

ClimateWorks
AUSTRALIA



Australian
National
University

PATHWAYS TO DEEP DECARBONISATION IN 2050

HOW AUSTRALIA CAN PROSPER
IN A LOW CARBON WORLD

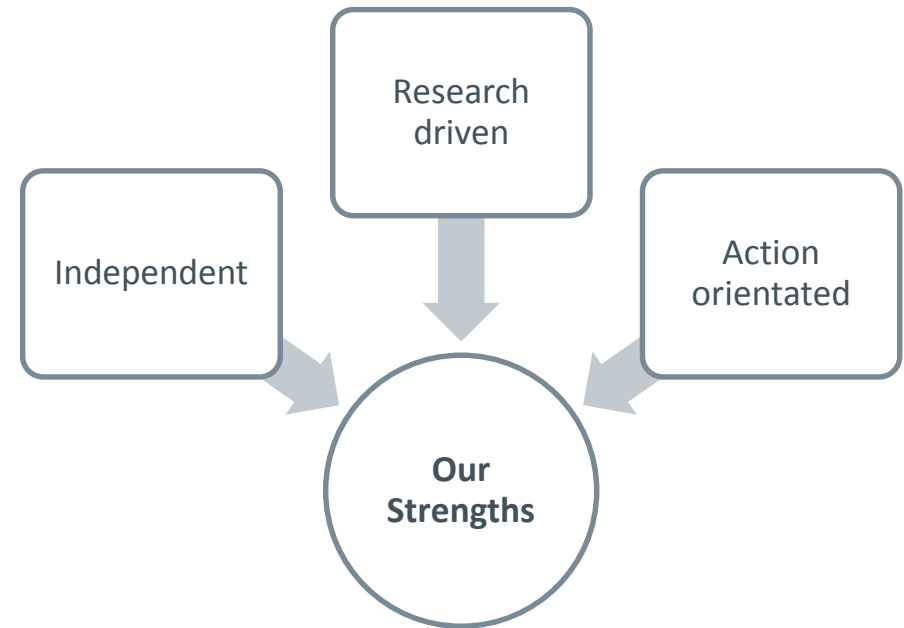
Motu Economic and Public Policy Research

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ClimateWorks Australia is a non-profit partnership between Monash University and the Myer Foundation

Our Mission: Catalyse action to substantially reduce Australia's greenhouse gas emissions



1. Project background

2. Deep Decarbonisation pathways for Australia

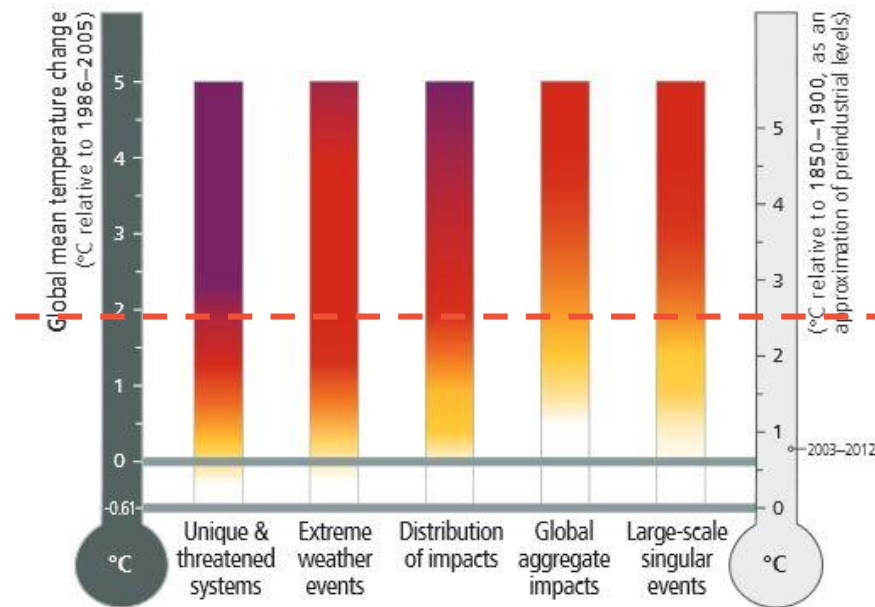
3. International results



In the Copenhagen Accord, 141 governments agreed that to reduce the risk of dangerous climate change, global warming must be limited to 2°C

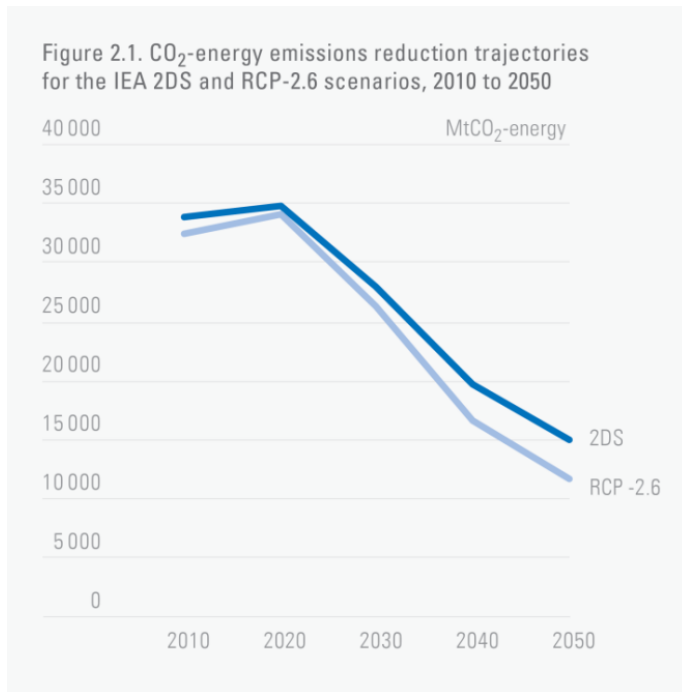
2°C

Impacts of climate change – the 2 degrees threshold

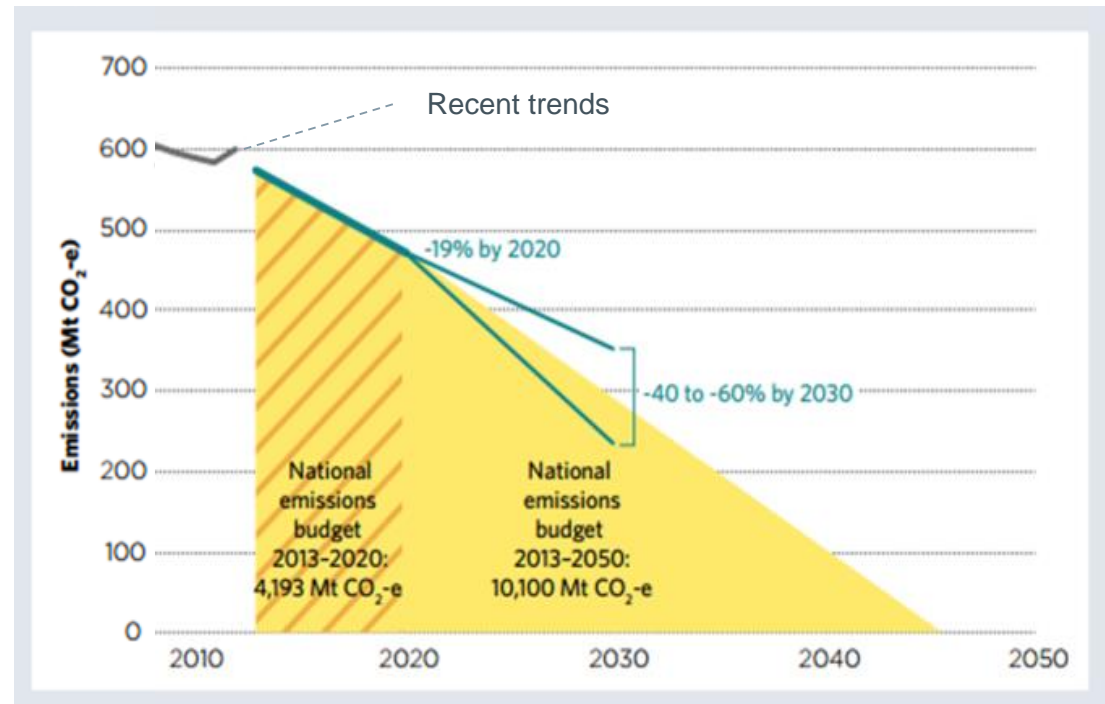


This means fast and deep emissions reductions across the globe, and for Australia reaching zero emissions around 2050

Energy emissions reductions required to reach 2 degrees target (SDSN, 2014)



Recommended equitable emissions trajectory for Australia (CCA 2014)



The Deep Decarbonisation Pathways Project consists of 15 country teams representing over 70% of global emissions



The global project aims to support global negotiations by shifting mindsets

? How can 2°C be achieved?

- Focus on problem solving
- Long-term perspective
- Need for global collaboration



1. Project background

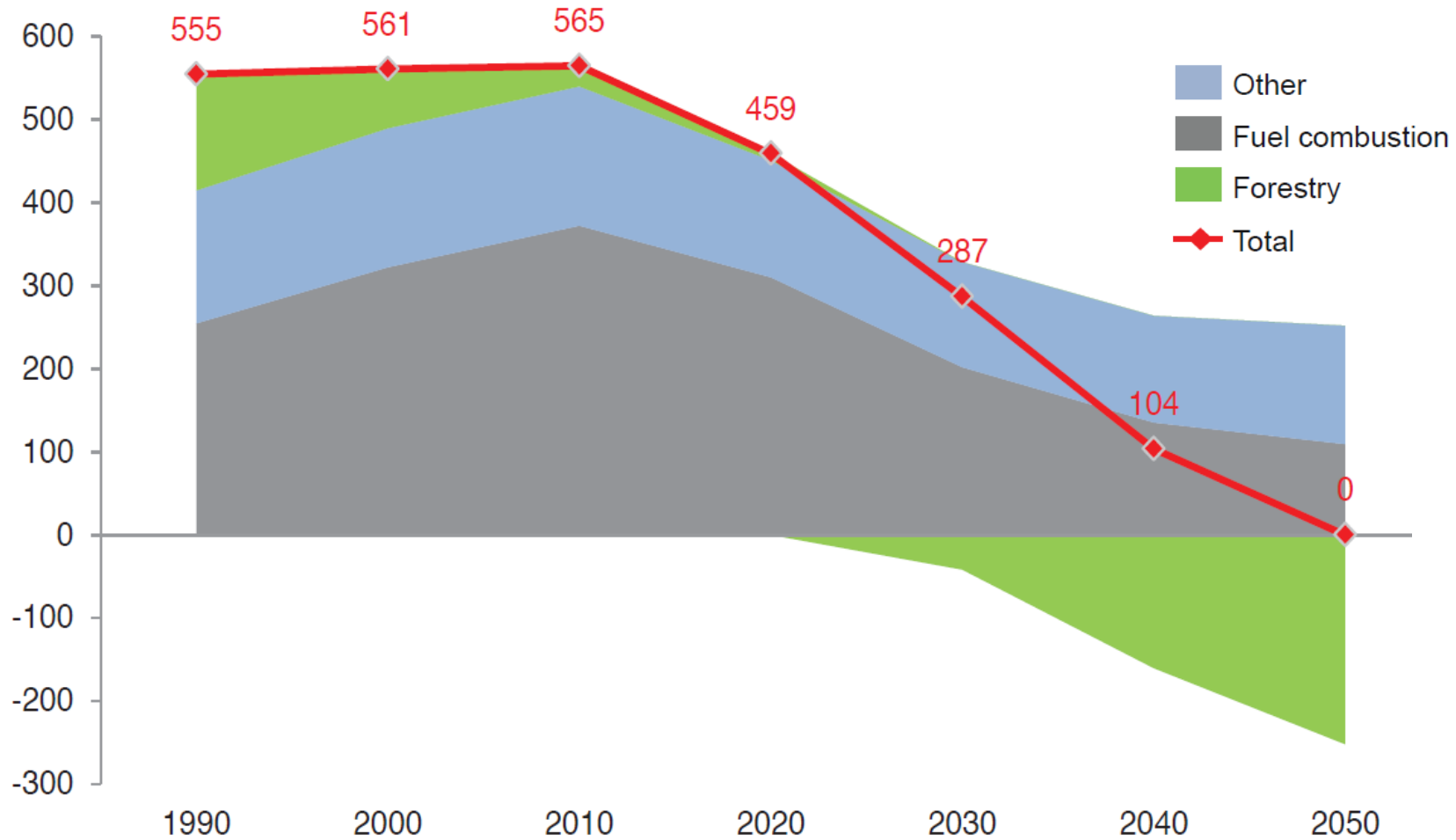
2. Deep Decarbonisation pathways for Australia

3. International results



Australia can achieve zero net emissions

Greenhouse gas emissions trajectory for illustrative pathway, MtCO₂e, 1990-2050



Deep Decarbonisation relies on four “pillars” of transformation

ENERGY PILLARS - COMMON TO TALL COUNTRIES

Ambitious Energy Efficiency

in all sectors leads to a halving of the energy intensity of the economy.



Low Carbon Electricity

Low carbon electricity is supplied by renewable energy or a mix of renewable energy and either CCS or nuclear power at similar costs.



Electrification and Fuel Switching

from fossil fuels to bioenergy, and from coal and oil to gas reduces emissions from transport, industry and buildings.



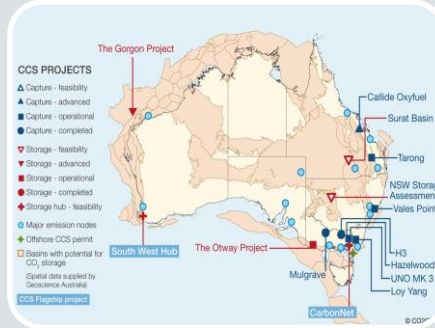
Non-Energy Emissions

are reduced through process improvements and CCS in industry, while a profitable shift from livestock grazing to carbon forestry offsets any remaining emissions.

CCS



Australia has world class resources for decarbonisation of energy systems, and has vast land available for carbon forestry for offsetting residual emissions



Renewable energy

Abundant supply of world class resources in wind, solar, biomass, wave and geothermal for energy production

Geological storage

Wide variety of geographically dispersed basins for carbon capture and storage

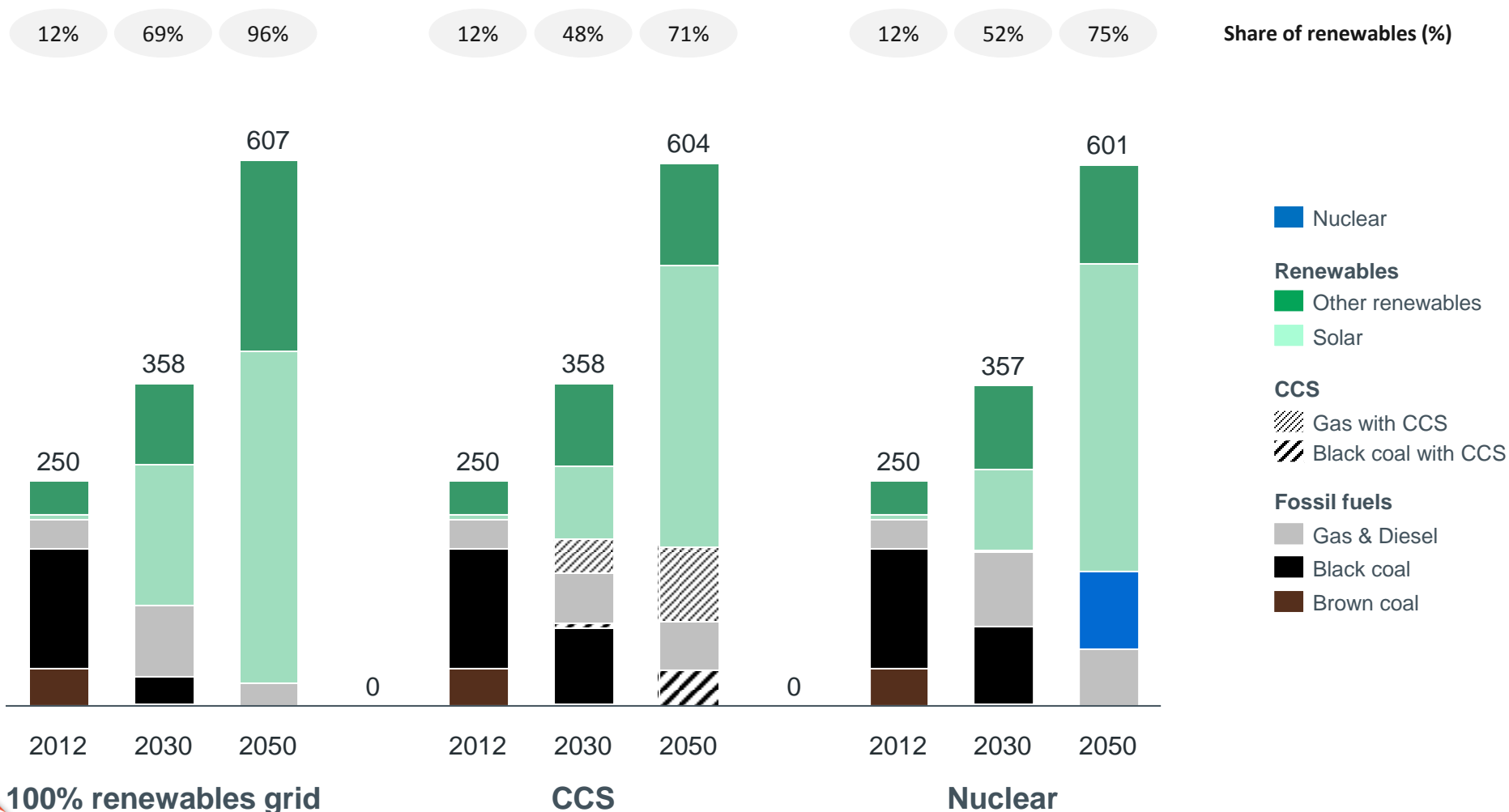
Arable land

Highest area of arable land per capita of all G20 countries, which could be used for carbon forestry



Australia's electricity grid can be almost completely decarbonised, using renewables or a mix of renewables and either CCS or nuclear, at similar costs

Generation for three electricity scenarios, TWh



This decarbonised electricity can then be used to replace fossil fuels in buildings, industry and transport

Buildings



Industry

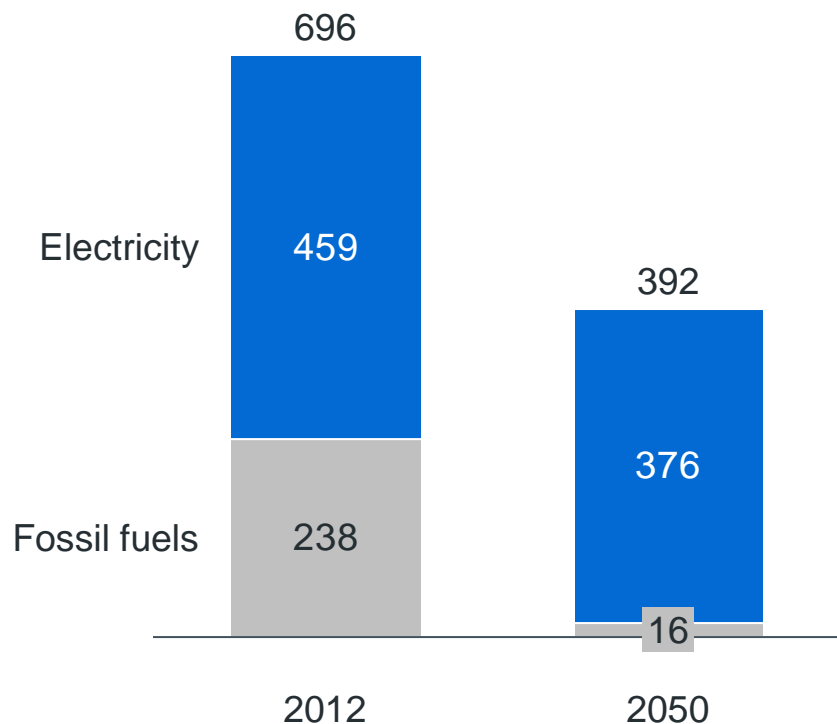


Transport

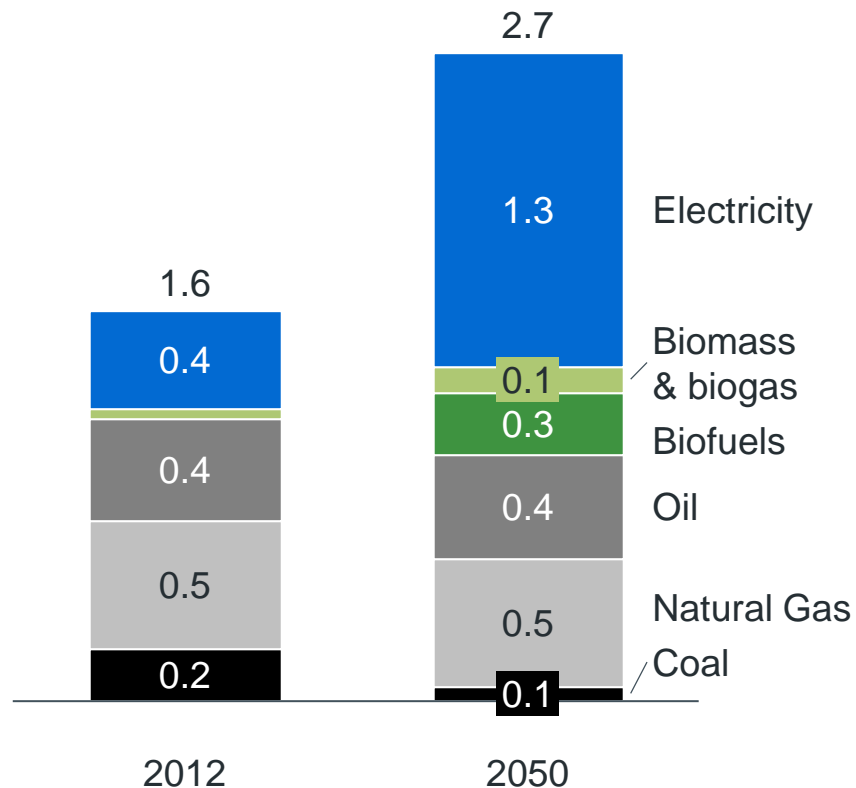


Industry and buildings energy emissions are significantly reduced through energy efficiency, electrification and a shift to low carbon fuels

Buildings energy use, PJ

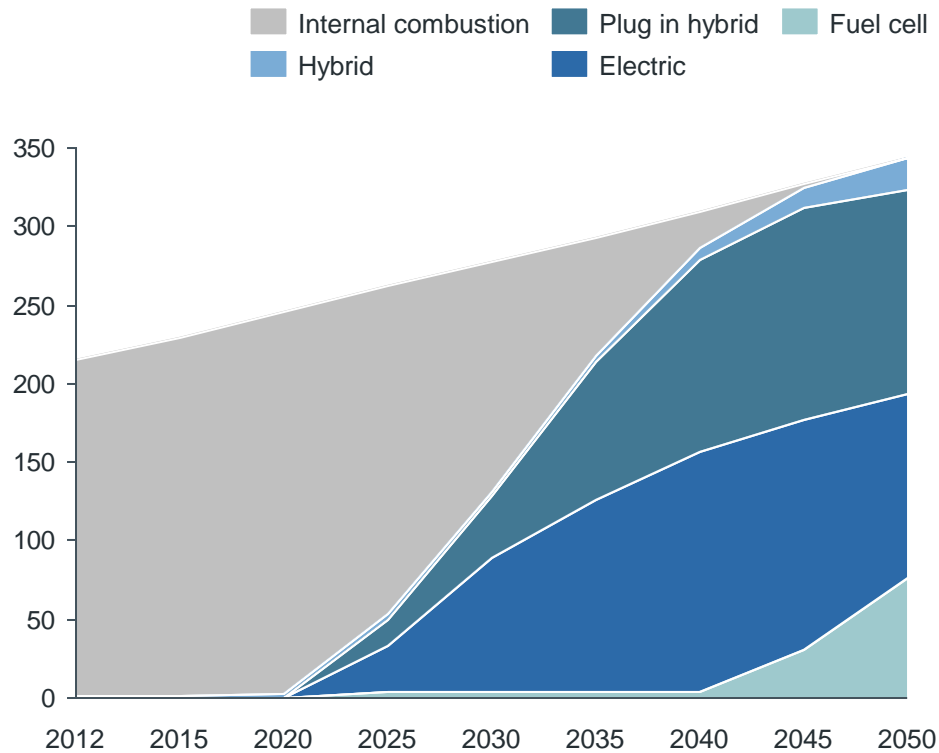


Industry energy use, EJ

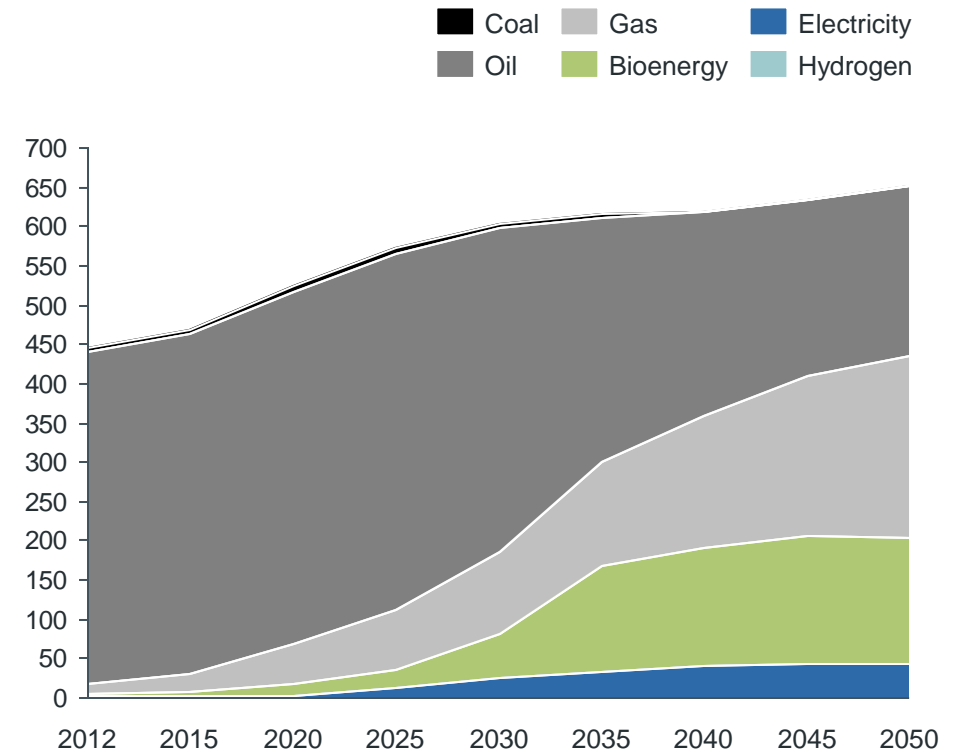


Decarbonisation of transport in Australia could be achieved through switching to electric, hybrid, and fuel cell cars, and to gas for trucks and bioenergy for planes

Cars & Light Commercial Vehicles drive type,
Billion vehicle kms travelled



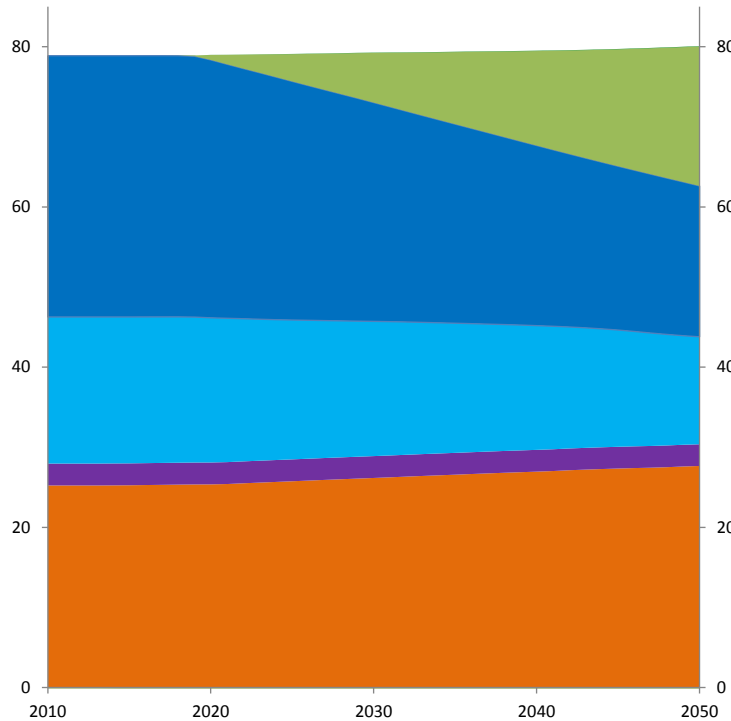
Fuel use for freight and aviation transport,
PJ



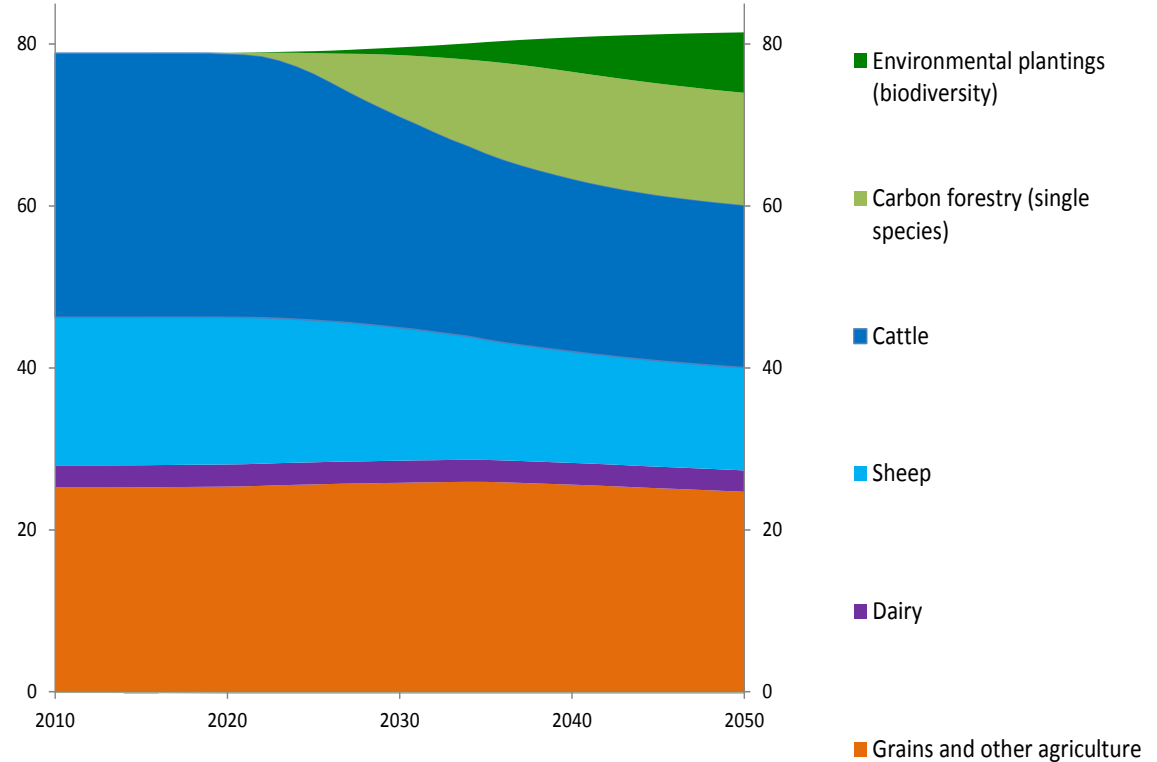
A shift from cattle grazing to carbon forestry where profitable full offsets residual carbon emissions by 2050

Land use change occurring under illustrative land use scenarios

Complementary to 100% renewable grid scenario
4.3 GtCO₂e abatement delivered, with single species plantings and constraint on annual rate of planting

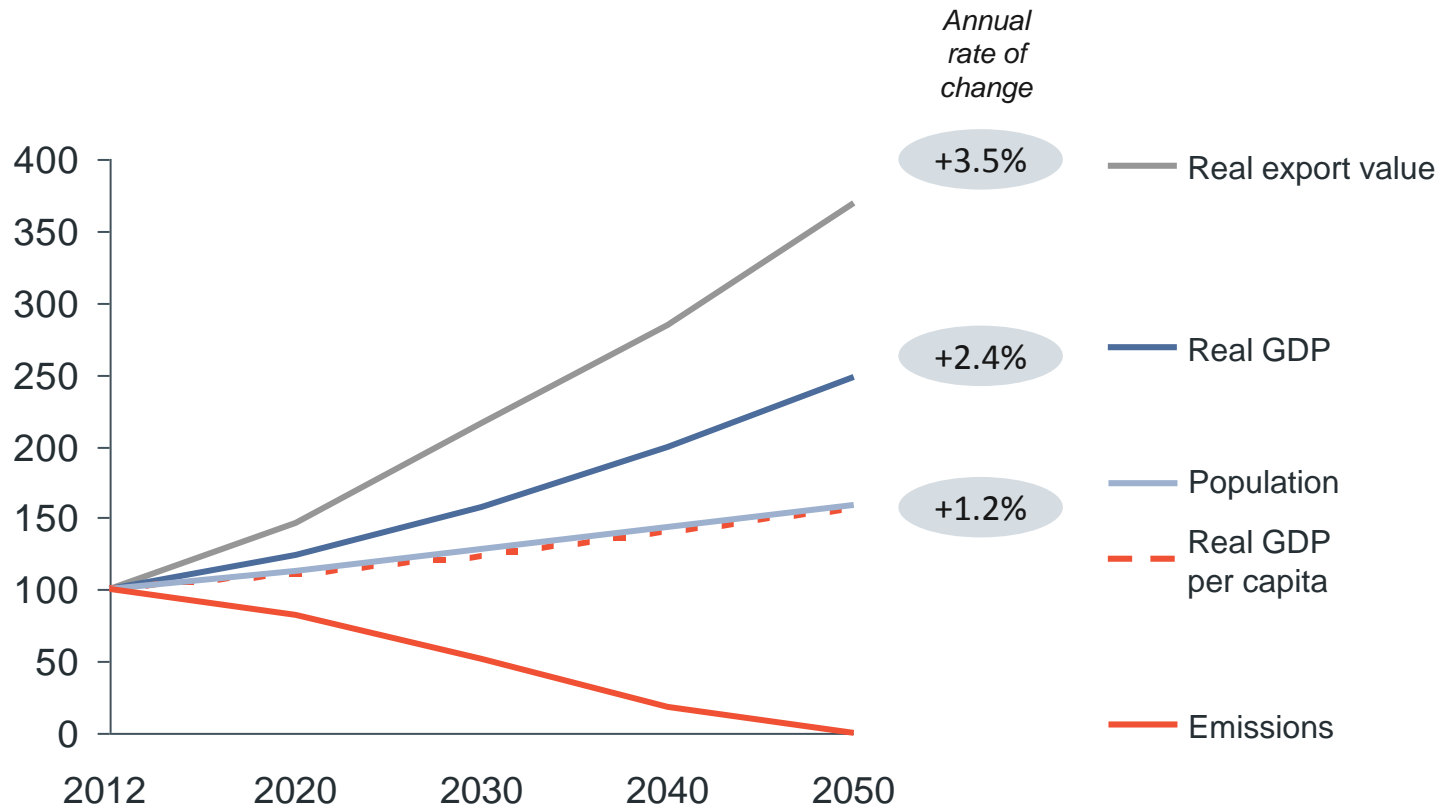


Complementary to CCS scenario
4.8 GtCO₂e abatement delivered, includes 35% of mixed native species and no constraint on annual rate of planting



Australia can decarbonise while GDP grows at an average annual rate of 2.4%, a similar rate to the past 5 years

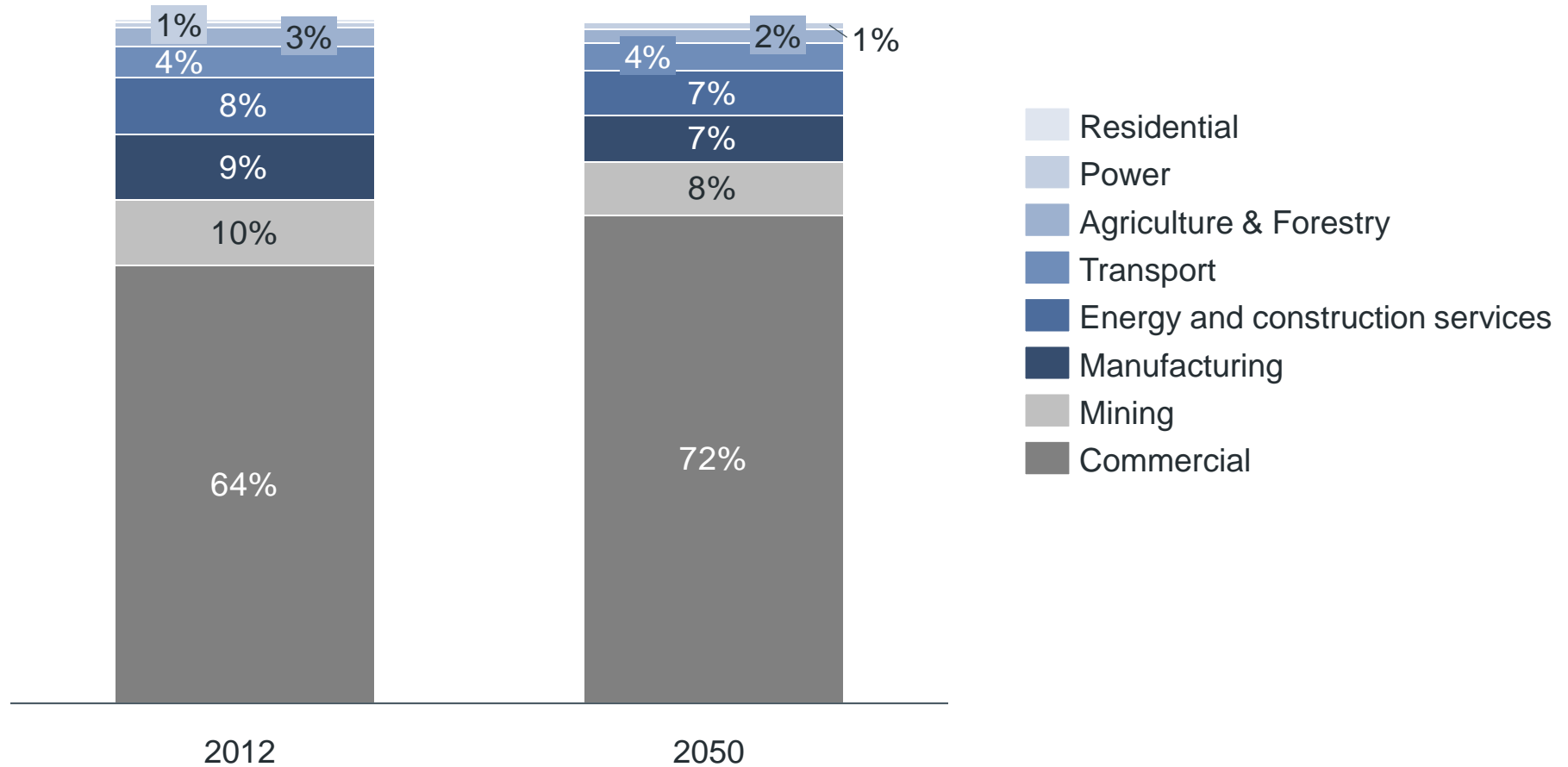
Key economic indicators (and emissions), indices



* The modelling comprises a reference case as a technical assumption, which overstates the economic cost incurred. Under this scenario, the annual growth in GDP would be 2.6% by 2050 of 2.4%. This reference case assumes no climate change mitigation in Australia, while the rest of the world undertakes mitigation. The reference case thus overstates the degree of action required and economic cost incurred. Any actions to reduce emissions, such as those that have already been taken in Australia, reduce the cost compared to the estimates provided here.

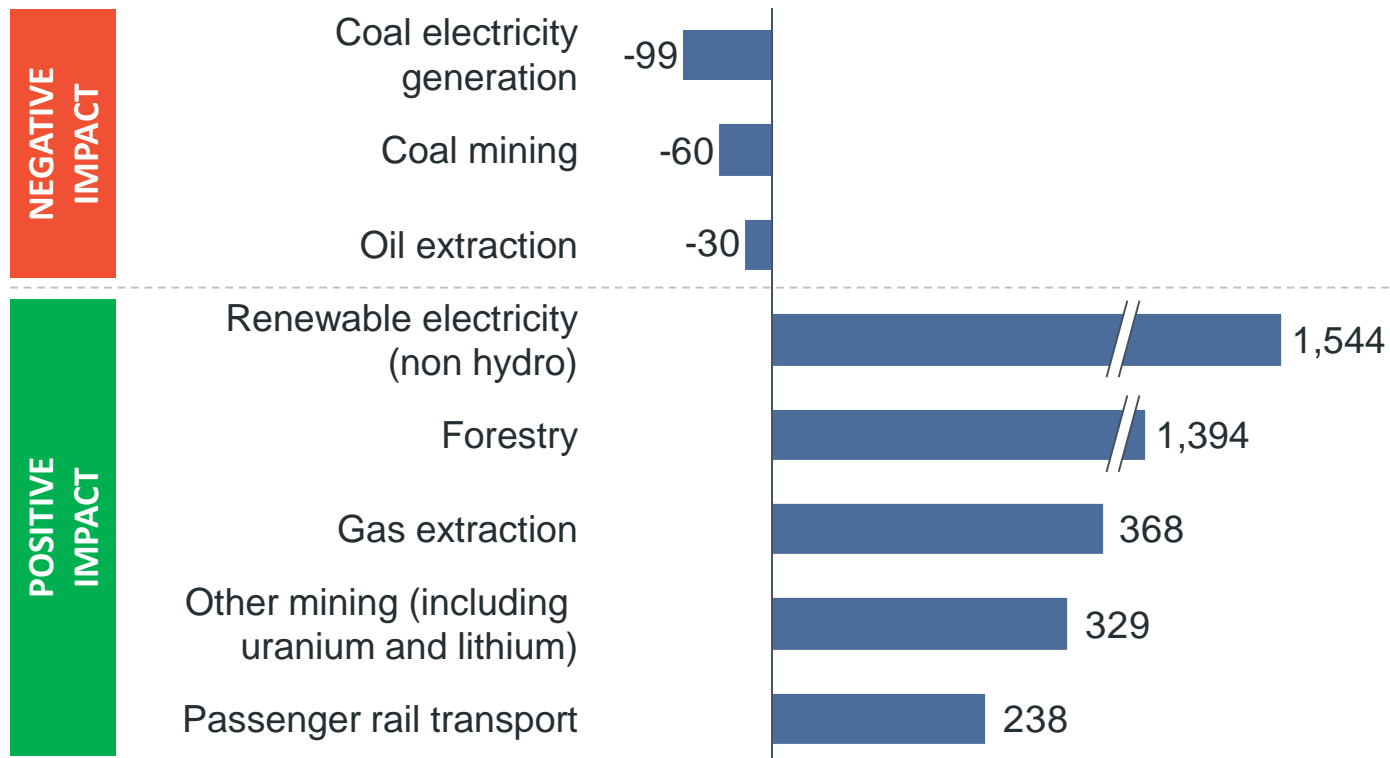
The structure of Australia's economy would not need to change significantly, with continued mining and manufacturing while services continue to grow

Figure 18 – Sectoral contribution to GDP, %

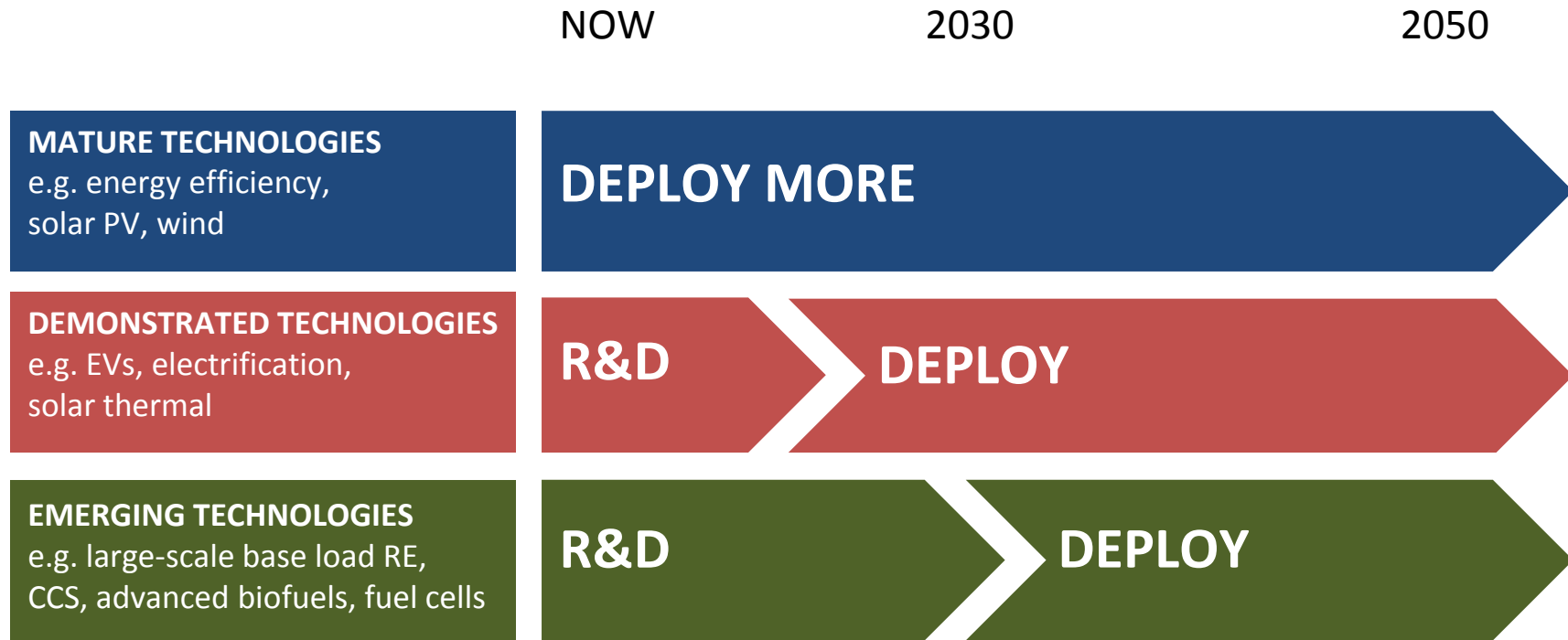


Coal and oil are most negatively impacted, while many sectors benefit from decarbonisation in Australia and globally

Key sectors impacted by decarbonisation,
Growth in value added between 2012 and 2050 in %



R&D is required to prepare for large-scale technology deployment from around 2030



Today it might be hard to imagine how we might achieve this, but a lot can happen in 36 years...

- In 1933 the world was still emerging from the great depression but by 1969...
- Today, solar panels cost 95% less than in 1980 and over 50% less than in 2010
- 20 years ago very few people had an email address
- 7 years ago very few people had a smartphone



In order to meet the carbon budget, decisions must be made in a long-term context, and action needs to start now

Key success factors to enable deep decarbonisation

Implication for government

Accelerate action now to reduce emissions

- Implement **profitable opportunities** e.g. energy efficiency
- Will **reduce the cost of action** and provide flexibility in future

Incentives for early action

Increased 2020 target

Avoid lock in of emissions intensive technologies

- Provide **clear long-term signals** to inform investment decisions
- Ensure **new assets** are compatible with the long-term pathway

Standards on vehicles, buildings, new developments

2050 emissions reductions target

Prepare for the future

- **Invest in R&D** to fill technology gaps and reduce costs
- Build the **supply chains, skills and capabilities**
- Develop country, region and sector **pathways** to help transition

R&D and pilot programs

Support pathways development



1. Project background
2. Deep Decarbonisation pathways for Australia
3. International results

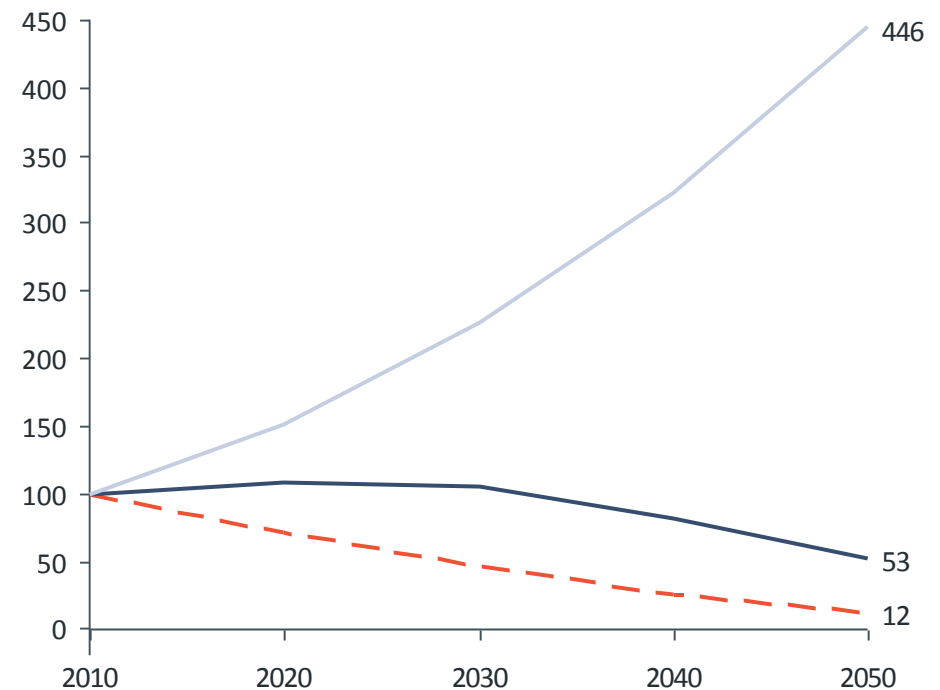


The global report finds that emissions can be halved while the global economy more than quadruples

Key project findings:

- Decarbonisation of energy systems is **possible** in all major emitting economies studied
- **Economic growth** and population growth are compatible with decarbonisation
- **Global collaboration** will be required, in areas such as R&D, trade, and financing mechanisms

Energy related CO2 emissions reduction and GDP growth trajectories, indices , 15 DDPs

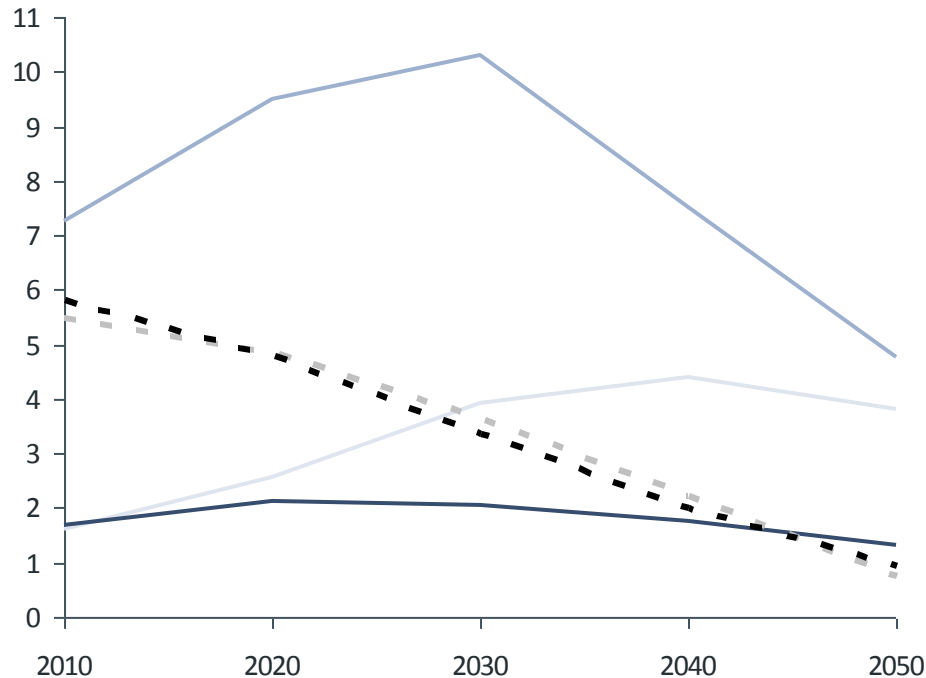


Developed economies achieve deep reductions in emissions while developing economies reverse their growth in emissions

Energy related CO2 emissions reduction trajectories, GtCO₂e

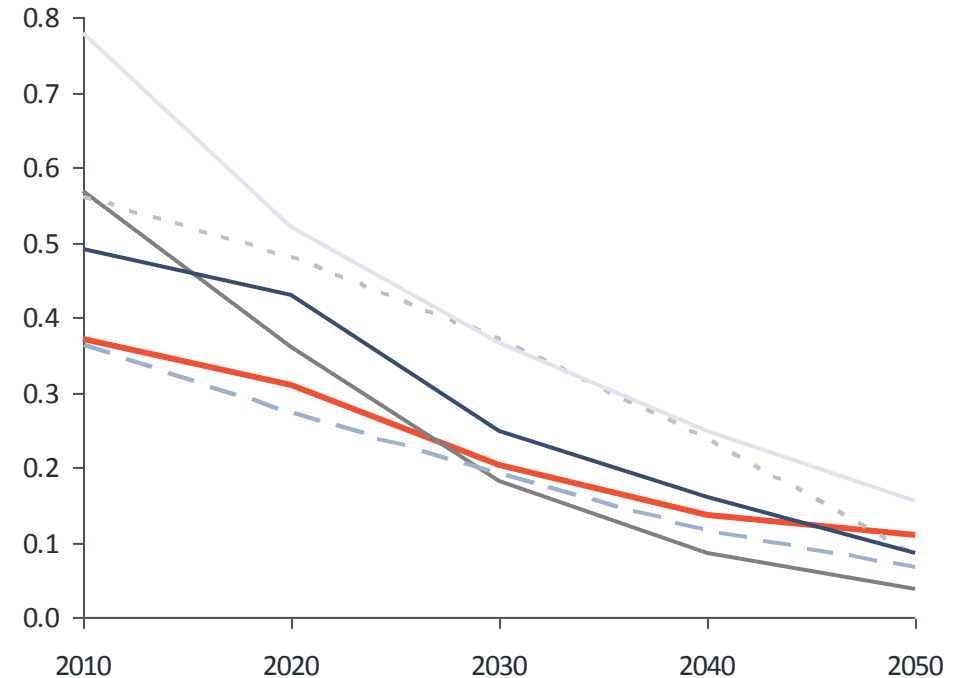
Summary of 15 DDPs

- India
- China
- Other developing economies*
- USA
- Other developed economies**



Australia and comparable countries

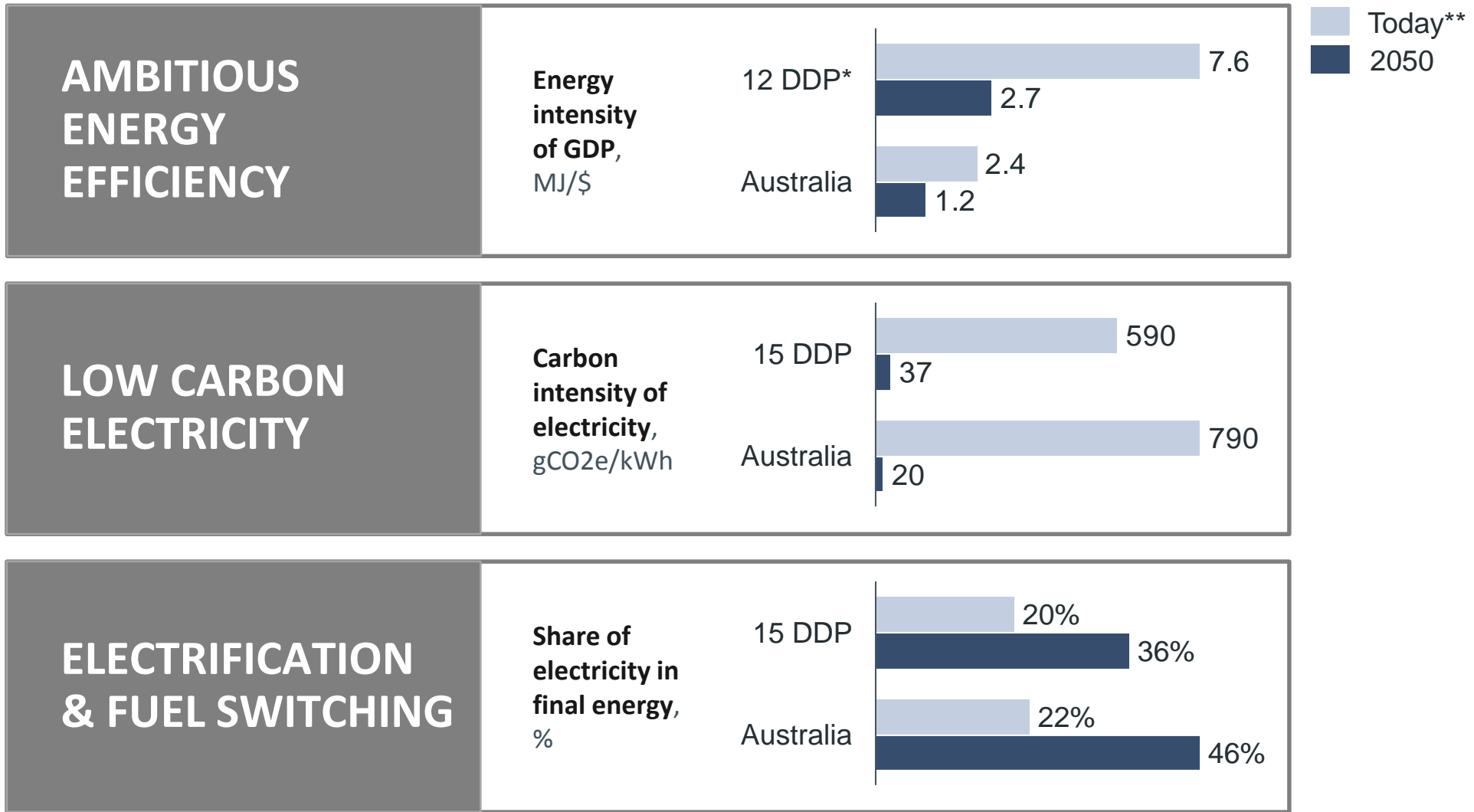
- Australia
- Canada
- UK
- South Korea
- France
- Germany



* Includes: Brazil, Indonesia, Mexico, South Africa; ** Includes: Russia, Japan, Germany, Australia, UK, South Korea, France, Canada



All countries experience deep transformations of their energy systems along the three pillars

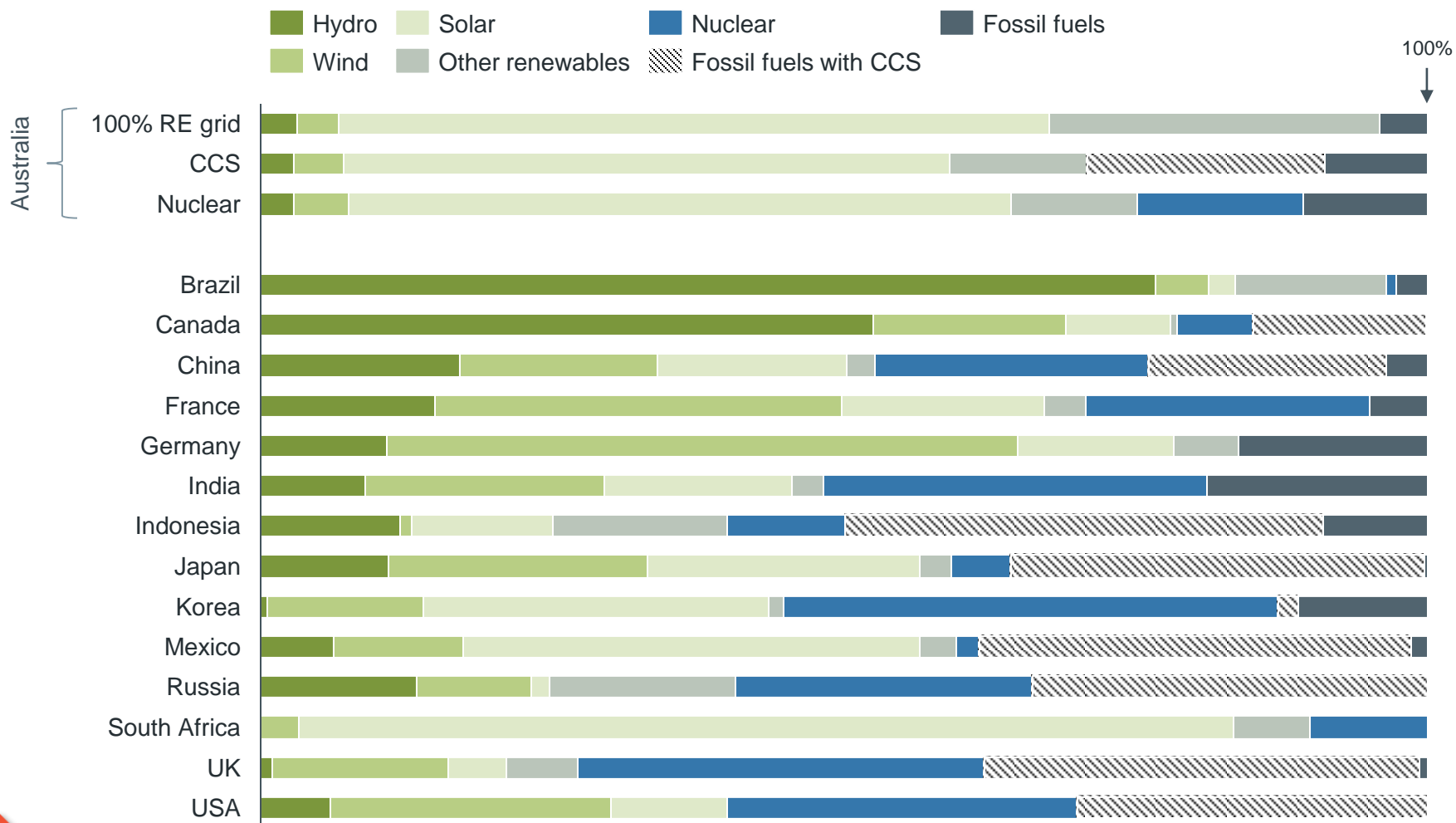


* Based on complete country chapters, excluding India, Brazil and Germany; ** 2012 for Australia, 2010 for DDP countries



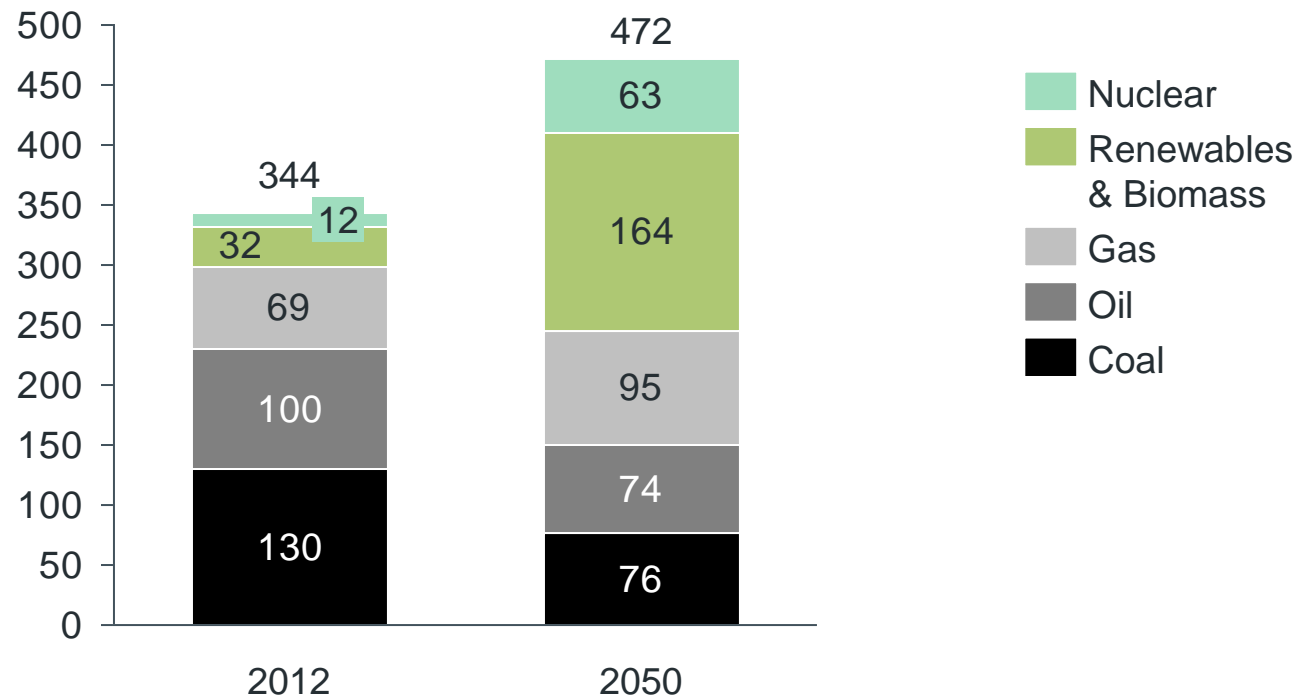
Low carbon electricity is supplied from a combination of renewables, nuclear and CCS

Electricity generation mix in 2050 for the 15 DDPs



Coal and oil use decrease while gas increases moderately and renewables and nuclear grow very significantly

Primary energy use, 15 DDPs, EJ



Next steps

Global project

- Deeper decarbonisation scenarios
- Investment implications

Australian project

- Engagement with business, investors and government
- Communication (including my2050 tool)

New Zealand

- Join UN Sustainable Development Solutions Network*?
- Development of a Deep Decarbonisation Pathway?

*free and open to universities, research institutions, foundations, civil society, and other organizations with expertise in sustainable development.





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FOR FURTHER INFORMATION:

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