

COAL FACTS

Produced by the Minerals Council of Australia

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World demand for coal is growing.

Coal is the world's fastest growing energy source.

In the past decade, coal use grew 4 times faster than renewables and 50 per cent faster than gas.

Coal is indispensable to modern life, power generation and the future.

Coal is building the roads, rail and wind turbines of tomorrow.

Coal accounts for 41 per cent of the world's electricity generation and is essential in the manufacture of modern infrastructure.

World primary energy demand will increase by 21 per cent between 2013 and 2030. And the simple fact is, the global community will need all available energy options – both renewable and non-renewable – to power the world into the future.

That means there will be no shortage of demand for our nation's vast reserves of quality thermal and metallurgical coal, and that's good news for jobs and investment in Australia.

Coal is here to stay.

What is changing is the technology that industry is employing to reduce emissions associated with the production and use of coal.

The story of coal – which has driven exports, wages, investment and tax revenue in Australia for decades – is changing and industry is changing with it.

High efficiency, low emission (HELE) technologies are powering some of the world's largest electricity producers. As well as HELE, there are 22 large scale Carbon Capture and Storage (CCS) projects in operation or under construction globally. Right now, HELE coal-fired power stations integrated with CCS can successfully reduce CO₂ emissions by around 90 per cent.

SaskPower's Boundary Dam project in Canada, for example, is the world's first coal-fired power plant with CCS. It's achieving an emissions reduction of 1 million tonnes of CO₂ a year. That's the equivalent of taking 250,000 cars off the road annually.

Coal producers are moving the industry towards a low emissions coal future. The process is well established and industry – with the support of research and technology from around the world – is taking the necessary steps to ensure a long-term, viable coal future.



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70%

WORLD STEEL
was produced
with coal in 2013

\$6b

AUSSIE WAGES
were paid in 2013-14
in the coal industry

\$3.3b

ROYALTIES
paid by the coal
industry in 2013-14

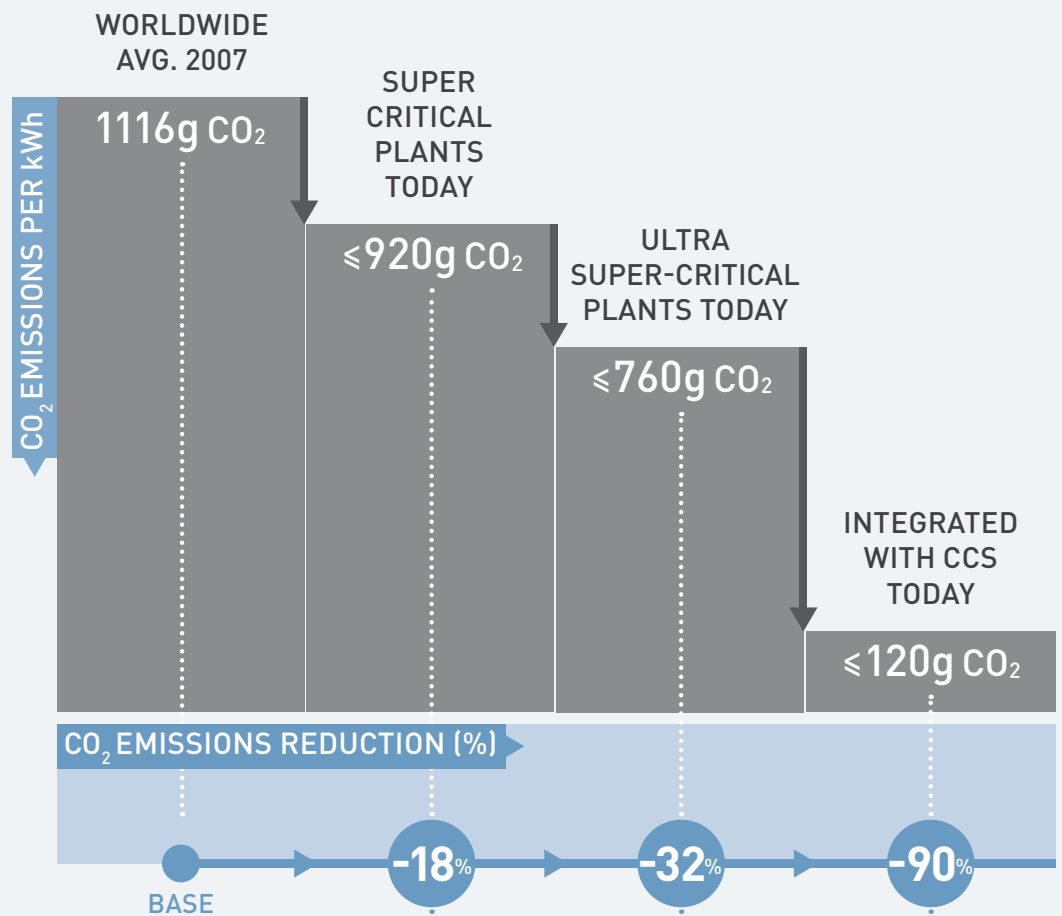
DELIVERING A LOW EMISSIONS COAL FUTURE

Step 1: High efficiency, low emission technologies (HELE).

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STEP ONE HELE

High efficiency, low emission (HELE) technologies allow power generators to operate at higher temperatures and greater pressure while at the same time reducing by up to 40% emissions generated per watt of electricity. HELE supercritical and ultrasupercritical coal technologies are operating throughout the world with a current capacity of 518GW and a further 286GW planned or under construction. In total, this is over 16 times Australia's coal-fired generation capacity.



HELE POWER GENERATION/ CCS AT WORK...

KOGAN CREEK

LOCATION: Australia
OWNER: CS Energy



Kogan Creek Power Station is Australia's fourth super-critical coal-fired plant. It has the capacity to power up to a million homes using less water through its dry cooling technology, and producing fewer emissions.

ISOGO

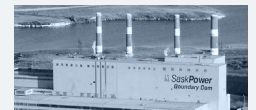
LOCATION: Japan
OWNER: J-Power



Isogo Thermal Power Station is an ultra super-critical plant that has set a new efficiency standard of about 45% while at the same time reducing regulated emissions to those typical of a gas-fired combined-cycle plant.

BOUNDARY DAM

LOCATION: Canada
OWNER: SaskPower



Boundary Dam Integrated CCS is the world's first commercial CCS project of its kind, reducing its emissions by 1 million tonnes of CO₂ a year. That's equal to taking 250,000 cars off Saskatchewan roads annually.

Improving the global average efficiency rate of coal-fired power plants from 33% to 40% with HELE technology would reduce CO₂ emissions by 2 gigatonnes a year.

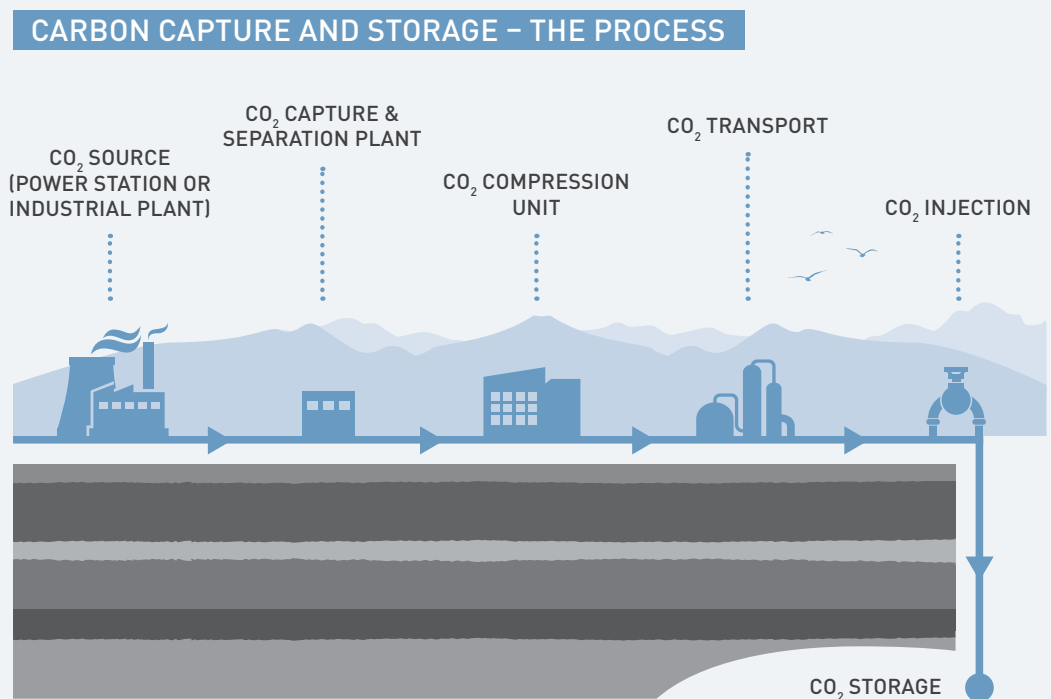
Step 2: Integration of HELE with Carbon Capture and Storage (CCS).

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STEP TWO

CCS

Carbon Capture and Storage (CCS) is the capture of CO₂ from power stations (or other industrial facilities) and storage in deep underground reservoirs. CCS is a proven, established technology and a reality in many parts of the world. The Sleipner project in Norway, for example, has been storing around 0.9 million tonnes of CO₂ per year in a deep saline formation under the North Sea seabed since 1996.



HOW CCS WORKS

Step 1 Capture: CO₂ is separated and captured from coal or gas-fired power plants, or other emitters, such as the manufacture of steel and cement. This process can capture 90% of CO₂ emissions.

Step 2 Transport: Captured CO₂ is then compressed and transported by pipeline, or ship if the storage site is offshore, to an identified site for safe and permanent storage.

Step 3 Storage: The CO₂ is then injected into a geological reservoir deep below ground. An impermeable layer of rock, known as the seal, traps the gas to prevent the leakage or migration of stored CO₂.

IS CCS SAFE?

CO₂ is a stable, non-toxic substance that allows the CCS injection process to be conducted above ground – and below – without the inherent danger to workers or the environment of some other gases and substances.

To protect against migration of stored emissions, CCS sites undergo exhaustive testing to ensure geological suitability, as well as monitoring during the injection period and long after.

The retention mechanism is not dissimilar to the naturally occurring retention of natural gas and oil that have existed for millions of years within securely capped porous rock formations beneath the ground.

CCS IN AUSTRALIA

Australia is contributing to the global effort through projects such as Gorgon, CarbonNet and South West Hub.

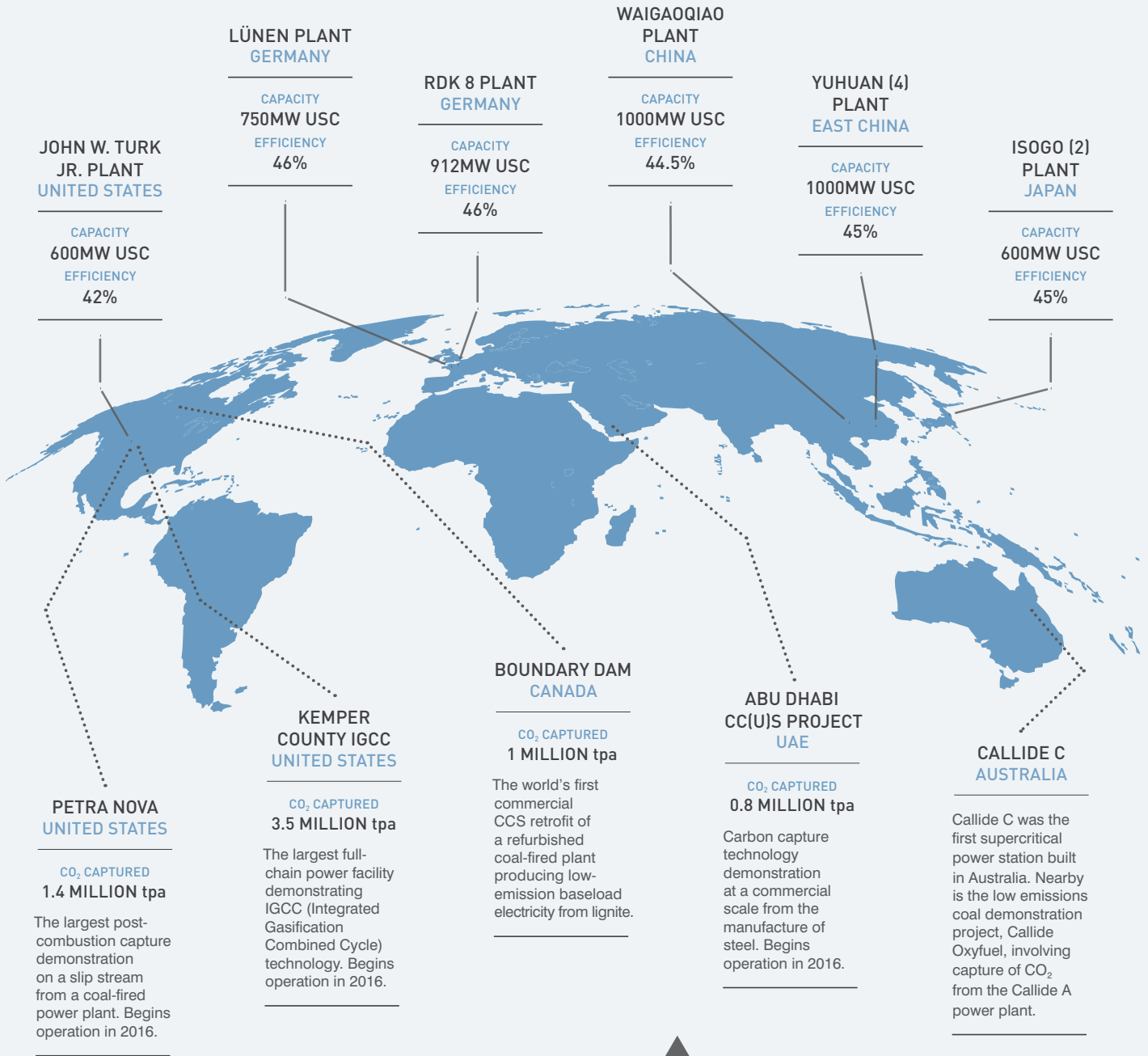
The Gorgon operation on Barrow Island in Western Australia, for example, will demonstrate the largest carbon capture and storage in the country when it begins operation in 2016.

Industry has also successfully captured CO₂ at Queensland's Callide coal-fired power plant; has sequestered 65,000 tonnes of CO₂ in a depleted gas field in Victoria's Otway Basin, and has intensified the search for storage sites in Queensland, New South Wales, Victoria and Western Australia.

GLOBAL PROGRESS

HELE PROJECTS AT WORK

Efficiency – usable energy yield (or usable energy recovered)
 USC – Ultra Super Critical plant (steam temperature +600 C)
 IGCC – Integrated (coal) gasification combined cycle



CCS PROJECTS AT WORK

COAL HAS A STRONG FUTURE

Coal will continue to be a major contributor to Australia's exports, job creation and the regions.

Australia is forecast to be the world's largest coal exporter by 2017.

High quality Australian coal and new technology will provide cleaner energy which is secure and affordable.

Australian coal will assist Asian economic expansion and also help alleviate poverty in developing countries.