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Workshop Session 4: Environmental regulation

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Outline

- Trends in the Australian energy industry
- Environmental issues for the Australian electricity industry
- Tools for environmental regulation of the industry
- Experience to date
- Current initiatives
- Conclusions

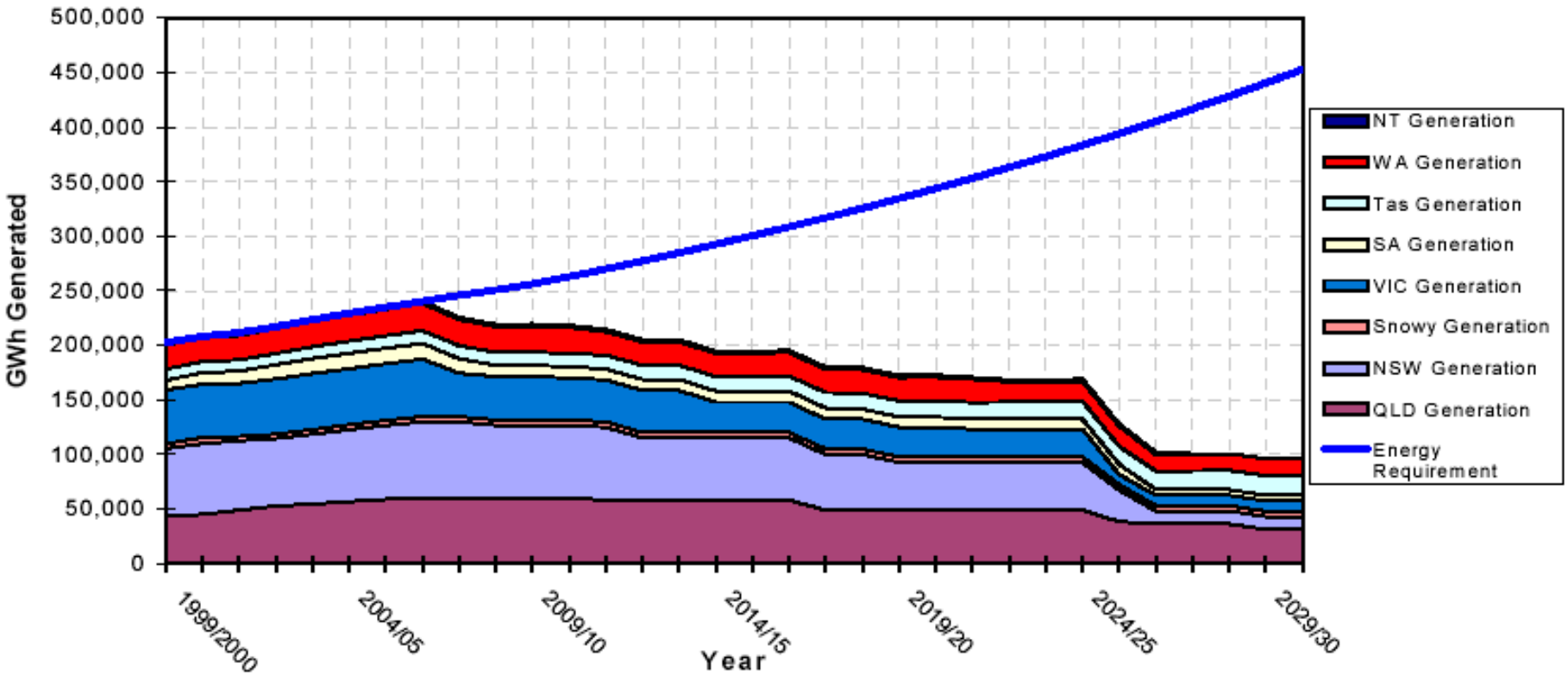
Aust.'s EI + sustainability - policy

- COAG's agreed national energy policy objectives
  (8 June, 2001)
  - Encouraging **efficient** provision of reliable, **competitively-priced** energy services to Australians, underpinning **wealth** and **job creation** and improved **quality of life**, taking into account the needs of **regional, rural and remote** areas;
  - Encouraging responsible **development** of Australia's energy resources, technology and expertise, their efficient use by industries and households and their exploitation in export markets; and
  - Mitigating local and global **environmental impacts**, notably greenhouse impacts, of energy production, transformation, supply and use.

Why regulate the electricity industry?

- A possible economist's (and Australian NCP) perspective
  - *For when the market does not provide efficient societal outcomes*
    - Monopolies; Public Goods; Incomplete markets; Information failures; The 'Business Cycle'
    - ***Externalities***
- *Electricity* markets
  - Would seem at risk of all these types of market failures
- *Externalities*
  - Pose particular challenges
    - Measurement, private cost – public benefit analysis
  - *Climate change* poses yet further challenges
    - Fundamental transformation that seems required (no easy 'fix')

Projections of Australian electricity supply & demand



(PMSEIC, December 2002)

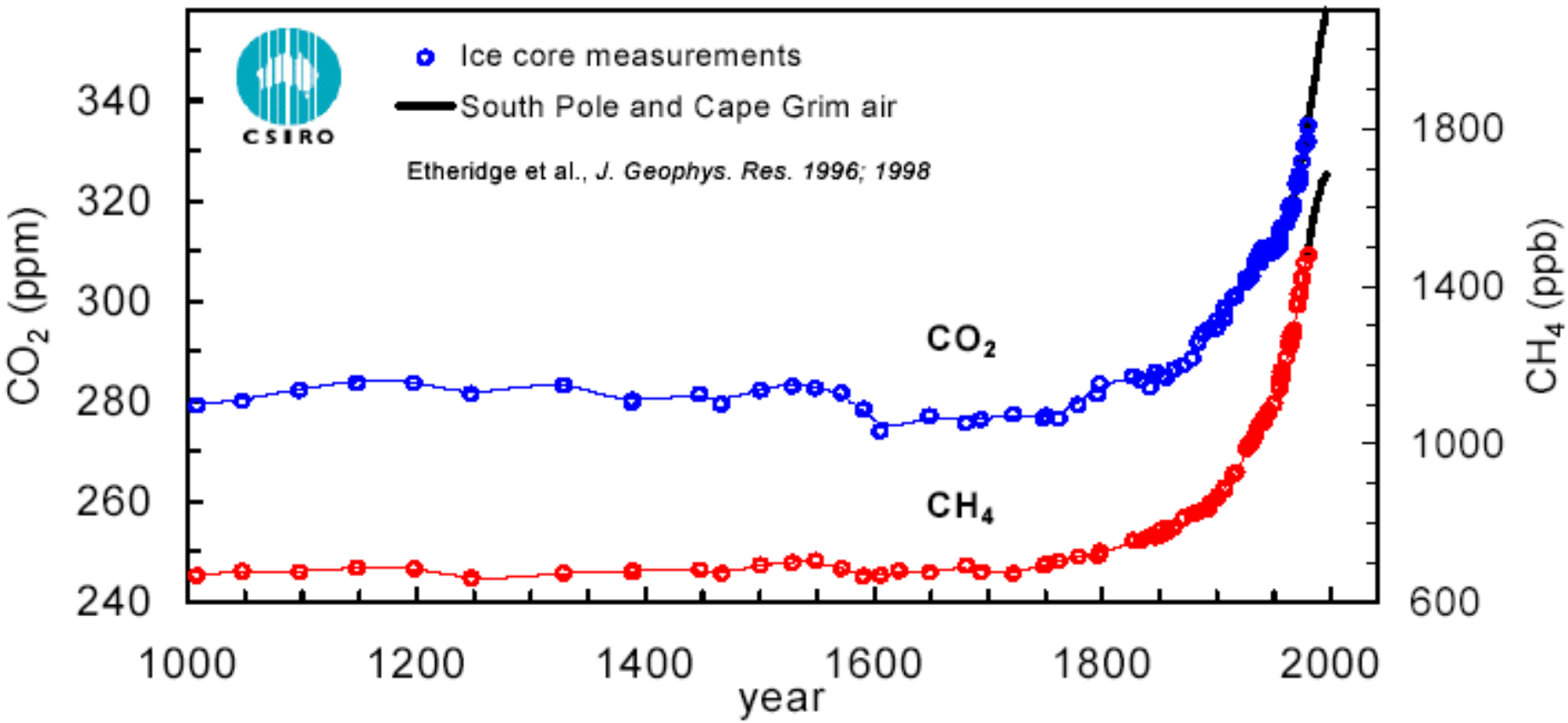
Trends in the Australian energy sector

- The Hon Ian MacFarlane MP, 24/10/02:

  "Australia's energy demand is forecast to grow by between 35 and 50 percent over the next 20 years. So by 2020 our energy usage level will be 20 times what it was in 1960 and double what it was in 2000. Industry associations calculate that $48 billion worth of investment is needed to meet that demand"

- Will sustainability improve?
  - Key issue for electricity is climate change

Atmospheric concentrations of CO_2 & CH_4 (CSIRO)

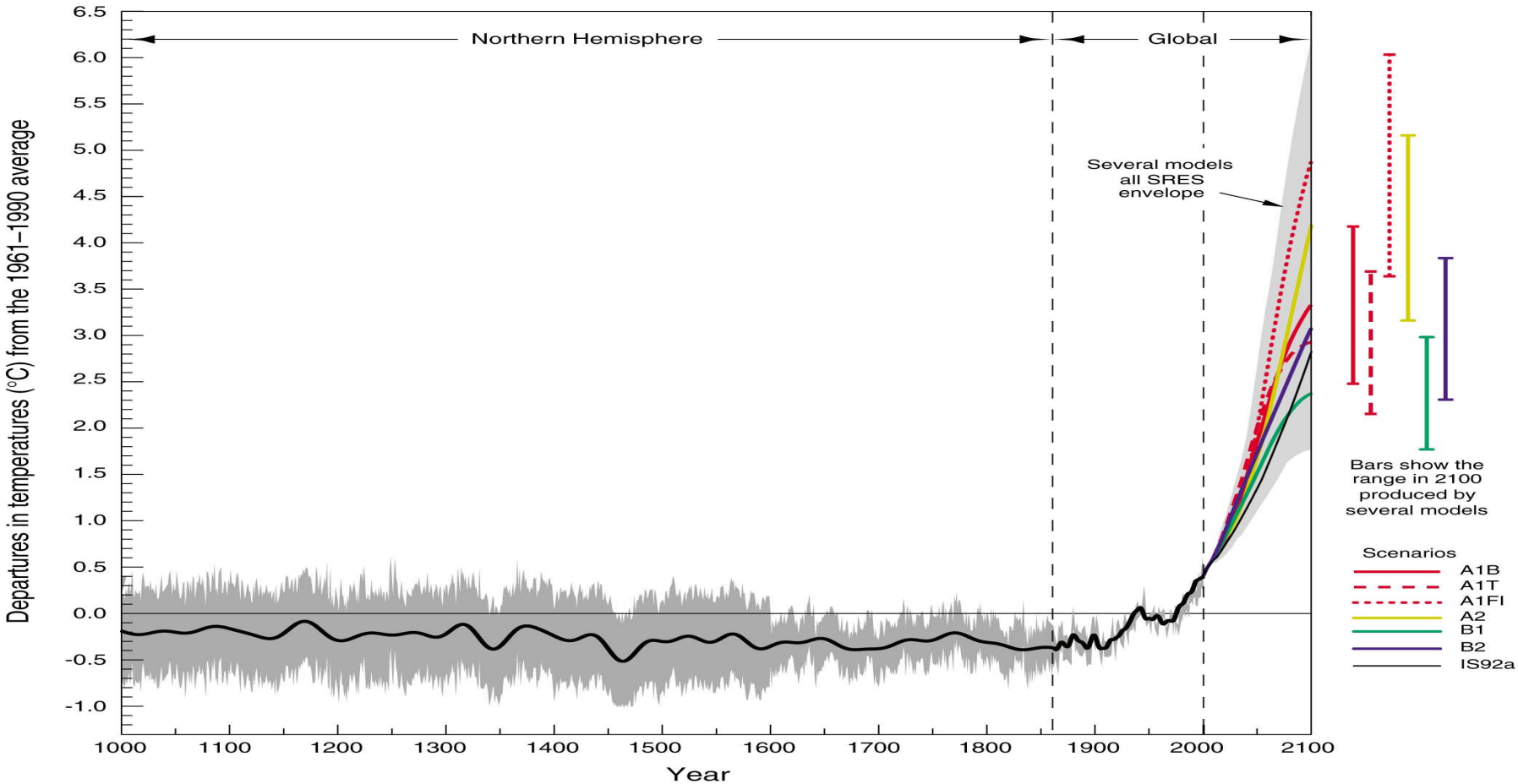


Temperature record & projections

(IPCC study results reported in AGO presentation, 2002)

Variations of the Earth's surface temperature: 1000 to 2100.

1000 to 1861, N.Hemisphere, proxy data; 1861 to 2000 Global, Instrumental;
2000 to 2100, SRES projections



Global warming concerns grow..

Climate change may lead to war

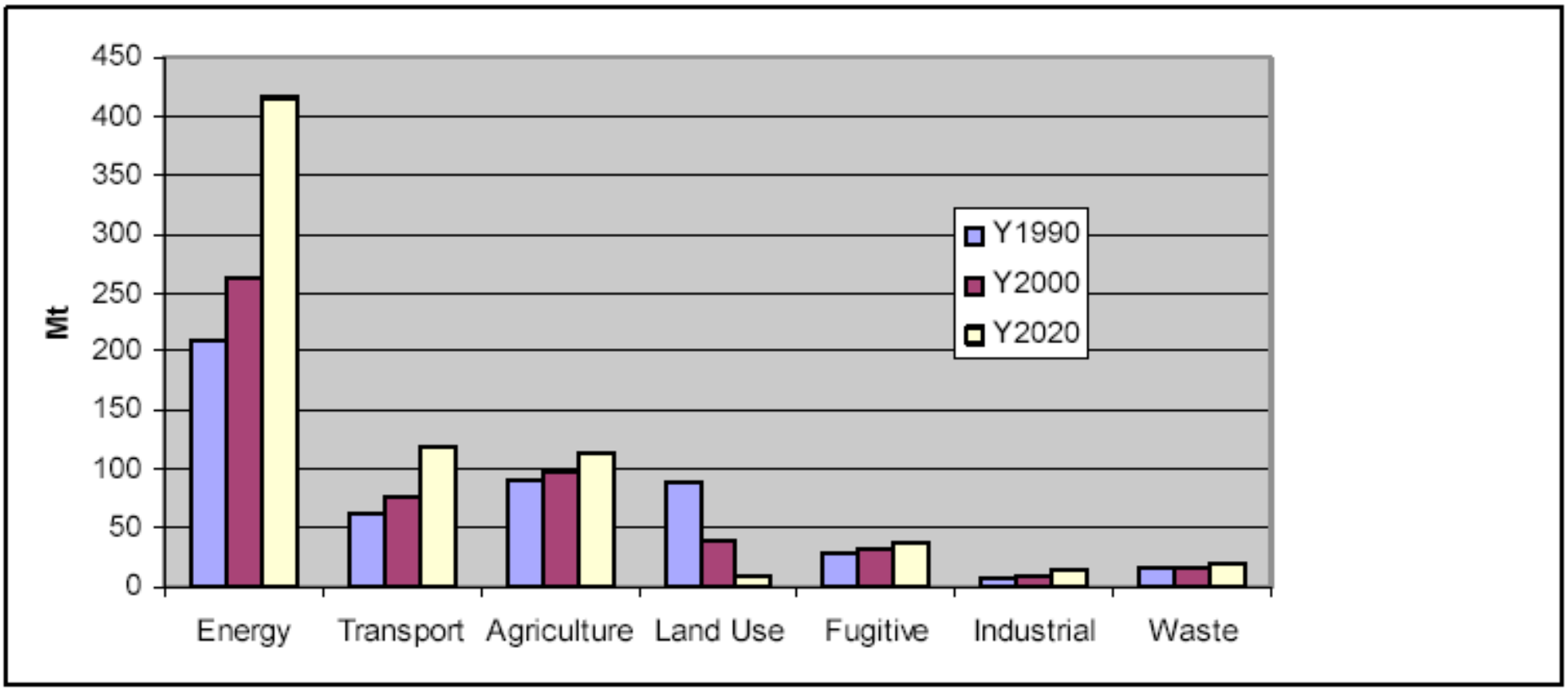
Guardian Unlimited

Sunday 22 February 2004 7:12 PM GMT

A secret report prepared by the Pentagon warns climate change may lead to a global catastrophe costing millions of lives and is a far greater risk than "terrorism".

The report was ordered by an influential US Pentagon adviser, but was covered up by US defence chiefs for four months, until it was obtained by a British newspaper.

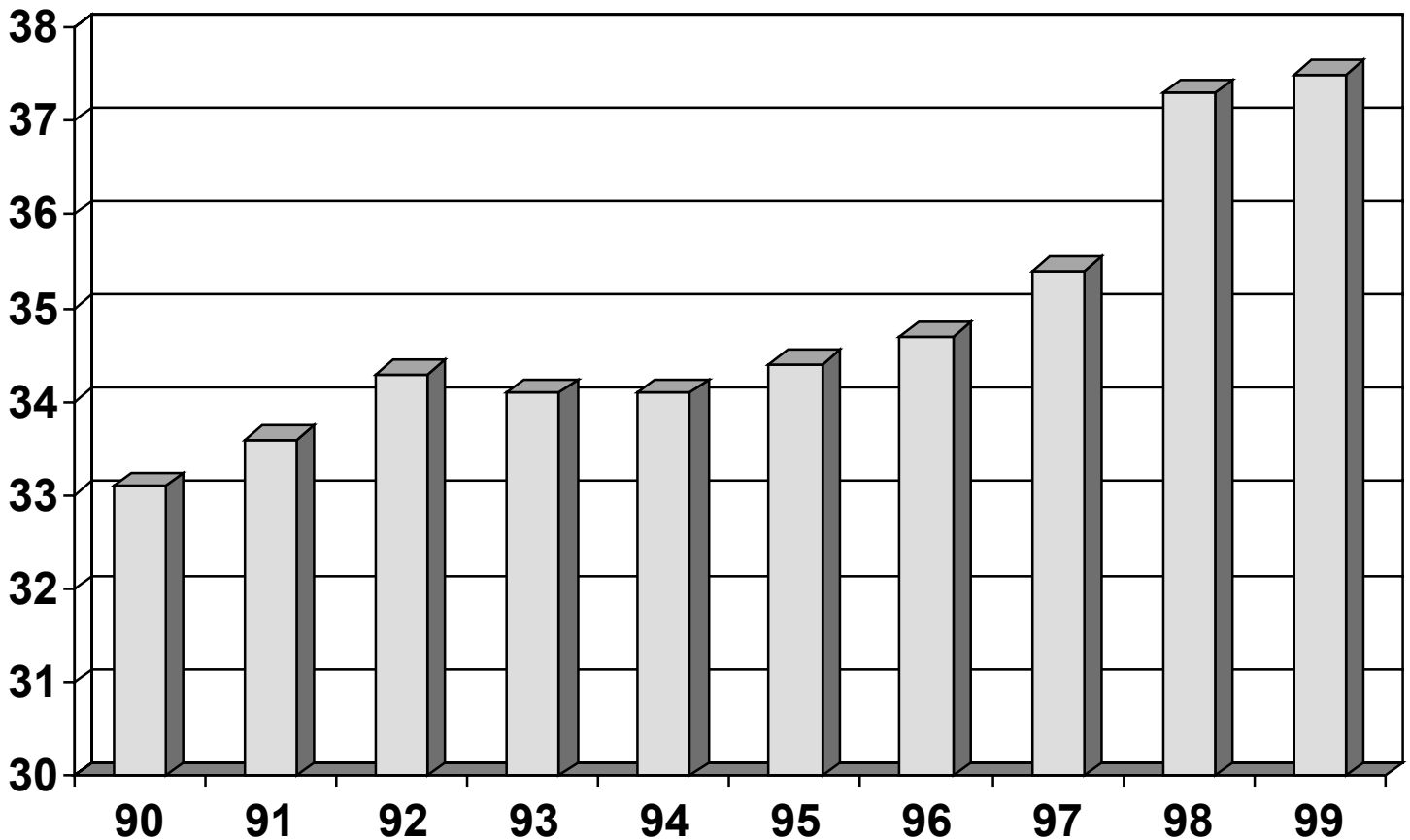
Australian CO2e emissions by sector history & projection to 2020



(PMSEIC, December 2002)

Electricity contribution to Australian greenhouse emissions

Source: www.greenhouse.gov.au/inventory, 2001



% of emissions except land use change & forestry

Key dimensions of sustainability

- Environmental (ecosystem) sustainability
- Social (quality of life) sustainability
- Economic (ability to progress) sustainability
- Technical (physical) sustainability

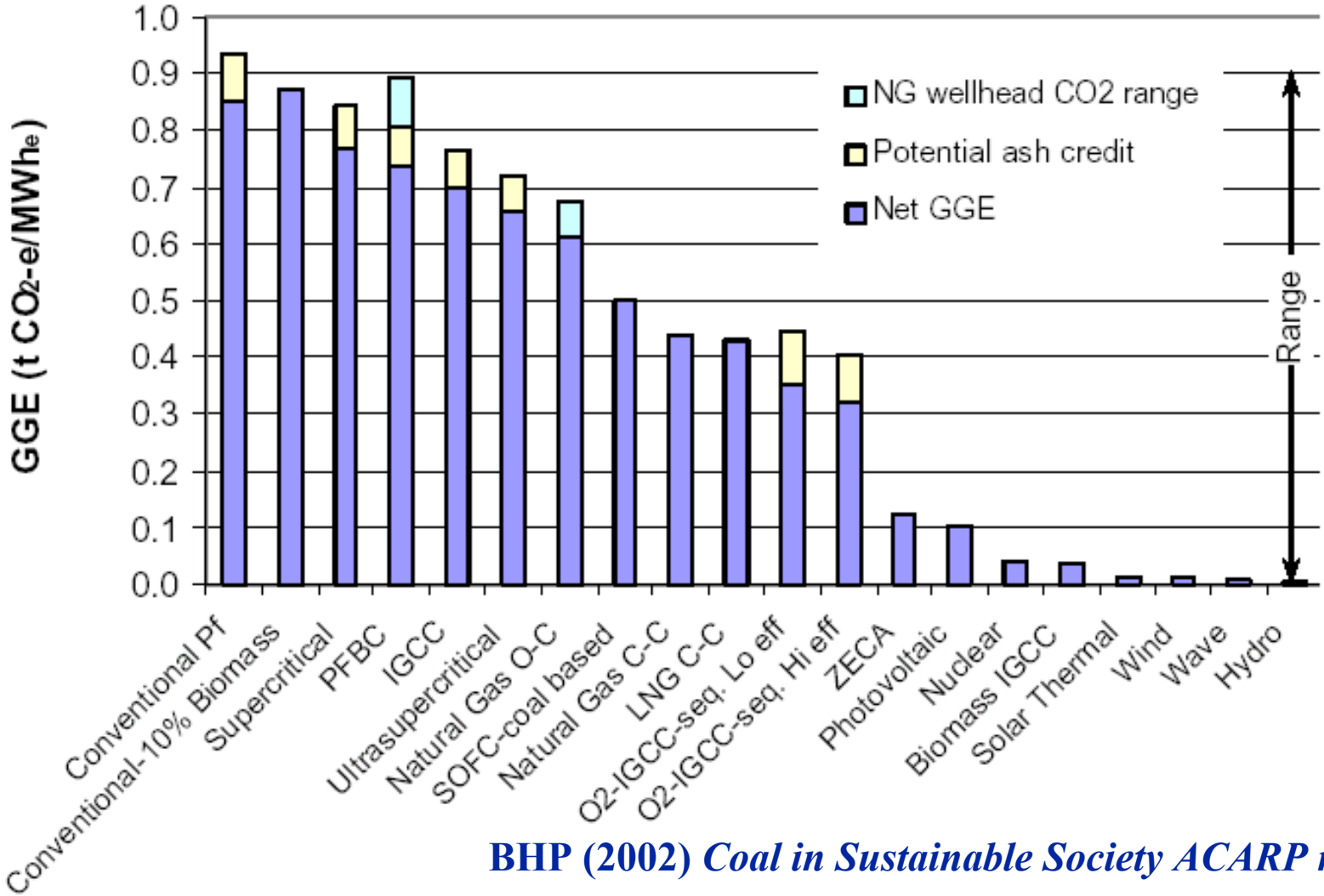
Energy + sustainability

- Energy services play a critical role in society
- Our present Electricity Industry has very high environmental externalities
  - Stationary energy sector contributes ~50% of Australia's GHG emissions, the electricity industry some 35% (excluding LUCF) (AGO, 2002)
- These externalities are unsustainable
  - BAU for Australian stationary sector suggests GHG emissions up 50% by 2020 (AGO, 2002)

Energy, sustainability + transformation

- Required energy sector transformation is large
  - *"Over this century the world is going to have to reduce its global greenhouse gas emissions by some 50-60%"* Dr Kemp, Federal Environment Minister (The Age, 2002)
- Seeking most cost-effective *efficient* action over the longer term + for major transformation
- Types of efficiency
  - Productive: reduce costs of existing techs
  - Allocative: choice of best mix of existing techs
  - Dynamic: process of tech + organisational innovation responding to longer-term picture
- *Dynamic* is the critical efficiency for transformation

Renews + sustainability: environment

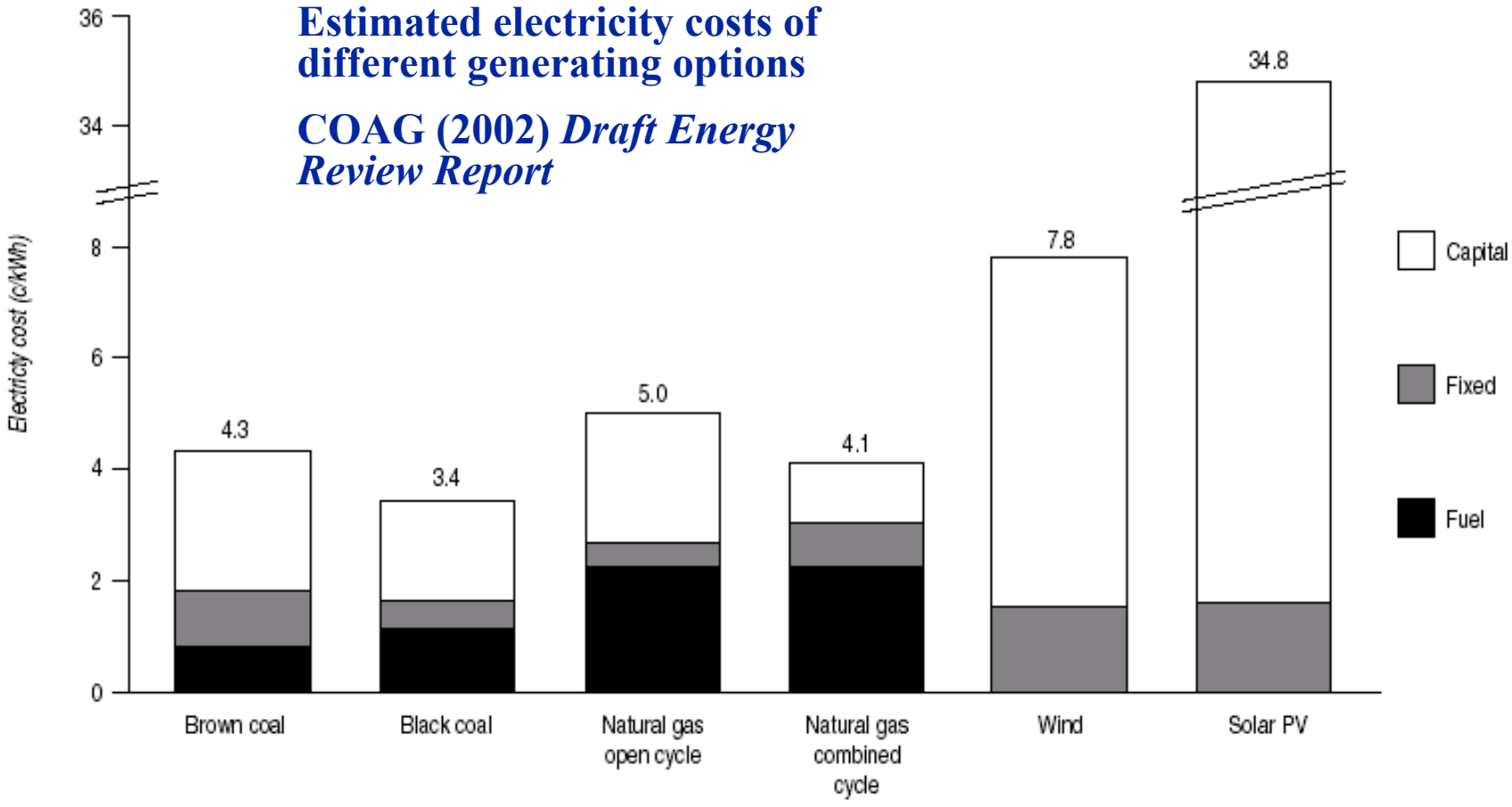


BHP (2002) *Coal in Sustainable Society ACARP report.*

Renews + sustainability: economics

Estimated electricity costs of different generating options

COAG (2002) *Draft Energy Review Report*



Renews + sustainability: economics

- Is there more to it?
  - Economic development
  - Employment
  - Falling costs of many renewables

- And mustn't forget
  - Subsidies to energy sector Reidy (2002) *Energy Policy*
  - Environmental externalities EU (2002) *ExternE Project*

Renews + sustainability: Social

- Generally strong public support for renewables
- Regional development opportunities
  - "Regional Australia stands to benefit from a greater uptake of renewable generation technologies"
    COAG (2002) *Draft Energy Market Report*
- Some challenges ...

Are renewables sustainable?

- Australia's Federal Treasury view

  "Even though renewable energy is renewable, it does not necessarily mean it is environmentally benign. Like fossil fuels, renewable energy can also impose external costs on the community… the large-scale use of wind turbines may adversely affect landscapes, migrating bird species, and pristine wilderness areas. Additionally, it may result in noise and aesthetic pollution…"

  Treasury (2002) "Renewable energy – a clean alternative?" *Economic Roundup Spring 2002*

- => renewable technologies aren't inherently sustainable, but appropriate renewable energy systems can be

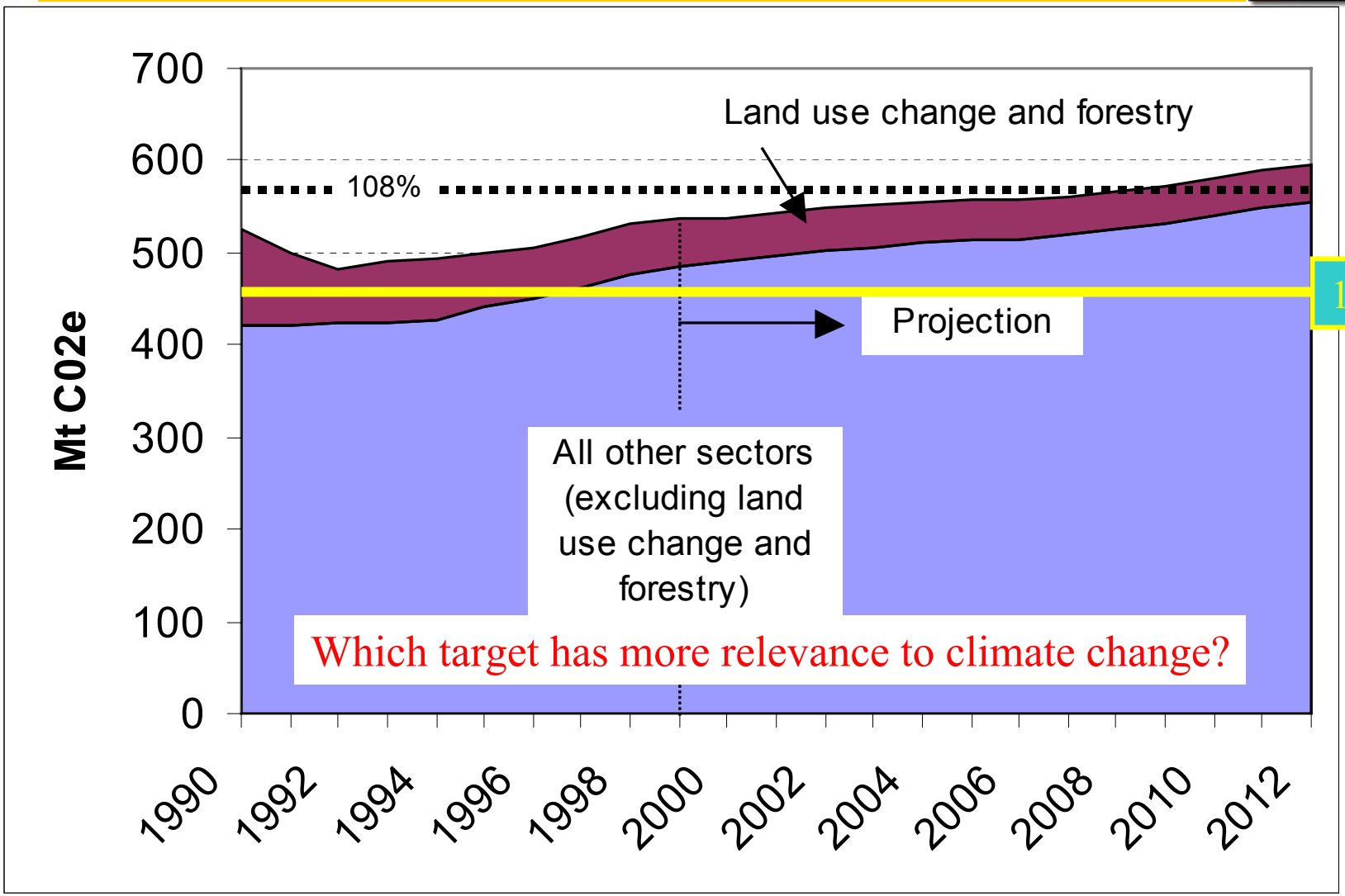
Key approaches to environmental regulation

- "command & control":
  - Direct regulation of environmental impacts
    - Eg, prohibition of the use of CFCs
- Economic instruments (some examples):
  - Taxes on pollutants, e.g:
    - "Load-based licencing" by NSW EPA
  - Tradeable permits, e.g :
    - Hunter River salinity scheme
  - Tradeable credits, e.g :
    - MRET scheme "Renewable Energy Certificates"

Key issues in regulating by tradeable environmental instruments

- Relationship to the physical phenomenon:
  - Each instrument is an abstraction from reality
- Design of trading arrangements:
  - Markets in the instruments & their derivatives
- Effectiveness of the regulatory mechanism:
  - Measured by attributable changes in operation & construction of assets
  - Some important issues:
    - Abstraction errors (including overlap), trading efficiency, compliance

The issue of abstraction: Australia's Kyoto target



Greenhouse market-based regulation

- EI subject to a confusing mix of Federal and State govt. objectives + jurisdictions (+ ownership + …)

- We will consider
  - **Electricity industry restructuring to date**
  - **Mandatory Renewable Energy Target (MRET)**
  - **NSW Greenhouse Benchmarks scheme**
  - Queensland 13% Gas scheme
  - Green power

Impact of Australian EI restructuring

- CoAG national energy policy objectives include the need for action on climate change
- National Electricity Code (NEC) doesn't include specific env. objectives
- However, expectation by some that would help "14 MtCO2 reduction from BAU in 2010":
  (Commonwealth Govt, *Climate Change: 2nd Communication to IPCC,* 1997)
  - Efficient competition in supply by cogen + renews
  - More sensible patterns of energy use through incentives for investment in EE
  - Greater penetration of natural gas

Outcomes of Australian EI restructuring

- Instead, now projected to increase 0.1MtCO2 above BAU (CoAG, 2002)
  - Low cost of coal fired generation in Australia
  - Excess electricity capacity depressing prices
  - Relatively immature and inflexible gas market
  - Reduced emphasis on EE from lower prices
  - **Current failure to price greenhouse emissions**
  - **Market design and regulation that favours incumbents (eg. for wind)**
  - **Supply-side orientation of reforms to date**

Mandatory Renewable Energy Target

Renewable Energy (Electricity) Act 2000

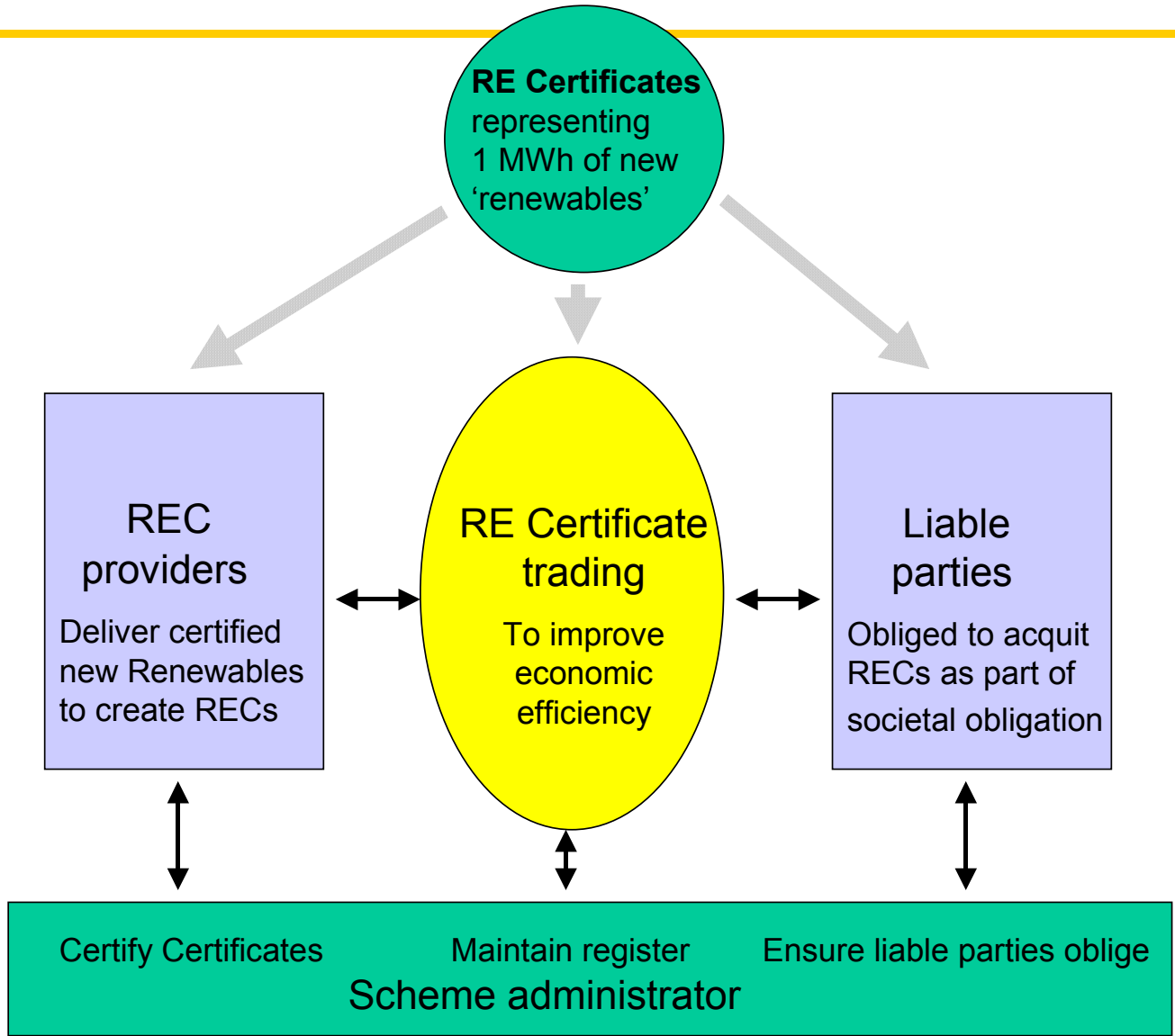
The objects of this Act are:

(a) to encourage the additional generation of electricity from renewable sources; and

(b) to reduce emissions of greenhouse gases; and

(c) to ensure that renewable energy sources are ecologically sustainable.

MRET – a 'designer' market



MRET 'settings'

RE Certificates representing 1 MWh of new 'renewables'

REC providers

A list of eligible technologies

Post-1997 'new' generation Otherwise, calc. a baseline

RE Certificate trading

Spot and OTC trading

Liable parties

Retailers must acquit RECs equiv. to elec. mkt share of MRET target = 9500 GWh/yr by 2010

Certify Certificates | Maintain register | Ensure liable parties oblige

Scheme administrator (ORER)

MRET performance to date

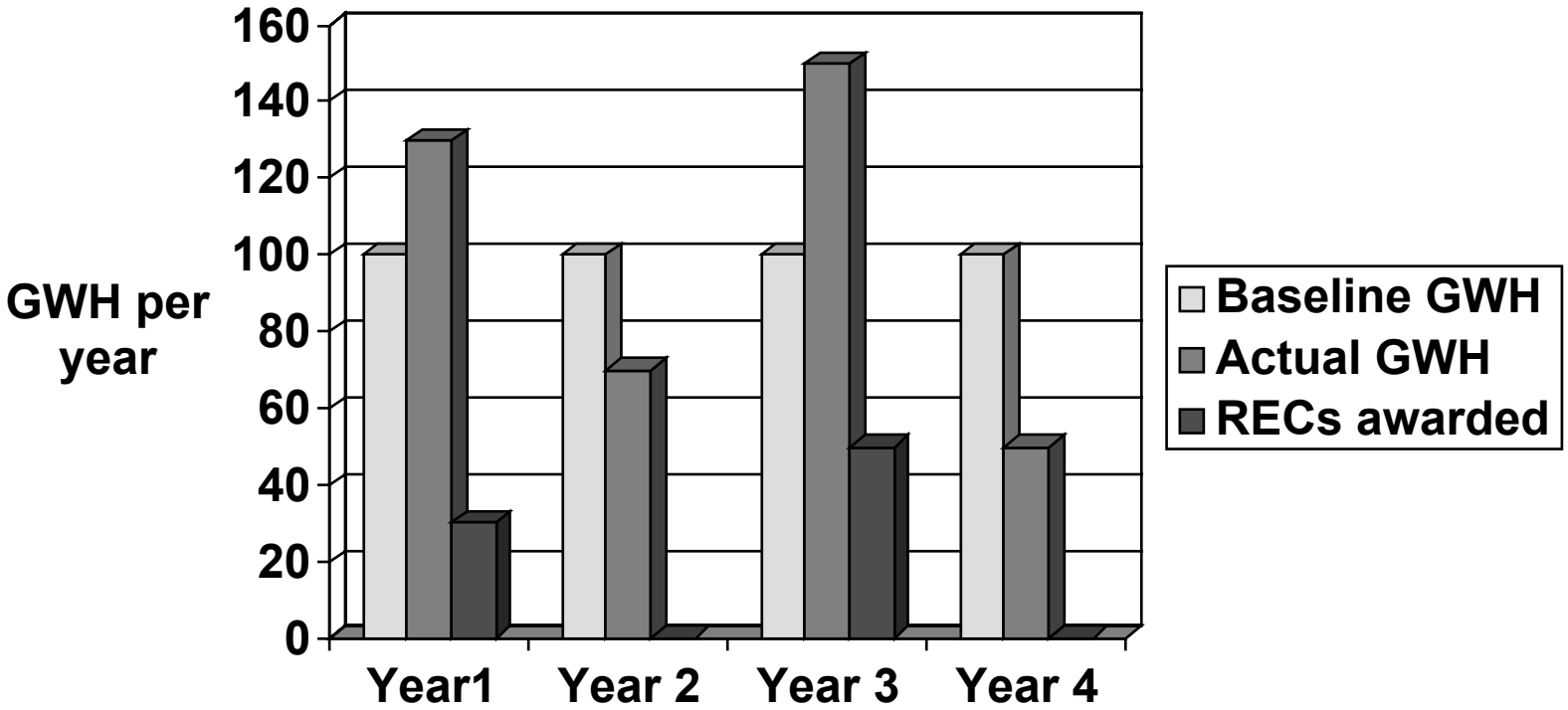
- Now operating for two years
- Ramping target easily met
- Challenges
  - Public opposition to some ‘eligible’ renewables
  - Inadequate target, in terms of settings (+2%) and objectives for greenhouse + industry development
  - Market information failures
    - Can register RECs any time => information asymmetry
    - Only annual acquittal => poor price discovery
- **Baselines**
  - **All BAU baselines are ‘made up’**
  - **Large hydro particularly problematic**
    - Baselines for hydro scheme where output limited by demand
    - Variable renewable generation and ‘The ratchet’

The issue of abstraction: Renewable Energy Certificates

- MRET scheme REC properties:
  - Traceable to a specific MWh from an accredited facility (nominal MWh for solar water heaters):
    - Hence potentially a unique price
  - Transferable & valid until surrendered
  - Awarded above a baseline but not “clawed back” below it (“rectifier” error):
    - Baseline setting subject to error
    - Rectifier & correlated baseline errors lead to a systemic “drift error” that may reduce the delivery of physical outcomes

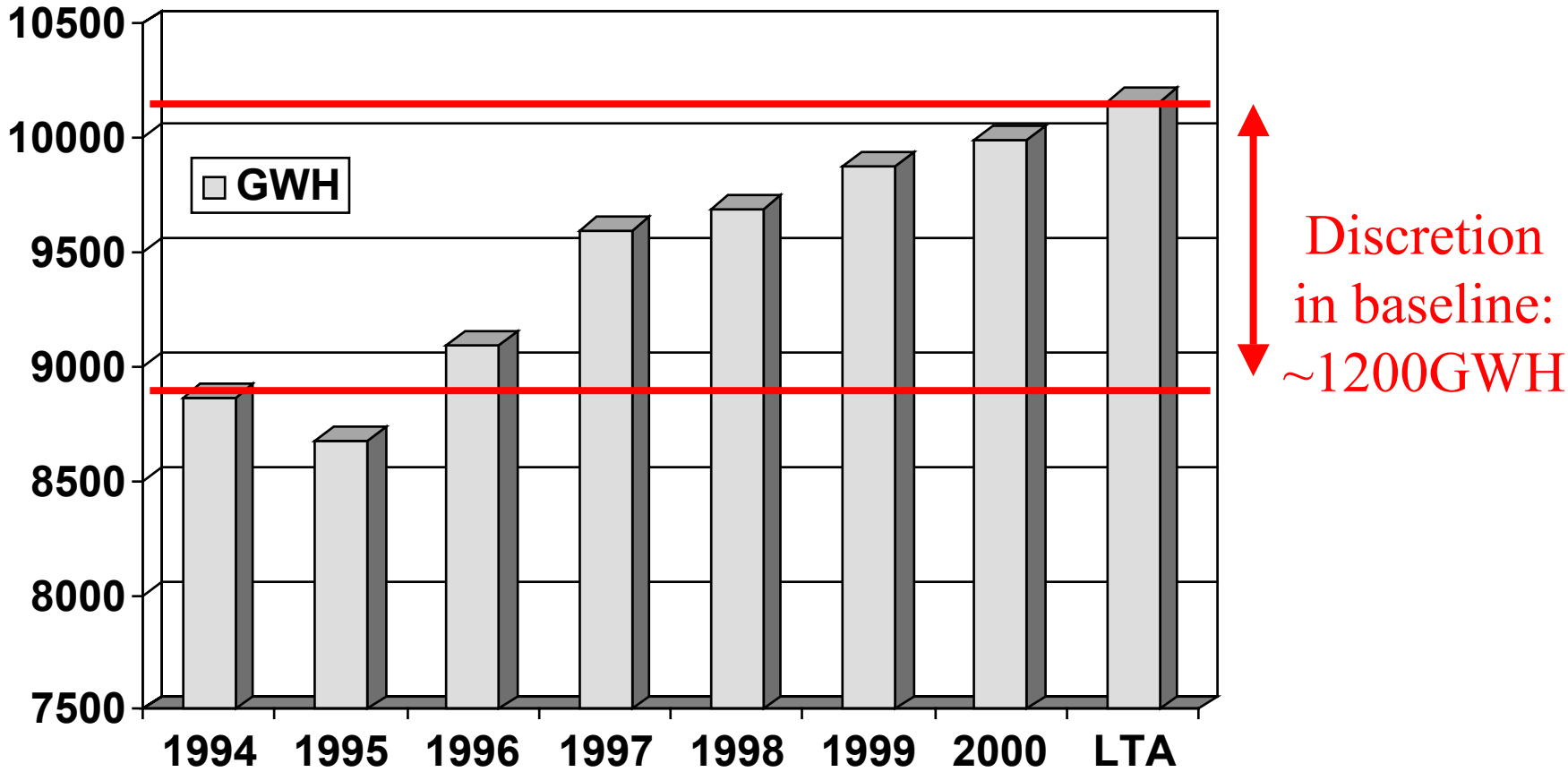
MRET baseline: default is 1994-96 Average output or LTA

RECs awarded above baseline but not "clawed back" below it



Rewards those generators with above-zero baseline & high annual variability (here 80,000 RECs over 4 years although ave. output = baseline)

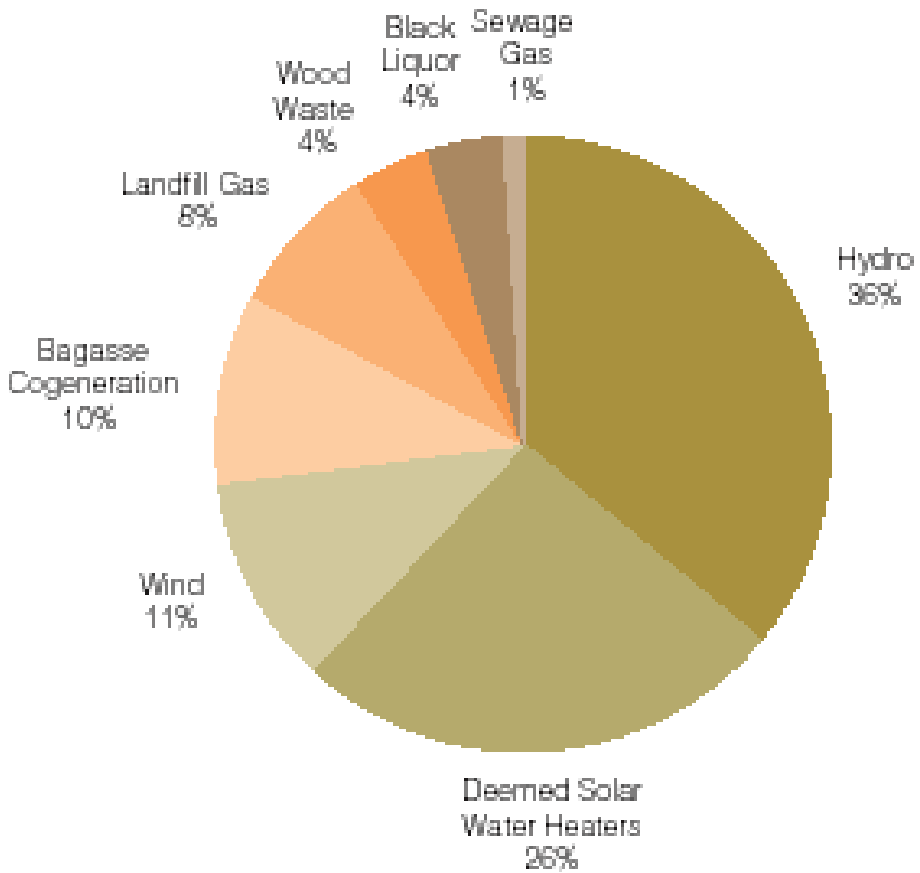
Potential REC baseline error: Tasmanian hydro with long term storage & load growth



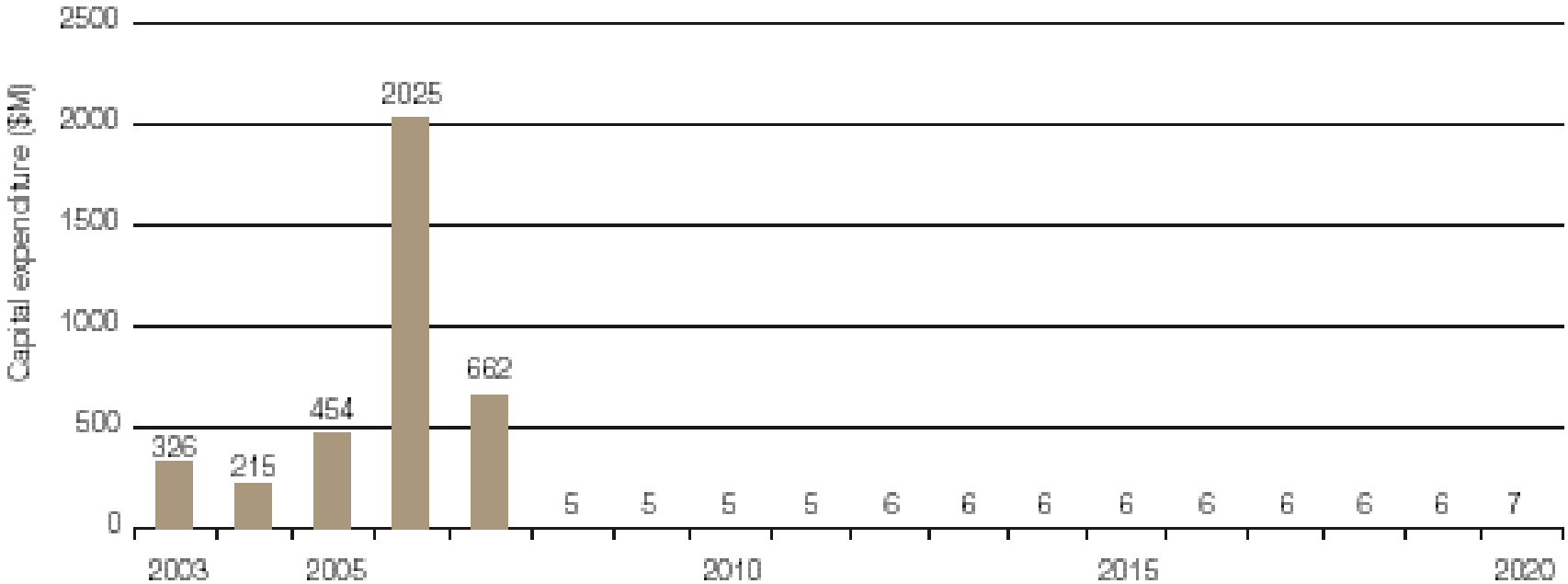
Note: Estimates only; actual baseline is confidential

Data: ESAA Annual Reports

Actual installations – 17 August 2003



Expected investment under current scheme

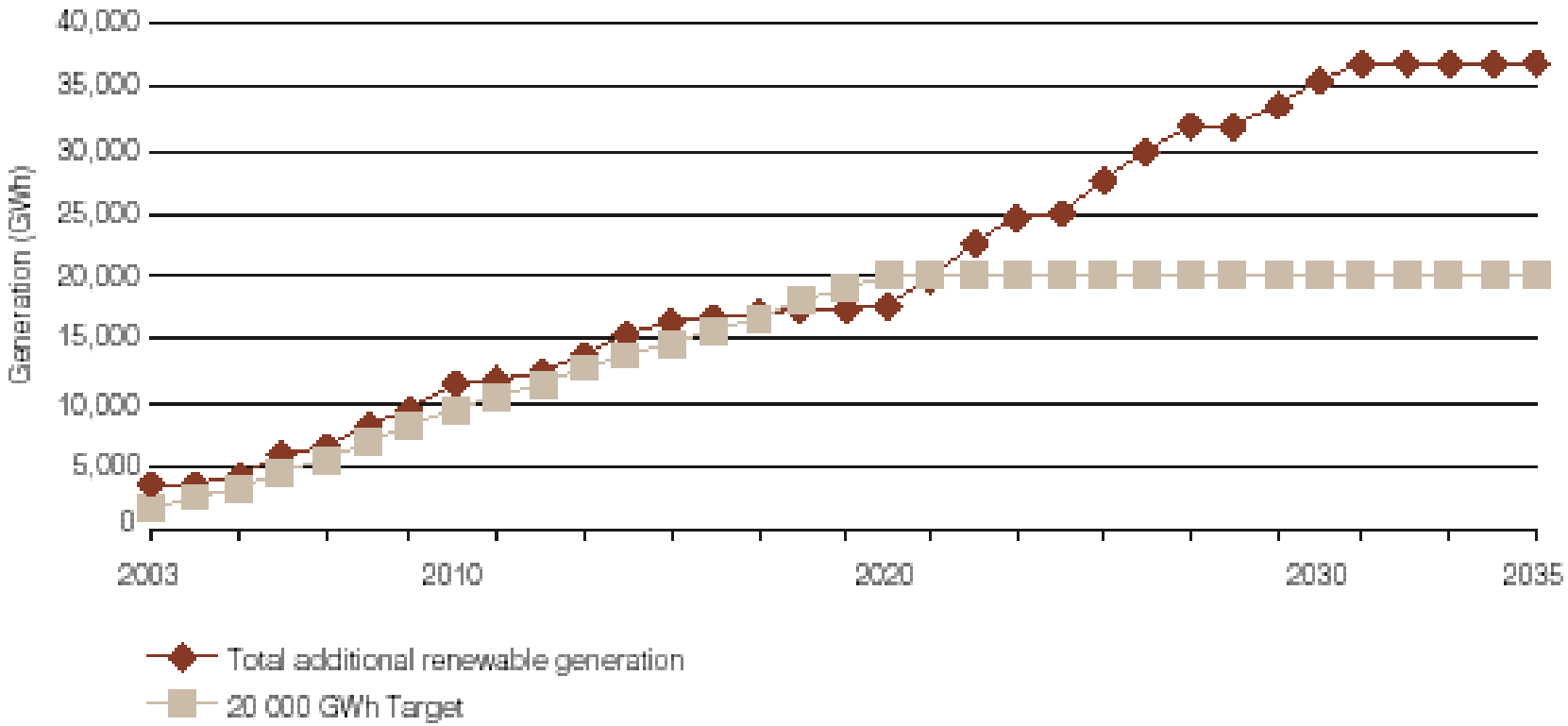


MRET Review Findings

"Objective is to create a viable industry at minimum cost to the economy while continuing to assist in the abatement of GHG emissions"

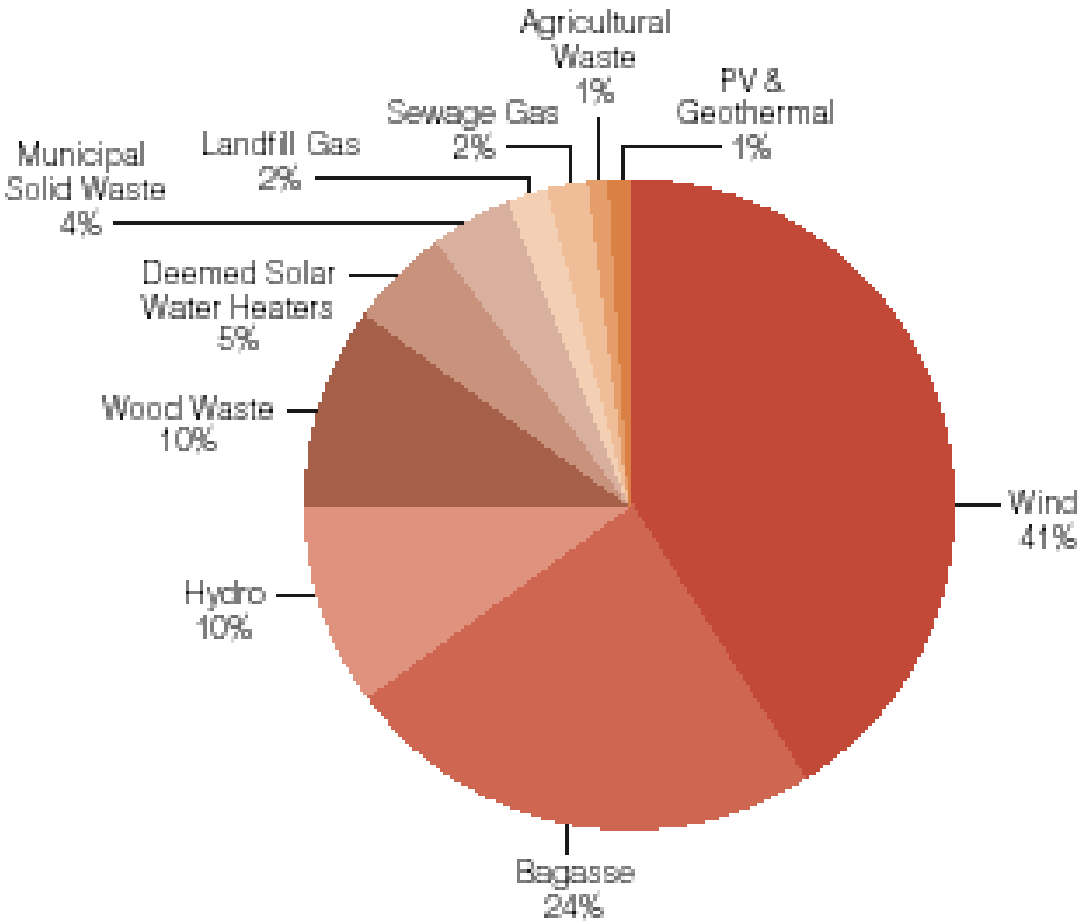
- Don't increase 2010 target (difficult to achieve) but extend target ramping to 2020 = 20,000GWh (maintain momentum + enhance industry dev.)
- Eligible pre-2005 generators only earn RECs to 2020, post-2005 generators earn RECs for full 15 years
- Short-fall charge indexed to CPI 2010-20
- Increased transparency for the RECs market
- Possible special arrangements required for PV, biomass
- …implement another review if NET is implemented, large shortfalls

Total renewable generation under proposed target (15 years of RECs)



Mix of renewables in 2020 with proposed settings

(MRET Review, 2003)

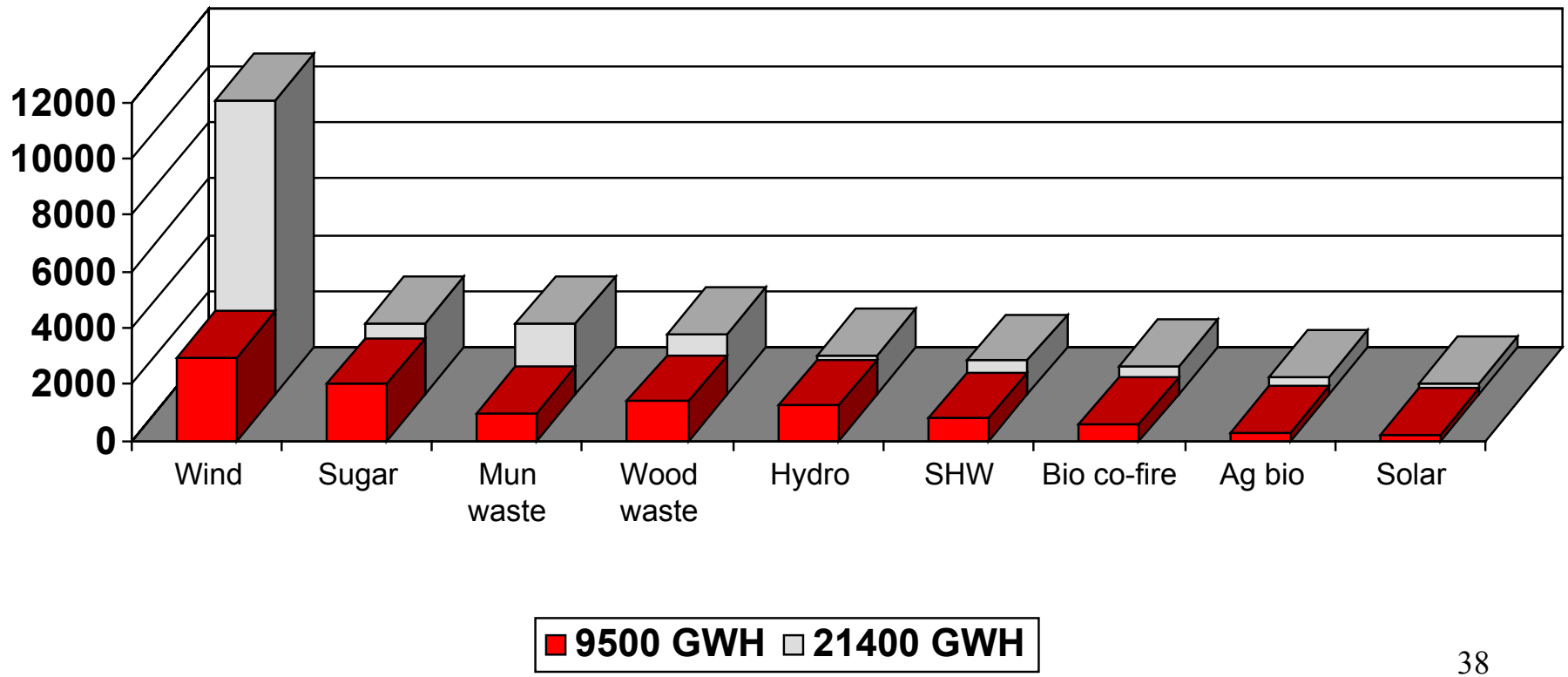


ABCSE prediction of renewable energy to meet MRET 9500 GWH pa target

(Australian Ecogeneration Association, 2001)

GWh per year

However considerable uncertainty in outcome



NSW Greenhouse Benchmarks Scheme

- Policy intent
  - "reduce greenhouse gas emissions associated with the production and use of electricity..."
    (Overview to the Electricity Supply Amendment Bill, 2002)
- Implementation
  - State per-capita greenhouse gas emissions targets for the NSW Electricity Industry via Retailer Licence Conditions
    (NSW Electricity Supply Act, 1995)
  - Baseline+credit 'emissions reductions' trading

The issue of abstraction: revised NSW licence condition

- Greenhouse reduction targets for retailers:
  - Based on imputed per-capita emissions:
    - Target will be diluted by population growth as not all emissions increase linearly with population
  - "NSW pool" sets a historical benchmark, which most NEM generators will be able to beat:
    - Can then create ("NSW pool" emission coefficient) minus (generator emission coefficient) NGACs per MWH
  - All new & existing NEM generators eligible:
    - Adopts MRET design including baseline & rectifier features:
      - Vulnerable to larger drift errors than MRET

NSW Scheme – a 'designer' market

NGA Certificates representing 1MWh emission reductions from BAU

Create NGACS via

Low-emission generation (gas, new coal)

Demand Side Abatement

Sequestration

NGAC providers

Deliver certified emission reductions to create NGACs

NGA Certificate trading

Arrangements to be provided by private enterprise

Liable parties

NSW Retailers obliged to acquit NGACs equiv. to NSW elec. mkt share X 'excess' NSW emissions

Certify Certificates | Maintain register | Ensure liable parties oblige

Scheme administrator (NSW IPART)

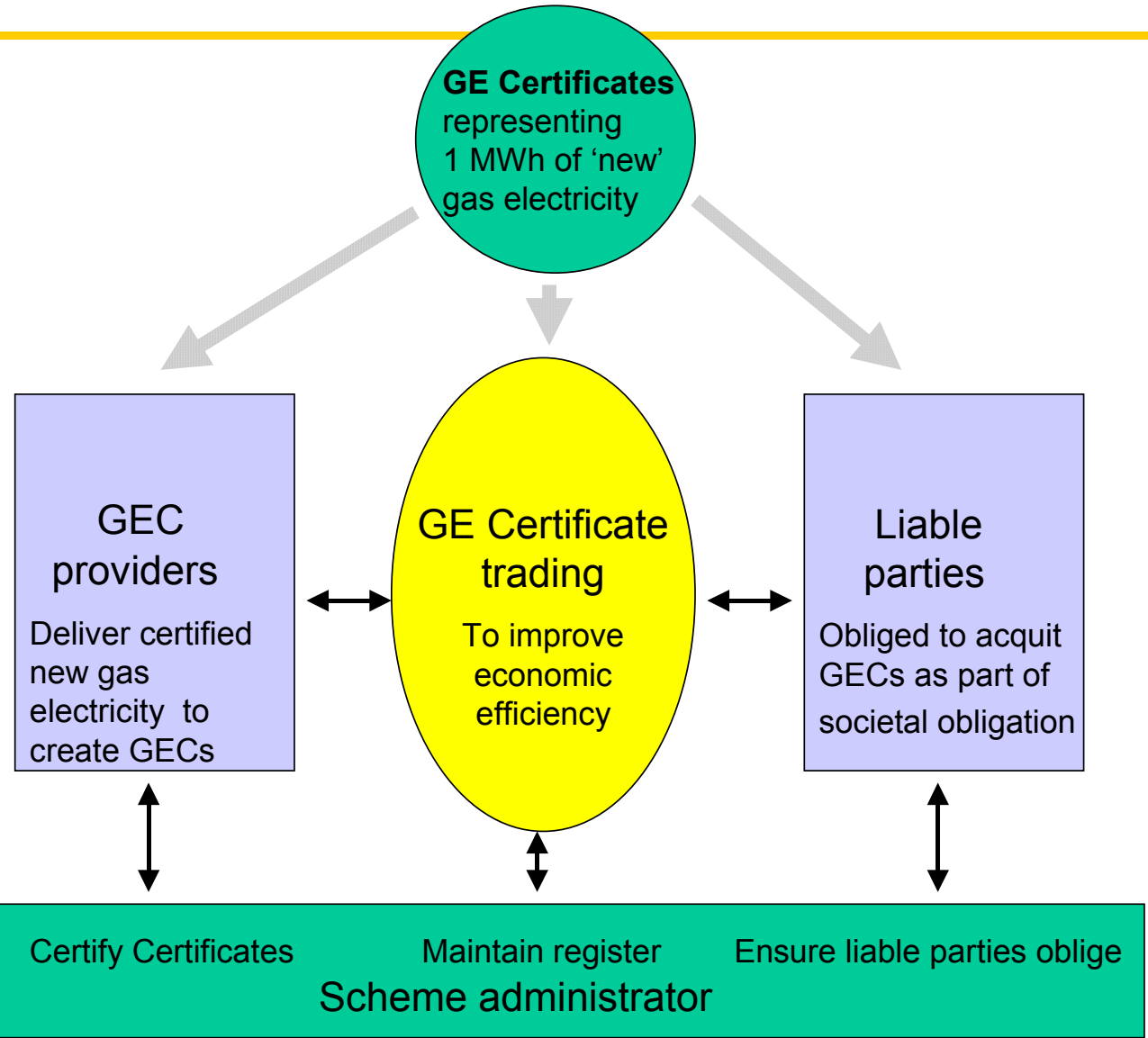
Proposed NSW licence condition: NGACs from DSA & sequestration

- NGACs from electricity "saved" by an end-user compared to a baseline (demand side abatement):
  - All end-uses eligible subject to contextual baseline
  - Deeming arrangements for common end-uses
  - No discussion of "claw-back" issues
  - Hard-to-regulate "moral hazard"
- Appears to be a risk of large drift errors
- Sequestration as climate change mitigation:
  - Dubious claim that carbon sequestered in the biosphere is equivalent to carbon sequestered in fossil fuels

The issue of abstraction: overlap

- Overlap between schemes reduces their effectiveness:
  - Physical outcomes less than summated instrument outcomes
  - Compliance provisions may be weakened
- Potential areas of concern:
  - Overlap between MRET & NSW retail scheme
  - Fungibility between generation, DSA & sequestration in NSW scheme:
    - Cheapest (&possibly least meaningful) options will dominate

13% Gas scheme design



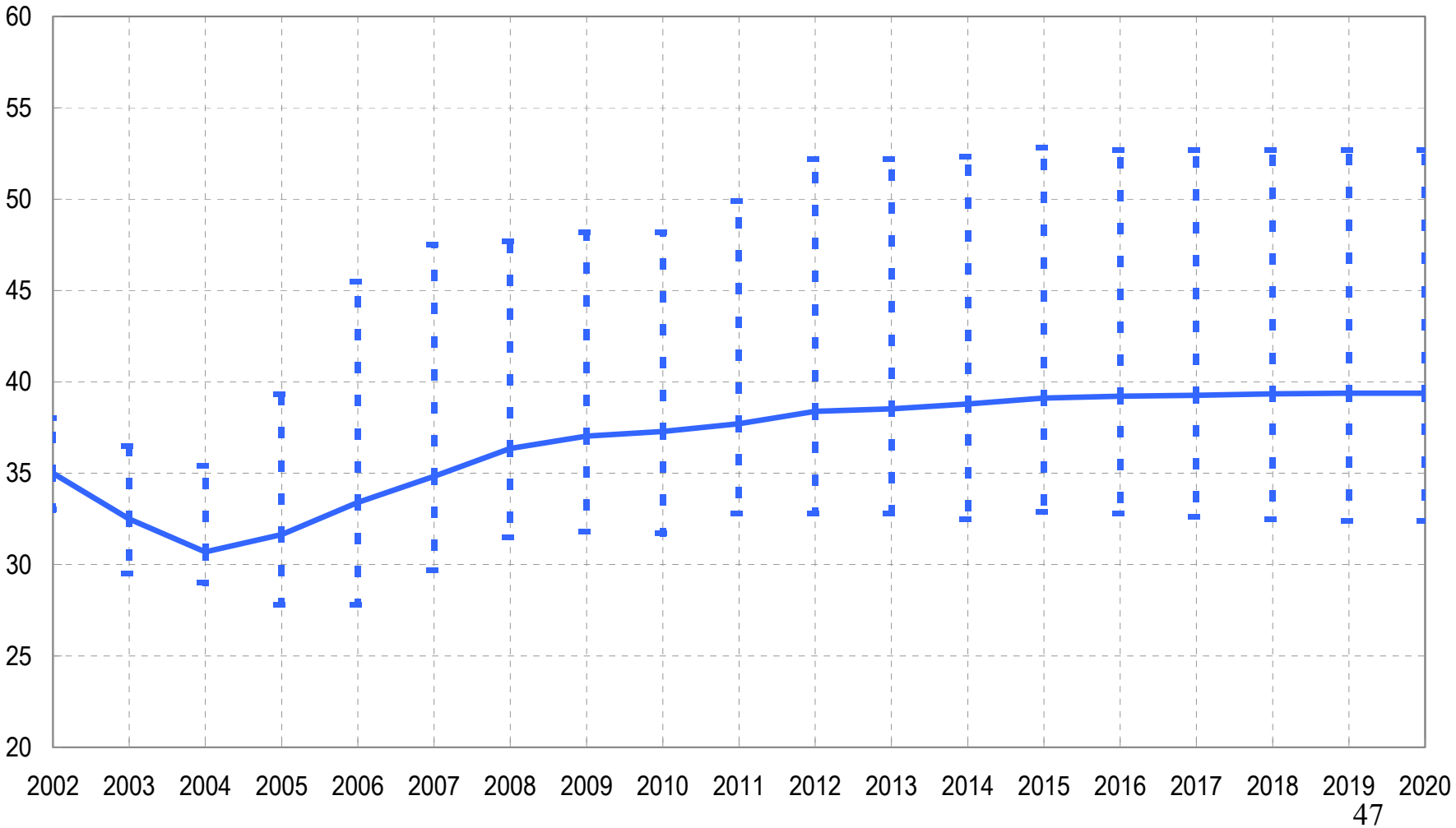
Greenpower

- Voluntary scheme for users to buy greenpower
- Design abstractions:
  - Can't physically deliver green e's => volume matching
  - Needs 'baselines' for existing renewables (large hydro)
- In Australia, national accreditation scheme
  - "to promote the installation of new green electricity generators by increasing consumer demand and confidence in Green Power products"
- Outcomes
  - Sales for 2001-2 fell 11% although customers up 13%
  - FRC questions; non-accredited products appearing

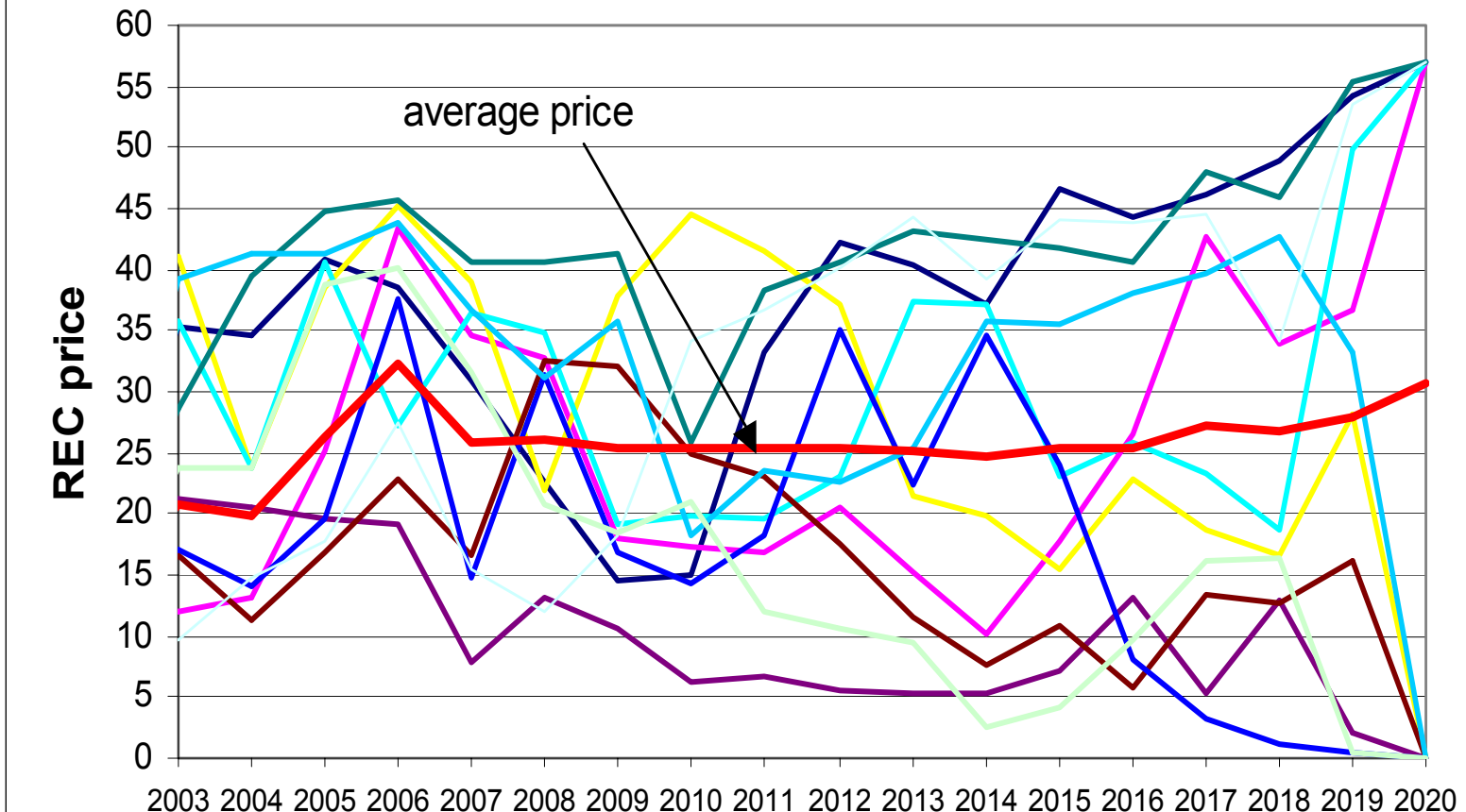
Design of trading arrangements: RECs & NGACs

- Liable entities must surrender RECs on an annual basis:
  - "slow" market with poor price discovery
- Little information on forward s/d balance:
  - No deadline to register RECs:
    - Exacerbates market risk caused by drift errors
- Proposed NGAC arrangements may be slightly better

Renewable Energy Certificate Prices (A$/MWH) (ORER, MMA2003)

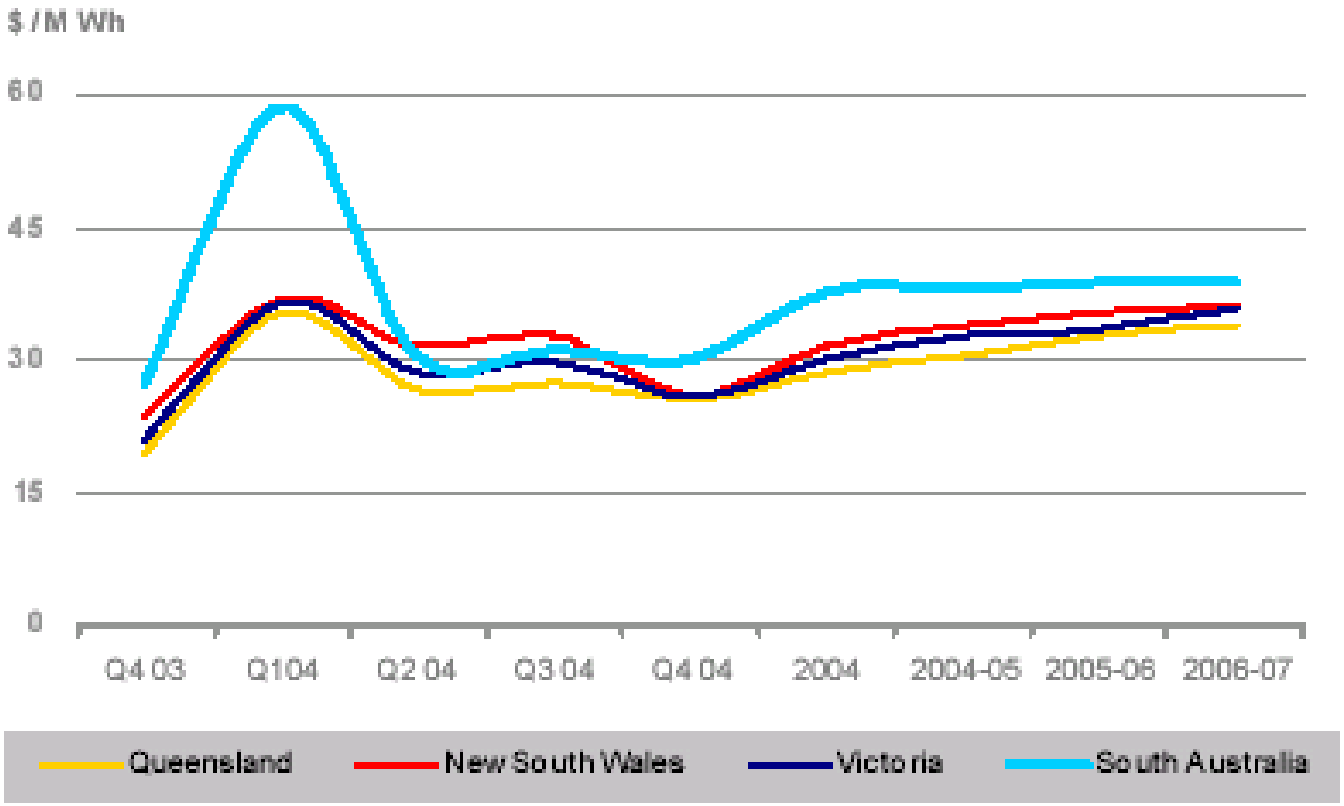


Renewable Energy Certificate Prices (A$/MWH) (ORER, IES2003)



Flat contract prices, 2003-2006

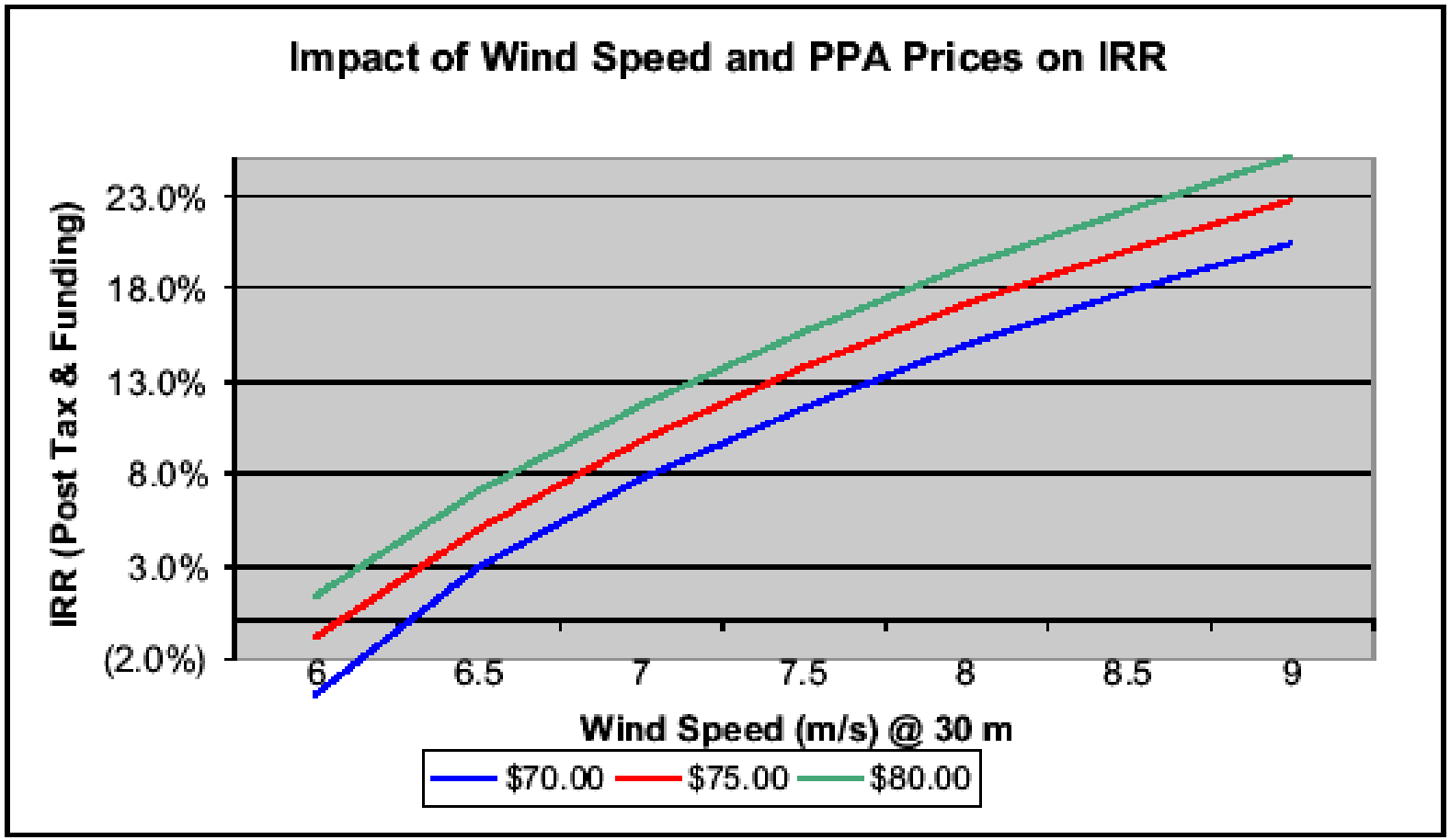
(NECA, 03Q4 Statistics, 2003)



4 ANNUAL AVERAGE FLAT CONTRACT PRICE

Wind farms marginal at $70/MWH

(PWC, 2002)



Conclusions

- Physically-based schemes straightforward, e.g. load-based licencing
  - But don't offer flexibility efficiency gains
- Tradeable instrument schemes have risks:
  - Abstraction must avoid moral hazard & design flaws: *cap & trade better than baseline & credit*
  - Trading rules must provide good spot & forward price discovery
  - Performance should be measured by physical outcomes rather than instrument quantities

Some suggestions for the design of tradeable instrument schemes

- Minimise complexity:
  - Avoid "umbrella" designs such as proposed NSW licence condition:
    - Design a separate energy efficiency policy
- For generation schemes:
  - Use a "industry average" benchmark
  - Set floor & ceiling prices to limit baseline error effects
  - Design trading rules for good forward price discovery
  - **State based 'additional MRET' targets could work well**
- Discussion papers & presentations on: www.ergo.ee.unsw.edu.au

Implications of a change to emission trading from MRET

- COAG energy market review report:
  - Introduce emission trading, drop MRET and state-based schemes
- Implications for wind energy:
  - Emission trading will promote gas rather than renewables unless target is challenging
  - MRET scheme is a hybrid policy:
    - Both emission reduction & industry development
- EU emission trading proposed start 2005
  …but Aust. government has rejected approach

Conclusions

- Environmental regulation is evolving:
  - Market compatible approaches are appearing:
    - Taxes, tradeable permits, tradeable credits
    - Bringing risks associated with abstraction
- Australian climate change policy evolving:
  - Emission trading may replace MRET
- Wind energy industry responses:
  - Essential to maintain “clean” public image
  - Lobby for industry development policies