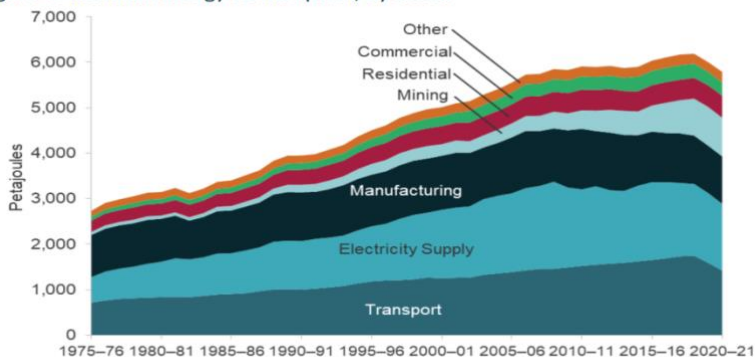


# Plan towards achieving net zero CO2 emissions by 2050 for Australia

## ENERGY DEMAND

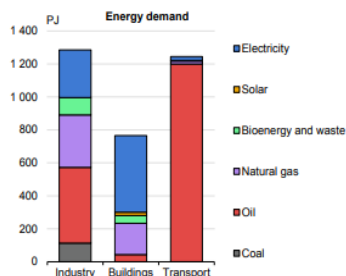
Figure 4 Australian energy consumption, by sector



Source: Department of Climate Change, Energy, the Environment and Water (2022) Australian Energy Statistics, Table E

Side image shows Australian energy consumption of various sectors which shows that mainly energy consume by transport ,electricity and manufacturing sector

## Demand management

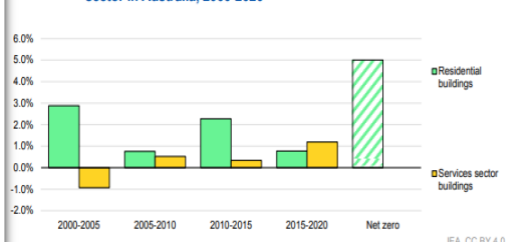


Notes: PJ = petajoule; TWh = terawatt hour.  
Source: IEA, (2022).

- Energy demand is highest in the industry sector, followed by transport and buildings (residential and service based buildings).
- Fossil fuels fulfil industry and transport sector demands, while electricity fulfils building demands.
- About 25% and 60% of demand are met by electricity in industry and buildings, respectively.

## Plan for demand reduction

Figure 4.6 Average annual energy efficiency improvements in the buildings sector in Australia, 2000-2020



Average annual energy efficiency improvements in the residential sector are decreasing and energy efficiency improvements in the service sector are increasing.

## Building:

Implementing National Construction Code (NCC) for residential and service based buildings from 2022

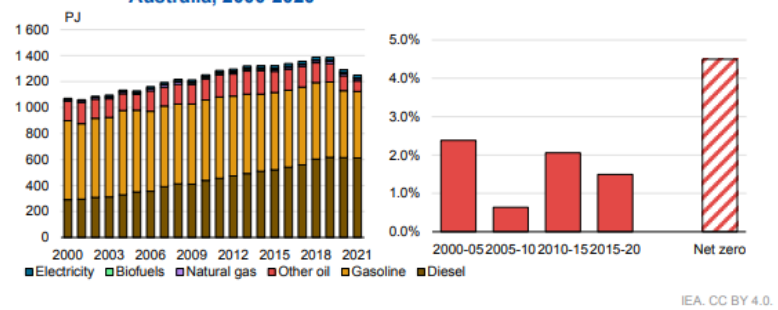
shows improvement of energy efficiency in building

- Developing and expanding targeted building policies, improving heating
- Focus on passive cooling

## Transport

- By Developing newer engines and technologies which have higher fuel efficiency
- Government make different policies for road vehicle and rail, marine, and aviation

Figure 4.11 Total final consumption in transport by fuel, 2000-2021 and average annual energy efficiency improvements in the transport sector in Australia, 2000-2020

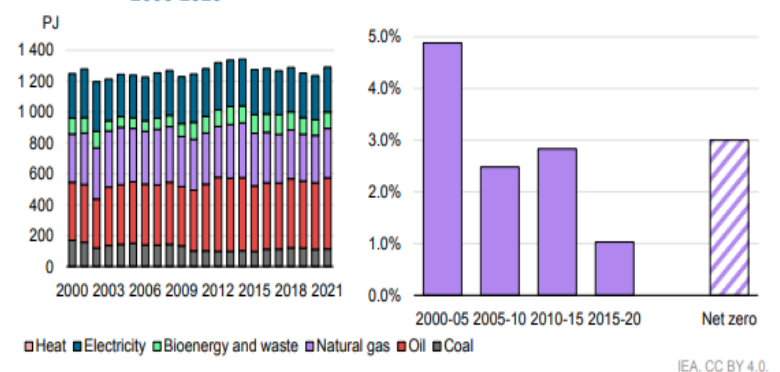


TFC in transport has increased since 2000, mostly driven by diesel demand. Average annual energy efficiency improvements have been in decline and remain far from net zero.

## Industry:

- Some set of standards apply to electric motors, chillers, refrigerates. Three additional products (pumps, air compressors and boilers) were identified as top priorities in the E3 Program 2021-2022
- Use recycling

Figure 4.9 Total final consumption in industry by source, 2000-2021, and average annual energy efficiency improvements in industry in Australia, 2000-2020



Oil and natural gas dominate industry's energy consumption. Average annual energy efficiency improvements are down from past levels, far from net zero emissions improvements (3%).

By applying measure for reducing demand we are estimated table given below (table 1). By analysis, it is observed that the total demand will come down by a net 36% than the projected demand in the literature.

Sector

Energy demand in 2050 (Literature)  
(PJ)

Energy demand in 2050  
(Analysis) (PJ)

<u>Industries</u>	<u>1846</u>	<u>1384.5</u>
<u>Transport</u>	<u>1704</u>	<u>1193</u>
<u>Buildings</u>	<u>1136</u>	<u>420.32</u>
<u>Total</u>	<u>4686</u>	<u>2997.82</u>

**Table 1**

## Energy generation

- Black coal contribute most to the energy production. Brown coal production decline 3 % in 2021–22 to 416 PJ .
- Natural gas keeps on rising
- Renewable energy increasing 10 % to reach 513 PJ in 2021–22. Wind and solar were the major sources of growth. RE accounted for 3% of total energy production in 2021–22

Australian energy production - by fuel type

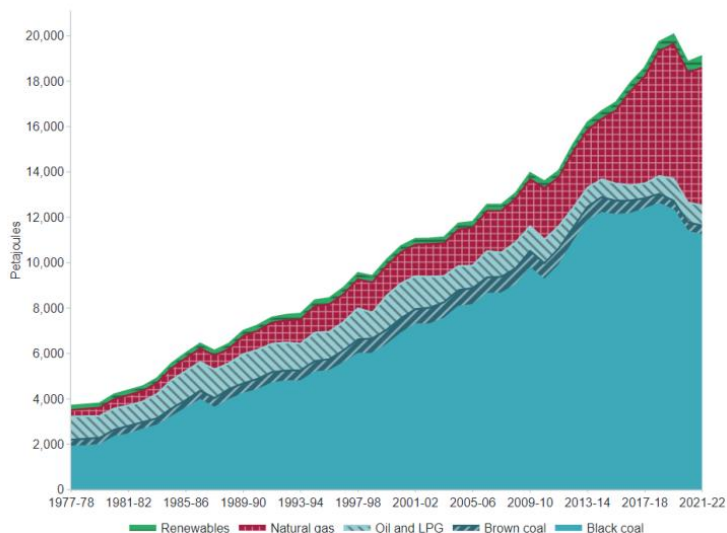
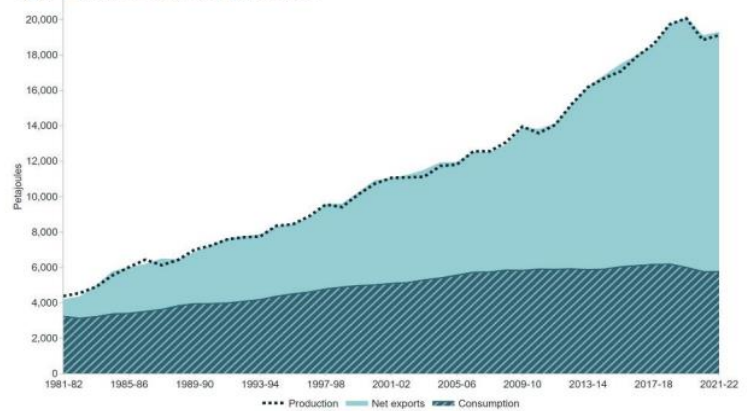


Figure 14 Australian energy balance



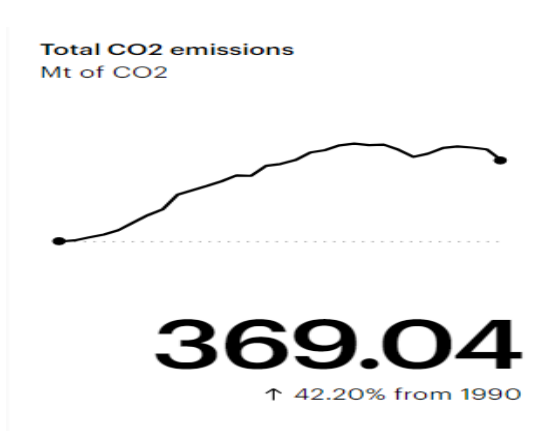
Note: Production equals Consumption plus Net exports, difference between these is statistical discrepancy.

Source: DCCEEW (2023) Australian Energy Statistics, Tables C, J

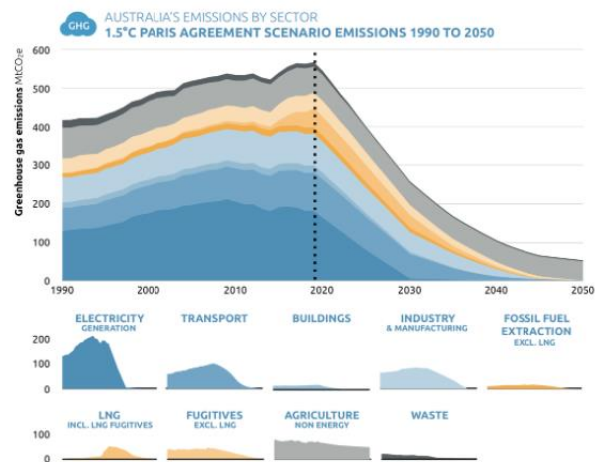
Australia is a net exporter of energy, including coal and natural gas, with net exports equating to over 2/3<sup>rd</sup> of production

## CO2 emission till now as of 2023

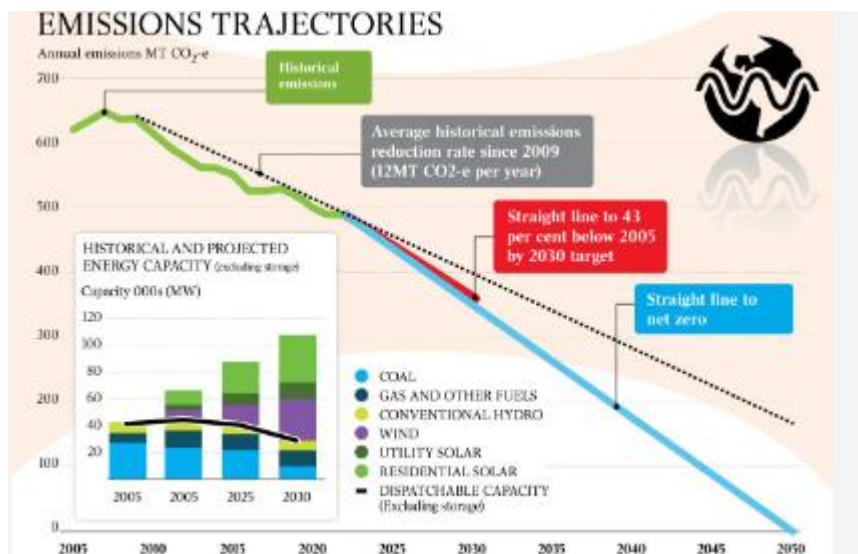
As per this graph, CO2 emission is 369mt



by 2021 that increase 42.20% from 1990 (iea report)



if we make usual trajectory and estimate the projection of emission for different sector by 2050, we are able to see that emission is decreasing, but not to zero emissions (right image source :climate action tracker)



*Net zero scenerio*

## Carbon capture and storage

- Australia was an early starter in CCS as compare to other countries.
- Geological storage has greatest technical potential for sequestration with 227 Gt total. It was estimated that if all geological storage projects in development are install, an estimate for economic sequestration will be of 50Mt per year for 2050.

- nature-based solutions have good technical potential for sequestration with technical potential sequestration of 480Mt per year, 631Mt per year and 115 Mt per year, respectively, by 2050.
- Below table shows various technology and natural ways of Present carbon sequestration and estimated 2050(table 1)

**Table 1. Economic potential estimated for 2050 and actual carbon sequestration levels for 2021–22 with corresponding length of storage**

TECHNOLOGY TYPE	ECONOMIC POTENTIAL SEQUESTRATION 2050 (MT PER YEAR)	ACTUAL SEQUESTRATION 2021-22 (MT PER YEAR)	LENGTH OF STORAGE (YEARS)
Permanent plantings	16	2.1 <sup>1</sup>	25–100
Plantation and farm forestry	32	11.5 <sup>1</sup>	25–100
Human induced regeneration of native forest	39	20 <sup>2</sup>	25–100
Avoided clearing	7.7	2.3 <sup>1</sup>	25–100
Savanna fire management	6	5.6 <sup>1</sup>	25–100
Soil carbon	5–29	0	25–100
Blue and teal carbon	No estimate	1.1 <sup>1</sup>	25–100
Pyrolysis biochar	No estimate	<0.1	>500
Geological storage	50	2.26 – (Gorgon project 2020-21)	>million
Bioenergy carbon capture and storage	25–38	No estimate	>million
Direct air capture	No estimate	No estimate	Depends on storage technology
Mineral carbonation and enhanced weathering	No estimate	0.1	>1000

Summary of technology potential. <sup>1</sup>AGEIS 2010-2020. <sup>2</sup>AGEIS 2016-2020  
Footnote: AGEIS – <https://ageis.climatechange.gov.au/>

## CCUS POLICIES

Australia has around 16 commercial CCS projects in operation or development, notably out of which some are mentioned here

- Gorgon CO<sub>2</sub> Injection Project: the facility have potential to capture up to 4 Mt CO<sub>2</sub> per year from natural gas processing. The project has stored over 7 Mt CO<sub>2</sub> since August 2019.
- Carbon Transport and Storage Company Surat Basin CCUS Project:
- Santos Moomba CCS Project: can store 1.7 Mt CO<sub>2</sub> per year in the same reservoirs that held oil and gas in place for tens of millions of years. The project is expected to become operational in 2023.
- CarbonNet Project: CarbonNet aims to provide a decarbonisation solution to emitting industries via a shared infrastructure pipeline for geological sequestration in the Gippsland Basin.

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