Australia's Power Supply
Brown and polluting

KEY FACTS

CLIMATE ANALYTICS

Electricity emissions contribute a third of Australia's total greenhouse gas emissions.

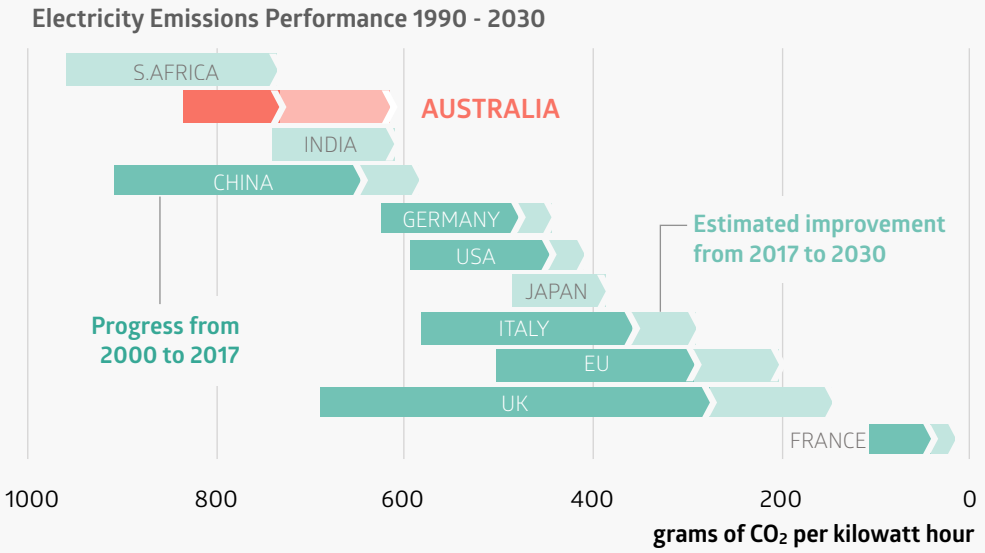
The Paris Agreement's 1.5°C limit requires that coal fired electricity be phased out by around 2030 in developed countries including Australia.

Coal accounts for 62% of electricity generation in Australia, helping make it one of the most polluting electricity grids in the world.

Australia has no national plan to manage the transition of coal fired power out of the electricity system.

Dependence on coal makes Australia's grid one of the dirtiest in the world

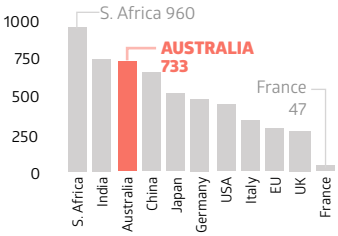
Australia has one of the most polluting electricity grids in the world. Coal accounts for about 62% of electricity generation in Australia, a proportion which is slowly declining, but which needs to rapidly accelerate so that it is close to zero by around 2030. Coal is the most carbon intensive fossil fuel and phasing it out is a key step to achieve the emissions reductions needed to limit global warming to 1.5°C,[1] as agreed in the Paris Agreement.



Electricity Emissions Intensity

g CO_2 / kWh

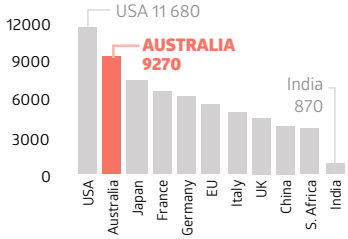
2017 Rank: 3rd last of 11



Electricity Consumption

kWh / person

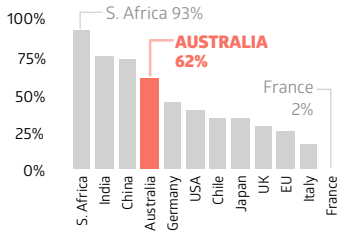
2017 Rank: 2nd last of 11



Coal Usage

% coal in total power

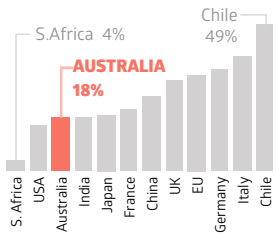
2014 Rank: 4th last of 12



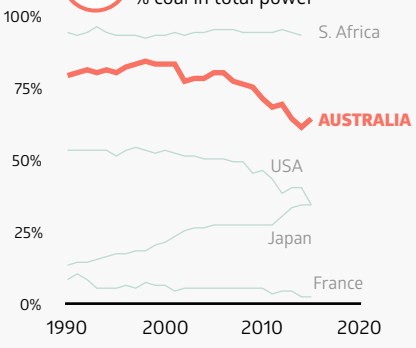
Renewables

% renewables in total power

2017 Rank: 3rd last of 12



Coal Usage
% coal in total power

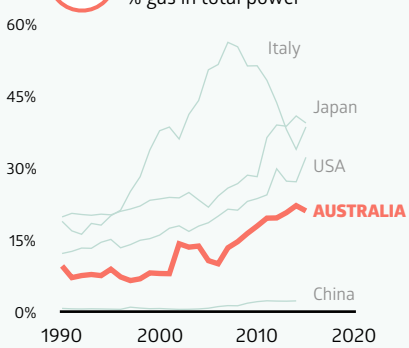


THE FUTURE FOR COAL UNDER THE PARIS AGREEMENT

OECD
PHASED-OUT
BY 2030

GLOBAL
PHASED-OUT
BY 2050

Gas Usage
% gas in total power

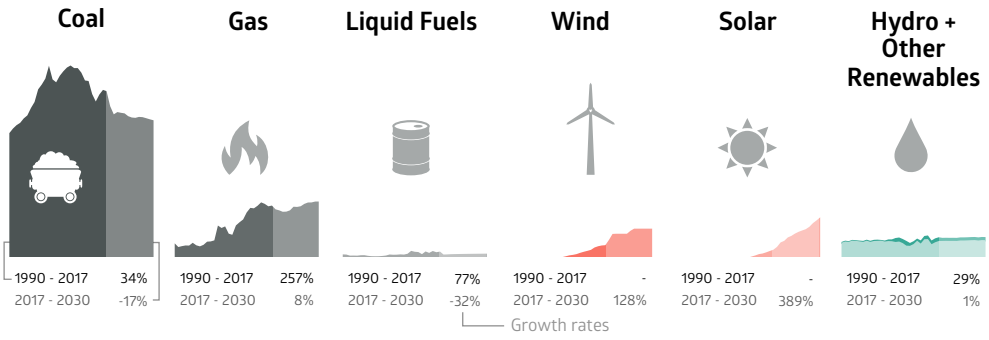


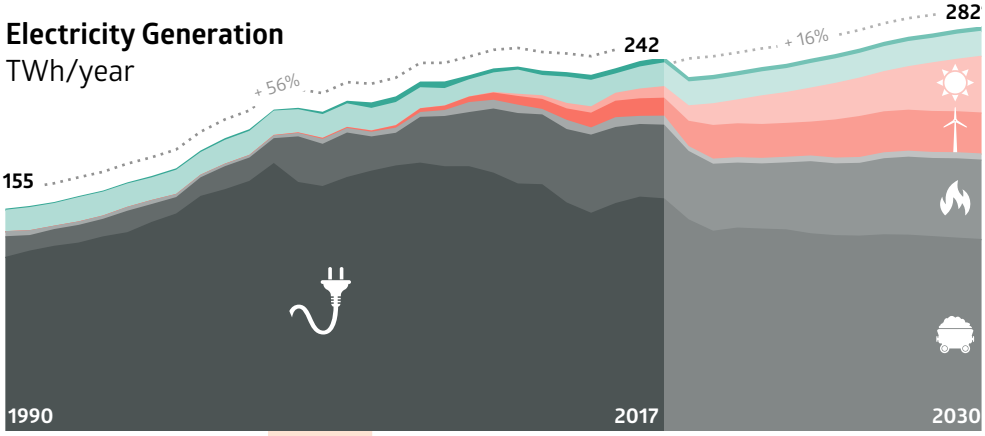
THE FUTURE FOR NATURAL GAS UNDER THE PARIS AGREEMENT

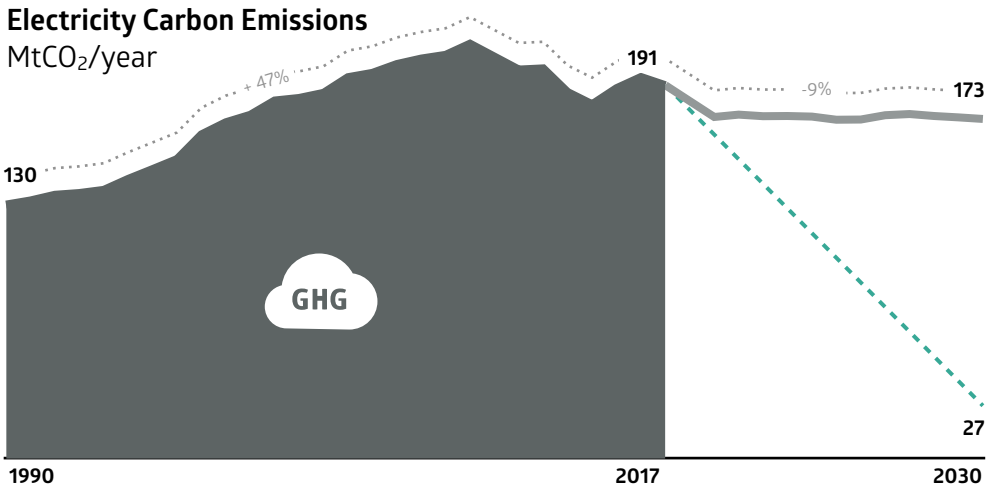
GLOBAL
PEAKING
BY 2020s

GLOBAL
PHASED-OUT
BY 2050

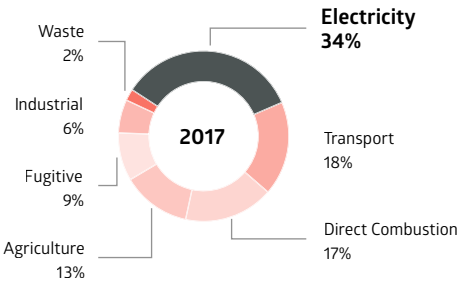
AUSTRALIA'S LARGEST POLLUTER IS ELECTRICITY







The power sector is the single largest contributor to greenhouse gas emissions, and contributes approximately one third of Australia's total emissions. Emissions are expected to slightly decline, then stay flat to 2030, in stark contrast to the downward trajectory needed to honour the Paris Agreement commitment.



Coal accounts for about 62% of electricity generation in Australia, and natural gas 20%. Renewables are at around 18%, with costs declining much faster than expected over the last decade, and expected to keep declining. Costs for solar photovoltaics alone have decreased by more than 50% since 2014.

Current Policies
9% reduction from 2017 levels

Paris Agreement 1.5°C Limit CO_2 Emissions Pathway
86% reduction from 2017 levels

THE PARIS AGREEMENT
WHAT DOES IT MEAN FOR ELECTRICITY?

The Paris Agreement, ratified by 181 governments, is a remarkable achievement for multilateralism and a landmark in the global fight against climate change. It aims to reduce the risks and impacts of climate change by holding warming to well below 2°C and pursuing efforts to limit it to 1.5°C above pre-industrial levels.[1]

Achieving the 1.5°C limit requires rapid decarbonisation of the overall economy and every sector will need to play its part. It is widely recognised that the electricity sector can - and must - decarbonise fastest, and then help decarbonise other sectors.

For the electricity sector this means that coal, as the most carbon intensive fossil fuel, needs to be phased out by around 2030 in developed countries like Australia. Natural gas, too, faces a dwindling role and needs to peak in the 2020s and be phased out towards the middle of the century, if large-scale reliance on negative emissions technologies is to be limited. There are numerous options for integrating renewables that reduce - and ultimately eliminate - the need for natural gas in the power sector, including on economic grounds. The future is renewables.

181 COUNTRIES
HAVE RATIFIED

1.5°C
TEMPERATURE LIMIT

WORLD ELECTRICITY
DECARBONISED BEFORE 2050

OECD COAL EMISSIONS
PHASED-OUT BY 2030

WORLD NATURAL GAS PEAKING BY 2020s
PHASED-OUT BY 2050

POLICY CHECKLIST

Electricity is one of the key sectors in the transformation needed to meet Paris Agreement-goals. Many countries across the globe are actively realising the potential of renewables and need for emissions reductions from the electricity sector. Policies to phase out coal are on the rise, but not in Australia.

NATIONAL TARGETS FOR RENEWABLE ELECTRICITY GENERATION

Renewable energy targets have long been a central mechanism behind the growth in renewables. Strong targets give market certainty and encourage investment.

Australia has a target that aims at generating 23.5% of electricity from renewables by 2020. There is no target for 2030, nor for 2050. The government has ruled out a target for 2030.

SPOTLIGHT ON: GERMANY

Germany has been a pioneer and significant driver towards renewable energy in the power sector. Germany's new government has, in 2018, increased its renewable energy target from 50% to 65% by 2030.

	Australia	USA	China	Japan	India	Chile	S. Africa	France	UK	Germany	Italy	EU
2020 Targets	✓	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓
2030 Targets	✗	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓
2050 Targets	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗

CARBON PRICING MECHANISM (CARBON TAX OR EMISSIONS TRADING SYSTEM)

Implementing a pricing mechanism on carbon allows the market to account for hidden cost of polluting the air. Not only does an effective carbon price make the economics more favourable for clean technologies, it creates a powerful incentive for markets to continually improve.

Australia has abolished its carbon pricing mechanism in 2014.

SPOTLIGHT ON: EU

Despite numerous flaws, the EU ETS system has operated for many years and has served as a model many nations have learnt from, including China. The biggest lesson: a relative scarcity of emissions permits must be maintained if an emissions market is to meet its overall goals.

Australia	USA	China	Japan	India	Chile	S. Africa	France	UK	Germany	Italy	EU
✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓

COAL PHASE-OUT DATE OR EMISSIONS PERFORMANCE REQUIREMENT

Direct policy such as a ban on coal based electricity or setting emissions standards on all power generation can accelerate the phase-out of coal. It is also important to establish a systematic framework to ease the transition away from coal in regions where coal plays an important role.

There is currently no policy to accelerate the phase-out of coal in Australia.

SPOTLIGHT ON: UNITED KINGDOM

The UK government has passed a bill that will make it illegal to burn coal for power generation purposes after 2025. This is one of the earliest phase-out dates in the world (See page 4 for more information).

Australia	USA	China	Japan	India	Chile	S. Africa	France	UK	Germany	Italy	EU
✗	✗	✗	✗	✗	⊖ under consideration	✗	✓ 2022	✓ 2025	⊖ under consideration	✓ 2025	✗

DECARBONISATION STRATEGY FOR THE ELECTRICITY SECTOR

Long-term clarity on a country's measures to decarbonise its electricity generation and integrate variable renewables is vitally important, both for investors and successful policy planning.

Australia has neither a long-term plan to decarbonise electricity generation, nor a clear action plan to integrate variable renewables into the system

SPOTLIGHT ON: GERMANY

Germany has a long-term energy transition strategy with ambitious renewable energy targets, policies and robust monitoring, providing investor and planning certainty needed for the transition.

Australia	USA	China	Japan	India	Chile	S. Africa	France	UK	Germany	Italy	EU
✗	✗	✓	✓	✓	✓	⊖ draft energy plan	✓	✓	✓	✓	✓

THERE ARE MANY REASONS TO GO RENEWABLE

Besides dramatically reducing Australia's carbon emissions and avoiding the worst impacts of climate change, there are many reasons to green our grids with renewable energy sources and storage technologies to provide clean, secure, affordable and reliable electricity. It is a win-win-win for people, the environment and the economy.

SAVE MONEY

Australian households and businesses are paying high electricity prices. Continuously falling costs of solar photo voltaic panels and wind will place downwards pressure on electricity prices. A decarbonised energy grid will save billions in upfront capital costs and consumer bills, and deliver a secure electricity system. Unsurprisingly there is increasing (corporate) appetite to buy renewable energy directly.

RELIABLE ENERGY SUPPLY

Coal power stations are increasingly unreliable, with almost 100 breakdowns between December 2017 and June 2018 in Australia. Ageing coal stations are increasingly expensive to operate, risk black-outs and high prices. Renewables with storage are the cheapest form of 'reliable' energy supply, surpassing also gas. They provide reliable generation and can ramp up even if the sun is not shining, while providing clean, reliable supply at least cost.

JOBS, JOBS, JOBS

There are many more jobs in solar and wind than coal and gas. The UK recognises the powerful economics of moving towards a clean and smart power sector, both for the economy as a whole as well as directly for the consumer. They are already seeing jobs, regional investment and export sales flowing from UK supply chains for clean power technologies. Australia: why not follow?

100% RENEWABLES IS ECONOMICAL

The lowest cost option for decarbonising the electricity sector are renewable energy technologies, combined with storage, demand management, and energy efficiency across all sectors. A transformation to 100% renewable energy can be achieved cost-effectively, given the disruptive transformation of the market taking place and the dramatic decrease in costs for wind and solar combined.

INNOVATION

21st century and beyond will be built on renewable and storage technologies and smart energy services - with massive economic opportunities. The question is whether Australia will be a leading player producing, deploying, and exporting renewable energy based products and services at scale - or a passive consumer?

AUSTRALIA: ENERGY SUPERPOWER

The global market opportunity for zero carbon energy presents an unprecedented opportunity for Australia. With enormous sun and wind resources, as well as mineral resources needed for green electricity, Australia has the ability to make an orderly and economically beneficial transition from a major coal and gas (LNG) exporter to a global renewable energy superpower - exporting renewable hydrogen or electricity to its major trading partners.

REDUCE HEALTH COSTS, SAVE LIVES

The health impacts of coal-fired power generation are estimated to cost Australia AUD$2.6 billion annually.

The use of coal is contributing to 4000 deaths each year, mostly by exacerbating existing chronic cardiac and respiratory illnesses.

RURAL REVITALISATION

Farmers have long been harvesters of solar energy through the raising of crops and livestock. Ready access to renewable generation technologies and financing mechanisms can mean farmers can realise additional streams of income. With this, farmers and rural communities have an opportunity to be revitalised from increased employment and opportunities.

EXAMPLES WORTH FOLLOWING

GERMAN ENERGIEWENDE
EARLY INVESTMENT PAYS BIG DIVIDENDS

The world owes much to Germany and its role in kick-starting the renewable energy revolution. Its early commitment and investment has had a big impact on the declining costs of renewables worldwide, and making renewables cost competitive with fossil fuels. While households still pay relatively high electricity rates, these have been stable since 2013, following declining costs of renewable energy. Furthermore, electricity bills are comparable to other industrialised countries as households are comparably more efficient and consume less electricity. Investing in renewable energy and efficiency is contributing to GDP growth and creating jobs - while the German electricity grid remains one of the most reliable in the world.

THE UNITED KINGDOM
IS SAYING GOODBYE TO COAL. FAST.

The industrial revolution began in Britain and was built on coal - firing steam engines. In 2025, burning coal for power in the UK will become a thing of the past. The slide away from coal started when the landmark *Climate Change Act* was passed into law in 2008. It mandated an 80% reduction in carbon emissions by 2050 and established a carbon tax in 2013. This tax upended the economics of coal, causing the market to rapidly switch to natural gas and renewables. From 2012 to 2017 coal went from supplying 40% of the UK's electricity to just 7%. This shows that a tipping point can be reached, and any country can phase out coal within 5-10 years if it chooses to do so. The 2025 ban simply seals the deal.

NATIONAL POLICY PERFORMANCE

POLICY FAILURE
THE PARALYSED POWER

The current Australian federal government has rejected even the inadequate National Energy Guarantee (NEG), and refuses to discuss any emissions reduction policy for the electricity sector. The government claims it wants to focus on reducing prices and supporting investment in coal and gas to ensure reliability.

The NEG, as proposed by the federal government – under Malcolm Turnbull, was inadequate. In particular, it cemented in an inadequate target and did not provide the right incentives for an energy system transformation.

The debate needs to urgently focus on adequate targets and policies to achieve fast decarbonisation and reduce costs. A wide range of studies show that a transformation to 100% renewable energy in the electricity sector can be achieved cost-effectively – given the disruptive transformation of the market taking place and the dramatic decrease in costs for wind and solar, combined with battery storage.

Australia is home to the world's largest battery storage plant (100 MW/129 MWh) and installed an estimated 20,800 battery storage systems in 2017, tripling the number of systems added in 2016. Most of these were sold in combination with rooftop solar photo voltaic panels.

For the government to neglect the realities of market power and economics will only aggravate the ongoing investment paralysis and slow the transformation of the electricity sector.

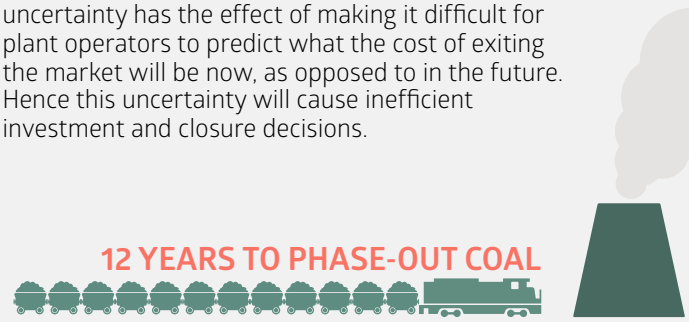
SPEEDING THE TRANSITION
THE FUTURE OF COAL IN AUSTRALIA

The burning of coal in conventional power plants is completely inconsistent with the Paris Agreement and if Australia is to reduce its emissions fast enough to do its share in limiting warming to 1.5°C, then it will need to phase out coal by approximately 2030. (To be consistent with the Paris Agreement, analysis shows that coal phase-out is needed no later than by 2030 in the OECD and EU28, and no later than by 2050 in the rest of the world).

The transition away from coal-fired power generation towards renewable sources of generation is already occurring but needs to accelerate.

The debate must shift from whether coal-powered plants should close to a conversation on how quickly and orderly these plant closures need to occur, and what supporting policies will be in place to help manage the process. A clear policy signal and structured phase-out plan will benefit the public, workforce and industry in many ways, and will also be beneficial for coal related businesses, workers, owners and investors to make a sound and just transition.

The most important barrier to an exit of coal-fired power stations in the Australian context is policy uncertainty: this uncertainty has the effect of making it difficult for plant operators to predict what the cost of exiting the market will be now, as opposed to in the future. Hence this uncertainty will cause inefficient investment and closure decisions.



STATES AND CITIES ARE LEADING THE WAY

ROOFTOP SOLAR
AUSTRALIAN SUBURBS LEAD THE WAY

Australia was one of the world's top installers (seventh) of solar photo voltaic (PV) capacity in 2017, and ranks fifth globally for total capacity per inhabitant. This is almost exclusively due to the incredibly high rates of solar PV installations found on rooftops of Australian homes. About 32% of dwellings in South Australia and 33% in Queensland had solar PV by early 2018, with substantial shares in several other states and territories as well, a trend that is showing no sign of slowing down. A record 351 MW was installed in the first quarter of 2018 and it looks like this will continue for years. This is not a boom driven by a pending reduction in subsidies, but by high electricity prices, highly affordable solar power system and people's desire to act on climate change.

In 2017, an estimated 40% of new solar rooftop installations included energy storage systems, amounting to almost 20,800 battery installations, mostly in the residential sector, up from 6,750 battery installations in 2016 and 500 in 2015.

33% OF QUEENSLAND DWELLINGS HAVE ROOFTOP SOLAR

SOUTH AUSTRALIA
BIG BATTERIES AND BIGGER AMBITIONS

On the subnational level, climate action is more visible. South Australia is a global leader in terms of share of variable renewable energy. Wind and solar are now at a share of 45%, just a few percentage points behind the world leader, Denmark. South Australia is also on track to meet its 2025 target of 75% renewable energy, and the Australian Energy Market Operator even expects South Australia to reach 100% renewables by 2025. This demonstrates what the rest of the country could achieve if it put its mind to it.

After the blackouts in 2016, then PM Malcom Turnbull blamed the state's recent turn toward renewable energy. Partially in response, Tesla bet it could build 100MW of battery storage in 100 days or it would be free. Tesla accomplished the build around 40 days shy of the deadline.

The battery bank is attached to the 325 MW Hornsdale wind farm. Together, they became the largest battery storage plant in the world.

75% RENEWABLE ENERGY TARGET BY 2025

ABOUT THE AUTHOR

CLIMATE ANALYTICS

Supporting science-based policy to prevent dangerous climate change, enabling sustainable development.

Climate Analytics is a non-profit climate science and policy institute based in Berlin, Germany with offices in New York, USA, Lomé, Togo and Perth, Australia, which brings together interdisciplinary expertise in the scientific and policy aspects of climate change. Our mission is to synthesise and advance scientific knowledge in the area of climate change.

climateanalytics.org

REFERENCES AND DATA SOURCES

Page 1

Coal accounts for about 62% of electricity generation in Australia
Source: Australian Government (2018). Australian Energy Statistics. Link: https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2016-17-and-2017

Graph: Electricity Emissions Performance 1990 - 2030
Source: IEA (2017) CO2 Emissions from Fuels Combustion. Link: www.iea.org/statistics;
Climate Action Tracker Data Portal (2018). Link: https://climateactiontracker.org/decarbonisation/

Graph: Electricity consumption
Source: IEA (2017), Energy Statistics and Balances 2017 Link: www.iea.org/statistics,
Climate Action Tracker Data Portal (2018). Link: https://climateactiontracker.org/decarbonisation/

Graph: Electricity grid emissions intensity
Source: IEA (2017) CO2 Emissions from Fuels Combustion. Link: www.iea.org/statistics,;

Graph: Coal usage
Source: IEA (2016), World Energy Balance

Graph: Renewables
Source: IEA (2017), Energy Statistics and Balances 2017 Link: www.iea.org/statistics,

Graph: Gas usage
Source: IEA (2016), World Energy Balance

Paris Reality Check
Climate Action Tracker (2018). Australia. Link: https://climateactiontracker.org/countries/australia/

Page 2

Australia's emissions progress
Sources: Australian Government (2017). "Australia's emissions projections 2017"; Climate Analytics (2017). "The Finkel Review and scientific consistency with the Paris Agreement." Link: https://climateanalytics.org/publications/2017/the-finkel-review-and-scientific-consistency-with-the-paris-agreement/

Electricity carbon emissions
Source: Australian Government (2017). "Australia's emissions projections 2017"

Paris Agreement 1.5°C Limit CO2 Emissions Pathway
Based on Pacific OECD results from MESSAGE model. Link: http://www.iiasa.ac.at/web/home/research/modelsData/MESSAGE/MESSAGE.en.html

Paris Agreement - what does it mean for electricity?
Sources: Climate Action Tracker (2017). Foot off the gas: increased reliance on natural gas in the power sector risks an emissions lock-in. Link: https://climateactiontracker.org/publications/foot-gas-increased-reliance-natural-gas-power-sector-risks-emissions-lock-/; Climate Analytics (2016). Implications of the Paris Agreement for coal use in the power sector. Link: https://climateanalytics.org/media/climateanalytics-coalreport_nov2016_1.pdf; Climate Action Tracker (2017).Improvement in warming outlook as India and China move ahead, but Paris Agreement gap still looms large. Link: https://climateactiontracker.org/publications/improvement-warming-outlook-india-and-china-move-ahead-paris-agreement-gap-still-looms-large/

181 countries have ratified:
Source: UNFCCC (2018). Paris Agreement - Status of ratification. Link: https://unfccc.int/process/the-paris-agreement/status-of-ratification

Page 3

National targets for renewable electricity generation
Sources: REN21 (2018) Renewables 2018 - Global Status Report.

Carbon pricing mechanism
Sources: OECD (2018). Effective Carbon Rates 2018 Pricing Carbon Emissions Through Taxes and Emissions Trading. Link: https://doi.org/10.1787/9789264305304-en

Coal-phase out date or emissions performance requirement
Sources: Climate Action Tracker (2018). Chile. Link: https://climateactiontracker.org/countries/chile/. Clean Energy Wire (2018). "Germany gears up for official talks on coal-phase out. Link: https://www.cleanenergywire.org/news/germany-gears-official-talks-coal-phase-out; Beyond coal (2018). Overview: national coal phase-out announcements in Europe. Link: https://beyond-coal.eu/wp-content/uploads/2018/03/Overview-of-national-coal-phase-out-announcements-Europe-Beyond-Coal-March-2018.pdf

Chile: "In early 2018, Chile announced that it will not build any new coal-fired power plants (without CCS) and will develop a plan to phase out coal—which made up 41% of electricity generation in 2016—aligned with the objectives set in the 2050 Energy Strategy." Climate Action Tracker (2018). Link: https://climateactiontracker.org/countries/chile/

Germany: Germany launched a Commission which aims to decide on an end date for coal power generation, and close current emissions gap for its 2020 target. CDU (2017). Koalitionsvertrag. Link: https://www.cdu.de/system/tdf/media/dokumente/koalitionsvertrag_2018.pdf?file=1 (for English Summary of Energy and Climate agreements in the coalition's treaty in English see here: https://www.cleanenergywire.org/factsheets/climate-and-energy-germanys-government-coalition-draft-treaty)

Decarbonisation strategy for electricity sector
Sources: Allianz (2017). Allianz Climate and Energy Monitor 2017. Link: https://www.allianz.com/v_1500328800000/en/sustainability/media-2017/Allianz_Climate_and_Energy_Monitor_2017_-_Report_final.pdf

South Africa: "The government released its Integrated Resource Plan (IRP 2018) in August, setting out a new direction in energy sector planning. The plan includes a shift away from coal, increased adoption of renewables and gas, and an end to the expansion of nuclear power. The revised plan, if adopted, would mark a major shift in energy policy." Source: Climate Action Tracker (2018). South Africa. Link; https://climateactiontracker.org/countries/south-africa/

Page 4

Save money
Source: Green Energy Markets (2018). Renewable Energy Index. Link: http://greenmarkets.com.au/news-events/renewable-energy-index-may-2018
The Australian National University (2018). Australia's renewable energy industry is delivering rapid and deep emissions cuts. Link: http://energy.anu.edu.au/files/Australia%27s%20renewable%20energy%20industry%20is%20delivering%20rapid%20and%20deep%20emissions%20cuts.pdf

Reliable energy supply
Sources: Australia Energy Networks and CSIRO (2016). "Electricity Network Transformation Roadmap: Key Concepts Report".
Reputex (2017). Renewables with storage now cheapest form of 'reliable' energy supply, surpassing gas. Link: https://www.reputex.com/media-releases/rising-gas-price-falling-storage-costs-makes-renewables-cheapest-for-reliable-power-in-australia/
Climate Council (2018). Clean and reliable power: Roadmap to a renewable future. Link: https://www.climatecouncil.org.au/uploads/2281dea087b8f3360bb96b6cad17edf7.pdf

Jobs, Jobs, Jobs
Source: HM Government (2017). The Clean Growth Strategy - Leading the way to a low carbon future. Link: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

100% renewables is economical
Sources: Green Energy Markets (2018). Renewable Energy Index. Link: http://greenmarkets.com.au/news-events/renewable-energy-index-may-2018;
Reputex (2017). Renewables with storage now cheapest form of 'reliable' energy supply, surpassing gas. Link: https://www.reputex.com/media-releases/rising-gas-price-falling-storage-costs-makes-renewables-cheapest-for-reliable-power-in-australia/

21st century
Source: World Economic Forum (2017). The Future of Electricity New Technologies Transforming the Grid Edge. Link: http://www3.weforum.org/docs/WEF_Future_of_Electricity_2017.pdf

Australia: energy superpower
Source: Climate Analytics (2018). "Western Australia's Gas Gamble". Link: https://climateanalytics.org/publications/2018/western-australias-gas-gamble/
Beyond Zero Emissions (2015). Renewable Energy Superpower Report. Link: http://bze.org.au/renewable-energy-superpower/

Reduce health costs, save lives
Sources: Horsburgh, F. Armstrong, and V. Mulvenna (2017). "Framework for a National Strategy for Climate, Health and Well-being"; The Guardian (2017). "Australian health groups urge coal phase out and strong emissions reductions. Link: https://www.theguardian.com/environment/2017/jun/22/australian-health-groups-urge-coal-phase-out-and-strong-emissions-reduction

Rural revitalisation
Source: Heinrich Böll Stiftung (2012). Revitalizing Rural Communities through the Renewable Energy Cooperative. Link: https://us.boell.org/sites/default/files/downloads/Bilek_EnergyCooperatives.pdf

German Energiewende
Source: Agora Energiewende (2017). "Energiewende in a nutshell." Link: https://www.agora-energiewende.de/fileadmin2/Projekte/2017/Energiewende_in_a_nutshell/Agora_The_Energiewende_in_a_nutshell_WEB.pdf

The United Kingdom
Source: UK Government (2018). Implementing the end of unabated coal by 2025. Link: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/672137/Government_Response_to_unabated_coal_consultation_and_statement_of_policy.pdf

Page 5

The paralysed power
Sources: REN21 (2018) Renewables 2018 - Global Status Report.

The future of coal in Australia
Sources: Climate Action Tracker (forthcoming). Scaling up climate action. Climate Analytics (2016). Implications of the Paris Agreement for coal use in the power sector. Link: https://climateanalytics.org/media/climateanalytics-coalreport_nov2016_1.pdf

Australian suburbs lead the way
Sources: REN21 (2018) Renewables 2018 - Global Status Report.
RenewEconomy (2018). Australian rooftop solar boom rolls on - 351 MW in first quarter. Link: https://reneweconomy.com.au/australian-rooftop-solar-boom-rolls-on-351mw-in-first-quarter-26595/
Climate Council (2018). Powering progress: states renewable energy race. Link: https://www.climatecouncil.org.au/wp-content/uploads/2018/10/States-renewable-energy-report-1.pdf

Big battery and bigger ambitions
Sources: REN21 (2018) Renewables 2018 - Global Status Report; Climate Action Tracker (2018). Australia. Link: https://climateactiontracker.org/countries/australia/
Vox (2017). Elon Musk bet that Tesla could build the world's biggest battery in 100 days. He won. Link: https://www.vox.com/energy-and-environment/2017/11/28/16709036/elon-musk-biggest-battery-100-days
AEMO (2018). Integrated System Plan. Link: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2018/Integrated-System-Plan-2018_final.pdf

Footnote

1 - Conceptualising the Paris Agreement's temperature goal
More than two decades of international climate negotiations laid the groundwork for the Paris Agreement and it is with this rich history in mind this treaty should be understood and conceptualised, particularly with regards to the long-term temperature goal.

At the Earth Summit in Rio de Janeiro in 1992 the UN Framework Convention on Climate Change (UNFCCC) was adopted with the ultimate objective being the "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations, 1992). Importantly, it had neither been clarified what level of climate change is to be considered "dangerous", nor was there an agreement on the exact concentration levels required to reach that objective. It was only in the Copenhagen Accord from 2009 that the first long-temperature goal of limiting the global temperature increase to **below 2 degrees Celsius** was mentioned (UNFCCC, 2010). During the subsequent COP16 in Cancun in 2010 the Parties adopted the 2°C limit, expressed as the aim "to hold the increase in global average temperature below 2°C above preindustrial levels".

Notwithstanding this decision, in 2010 the UNFCCC established a review process to evaluate whether the long-term global temperature goal of holding warming below 2°C was adequate to avoid dangerous climate change and to consider "strengthening the long-term global goal on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5°C". In 2015 the Structured Expert Dialogue ended with the conclusion that a warming of 2°C cannot be considered safe (UNFCCC, 2015b). This has ultimately led to the Paris Agreement's objective to "pursue efforts to limit" global warming to 1.5°C above preindustrial, while holding warming to "**well below 2°C"**.

The Paris Agreement's long-term temperature goal therefore goes beyond the Cancun Agreements' 2°C temperature limit.

Under the long-term temperature goal (Article 2.1) of the Paris Agreement, Parties agreed to "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognising that this would significantly reduce the risk and impacts of climate change".

VIEW THE OTHER FACTSHEETS

FACTSHEET 1
AUSTRALIAN ECONOMY

FACTSHEET 2
ELECTRICITY SECTOR

FACTSHEET 3
TRANSPORT SECTOR

FACTSHEET 4
INDUSTRY