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Ways to reduce Australia's emissions by 60%

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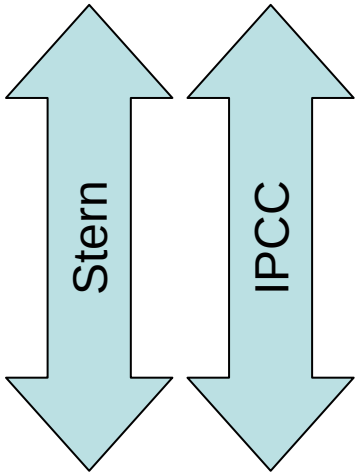
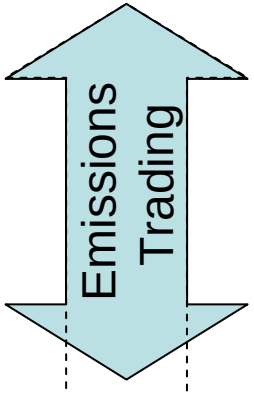
Covering Climate Change and Greenhouse Gases



- Climate Science
- Emission Targets
- Abatement Incentives
- Abatement Activities



Under examination

This is an enormous topic

- Australia's place in the world
- What Australia emits now
- What we can do - now - to reduce emissions
  - And what's possible with a bit of a stretch
- Policy options to get us there
- The Prime Ministers Task Group on Emissions Trading

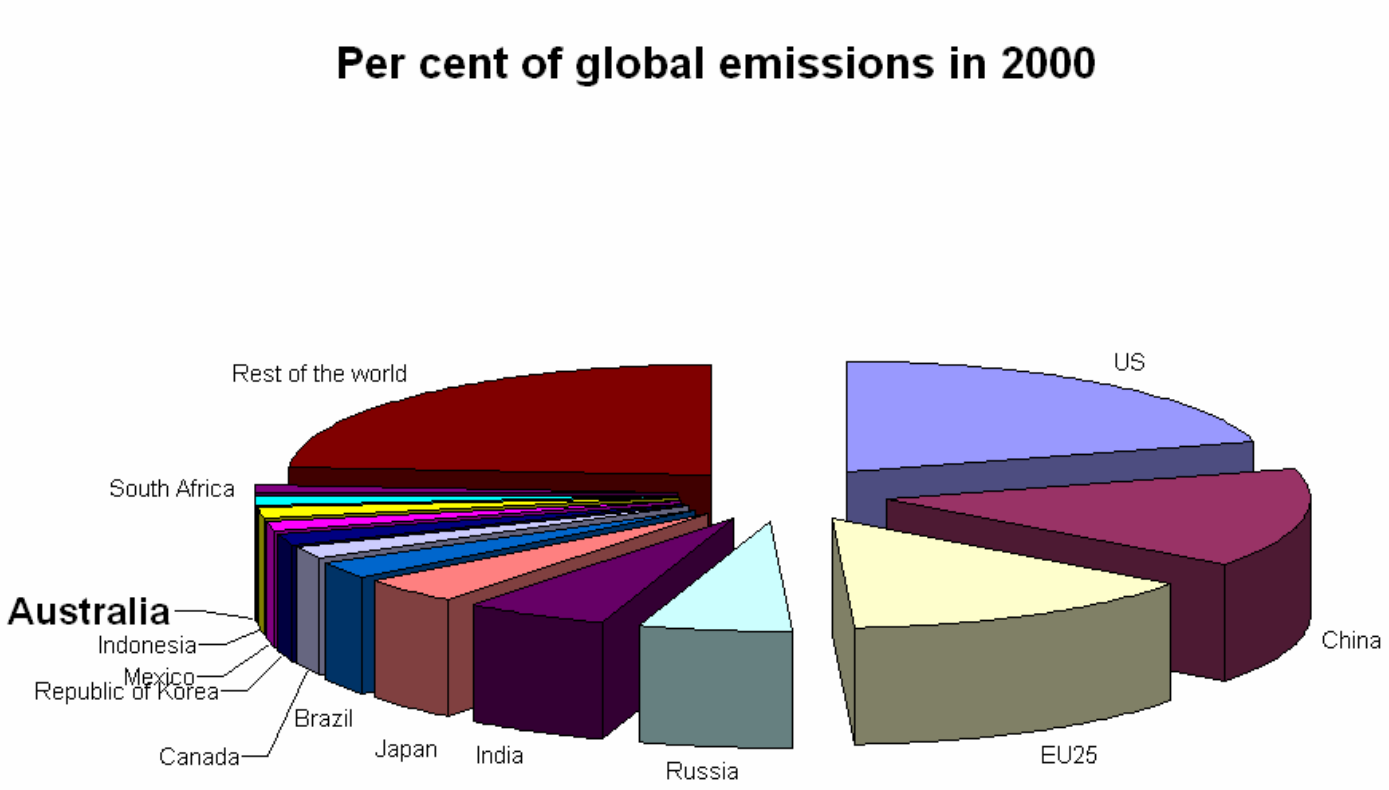
"Imprecision"

The disclaimer…

- Long term projections of large scale structural change
- We cannot be precise
- One previous Study to 2050
  - Australia Institute, 2002

Australia in the world

The skinny blue wedge – but still 12th!



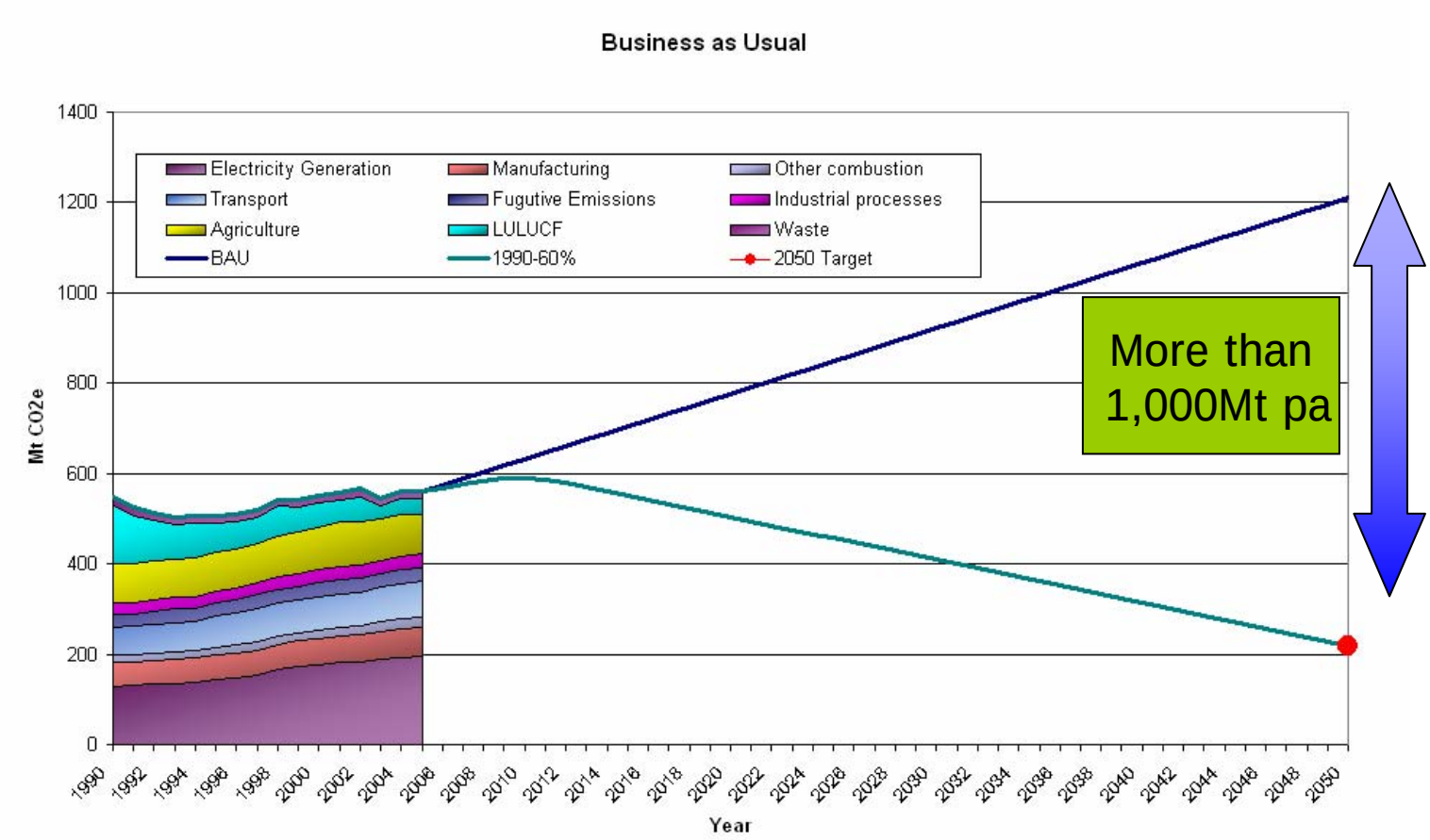
A place to start – the 2005 NGGI

	Emissions Mt CO_2-e[a]		Per cent change in emissions
	1990	2005	1990 - 05
Australia's Net Emissions	**547.1**	**559.1**	**2.2**
Energy	**287.0**	**391.0**	**36.3**
Stationary Energy	196.0	279.4	42.6
Transport	61.9	80.4	29.9
Fugitive Emissions	29.1	31.2	7.3
Industrial Processes	**25.3**	**29.5**	**16.5**
Agriculture	**87.7**	**87.9**	**0.2**
Land Use, Land Use Change and Forestry [b]	**128.9**	**33.7**	**-73.9**
Waste	**18.3**	**17.0**	**-6.9**

(a) Carbon dioxide equivalent, CO_2-e, provides the basis for comparing the warming effect of different greenhouse gases.

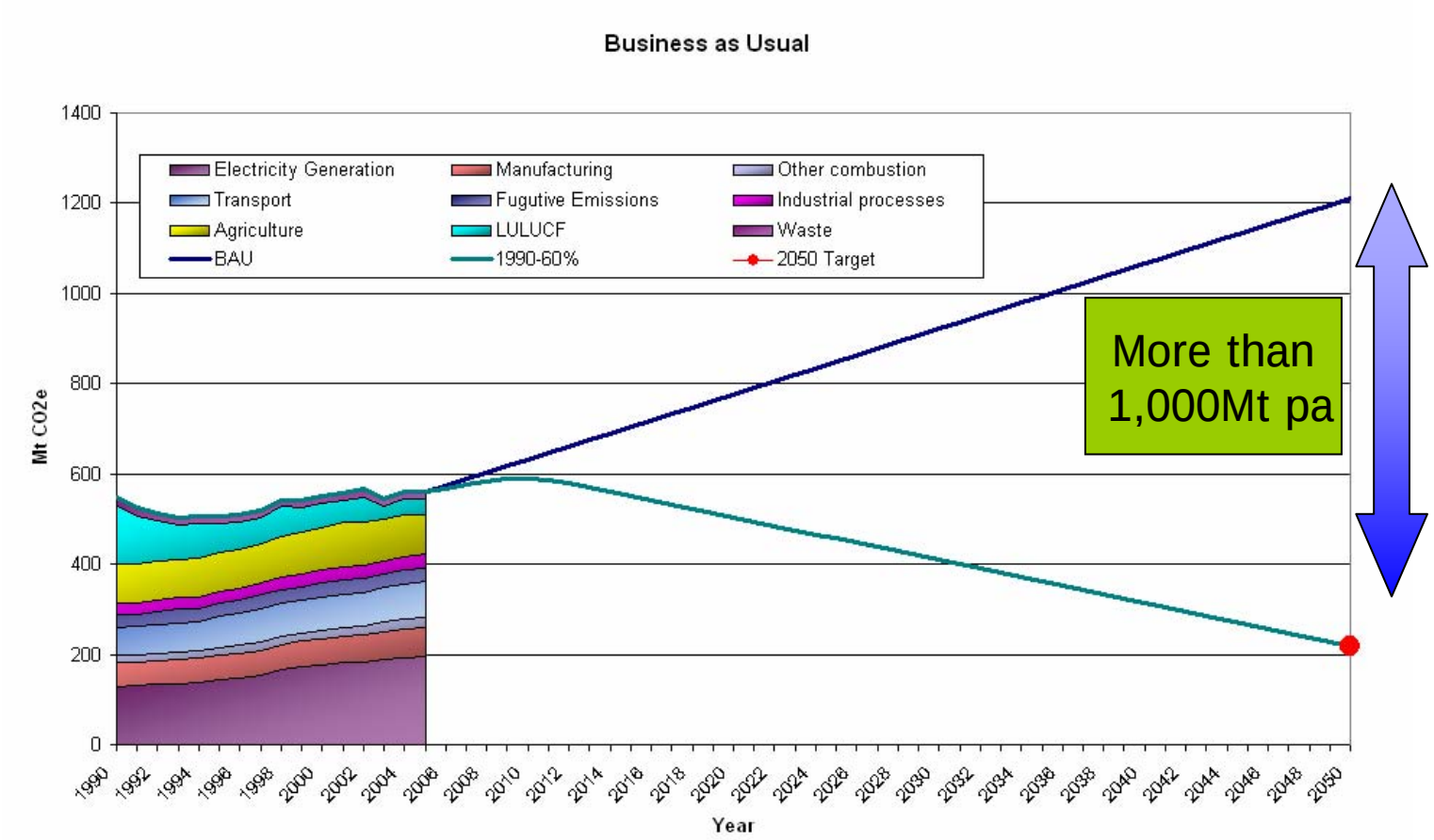
(b) 2005 estimate is interim only and will be revised with the next update of the inventory.

So where is 60% below 1990?



Not >1,200Mt, but <u>219Mt pa</u>

Do Nothing & where is 60% below 1990?



Not >1,200Mt, but <u>219Mt pa</u>

Can we get to 219Mt pa by 2050?

- Lets consider this, using only things we know about right now.
  - With a little bit of a stretch
- Examine possible reductions by sector

Stationary Energy – Electricity

Electricity Generation is a key to emissions reduction

2005: 194Mt

Do Nothing (keep using current technology coal): 446Mt pa in 2050

Three mechanisms to reduce emissions:

- Reduce demand
- Clean up current technology
- Introduce new technology

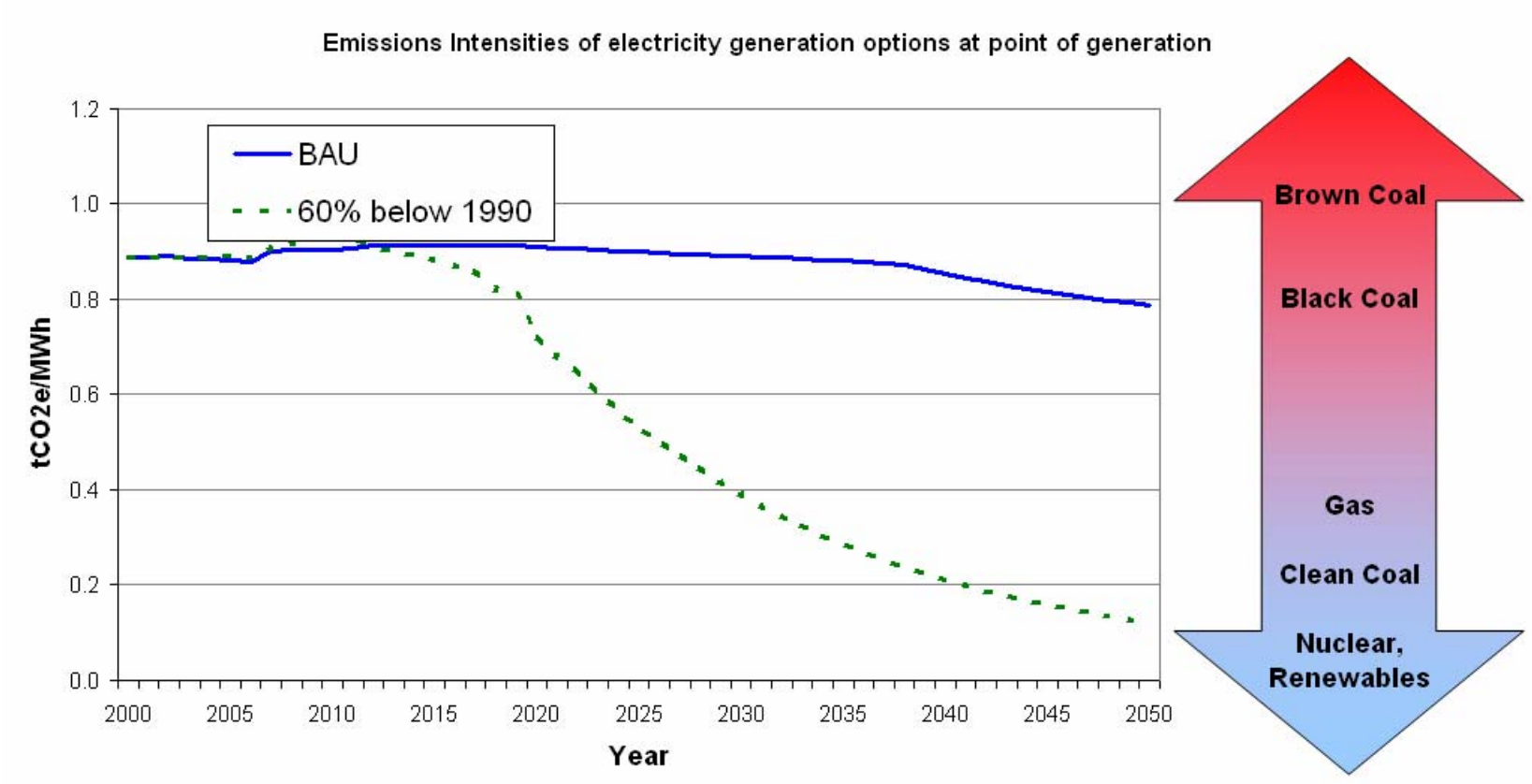
Reduce Electricity Demand

- Demand is historically relatively price inelastic
- If wholesale price doubles to pay for emissions – end user price increases 30% to 50%
  - poles and wires costs unchanged
- CSIRO: 10% retail price increase: 2.5% demand reduction
- 50% price increase, 12.5% demand reduction saves 70TWh pa and 50Mt pa of emissions
  - Untested for very large price increases
  - Anecdotally, demand reduction would be much larger – 110TWh and perhaps more

Clean up current generators

- Some very minor engineering improvements possible on current fleet
- New fleet using best current technology is a little better, but
- Major gains by capturing CO2 from existing stations
- Not proven at scale for new generators let alone retrofitted to existing ones

Introduce new technology – how clean does it have to be?

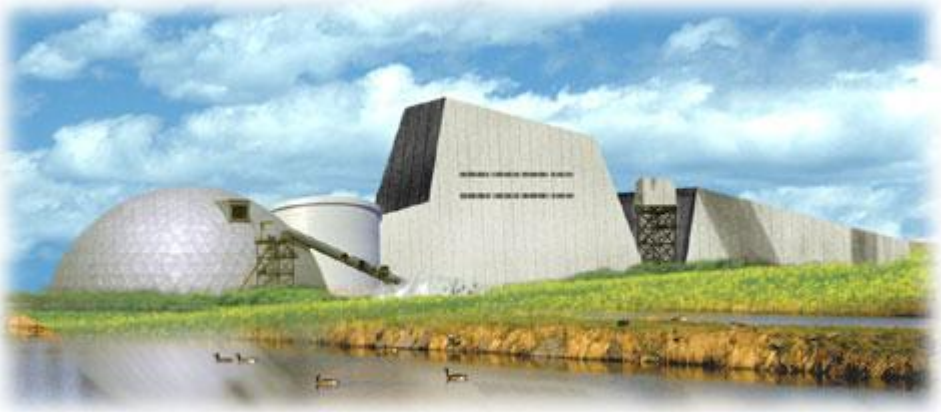


- To make deep cuts, new technology has to be VERY clean

Introduce new technology ii

446Mt pa
to
49Mt pa

- If current coal fleet replaced with gas, could save 225Mt (+50Mt demand reduction)
- If current coal fleet replaced with clean coal, nuclear and renewables, could save 347Mt (+50Mt demand reduction)



Stationary Energy – Other combustion

- 2005: 85Mt
- Fuel production; Manufacturing; Other industry including domestic and commercial combustion
- Projecting AGO growth rates 2010 -> 2020 through to 2050, emission reach 222Mt pa
- Driven by strong growth in metals production, mining

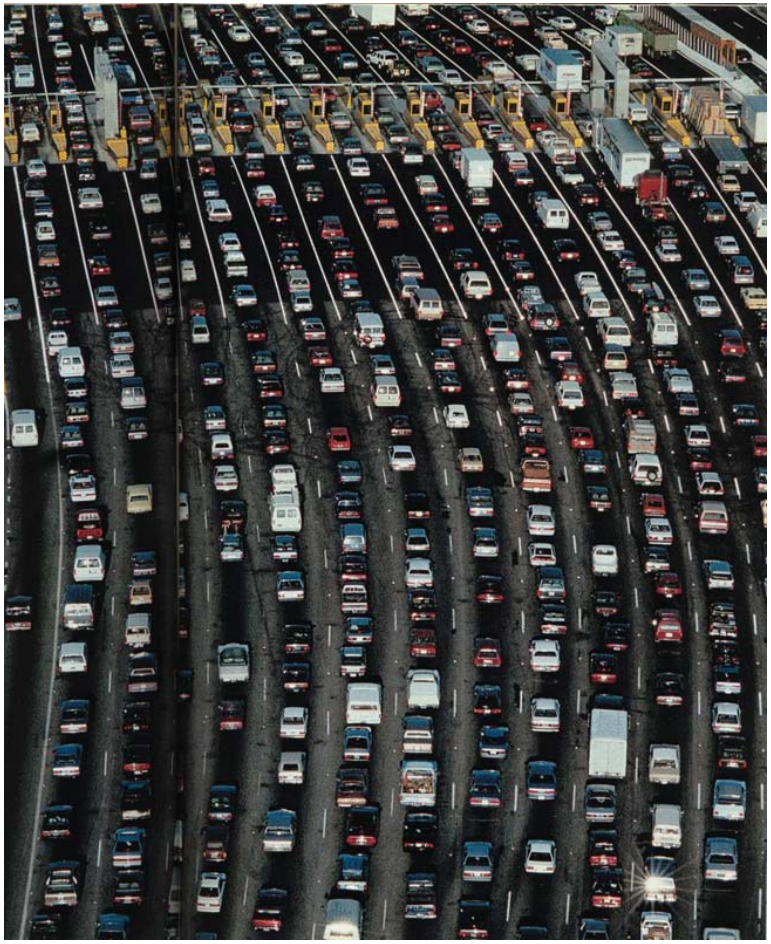
Stationary Energy – Other opportunities

222Mt pa
to
109Mt pa

- Energy efficient processes
  - Kilns, driers, furnaces, electrolytic processes
- Combustion fuel switching – coal & petroleum to gas
- We speculate 66Mt saving possible at 2050
- Net emissions 156Mt pa
- If electricity becomes clean, could be a process switch BACK to electricity
- Potential to save another 47Mt – Net 109Mt
  - Speculative

Transport

- 80.4Mt pa in 2005
- 55% passenger vehicles
- 25% Light commercial and trucks
- BAU 2050: 160Mt pa
  - More cars and trucks on road
  - More vehicle kilometres travelled



Transport: Lots of measures available now

160Mt pa
to
54Mt pa

- Hybrid Cars: 1/3 the emission levels of current fleet
- Biodiesel and Ethanol: life cycle emissions 72% lower than current fleet
- If passenger fleet turned over, light commercials and trucks move to these two fuels, 160Mt pa becomes 54Mt pa

Fugitives

- 31.3Mt in 2005
- Derived from Coal (69%) Gas (30%) and Oil (1%) production
- BAU Projection to 2050 168Mt
  - Continued coal production
  - Rapid growth in LNG production forecast
    - NW Shelf and East Coast proposals
    - Cleaner Generation fuel

Fugitives – what can be done

168Mt pa
to
50Mt pa

- Coal: export demand to grow or decline?
- Coal: avoid “Gassy” mines
  - 12% of coal produces 48% of coal fugitives
- Capture waste mine methane for power generation, or flare
- LNG: sequester flared and vented gases
  - Planned for Gorgon LNG project
  - Subject to technical feasibility
  - BUT LNG is potential replacement fuel for coal!
- Could reduce fugitives to as low as 50Mt pa

Industrial processes

83Mt pa
to
83Mt pa

- 2005: 29.5Mt pa
- 2050 projection: 83Mt pa
- Rely on chemical process – not combustion
- Growth driven by new chemical processes
  - Ammonia, nitric acid
- Metal production emissions flat
- Reluctant to take account gains until new chemical processes materialise

Agriculture

- 87.9Mt pa in 2005
- Livestock 79%, Crop activity 9%, Savanna burning 12%

Projected to 112Mt pa in 2050

- Slow growing sector
- Significantly dependent on national herd size
- Potential for large variation

Agriculture opportunities

112Mt pa
to
92Mt pa

- Selective breeding, lower emission cattle
- Change to lower emission feed for sheep
- Changed cropping practices
- Perhaps 20Mt pa of opportunity by 2050
  - If farmers can be encouraged to adopt practices

21Mt pa
to
21Mt pa

Land Use Change

- 53.3Mt in 2005
- Projected to reach 20.7Mt in 2010 and remain at that level thereafter
  - Little further opportunity remains for reductions in land clearing rates
  - Australia already ahead of the world

Forestry

- An area with potential but also myriad complications
  - Tree type
  - Permanent or Cropped
  - Tropical or temperate
  - Plantation or native

Forestry

- Sequestration rates vary widely
  - Tropical sequesters more than temperate
  - Species very significantly
- Plantations can emit, absorb and them emit again over life cycle

Forestry

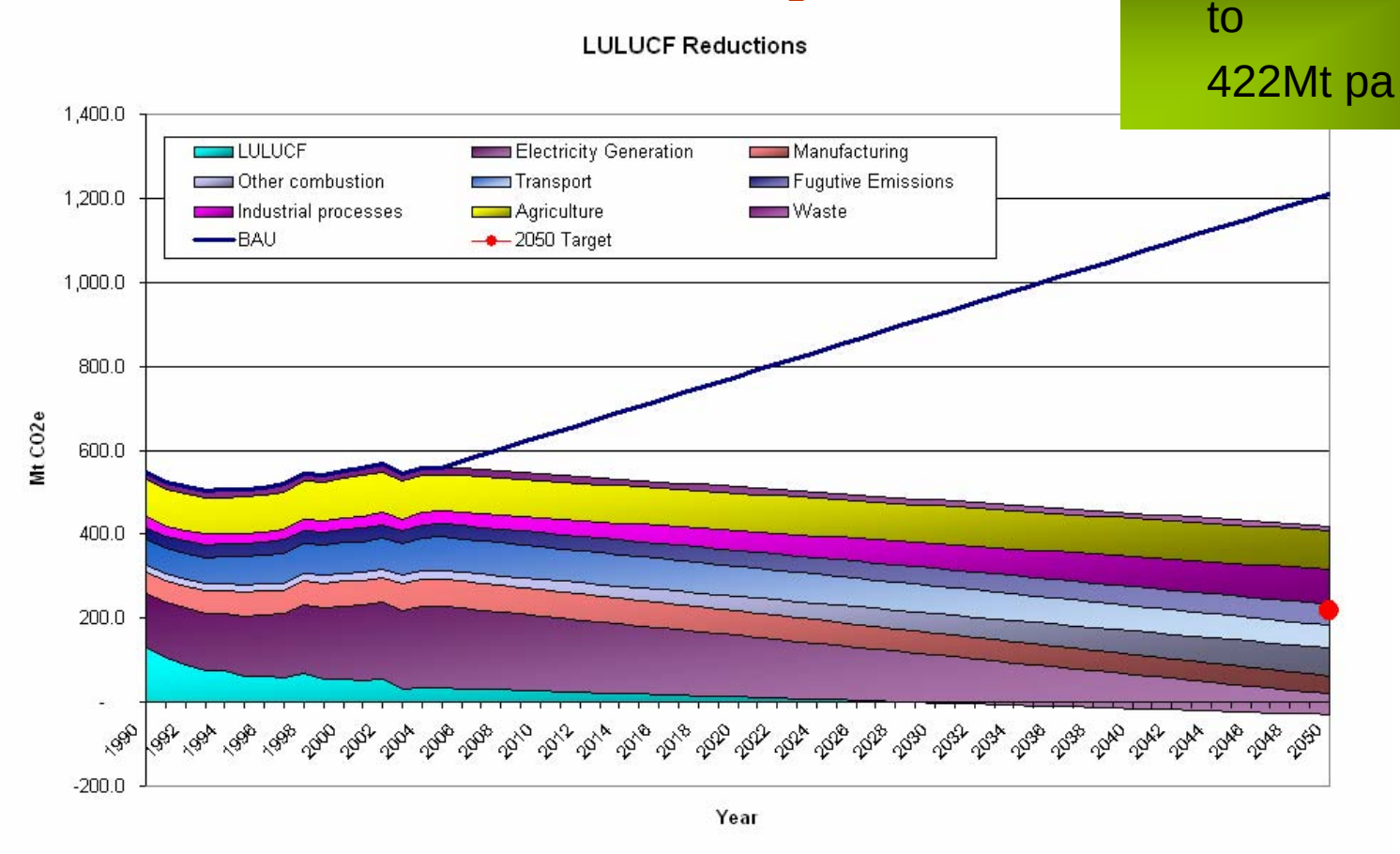
- Sequestration then depends on planting rates
- To make significant inroads planting rates and areas need to be enormous
- With lots of averaging (tree type, location)
- Extrapolating AGO planting rates
  - 1.47m Ha under forest, 12 Mt pa sequestration
- 50Mt pa sequestration by 2050 needs nearly 5 million hectares under forest
  - Tasmania is 6.8m ha in area
- Use 25Mt pa for our projection

So…

- We have really stretched the definition of ”what we can do now” …
- Uncertainty? Hell yes!
- And it looks like…

Finally…

1209Mt pa
to
422Mt pa



25% below 1990 emission levels, pushing the boundaries of ”what we can do now” to get here

Stricter interpretation gives an 11% INCREASE on 1990 emissions

Conclusions

- **Even with measures speculated in this paper, we only calculate a 25% reduction in emissions below 1990 levels – some 200Mt pa short of a 60% reduction.**

- **Much, much more is required to achieve the 60% reduction target and shoulder our burden share of a global reduction of this level.**

- **To bridge the gap:**
  - **Offset permits could be purchased form other countries who are capable of much deeper cuts than Australia, i.e. can contribute beyond a 60% reduction.**
  - **Significant research, innovation and development would be needed if Australia were to attempt to find these reductions itself.**

Four Key Policy Options

- **Internalise:** bring emitters and those affected into one organization or group to deal with the issue, i.e. internalize the externality.
- **Tax:** fix price, let emissions volume vary
- **Regulate/Incentivise:** limit the volume of emissions by law and penalize for breaching
- **Trading:** Create the property right to emit, fix (&limit) volume, let market sort out price

The Prime Ministers Task Group

- Terms of reference made emissions trading design inevitable
- Asked for the design of a global scheme into which Australia could fit
- Cap and trade post 2011
- Proposal is essentially McKibbin Wilcoxen model
- Aspirational long term target, flexibility to move in the meantime to accommodate changes in science, technology
- Extended NETS scheme would fit

In and Out

- Included:
  - Stationary energy
  - Fugitive emissions
  - Forestry
  - Transport
- Excluded:
  - Agriculture
  - Land use and land use clearing
  - Waste emissions

Free permit allocation

- "Compensation": one off up front allocation of permits, for "disproportionate loss of value"
- Case by case basis: expect every single determination to be challenged
- Electricity Generation and Trade exposed sectors catered for
  - Trade exposed sector: permits for new entrants - ???

Process

- 2008: Emissions reporting in place, long term aspirational targets set
- 2009: Legislative Basis
- 2010: Permit allocation and auction
- 2011 or 2012: trading starts

Actuaries can be involved

- Complex systems
  - Cross sectoral
  - international
  - multidisciplinary
- Long durations
- Significant uncertainty
  - and significant risk

What you can do

- Buy green power
- Get Solar Hot water
- Insulate your house
- Set the airconditioner to 24 degrees and the heater to 18
- Drive a hybrid car or take public transport
- Buy local
- Recycle
- Rent “An Inconvenient Truth”

Good Luck