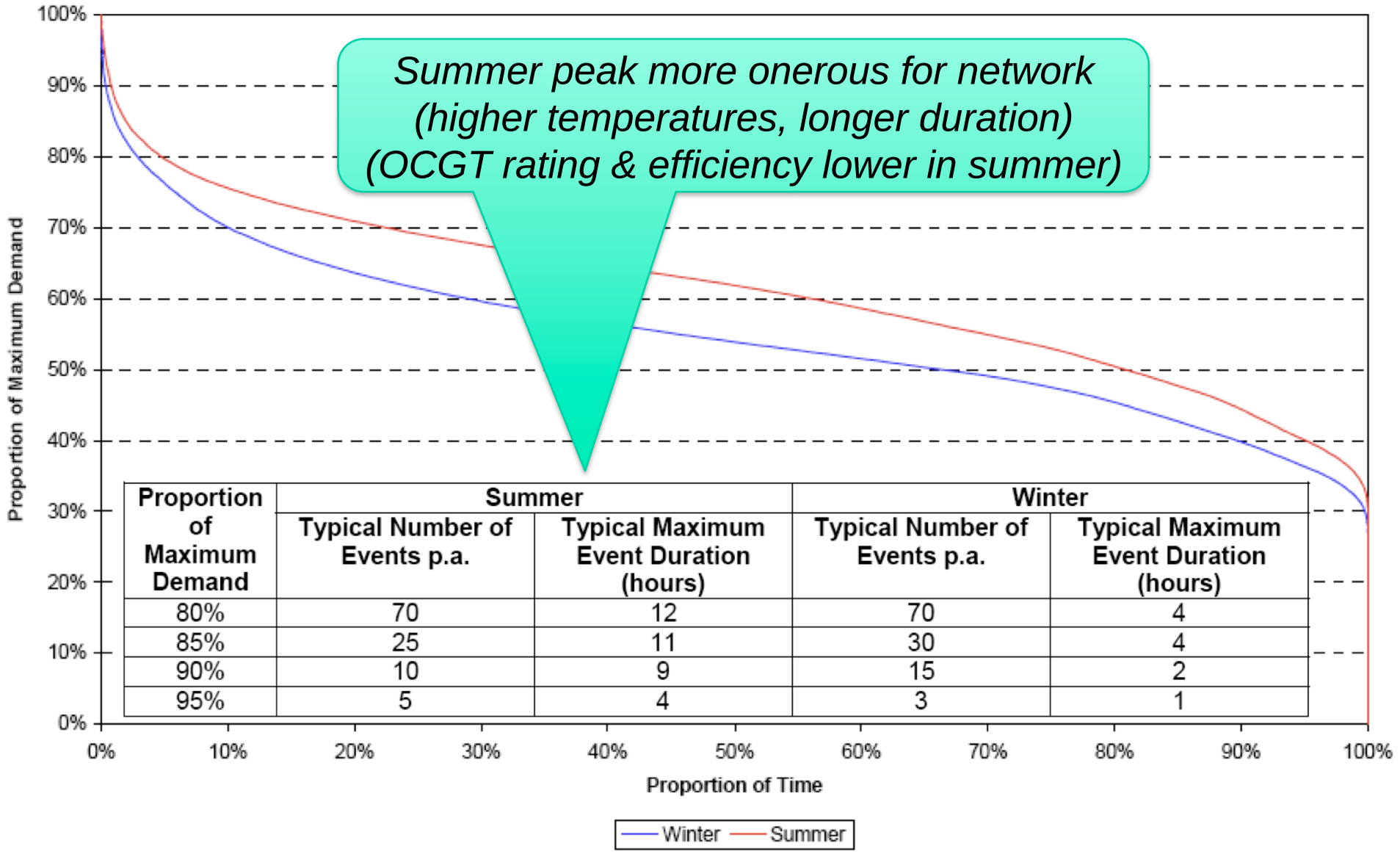
Stroud to Port Macquarie load history
(Transgrid, 2006)



Taree to Port Macquarie peak load shapes
(Transgrid, 2006)



Taree to Port Macquarie load duration curves (Transgrid, 2006)



Proportion of Maximum Demand	Summer		Winter	
	Typical Number of Events p.a.	Typical Maximum Event Duration (hours)	Typical Number of Events p.a.	Typical Maximum Event Duration (hours)
80%	70	12	70	4
85%	25	11	30	4
90%	10	9	15	2
95%	5	4	3	1

Load growth & load reduction effectiveness
(Transgrid, 2006)

Area	Relevant Network Outage(s)	Forecast Summer Load Growth (MW p.a.)	Forecast Winter Load Growth (MW p.a.)
Coffs Harbour to Stroud Area	(Future) Armidale – Coffs Harbour 330 kV line	21	13
Stroud to Port Macquarie Area	Kempsey – Port Macquarie 132 kV line	14	8
Stroud to Taree Area	Beresfield – Stroud 132 kV line Tomago – Taree 132 kV line	6	3
Taree (66 kV)	Taree 132/66 kV Transformer	4.5	2.5
Kempsey (33 kV)	Kempsey 132/33 kV Transformer	2	1.3

Herons Creek PS: location sound but large compared to load growth

Line Outage	Location of Load Reduction				
	Coffs Harbour	Kempsey	Port Macquarie	Taree	Stroud
Armidale – Coffs Harbour 330 kV line	0.2	0.6	0.9	1.0	0.4
Kempsey – Port Macquarie 132 kV line	No Effect	No Effect	1.0	0.5	0.25
Beresfield – Stroud 132 kV line	Negligible	0.25	0.5	0.75	1.0

Transgrid near-term augmentation options for Stroud – Port Macquarie

(Transgrid, 2007)

Option	Description	Scenario 1		Scenario 2	
		PV of Costs ($M)	Rank	PV of Costs ($M)	Rank
Option 1	Kempsey – Port Macquarie Line	13.5	1	13.5	1
Option 2	Kempsey – Herons Creek Single Circuit Line	19.3	2	22.9	3
Option 3	Kempsey – Herons Creek Double Circuit Line	23.5	3	22.0	2

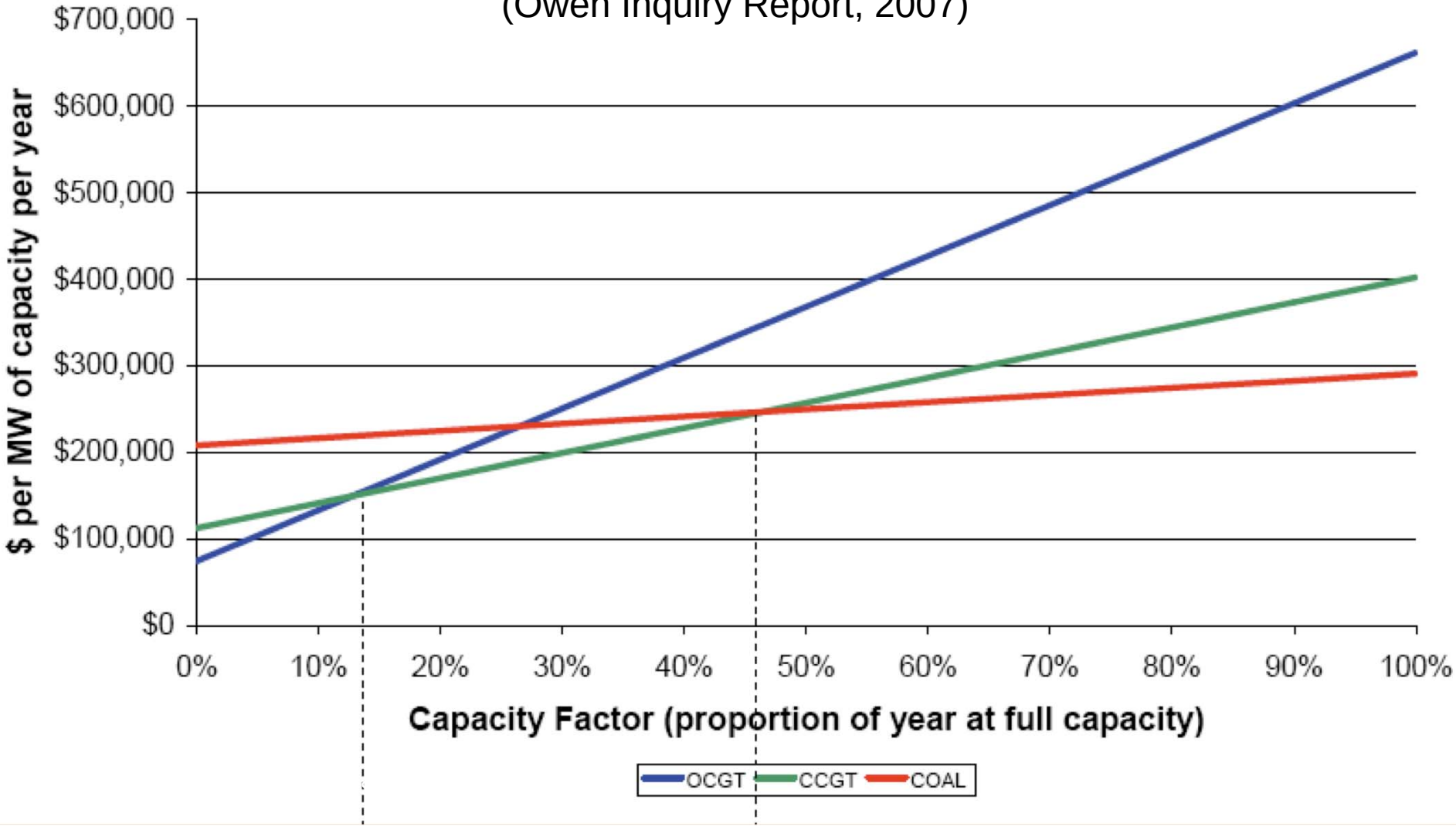
- *Option 1 presently out for tender, to be commissioned by mid 2010*
- *Further augmentation likely south of Herons Creek at a later date*

Conclusions

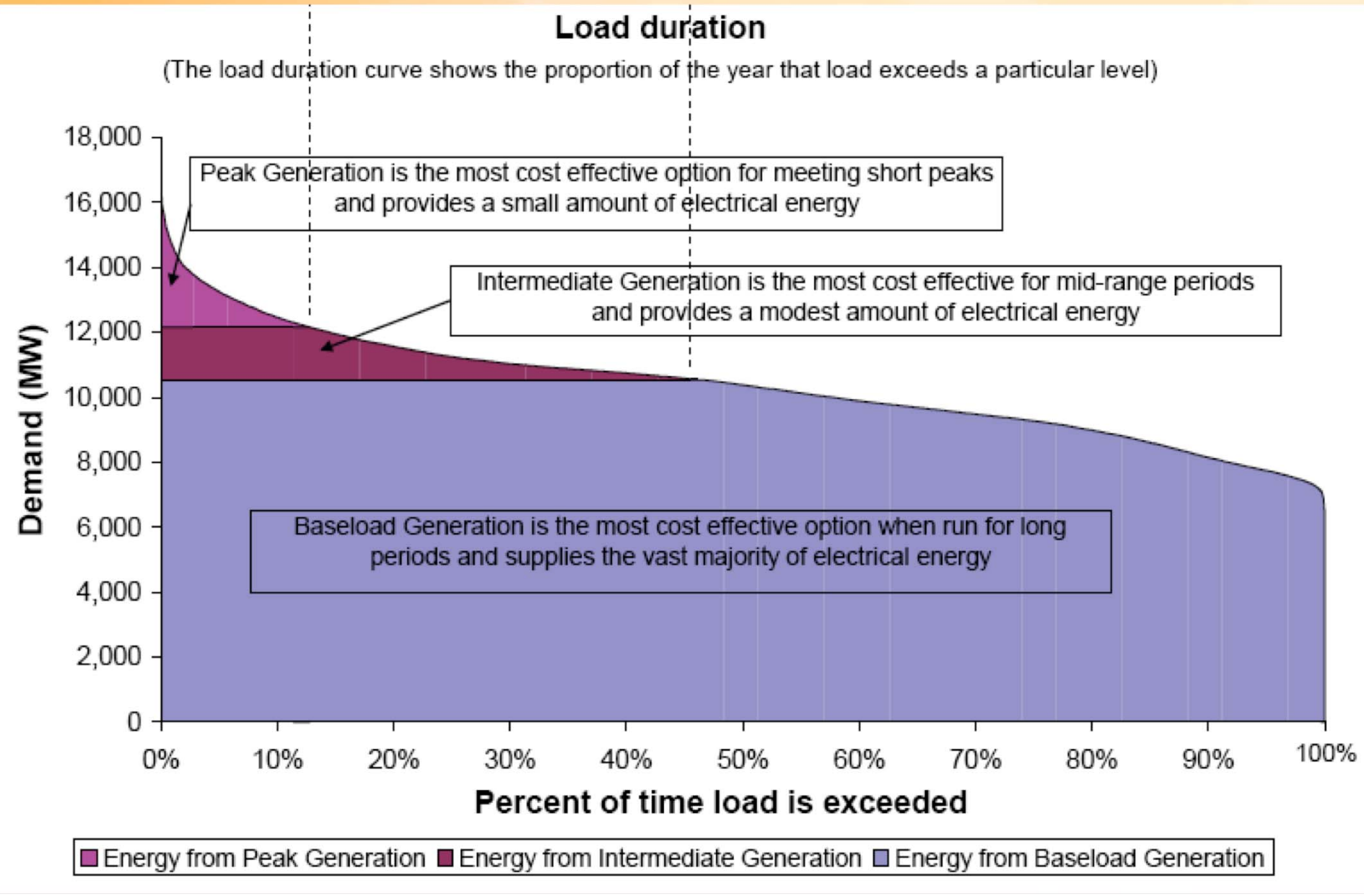
- Climate change & high fuel prices are key issues
  - End-user options are the best near-term responses:
    - Frugality, improved efficiency & flexible timing of demand
  - Renewable energy generation next best:
    - Wind farms, geothermal?, biomass?, solar thermal?, PV?, small hydro?
- Combustion turbines burning oil:
  - Used for peak demand or to backup other generators:
    - A useful complement to non-storable renewables (wind, solar)
    - Low operating hours implies low greenhouse emissions
  - May delay defer future transmission augmentation:
    - Herons Creek PS rating comparable to local peak load

Cost Curves for Different Options

(Owen Inquiry Report, 2007)



(Owen Inquiry Report, 2007)



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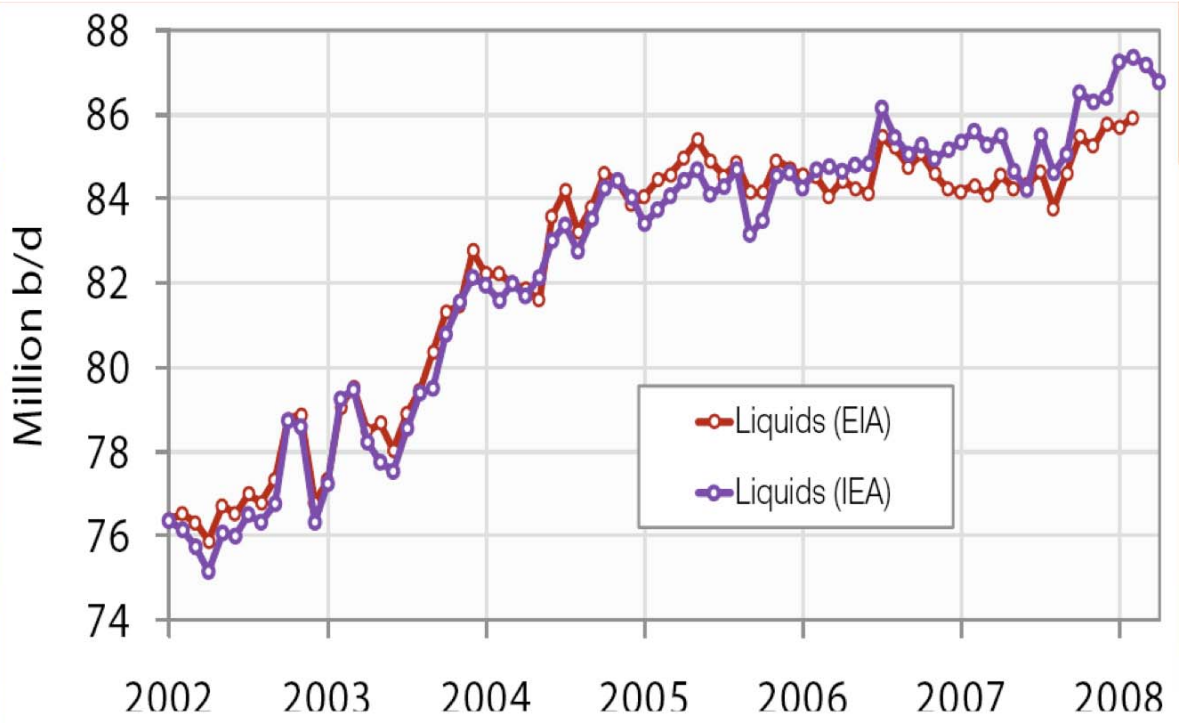
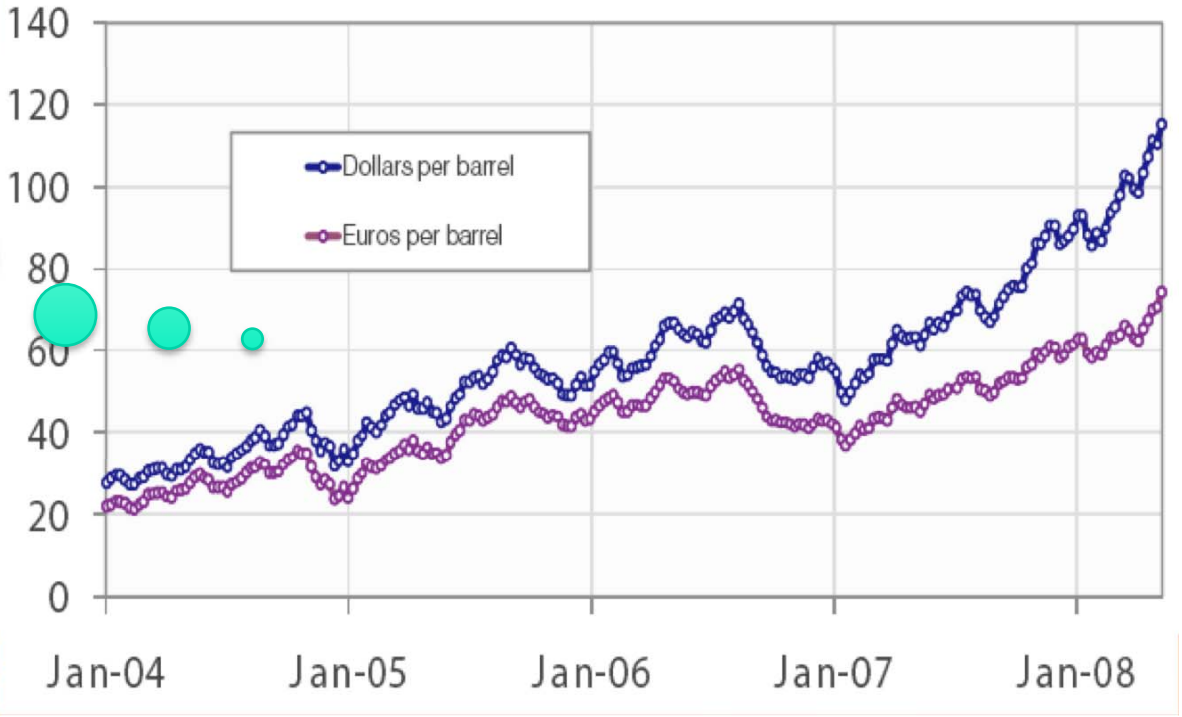
Oil production & price trends to April 2008

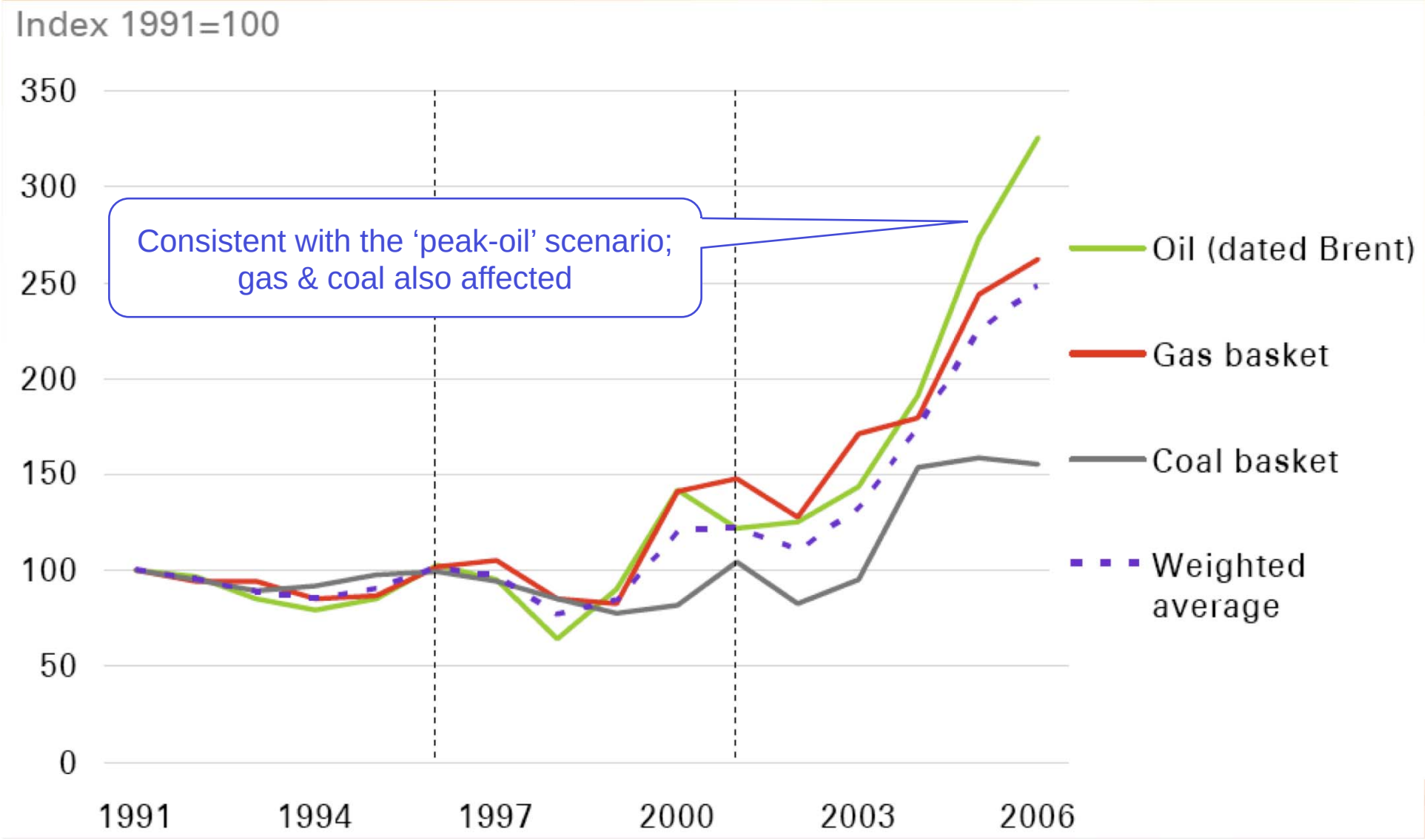
(Oilwatch Monthly May 08)
(www.theoildrum.com)

Growing demand & falling supply: Prices likely to rise further





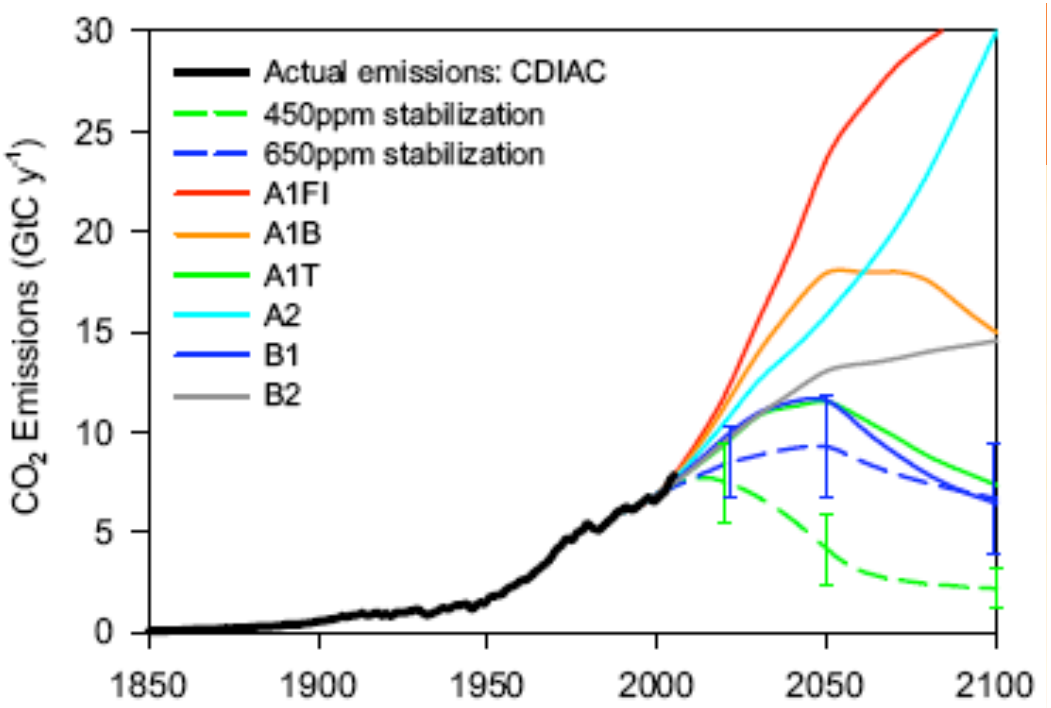
Prices for key energy commodities (BP Review 2007)

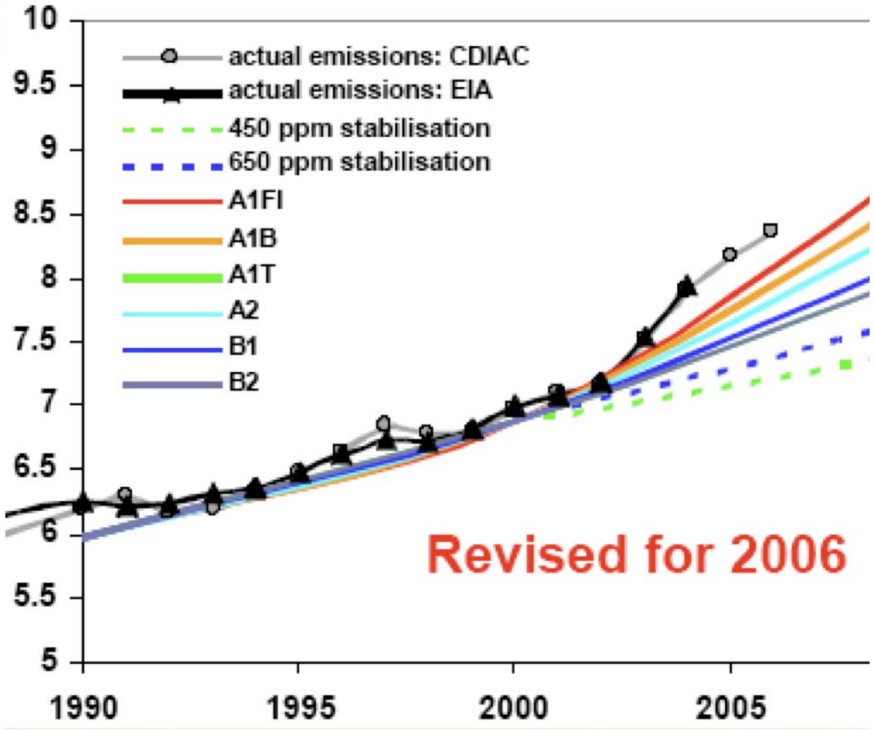


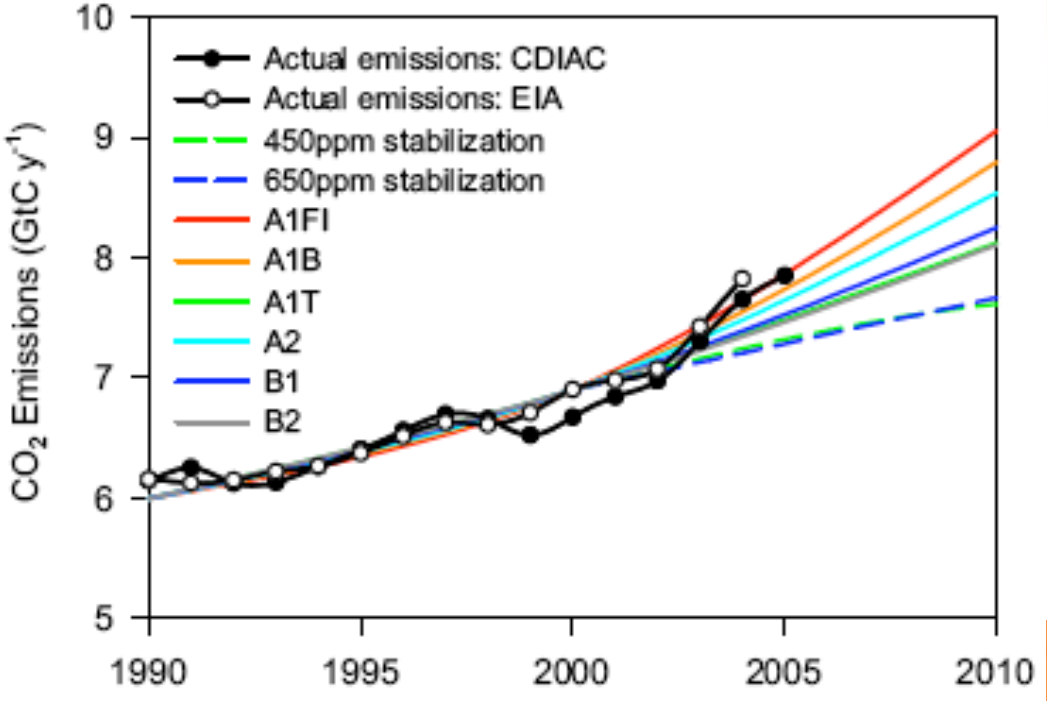
Actual emissions at or above "BAU"

(Raupach et al, 2007)

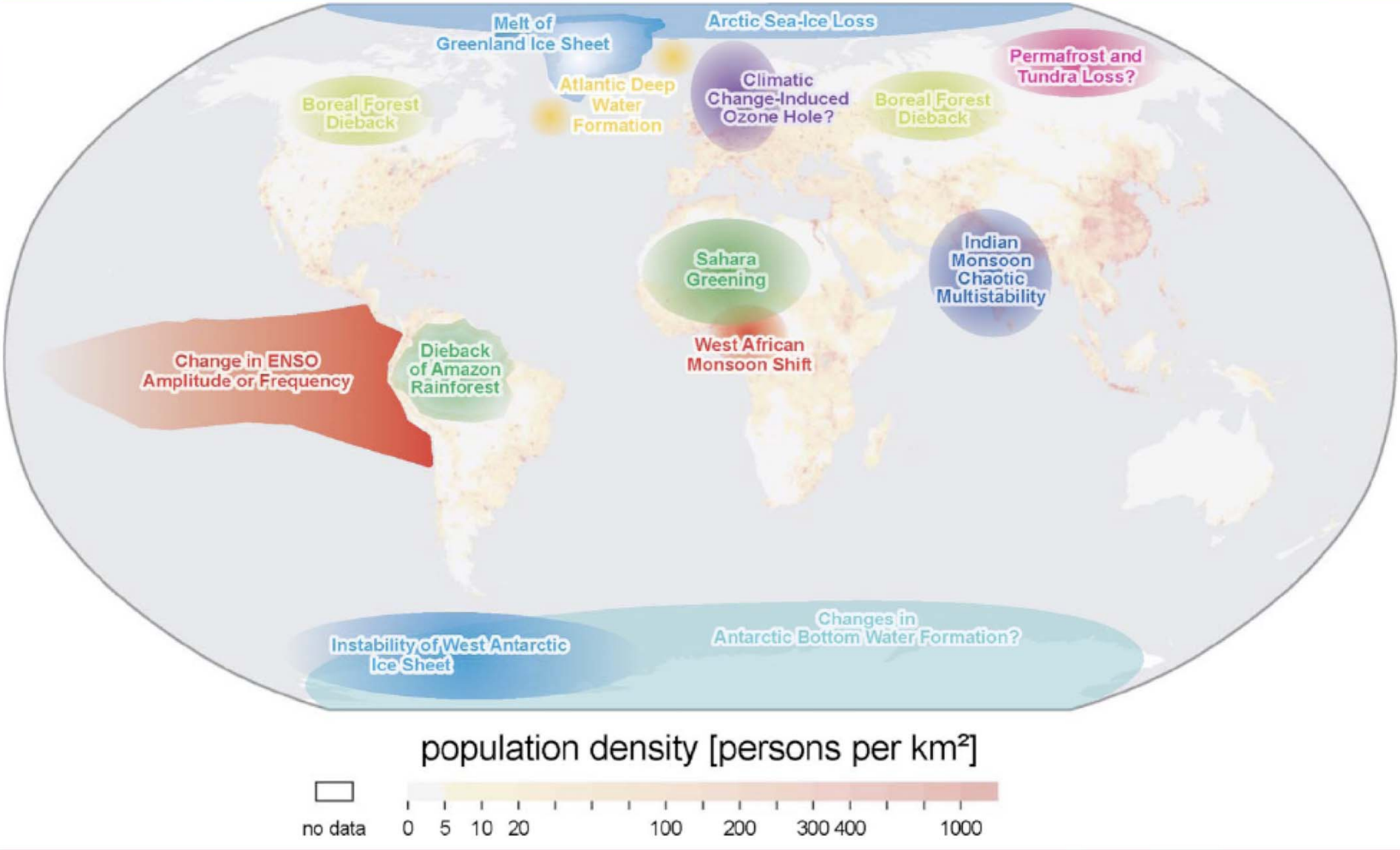
Only rapid emission reduction can avoid dangerous climate change





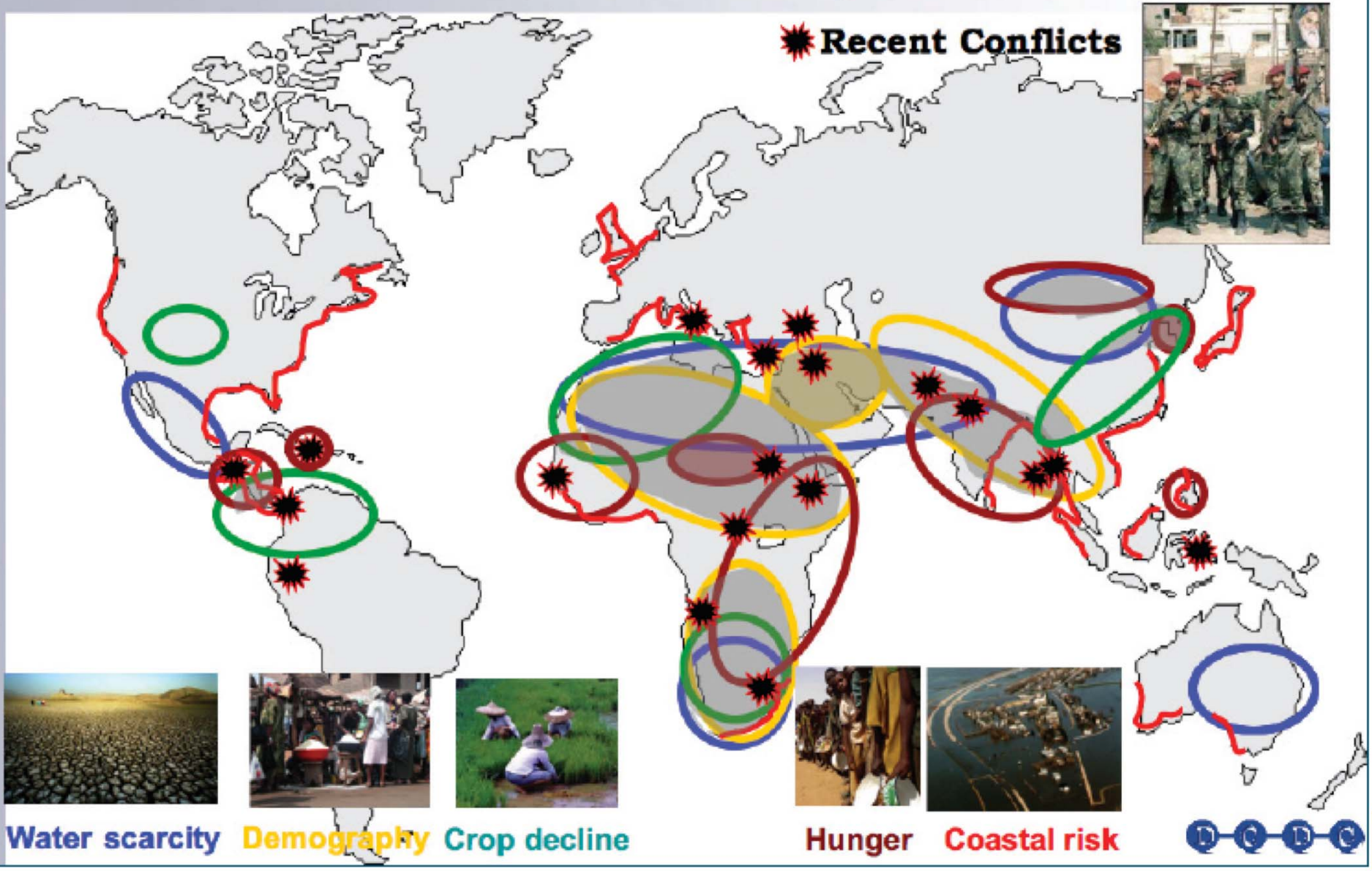


Potential climate change tipping points
(Lenton et al ,2008)

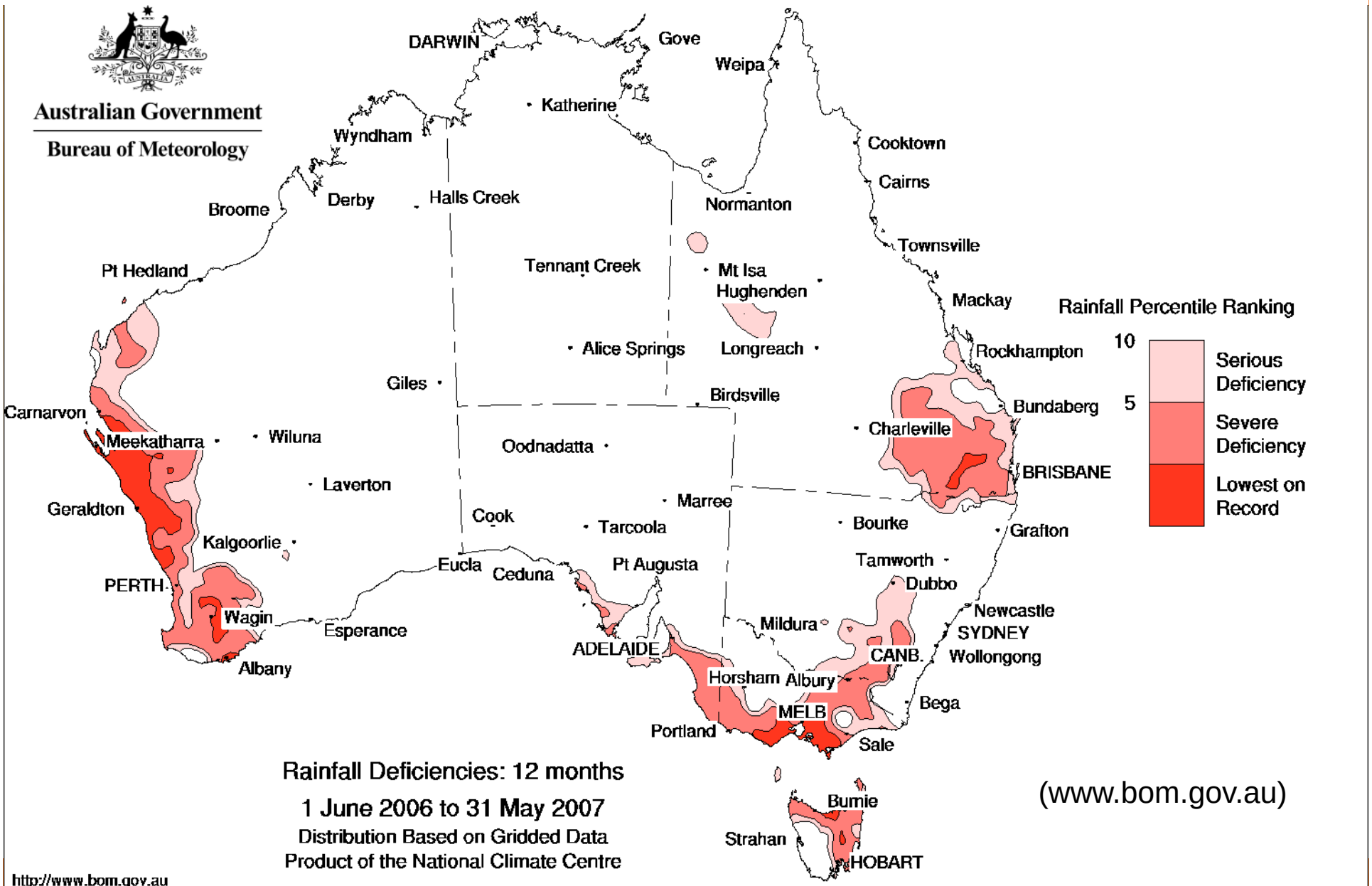


Climate Change - a Multiplier for Instability

(Lord May, Lowy Lecture, 2007)



Drought & electricity gen'n (coal & hydro)



Global fossil fuel flow constraints & climate change emissions

- Driving policies on emissions & renewable energy
- Problems are far greater than politicians admit
- Now faced with either:
  - Rapid but coherent global response to both problems
  - Severe social stresses within and between countries
- Near-term response options for the NEM:
  - Coal-to-gas; proven renewable energy technologies; end-use efficiency; frugality
  - *Of these, frugality is the most important & effective but least politically palatable*

Owen Inquiry comparison of generation options

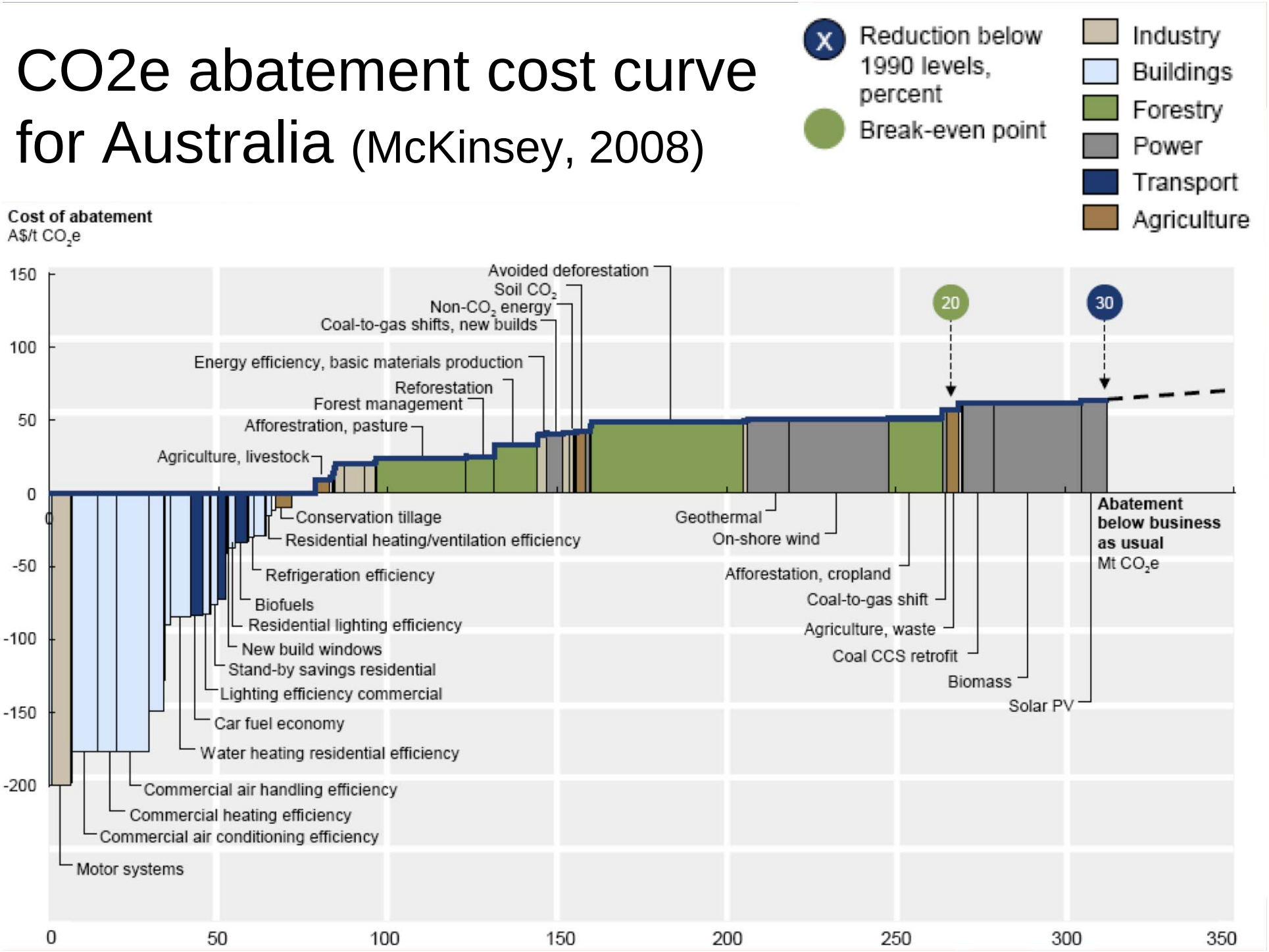
(2007)

Table 7.1: Qualitative Comparison of Generating Technology by Risk Characteristics

Technology	Unit Size	Lead Time	Capital Cost/kW	Operating Cost	Fuel Cost	CO_2 Emissions	Regulatory Risk
CCGT/OCGT	Medium	Short	Low	Low	High	Medium	Low
Coal	Large	Long	High	Medium	Medium	High	High
Nuclear	Very large	Long	High	Medium	Low	Nil	High
Hydro	Very large	Long	Very high	Very low	Nil	Nil	High
Wind	Small	Short	High	Very low	Nil	Nil	Medium
Recip. Engine	Small	Very short	Low	Low	High	Medium	Medium
Fuel Cells	Small	Very short	Very high	Medium	High	Medium	Low
Photovoltaics	Very small	Very short	Very high	Very low	Nil	Nil	Low

Source: Morgan Stanley Expert Report, p. 107

CO2e abatement cost curve for Australia (McKinsey, 2008)



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