Greenhouse Gas Issues Within Australia's Electricity Industry

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IAAust BIENNIAL CONVENTION 2003

Institute of Actuaries of Australia

Today we will discuss..

- What Emissions?
- Total Emissions and the Electricity Sector
- Electricity Industry Snapshot
- What's already being done
- Where to next
- The Parer report to COAG
- Conclusions

Richard Cumpston

What Emissions?

Total Emissions and the Electricity Sector

Electricity Industry Snapshot

What's already being done

Where to next

The Parer report to COAG

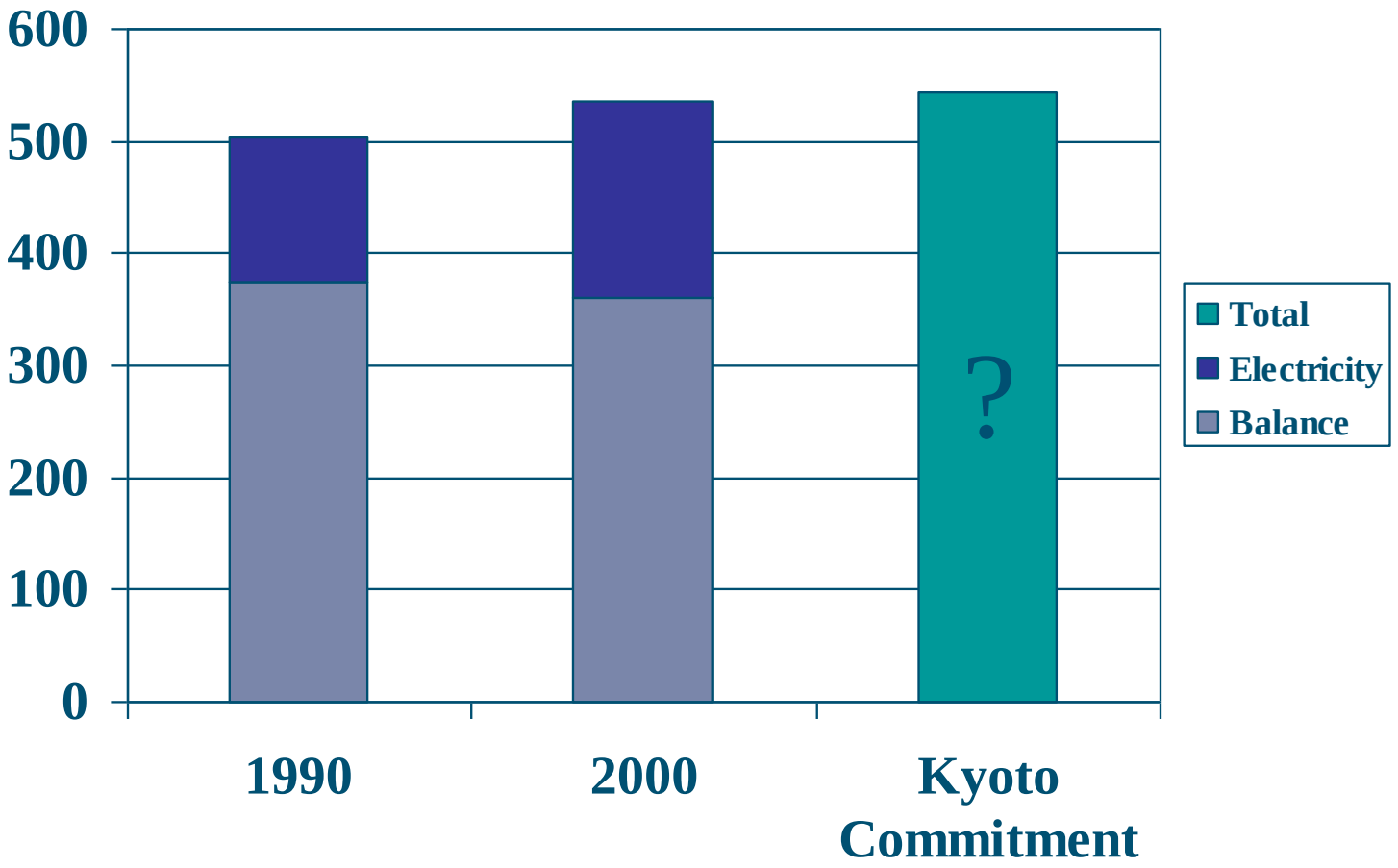
Conclusions

The problems

- CO_2 (1*)
- CH_4 (1 tonne = 21t CO_2 equivalent)
- NO_x (1 tonne = 310t CO_2 equivalent)

Also SF_6 and PFCs: not considered problems in Electricity

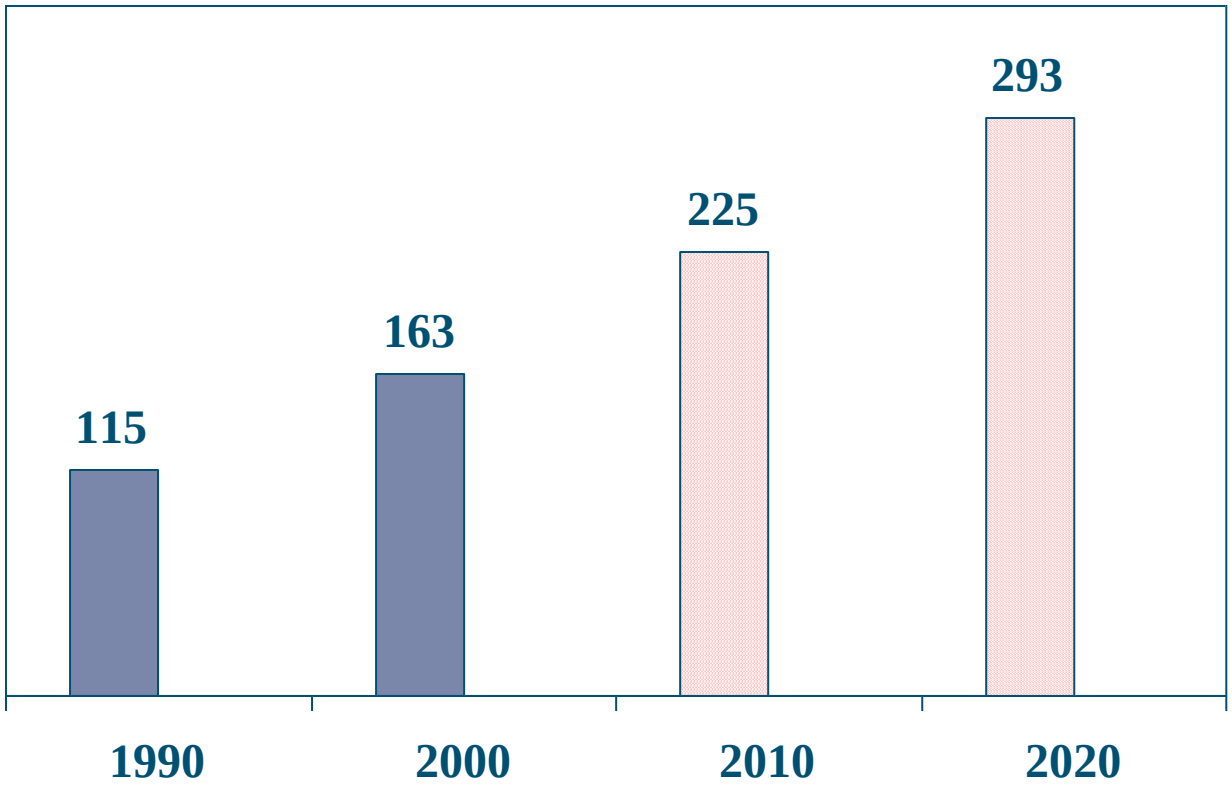
Emission targets, progress to date



So how did this happen..

..and where to next?

Electricity Demand, TWh pa



Demand: increased 42% in 10 years
forecast to increase 154% in 30 years!

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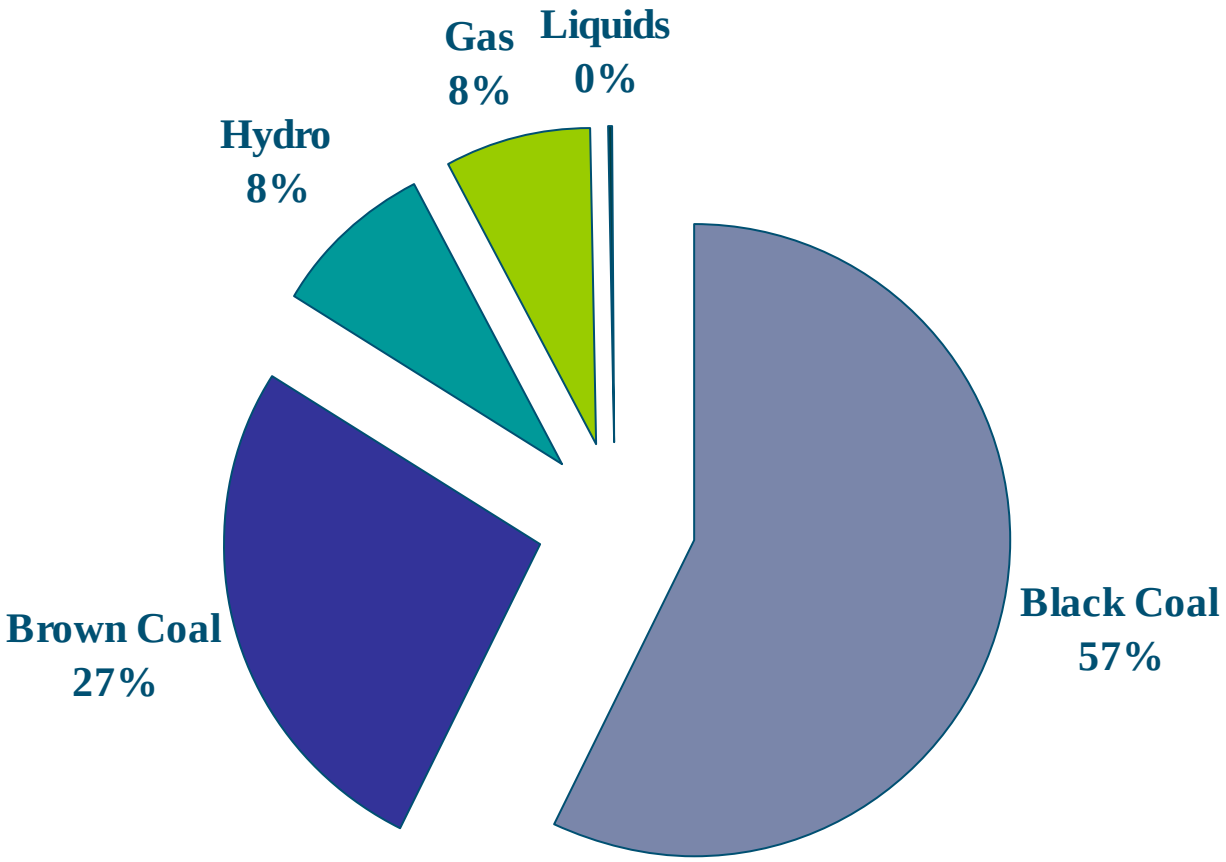
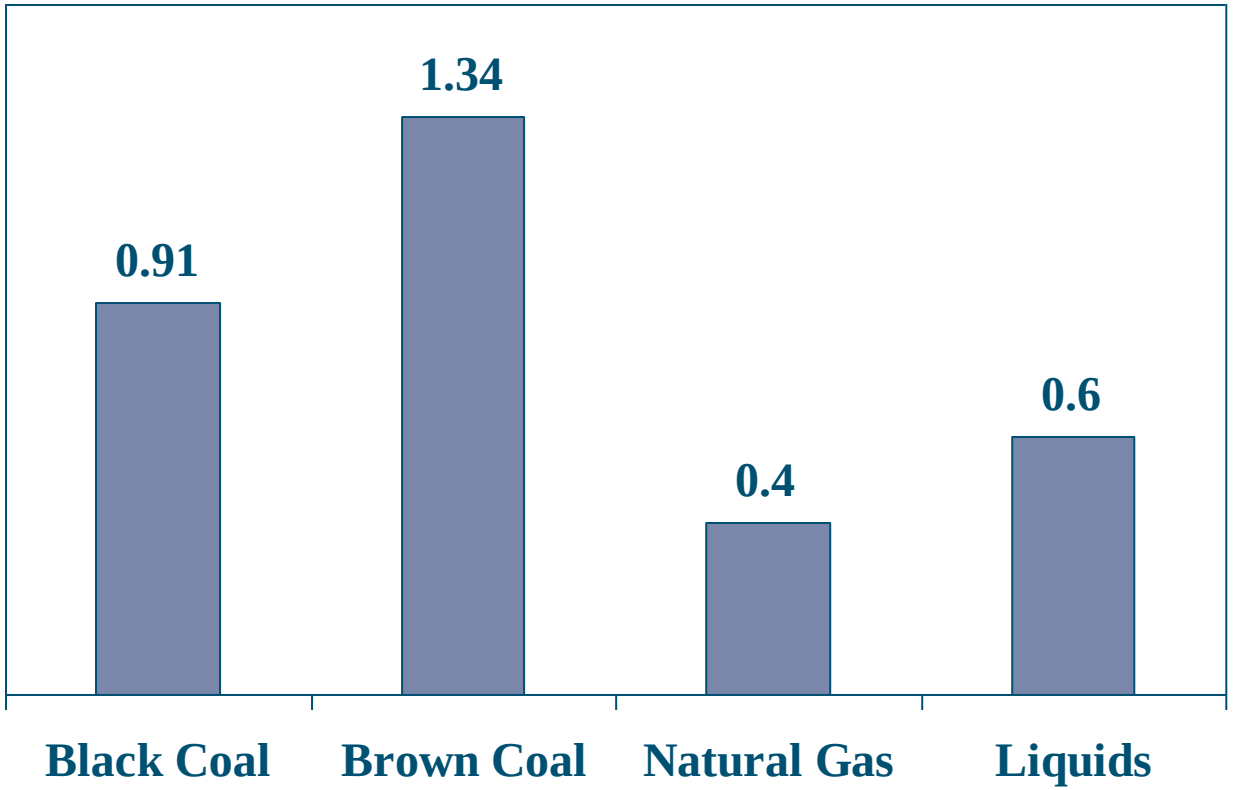
How demand is currently met

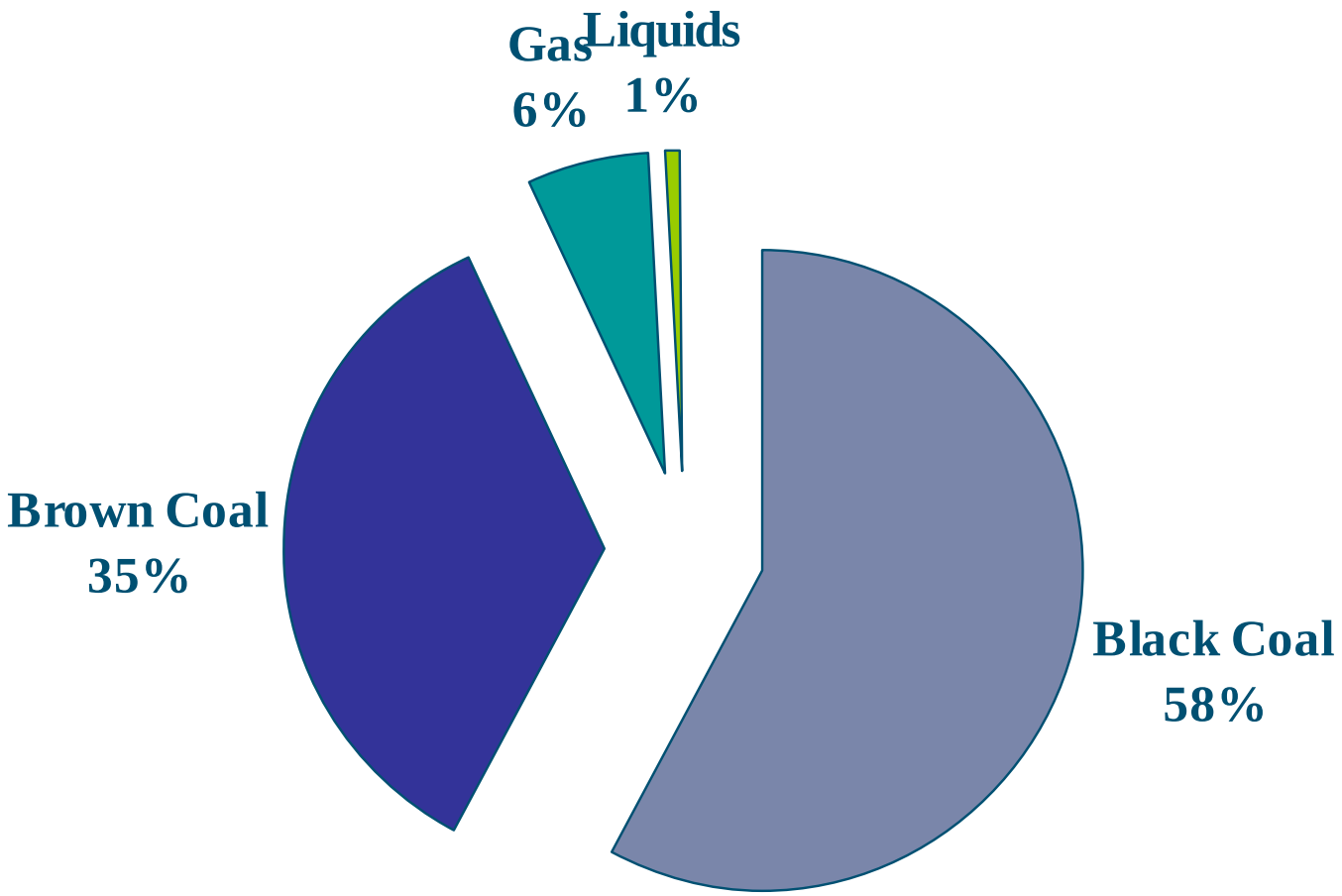


Emissions by generator type*



*tonnes of CO_2e per MWh output

Electricity Generation emissions composition



Generator types

- Coal
  - Cheap
  - Plentiful Fuel
  - Relatively Dirty
  - Lifetime Ownership cost: $26-$45/MWh

Generator types

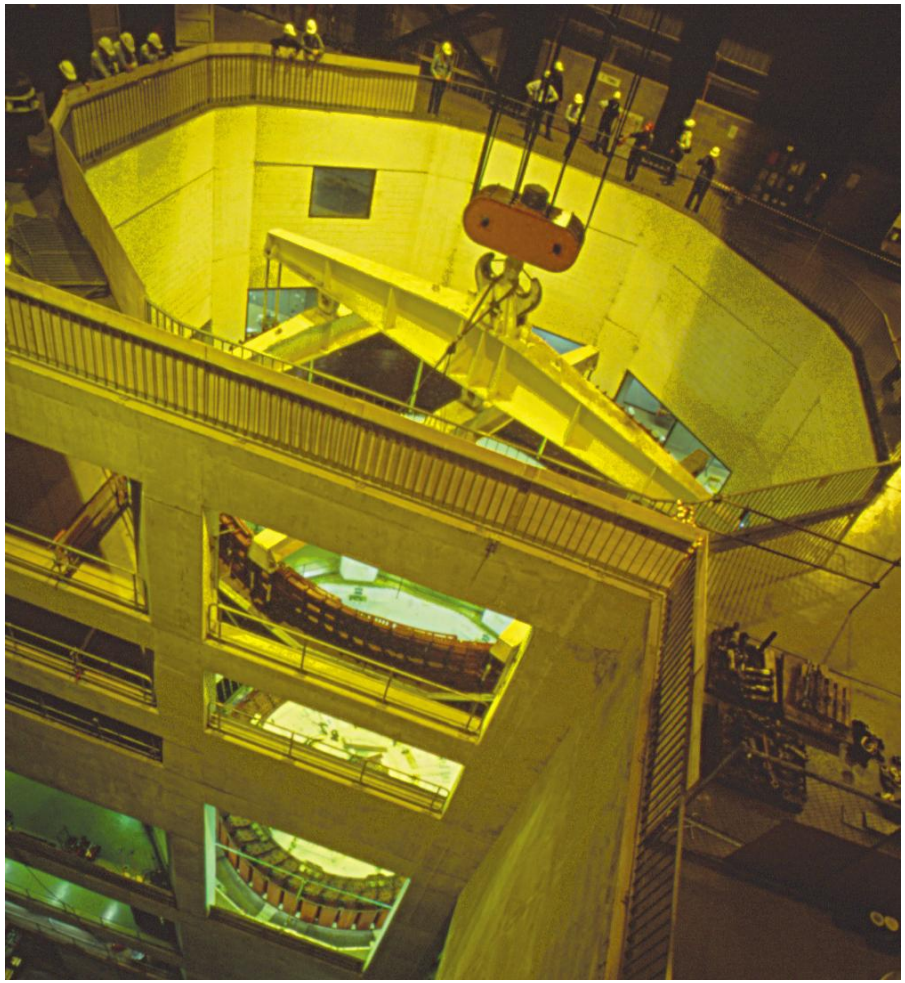
- **Gas** (combined cycle)
  - Cheap
  - Reasonably Plentiful Fuel
  - Cleaner
  - Lifetime Ownership cost:

    $38-$55/MWh

Generator types

- Hydro
  - Capital intensive
  - Fuel cheap, not always regular
  - Other water requirements
  - clean
  - Lifetime Ownership cost:

    $50-$300/MWh



Generator types

- **Landfill, Biomass**
  - **Capital intensive**
  - **Fuel finite, but cheap (waste products)**
  - **can be >100% clean**
  - **Lifetime Ownership cost:**

    $45-$70/MWh

Generator types

- **Wind**
  - **Capital intensive**
  - **Fuel variable, but free!**
  - **100% clean**
  - **Lifetime Ownership cost:**

    $65-$95/MWh

Generator types

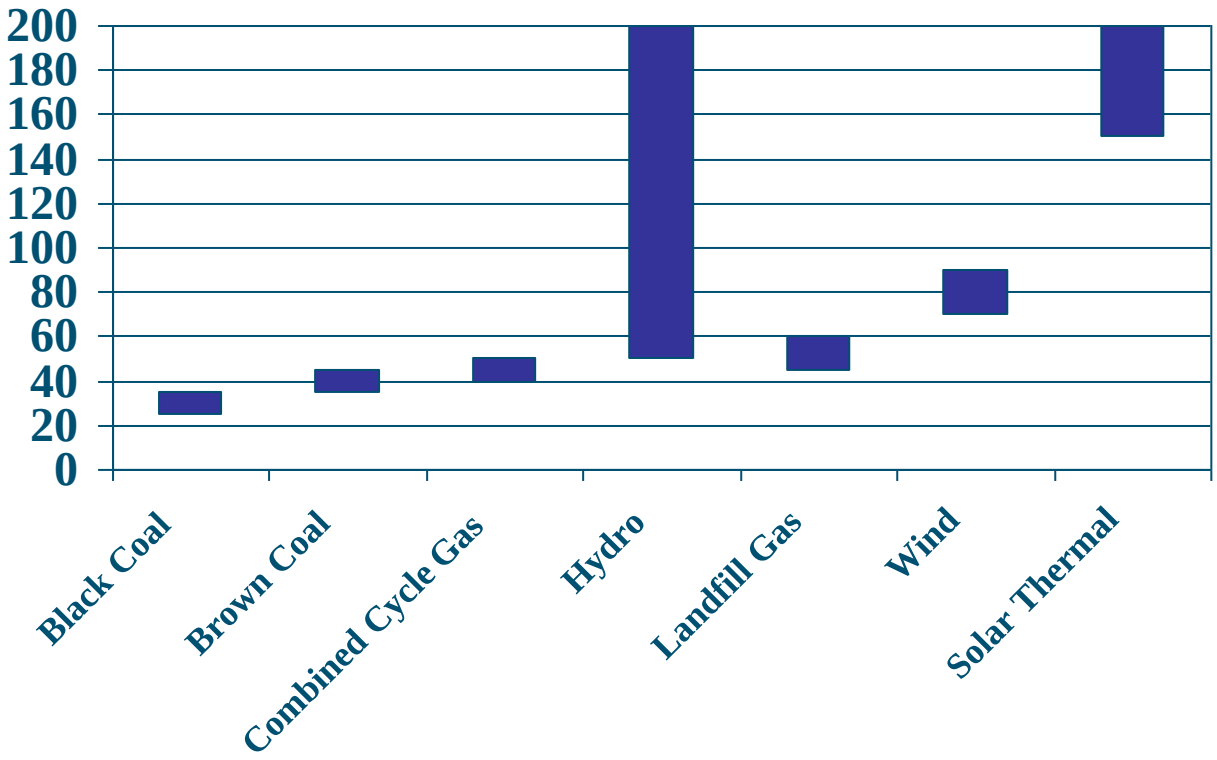
- Solar
  - Capital intensive
  - Fuel variable, but free!
  - 100% clean
  - Lifetime Ownership cost:

    >$100/MWh

Generator types - an idea...

- Solar Tower
  - Very Capital intensive
  - Fuel free!
  - 100% clean
  - Lifetime Ownership cost: ~$70/MWh ?

Lifetime ownership costs, $/MWh



cheapest generators <=> highest emitters!

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What Emissions?

Total Emissions and the Electricity Sector

Electricity Industry Snapshot

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The Parer report to COAG

Conclusions

The 5 big schemes

- **MRET**
- GEC
- NGAC
- GGAP
- GES

Mandated Renewable Energy target

Certificate base scheme (the REC)

Applies Nationally

1 REC = 1 MWh

9,500 GWh pa by 2010 (with rampup)

Non compliance penalty: $40/MWh

Non tax deductible

The 5 big schemes

- MRET
- **GEC**
- NGAC
- GGAP
- GES

Gas Electricity Certificate scheme

Certificate base scheme (the GEC)

13% of Qld Electricity Demand to be met by gas generation from 2005

1 GEC = 1 MWh (almost)

Non compliance penalty: $11/MWh

The 5 big schemes

- MRET
- GEC
- **NGAC**
- GGAP
- GES

NSW Greenhouse Abatement Certificate Scheme

Certificate base scheme (the NGAC)

Targets NSW emissions of 7.27t CO2e pa per capita by 2007 - currently nearly 9t

1 NGAC = 1t of CO2e abated

Non compliance penalty: $11.50/MWh

Non tax deductible

The 5 big schemes

- MRET
- GEC
- NGAC
- **GGAP**
- GES

Greenhouse Gas Abatement Program

Capital funding scheme: funds projects that wouldn't succeed otherwise

Projects must be significant abatement projects

The 5 big schemes

- MRET
- GEC
- NGAC
- GGAP
- **GES**

Generator Efficiency Standards

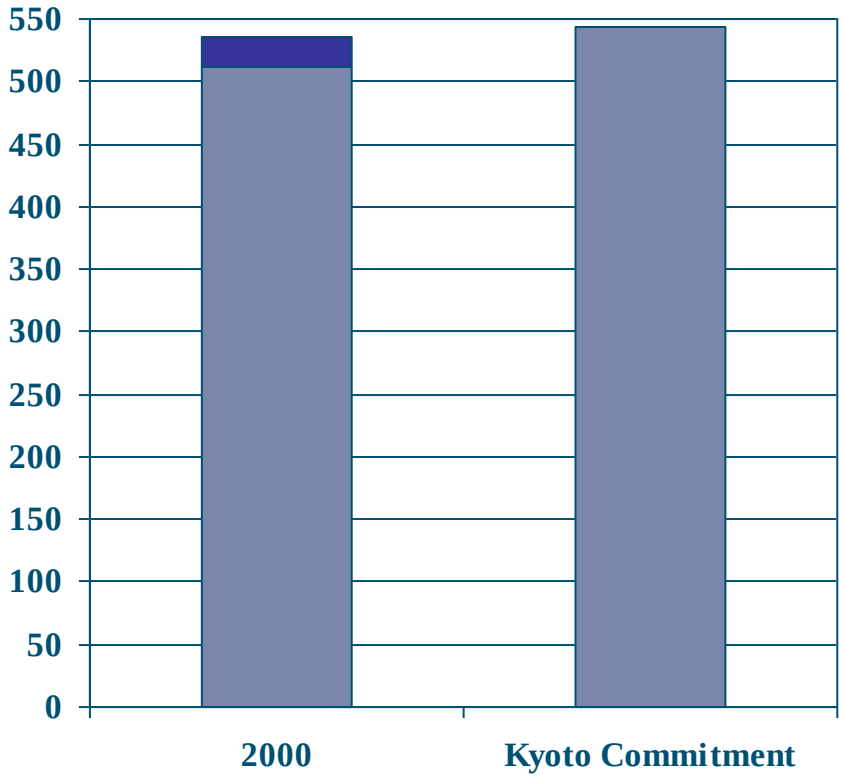
Voluntary program, widely adopted

Prescribes best practice for technology, plant age, fuel type etc

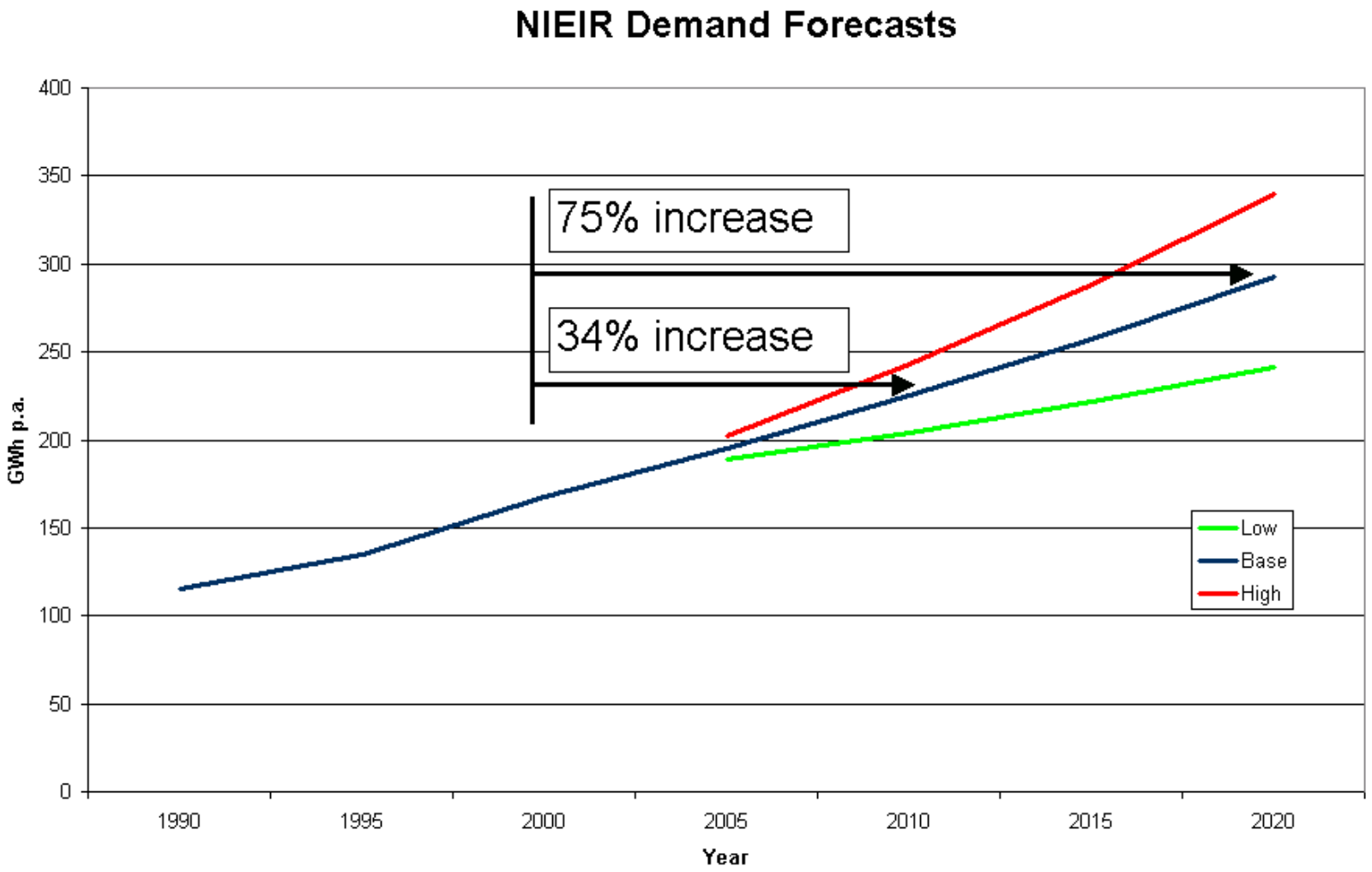
What these schemes abate

- MRET: 6.6 Mt pa
- GEC: 3.0 Mt pa
- NGAC: 9.0 Mt pa
- GGAP: 2.1 Mt pa
- GES: 4.0 Mt pa

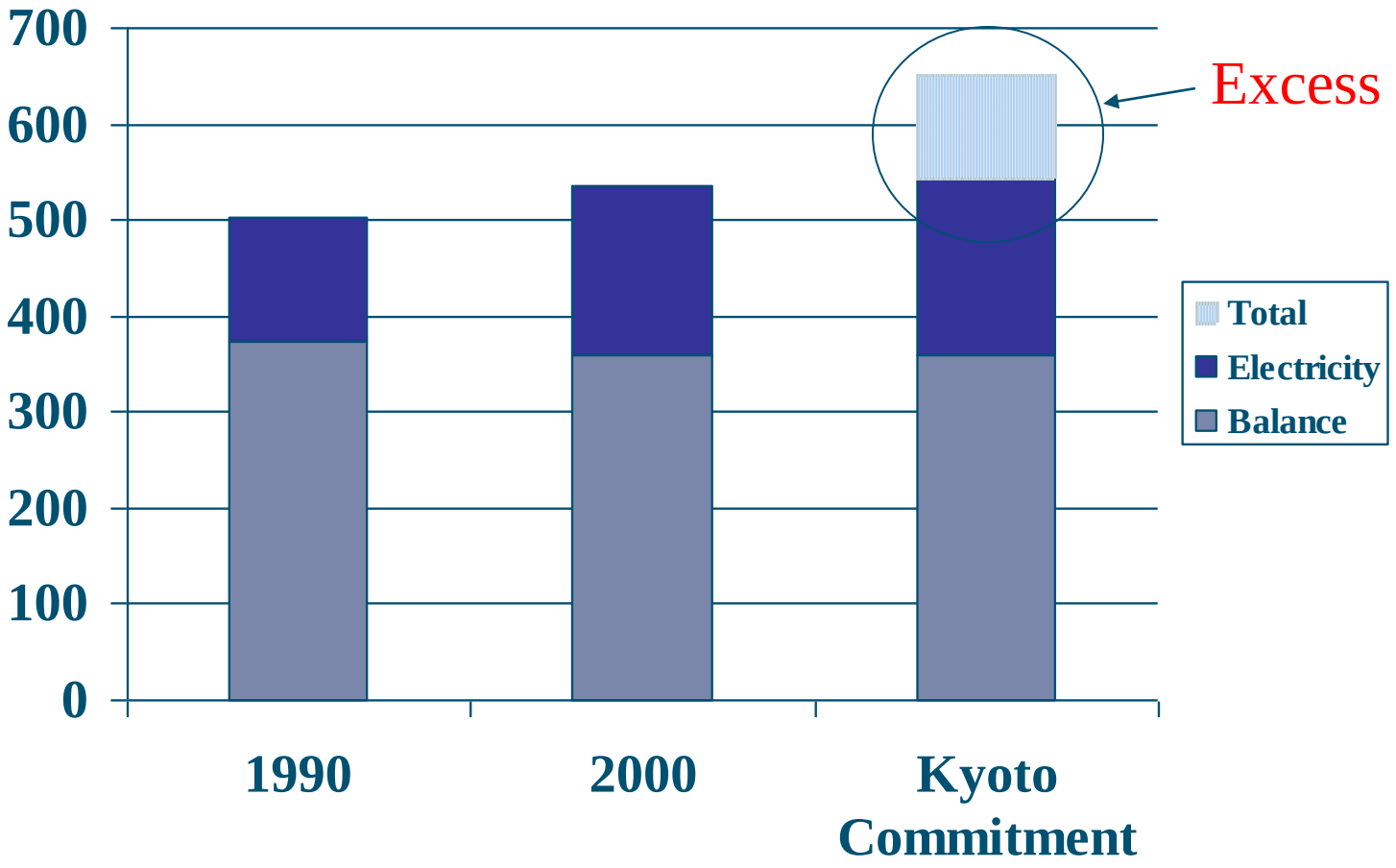
- TOTAL:24.7 Mt pa



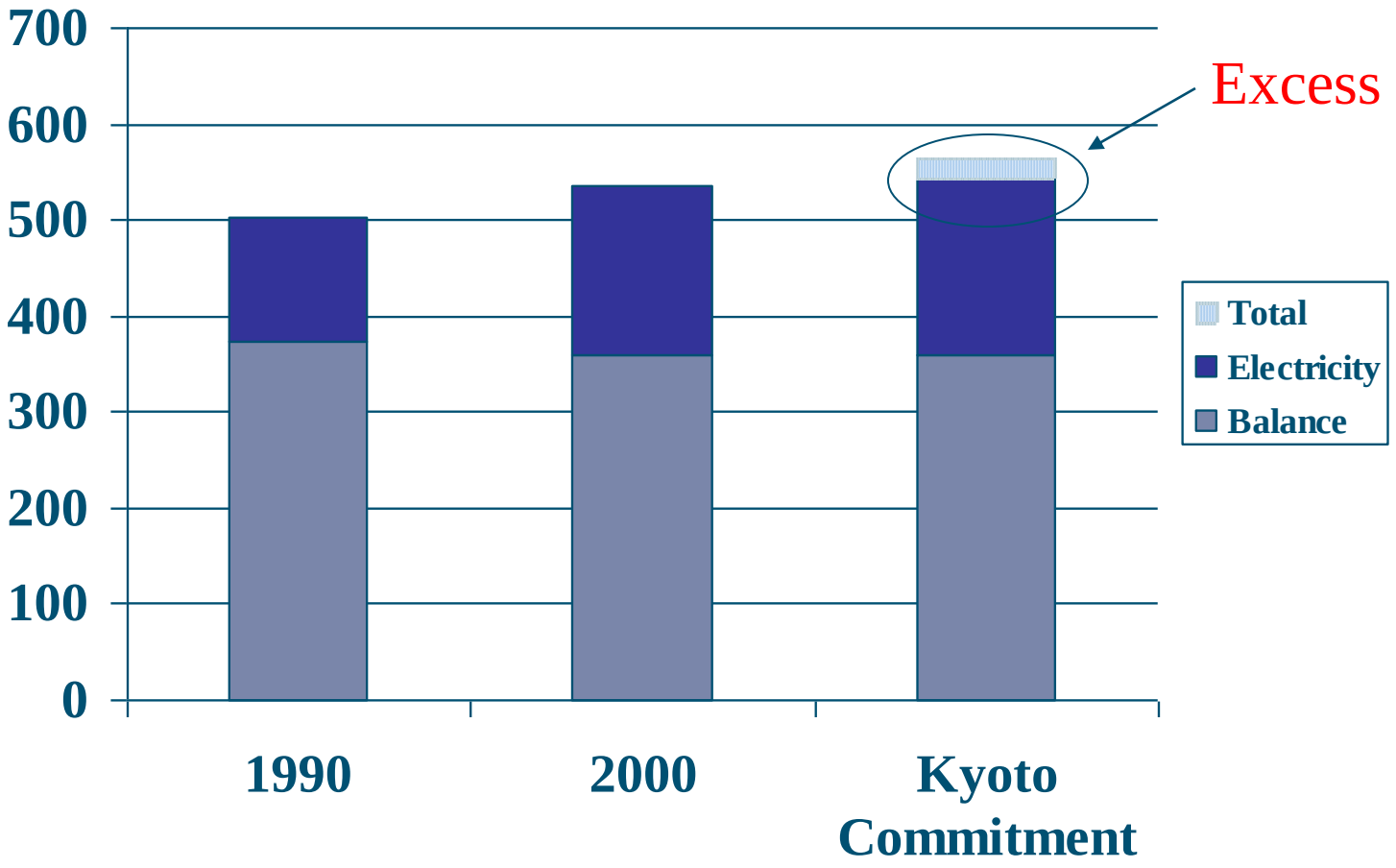
Demand: the future



Meeting incremental demand with coal



Meeting incremental demand with, say, gas



Levelling the playing field: Coal vs Gas

	Supercritical Coal	Combined Cycle Gas
Long Term ownership cost	34	41
Emission intensity	0.83	0.35
Cost of emissions	15	15
Revised cost of ownership	46	46

Issue: Fuel (1)

- An extra 130TWh pa of electricity
  - 910 PJ pa of gas
  - 1,200 PJ pa of coal (~55-60Mt pa)
- Hundreds of years of coal
  - 76,000 Mt reserves, 320Mt pa mined > 200 yrs
  - at 380Mt pa ~200 yrs reserves
- How much gas
  - 157,343 PJ reserves, 1,200 PJ pa produced
  - at 2,110 PJ pa, 74 years reserves

Issue: Fuel (2)

- Fuel location matters
  - Transportation can be costly
  - May impair gas further
- Coal technology advances
  - Fluidised beds
  - Integrated gasification

The Parer report

- Wide ranging report
- Generally focussed on shorter term issues in the NEM
- Did include a section on greenhouse gases
  - some good work, but
  - acknowledged analysis was not complete in the COAG timeframe

A National Greenhouse Gas Trading Scheme

- Parer panel recommended emissions trading
- places an economic cost of emission/value of clean air
- All industry sectors participate
- Exemptions for the traded good sector

Form of a proposed scheme was out of scope

- Emission permits: Allocate or Auction?
- Do this one time, or annually?
- What is the penalty for non-compliance?
- Does the direct emitter or end user participate in the scheme?

Conclusions

- Business as usual is not a genuine option
- We have made a start, but
- Significant action required, and required quickly
- National Leadership is required


Questions