



Australian Government
**Department of Climate Change
and Energy Efficiency**

Strong Growth, Low Pollution Modelling a Carbon Price

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thinkchange



Modelling Context

- Purpose of the modelling
 - Inform policy design
 - Assess economic impacts (macro, sectoral, hholds)
 - Explain impacts of policy to the community
- Domestic policy evaluation requires modelling of international environment
- Details released with Clean Energy Future policy

What drives mitigation?

- Pricing emissions will change relative prices:
 - Reduce demand for emission-intensive goods
 - Profitable to switch to different ways of producing the same goods with low-emission technology
- Economist speak: both demand and supply change and these interact with each other

What is the cost of mitigation?

- Costs arise from shifting the structure of the economy (how we do things)
 - Short-run transition costs: retraining labour, modifying or scrapping capital
 - Long-run productivity: reduced relative to existing structure of economy
 - Changing the way we make things will add an 'extra cost'
 - But, overall welfare enhanced as mitigating global emissions will reduce climate change impacts

International action

Medium global action	Ambitious global action
550 ppm	450 ppm
low end pledges under the Cancun Agreements until 2020	High end pledges under the Cancun Agreement to 2015-16. After 2016, major advanced economies increase effort above pledge levels
Multistage action: developed countries /China lead; all countries act by 2031	Multistage action: developed countries /China lead; all countries act by 2026
Mechanism: from 2013 to 2015 uncoordinated global action, no trade, differentiated carbon prices. From 2016 onwards, trade bilaterally/central market.	
Coverage: all sectors covered, except agriculture, which is covered from 2031	

Australian Context

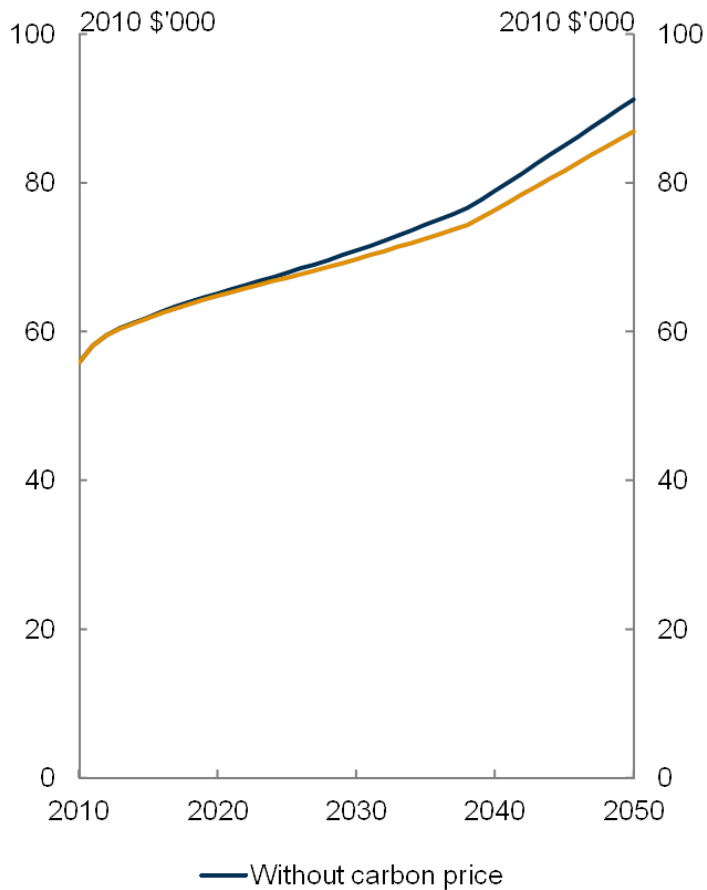
- Small open economy
 - International trade impacts important
 - Macro variables: terms of trade, exchange rates, etc
 - Carbon price taker (high marginal cost of abatement)
 - Sectoral impacts; interaction between sectors
 - General equilibrium modelling with global trade components best capture these effects

Modelling Framework

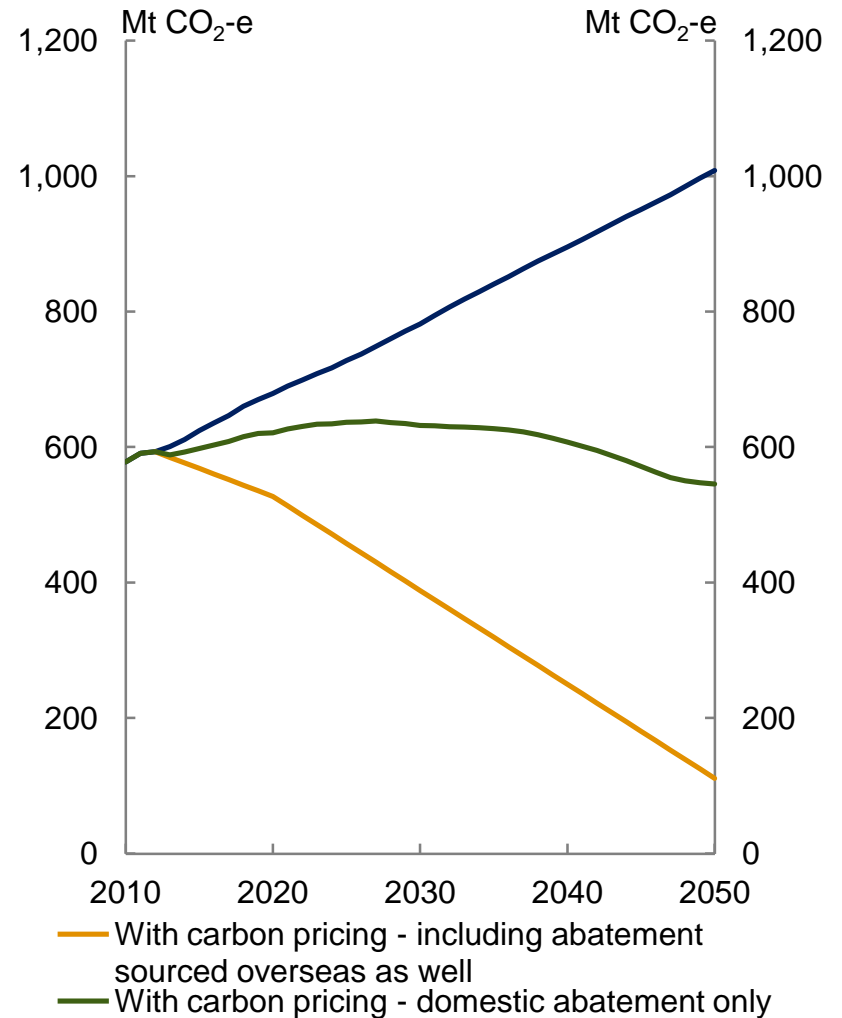
- Link a 'suite of models' (global/national/sectoral/household)
- Two CGE models (Global and Australian)
- Sectoral models for key emission-intensive sectors
 - Electricity generation (two models)
 - Transport
 - Agriculture/land-use (two models)
- Price and household distributional impacts
 - PRISMOD (IO and DIST)

Australia with carbon pricing

GNI per person

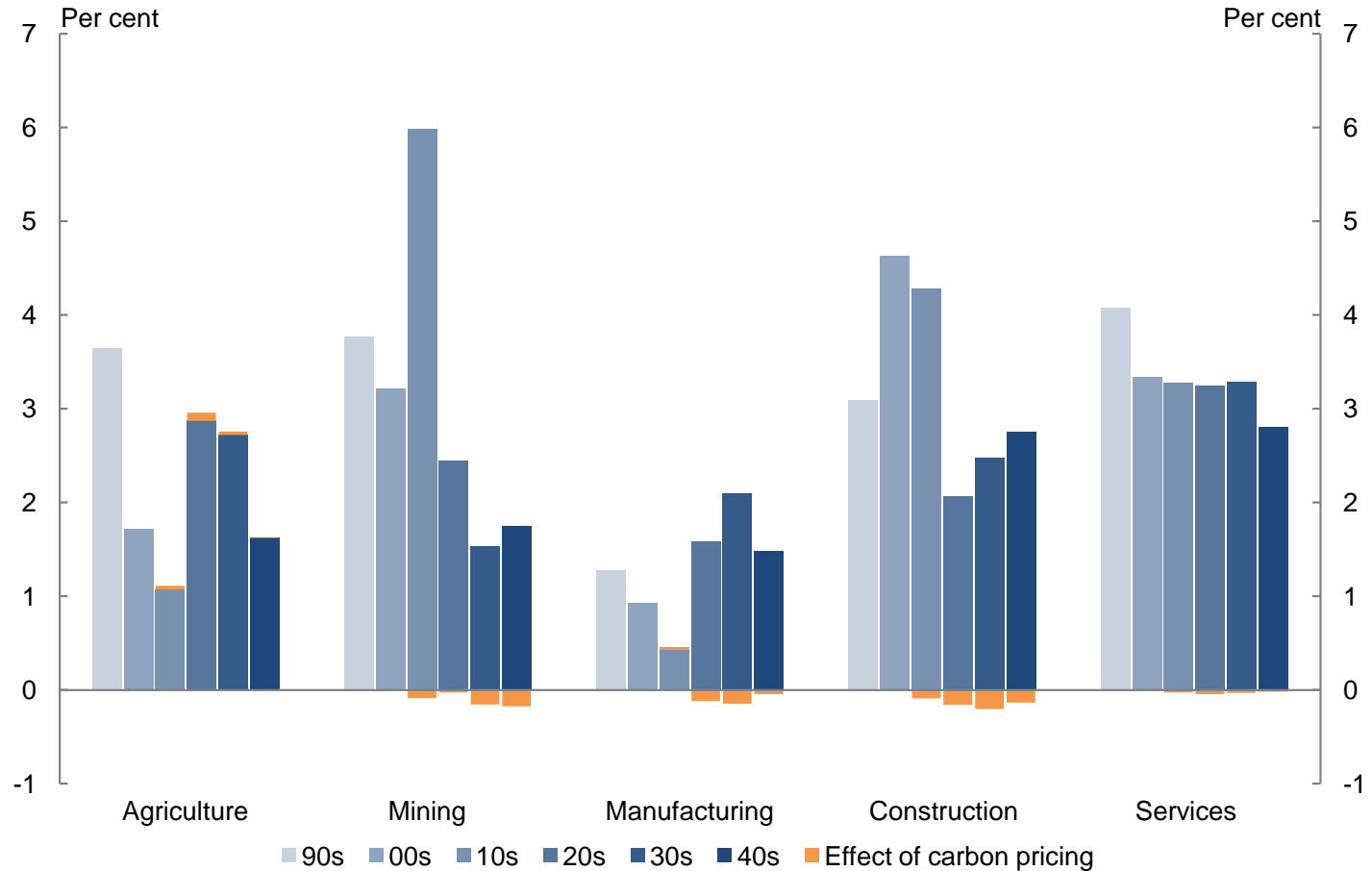


Emissions



Australian output growth by broad sector

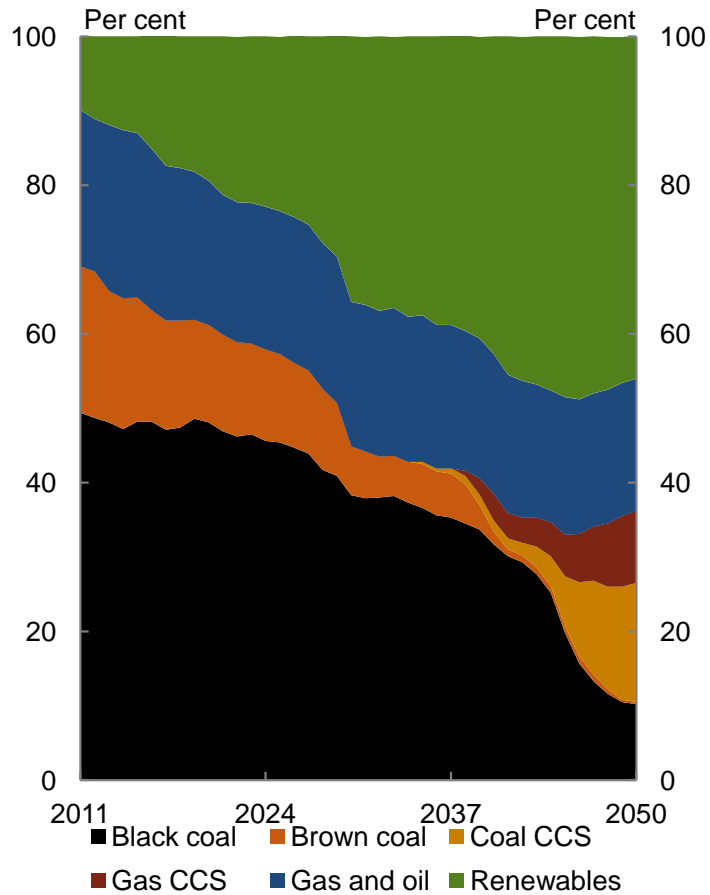
Annual average growth rates
Medium global action scenario and effect of carbon pricing



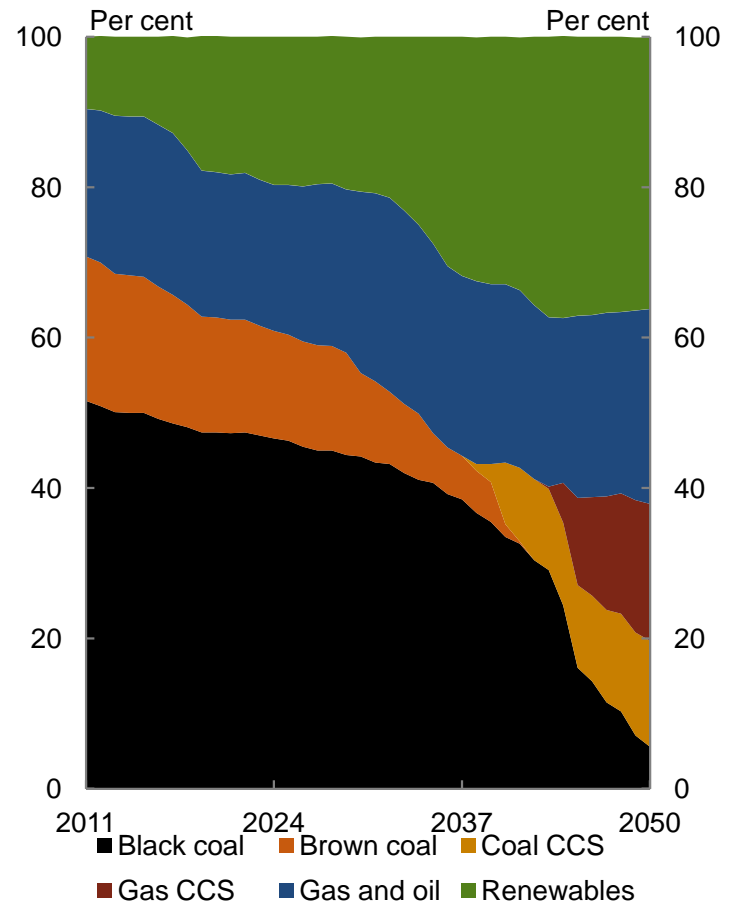
Sources of electricity generation

Core policy scenario

SKM MMA

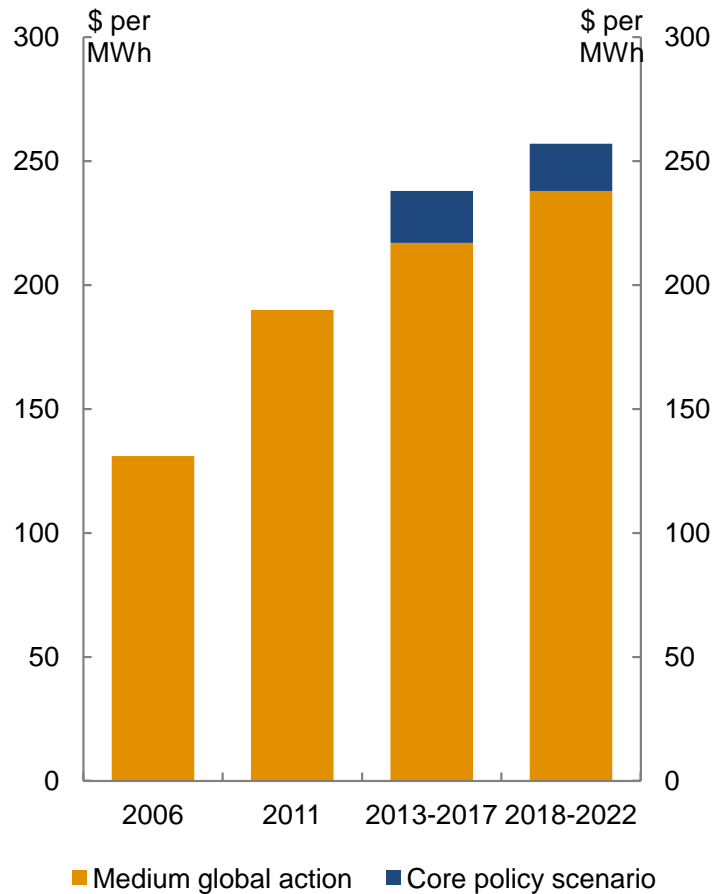


ROAM



Prices effects

Household electricity prices



Effect of \$23/t CO₂-e carbon price

	Weekly expenditure \$ per week	Consumer prices Per cent
Electricity	3.30	10
Gas	1.50	9
Food	0.80	<0.5
Overall effect	9.90	0.7

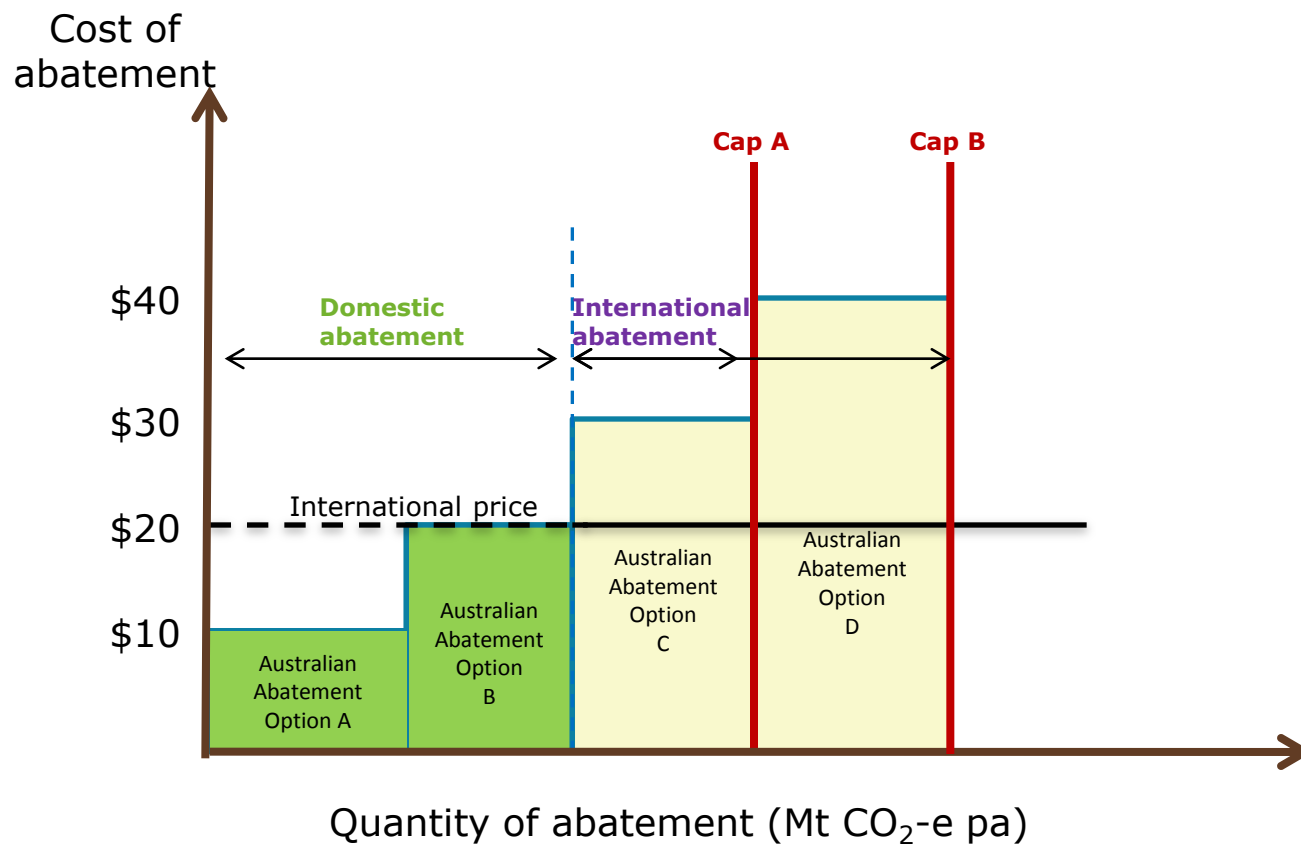
Limitations of modelling

- GE modelling lacks regional/locational detail
- Cost of abatement is uncertain
- GE modelling assumes no negative cost abatement available
 - Sectoral/Expert based analysis can help
- Difficulties merging detailed sectoral models (partial equilibrium) with GE modelling

Modelling different policy mechanisms

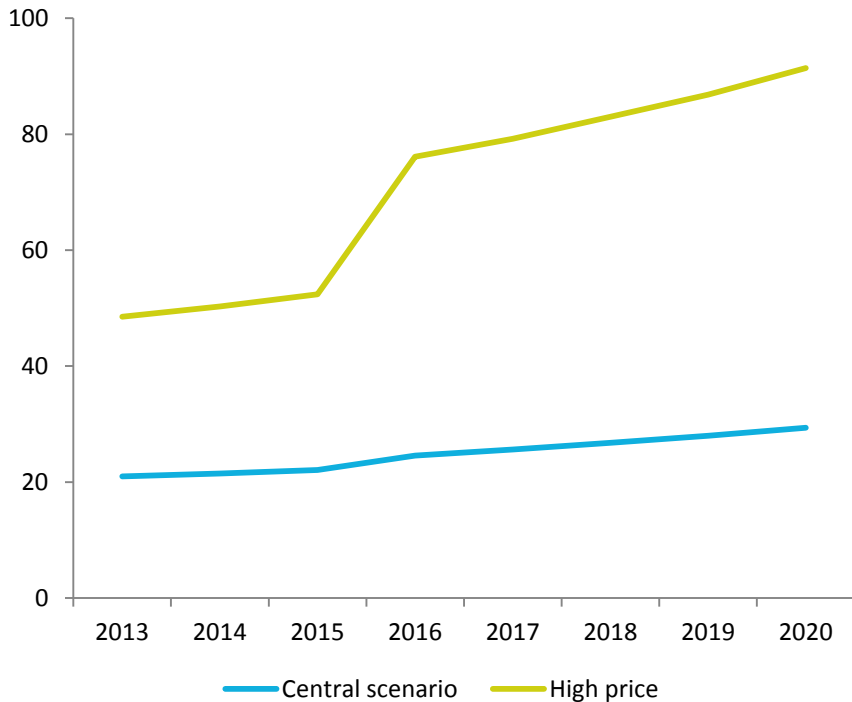
- Government policy options
 - emission trading scheme, carbon tax, regulations
 - All put an explicit or implicit price on emissions
- Modelling differences
 - Tax: Price fixed, expected emissions modelled
 - ETS (domestic): Quantity fixed, price modelled
 - ETS (price taker): Quantity fixed, price fixed, imports modelled

Effect of an internationally-linked scheme on the quantity, source and cost of abatement



Modelling results – Australian carbon price scenarios and emissions

Real carbon price (2010 A\$/t CO₂-e)



Annual emissions (Mt CO₂-e)

