


ASX ANNOUNCEMENT (ASX:LCK)
Thursday, 19 August 2021



Carbon Capture Presentation

Leigh Creek Energy is fully committed to its target of being Carbon neutral from 2022 as a part of its Environmental, Social and Governance (ESG) strategy.

LCK's GM Sustainability and COO will present LCK's plan to the 2022 Australian Carbon Capture Utilisation and Storage conference.

This includes updates on the 2022 Carbon Neutral programme and independent reports supporting the commercial feasibility of the LCK CCUS plans.

The presentation is attached.

The Board of Leigh Creek Energy Limited authorised this announcement to be given to the ASX.

Further information:

Investors

Tony Lawry

T: +61 412 467 160 | E: tony.lawry@lcke.com.au

Media

Tristan Everett

T: +61 403 789 096 | E: tristan.everett@marketeye.com.au

About the Leigh Creek Energy Project

The Leigh Creek Energy Project (LCEP) is Leigh Creek Energy's (ASX:LCK) flagship project, developing low-cost nitrogen-based fertiliser for local and export agriculture markets. Located in South Australia, 550 kilometres north of Adelaide, the LCEP will initially produce 1Mtpa (with potential to increase to 2Mtpa) of zero carbon urea.

The \$2.6 billion LCEP will be one of the biggest infrastructure projects of its type in Australia, providing long term economic development and employment opportunities for the communities of the Upper Spencer Gulf region, northern Flinders Ranges and South Australia.

The LCEP will be the only fully integrated urea production facility in Australia, with all inputs for low carbon urea production on-site. Forecast operating cost is within the lowest cost quartile of the global urea production cost curve. Pre-tax leveraged Net Present Value (NPV) is A\$3.4 billion, with an Internal Rate of Return (IRR) of 30%.

LCK has a comprehensive environment, social and governance strategy. It has produced syngas within all approved environmental parameters set by the regulator and will be carbon neutral by 2022.

LEIGH CREEK ENERGY

A culture of carbon consciousness
through CCUS



2022 Carbon neutral
by design

Noreen Byrne, General Manager, Sustainability & People

Cristian Bolda, General Manager, Operations

Important Notice

Disclaimer

This presentation has been prepared by, or for Leigh Creek Energy Limited (LCK). It contains, and we may make other written or verbal forward looking statements with respect to certain of LCK's plans, current goals and expectations relating to future financial condition, performance, results, strategic initiatives and objectives. By their nature, all forward-looking statements involve risk and uncertainty and are subject to factors that could cause actual results to differ materially from those indicated in this presentation and/or any statement, including forward-looking statements. Some of the factors that could cause actual results or trends to differ materially, include but are not limited to: price fluctuations; actual demand; currency fluctuations; drilling & production results, reserve estimates, loss of market, industry competition, market developments and government actions, environmental and physical risks, legislative, fiscal and regulatory developments, local, regional and international political, regulatory, economic and financial market conditions, political risks, the effect of information and technology and third-party service providers for certain of our operations and systems, legal proceedings and regulatory investigations, the impact of operational risks, including inadequate or failed internal and external processes, systems and human error or from external events (including cyber attack), risks associated with arrangements with third parties, including joint ventures, the failure to attract or retain the necessary key personnel; systems errors or regulatory changes, the effect of fluctuations in share price as a result of general market conditions or otherwise, the effect of simplifying operating structure and activities, the effect of a decline in any ratings or recommendations for losses due to defaults by counterparties or restructurings, on the value of investments, changes in interest rates or inflation, changes in equity and/or prices on our investment portfolio, the impact of natural and man-made catastrophic events on business activities and results of operations, reliance on our standing among customers, broker-dealers, shareholders, agents, wholesalers and/or other distributors of our products and/or services, changes to brand / reputation, changes in government regulations or tax laws in jurisdictions where we conduct business, the inability to protect intellectual property, the effect of

undisclosed liabilities, the timing of any regulatory approvals, integration risk, and other uncertainties, such as non-realisation of expected benefits or diversion of management attention and other resources, relating to future acquisitions and/or pending disposals, project delays or advancement, approvals and cost estimates amongst other items and the cumulative impact of items.

While we try to ensure that the information we provide is accurate and complete, LCK advises you to verify the accuracy of any information and/or statement, including a forward-looking statement before relying on it. LCK has no obligation to update the forward-looking statements in this presentation or comm other forward-looking statements we may make. Forward-looking statements in this presentation are current only as of the date on which such statements are made.

This presentation may also contain non-IFRS measures that are unaudited but are derived from and reconciled to the audited accounts. These should only be considered in addition to, and not as a substitute for, or superior to, our IFRS financial measures. All references to dollars, cents or \$ in this presentation are to Australian currency, unless otherwise stated.

Gas Resources Compliance Statement

The PRMS resources estimates stated herein were initially reported to the ASX on 27 March 2019. LCK is not aware of any new information or data that materially affects this information and all the material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

Mineral Resource Compliance Statement

The JORC resource estimates stated herein were initially reported to the ASX on 8 December 2015 and were updated on 27 March 2019. LCK is not aware of any new information or data that materially affects this information and all the material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

Leigh Creek Energy & CCUS



Leigh Creek Energy Project at a glance

The Carbon Neutral Program

The Geology

The Technology - CCUS



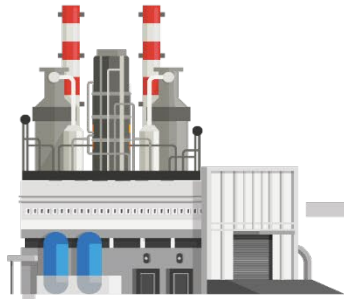
We begin today by acknowledging the Adnyamathanha people, Traditional Custodians of the land on which we work on, and pay our respects to their Elders past, present and emerging.

The Project

Leigh Creek Energy Project at a glance



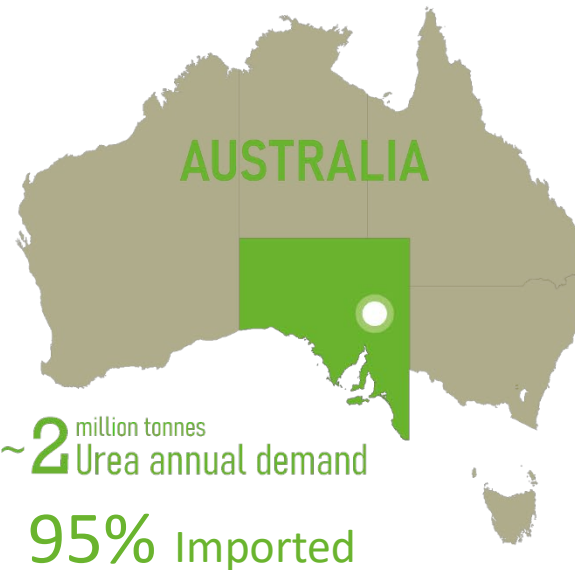
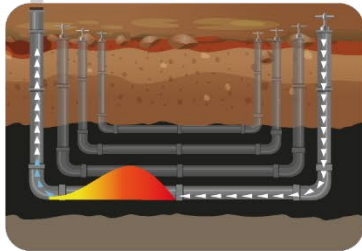
UPSTREAM DOWNSTREAM



Urea world's most commonly used fertiliser



ISG



BENEFITS

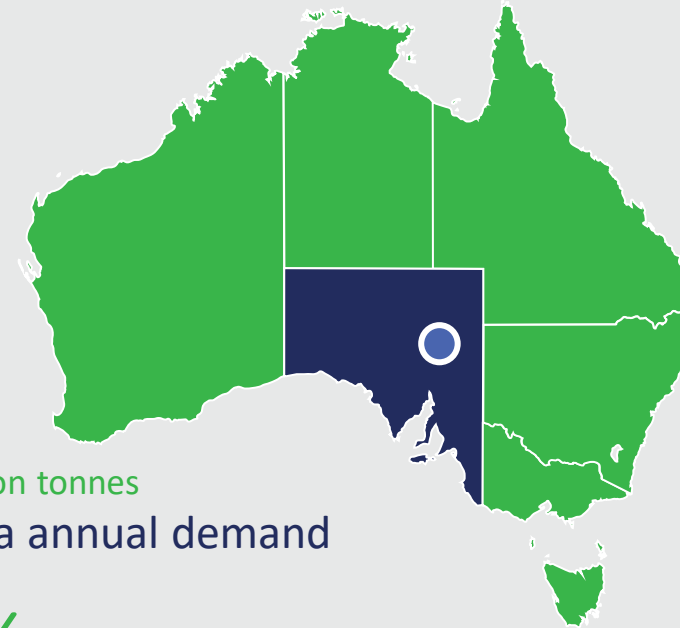
- ✓ Competitive price
- ✓ Domestic production
- ✓ Australian jobs



Leigh Creek Energy Project



- The Leigh Creek Energy Project (LCEP) will initially produce 1Mtpa of urea from a dedicated facility at a low cash cost using syngas sourced from its wholly owned resources
- Of the 2 million tonnes of urea used in Australia each year, 95% is imported from the Middle East and Asia
- Urea produced in Australia will avoid the risks and costs associated with transport, exchange rates, commodity prices and import logistics
- LCEP plans to send granular urea by rail to domestic markets
- Excess urea produced outside of the main demand seasons in Australia will be exported overseas



2 Million tonnes
Urea annual demand

95%
Imported

Benefits

- ✓ Competitive price
- ✓ Domestic production
- ✓ Australian jobs

¹. Source: Fertiliser Australia <https://www.fertilizer.org.au/Fertilizer-Industry/Australian-Fertilizer-Market>

Economic advantages of In Situ Gasification (ISG)



- More economic than coal mining with no capital intensive infrastructure.
- Main advantage is the ability to utilize uneconomical coal deposits (>500m depth and low rank coals).
- 80% of the world's coal deposits are uneconomic to mine.
- Most countries have coal deposits (economical and uneconomical), but no gas reserves. This allows most countries to produce their own gas using ISG.
- Producing gas allows these countries to improve their economies without the impact of coal mining.
- Syngas is used as a feedstock by those industries that convert natural gas to syngas.

2019 Demonstration Site



Environmental benefits of ISG



- ISG has a much smaller ground surface disturbance footprint than conventional coal mining
- Minimal dust and noise generated by ISG activities compared to coal mining
- ISG infrastructure can be located away from environmentally sensitive area
- ISG does not require solid waste handling and disposal facilities (Overburden dumps, ash dumps and tailings dams)
- ISG does not require dewatering of the coal seams and uses far less water than coal mining
- The GHG emissions from the syngas can be easily separated out and captured
- ISG has far less greenhouse gas emissions than conventional coal mining for power generation

LCEP proven track record

- The PCD was successfully operated in accordance with the approved Environmental Impact Report and Statement of Environmental Objectives
- The regulator confirmed the PCD was safely operated and fulfilled all environmental and safety compliance requirements
- PPL was awarded in November 2020, this was the final petroleum licensing for upstream development

Project History



- Located 550 kms North of Adelaide
- Using uneconomic deep coal from a 60-year-old coal mine, which was closed in late 2015
- Has all existing infrastructure from previous coal mining operations (town, airport, main road, railway, power, water)
- 300mt of deep coal remaining suitable for ISG
- Resource is contained within a closed basin (7km x 4km) with 3 coal seams

LCEP Urea Manufacturing Process

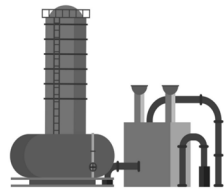


Urea is manufactured for distribution to market using a three-step process

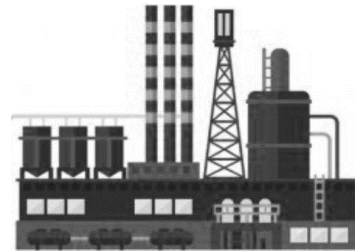
1. Gas Processing

2. Ammonia Synthesis

3. Urea Production



Syngas produced on-site is fed into a gas processing facility



The resulting H_2 and N_2 are fed into an ammonia plant where they are converted into liquid Ammonia (NH_3)

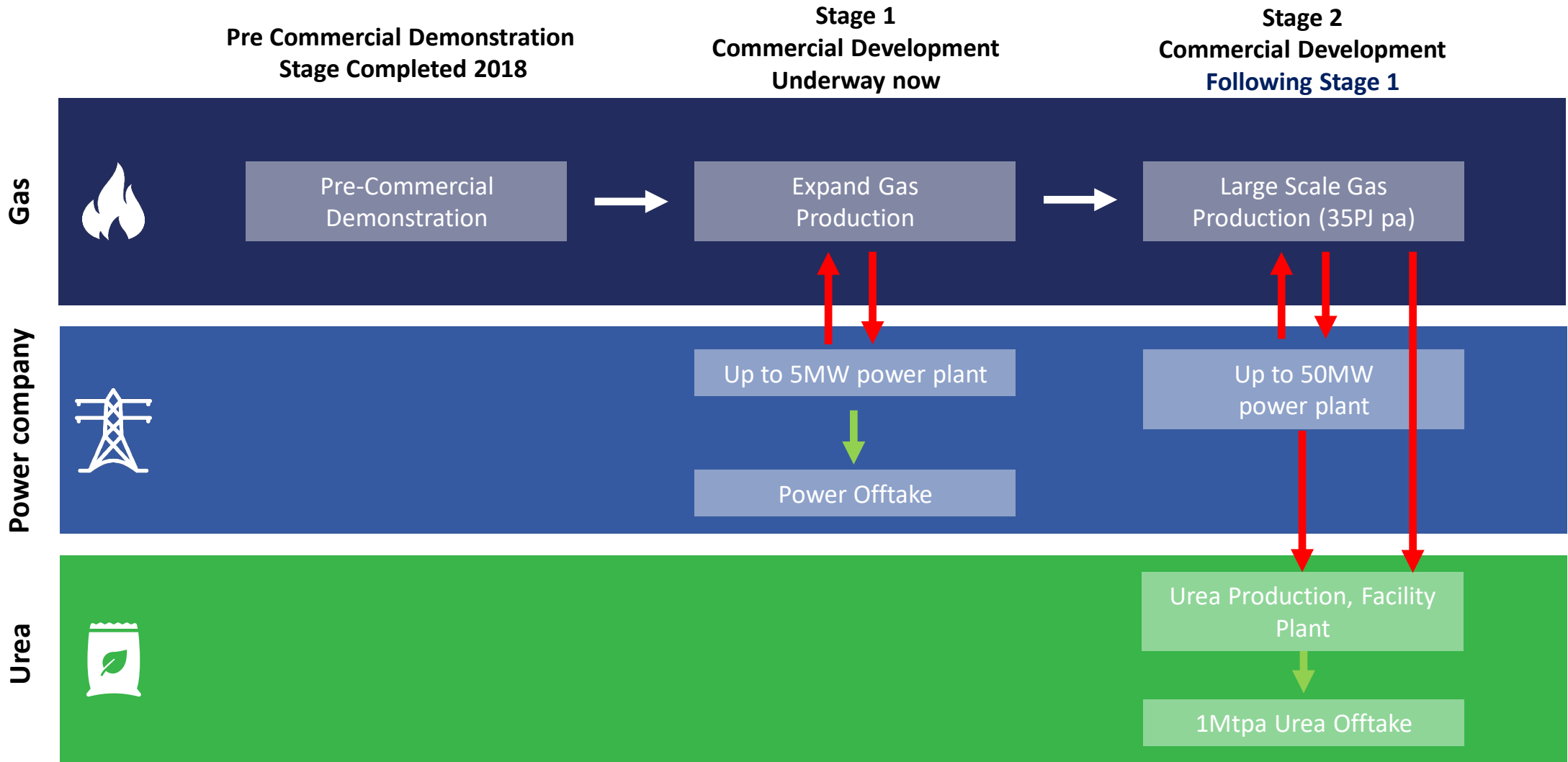


The NH_3 is fed into a urea plant where NH_3 and CO_2 are combined to form Urea (CH_4N_2O)
- Approximately 75% of the CO_2 will be utilised during this process



Granular urea is shipped or trucked in bulk and buyers may blend it, as required, for agricultural use

Commercial Development Pathway



Ahead of the curve

Our Commitment to Sustainability



ESG processes were established in 2018 and have continued to evolve



Environmental

- Commitment to be carbon neutral by 2022
- Carbon capture and underground storage plan
- Zero emissions (water and chemical)
- Macro and micro “Going Green initiatives”



Social

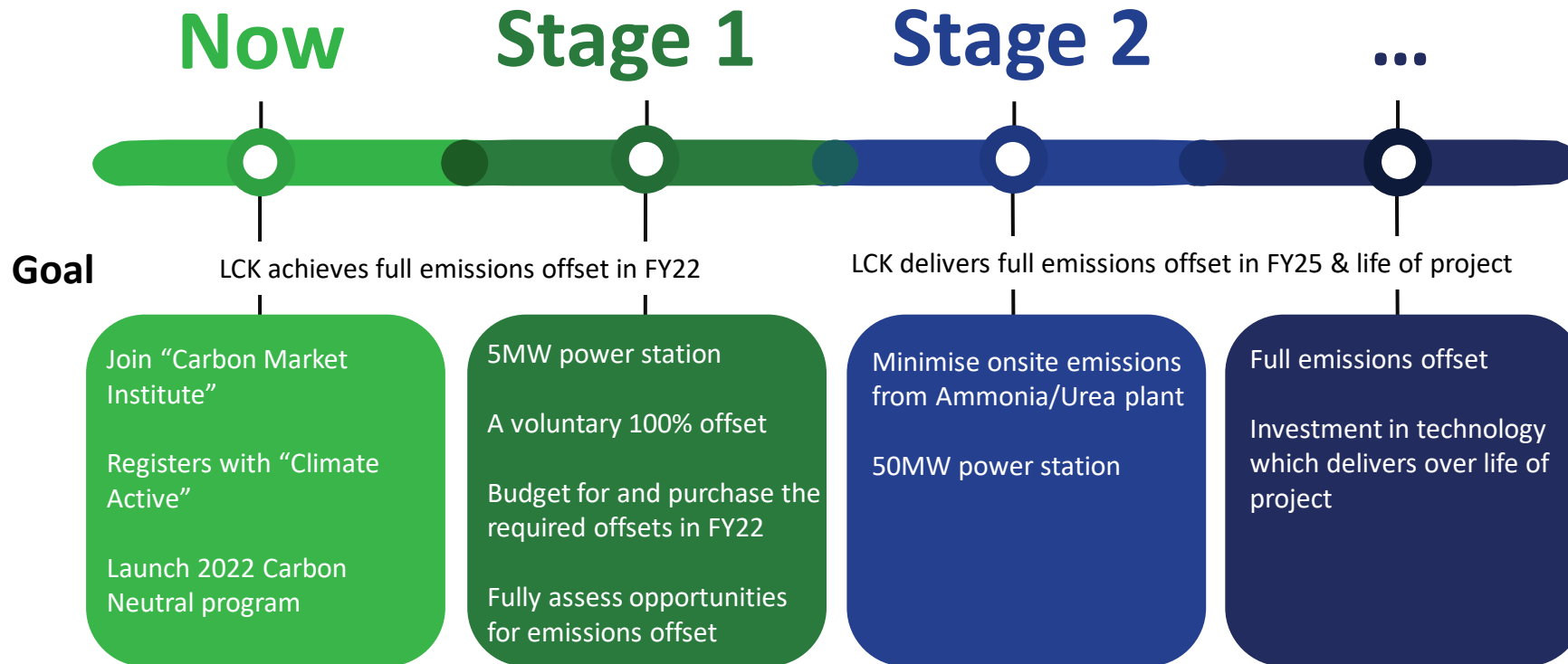
- Continue outstanding safety record
- Maintain positive, enduring stakeholder relationships
- Community education and sponsorship programmes
- Staff mental health initiatives
- Develop ethical supply chains



Governance

- Abide by United Nations Global Compact standards
- Adhere to strategic framework
- Continue strict regulatory compliance
- Develop sustainability reporting
- Report through TCFD measures

LCK Carbon Neutral Pathway



Now



GOAL:
**LCK set Carbon
Neutral targets**

PATHWAY FROM NOW

LEIGH CREEK accepted as a supporter of United National Global Compact (UNGC)

LEIGH CREEK JOINS INDUSTRY PEAK BODY “CARBON MARKET INSTITUTE”

- Access and affiliation with a market leading peer group – developers, aggregators, traders, “market makers”
- Access to carbon farming project developers and sellers of ACCUs

LEIGH CREEK REGISTERS WITH “CLIMATE ACTIVE”

with the aim of being independently accredited as a carbon neutral business in FY22

- Registration with Climate Active
- Assessment of LCKs existing/planned Scope 1, 2 and controllable scope 3 emissions
- Include emissions from the Commercial Stage 1 - 5 MW power station, commencing in first half of 2022

LEIGH CREEK establishes governance and uses accredited resources to set up LCK emissions reporting through TCFD reporting measures.

Stage 1



GOAL:
**LCK achieves full
emissions offset
in FY22**

FROM NOW TO STAGE 1 COMMERCIAL DEVELOPMENT – 5MW POWER STATION

MEASURE AND RECORD EMISSIONS

with operations commencing in first half of 2022

5MW POWER STATION

- Assess expected operations and emissions
- Will have the capacity to generate up to 43,800 MWh electricity per year and
- Will produce a forecast 65,000 tonnes CO₂e per year

A VOLUNTARY 100% OFFSET

will cost LCK circa \$1.09-1.4M in LGCs or ACCUs

FULLY ASSESS OPPORTUNITIES FOR EMISSIONS OFFSET

including hybrid and renewable electricity generation options during front end engineering and design phase

Stage 2



GOAL:
LCK delivers full emissions offset in FY25 & life of project

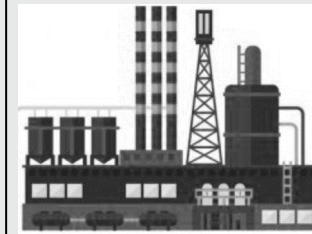
STAGE 2 COMMERCIAL DEVELOPMENT – AMMONIA/UREA PLANT

FEED DRIVES LCEP OPPORTUNITIES TO MINIMISE ONSITE EMISSIONS FROM AMMONIA/UREA PLANT

- Exhaust captured from the estimated 50MW power station reduces CO₂ emissions and provides feedstock to urea production
- Urea production will utilise approximately 75% of the produced CO₂
- On-site Carbon Capture and Storage commences
- Renewable energy offset integration as part of operation continues
- Carbon farming and future work development of arid lands through revegetation to complement CO₂ offset.
- Technology and engineering innovation

Scope 2 Emissions

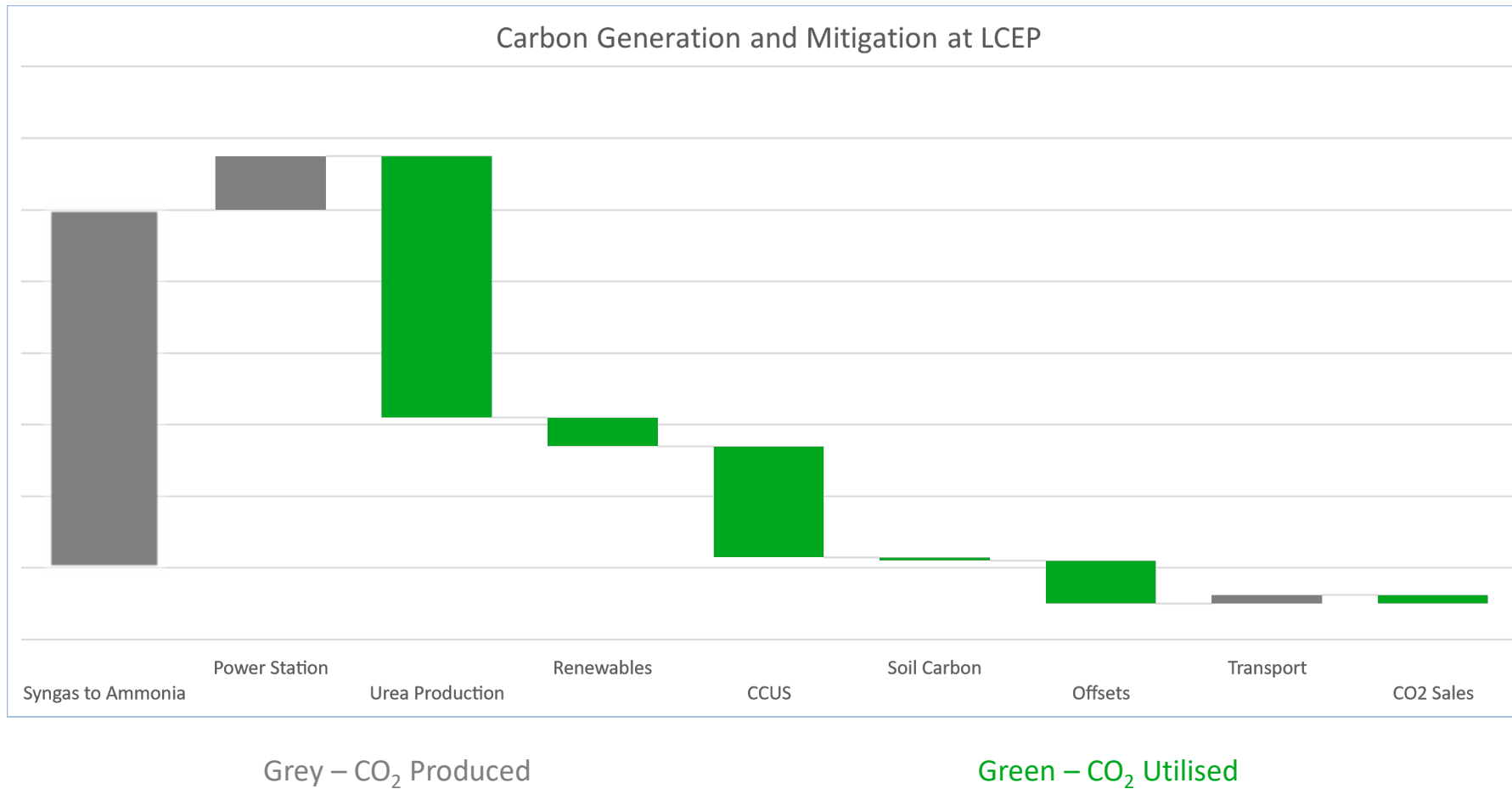
Ammonia Synthesis



Urea Production



INTEGRATED UREA PRODUCTION



Geology

History

1800s

Coal was initially discovered at Leigh Creek in 1888 and intermittent testing and mining took place with limited success over the next 55 years.

1900s

Open cut mining officially commenced in 1943 under the management of the Engineering and Water Supply Department (EWS) until the Electricity Trust of South Australia (ETSA) took control of the Coalfield in 1948 as part of the process of developing the Port Augusta Power Station.

2000s

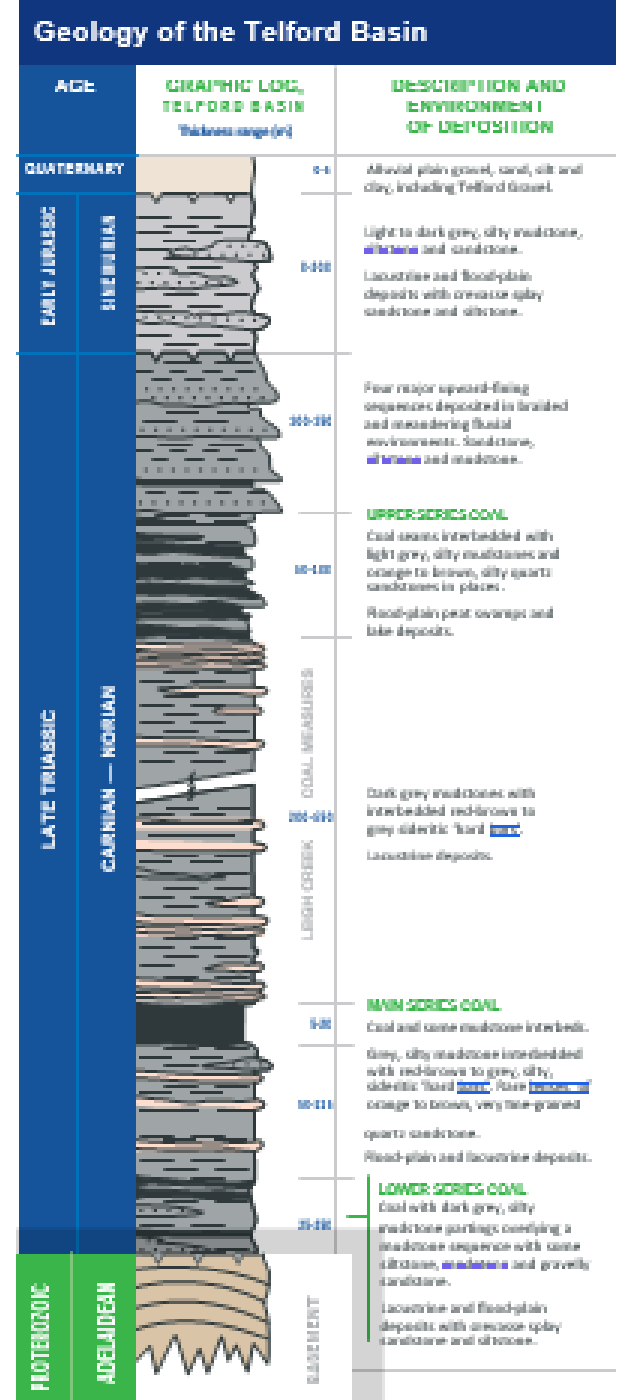
Mining ceased in November 2015, following a decision to close the mine as it had become increasingly uneconomic. From that time, the Leigh Creek Coalfield undertook closure and rehabilitation activities.

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The Age

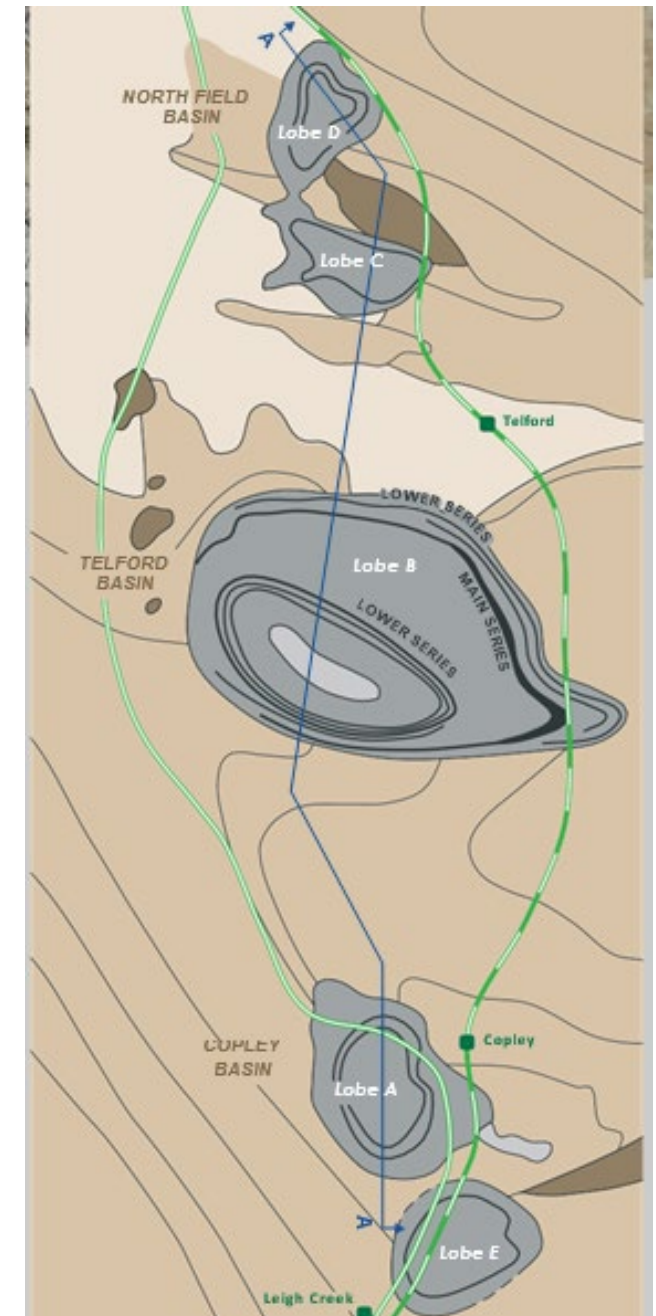


- The Leigh Creek Coal measures and associated mudstones located in the Telford Basin were deposited between 240 and 150 million years ago during the Triassic and Jurassic periods.
- They were deposited directly on top of a group of rocks referred to as the Adelaidean meta-sediments (Adelaidean Basement) of the Adelaide Geosyncline rock province.
- The underlying Adelaidean Basement is Neoproterozoic in age, meaning that they were deposited between 700 and 540 million years ago.
- Since the rocks of the Telford Basin have a low hydraulic conductivity, this ensures that these rocks act as a barrier to water and gas flow. In effect the rocks within the Telford Basin are a very thick aquitard.
- It is anticipated that historically most of the regional groundwater would have flowed around and beneath the Telford Basin, rather than through it, which means the Telford Basin plays a very small role in the regional groundwater flow patterns.



The Geology

- Leigh Creek Energy's in situ gasification (ISG) demonstration project sits within the Telford Basin of the Leigh Creek Coalfield
- The Leigh Creek area is home to five coal bearing basins, with the Telford Basin also being referred to as Lobe B
- The Telford Basin's geology is unique to the area and has played a major role in shaping the history of South Australia and the townships of Leigh Creek and Copley
- The Leigh Creek Coal Measures within the Telford Basin are a result of three depositional phases beginning in the Late Triassic and concluding in the Middle Jurassic periods, sometime between 164–237 million years ago
- The project is located 100 kilometres from the Great Artesian Basin.



CCUS

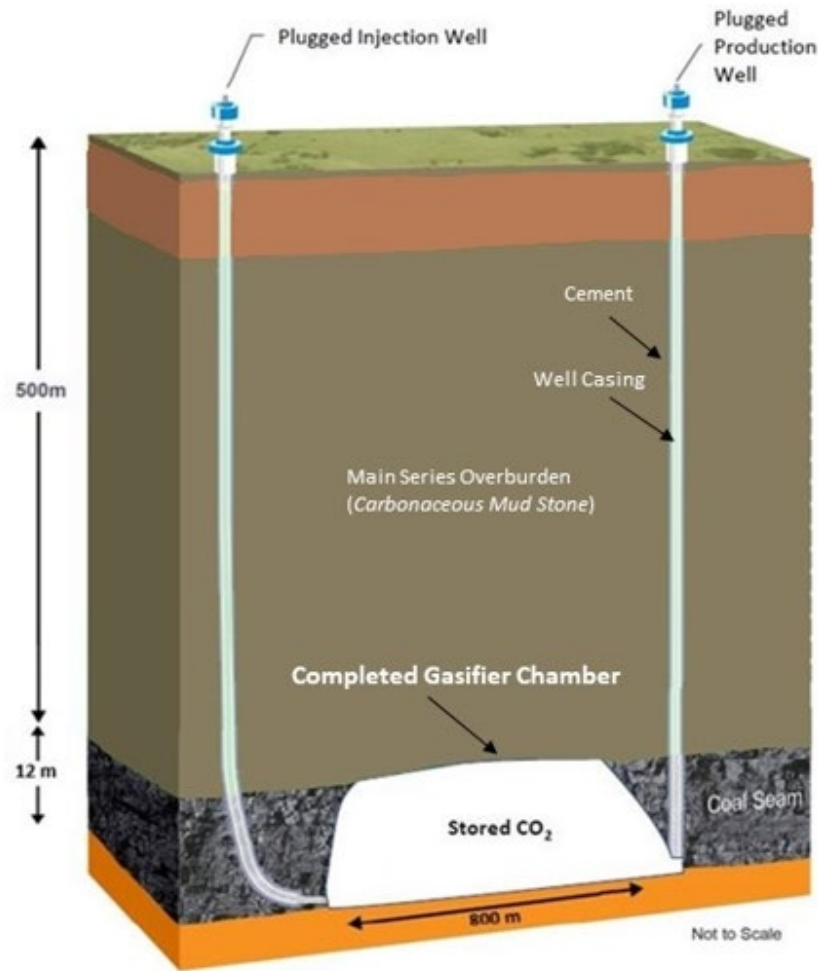
LCK – Storage technology and mechanisms

Carbon Capture, Utilisation and Storage (CCUS)

For CCUS there are three main types of geological formations that have received extensive consideration for the geological storage of CO₂:

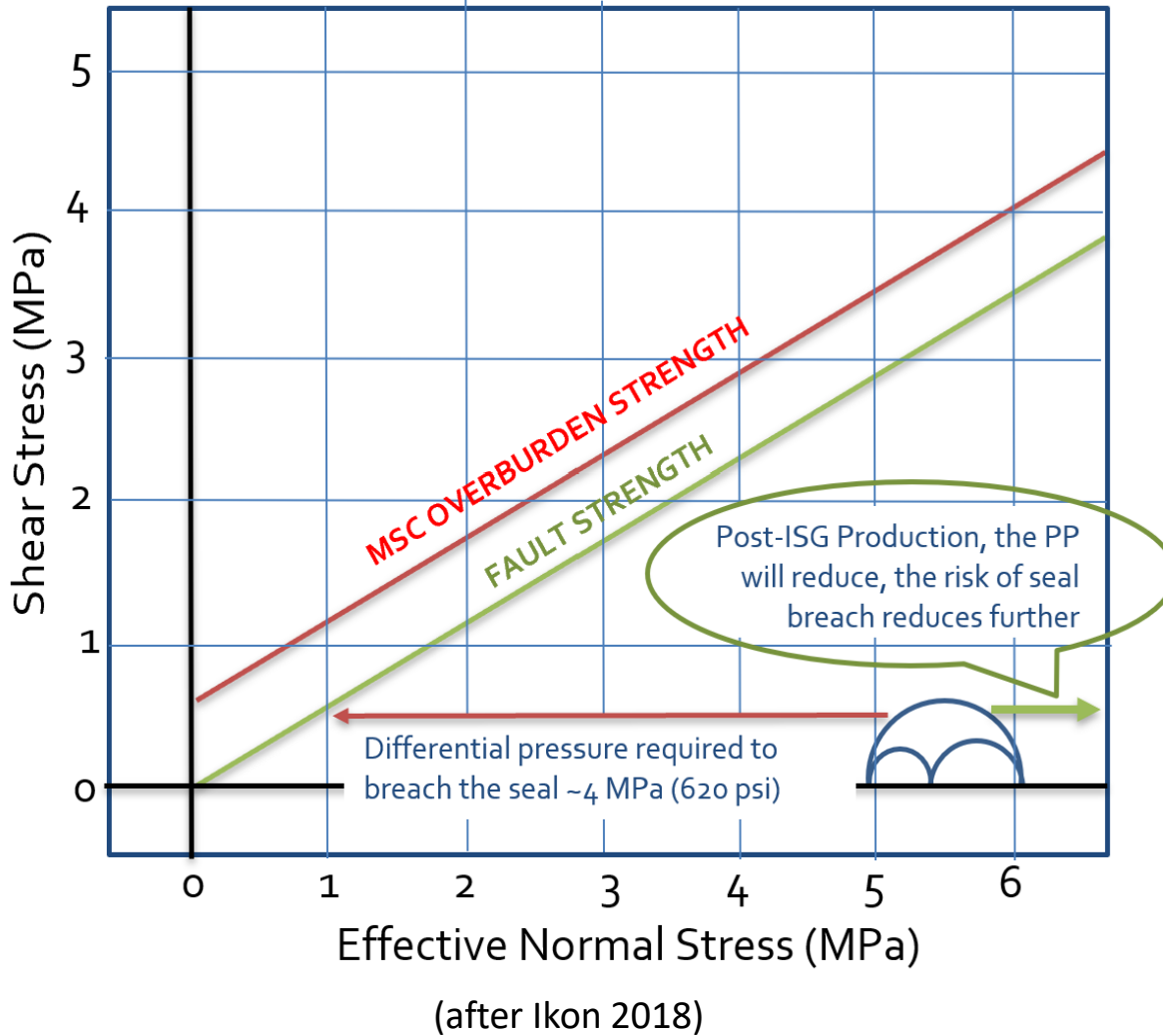
- Oil and gas reservoirs,
- Deep saline formations and
- Coal that is uneconomical to mine

In-situ gasification



- Underground Coal Gasification (UCG) or In-situ Gasification (ISG) is a process that converts in-situ coal from a solid into synthesis gas (syngas)
- Directional drilling used for inlet/outlet
- The coal is heated, and an oxidant is fed down the inlet well, to feed the reaction
- The chamber grows until the chamber size and temperature is enough to start the chemical reaction
- The resulting syngas is extracted via the outlet well
- The syngas composition can be varied, based on pressures and water content

Preliminary Geological Studies (for CO₂ injection)



An independent geological study of the Telford Basin has found:

- Post-ISG, the pore pressure of the reservoir will reduce, which has the effect of increasing the capacity for CO₂ injection.

Preliminary Geological Studies (for CO₂ injection)



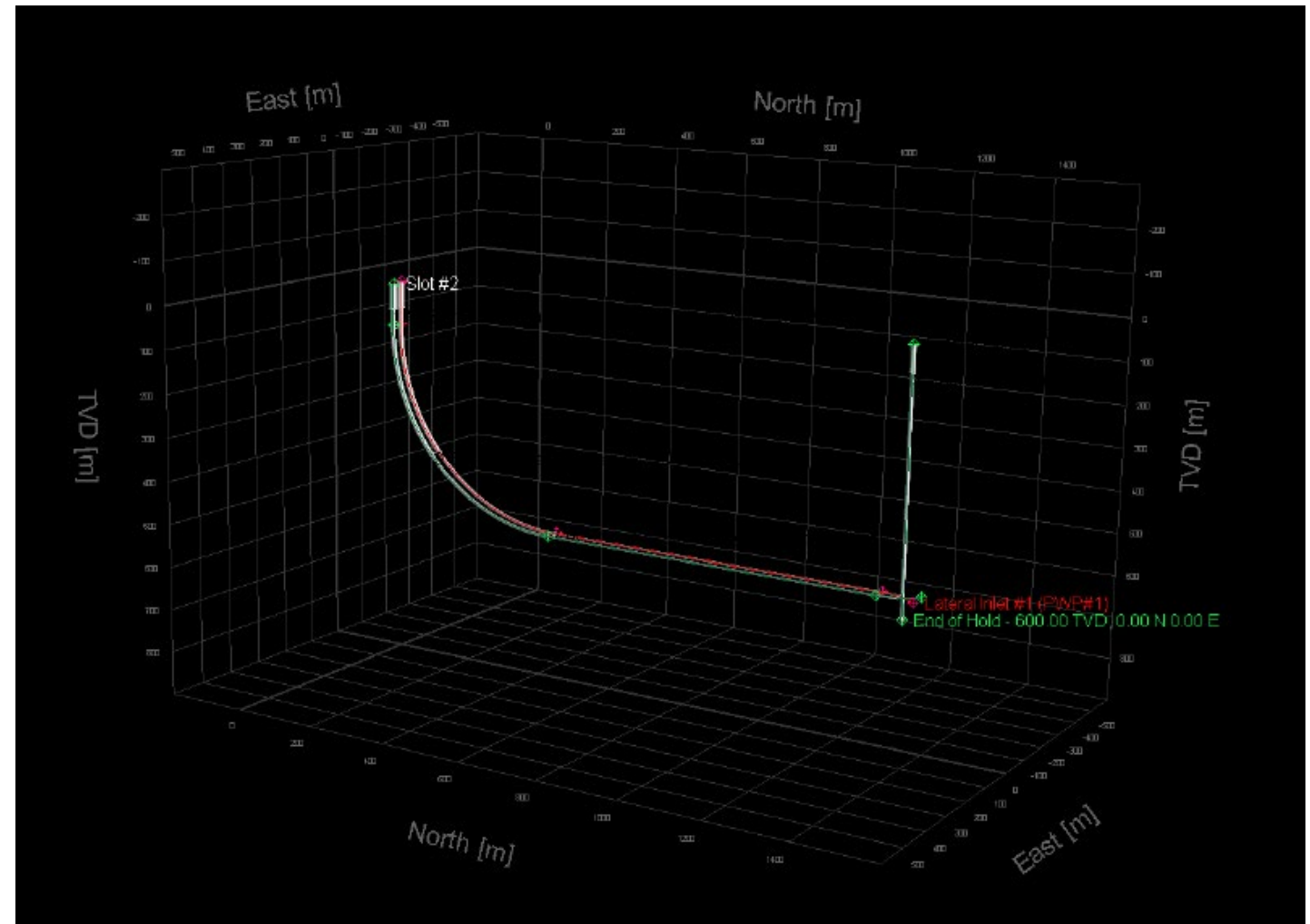
Fluid/gas sealing potential of Telford Basin rocks

Depositional Environment	%Clay	%Silt	Abundant Accessory Mineral	Sonic (micro.se c/ft)	Bulk Density	Gamma Ray	Resistivity	Seal Quality	Data Source
Low energy, Distal, Hemiplagic	72.30%	21.90%	Siderite &/or Pyrite	105.6 ↓	2.61↑	4.1	0.7 (unit unknown)	Excellent	Harrison 2010
Low energy, floodplain, peat swamp	Dark grey - black carbonaceous mudstones described	minor silt	Siderite		2.65 - 3.0↑	90-100		Excellent	Playford 2A wireline log
Low energy, floodplain, peat swamp	Dark grey - black carbonaceous mudstones described	minor silt	Siderite	100 ↓	2.7 - 2.8↑	70-80	40-70 ohm.m	Excellent	Playford 5 wireline log
Low energy, floodplain, peat swamp	Dark grey - black carbonaceous mudstones described	minor silt	Siderite		2.8 - 3.0↑	40-60	higher peaks noted	Excellent	Playford 7 wireline log

An analysis of the petrology and mineralogy of the rocks above the proposed gasifiers show that they have excellent sealing potential for fluids and gases.

Well Design (for CO₂ injection)

- The well design for the ISG wells (and subsequent CO₂ wells) is shown on the right, with the cased sections of the wells in white.
- The red and green sections are the parts of the wells that are within the coal seam and will be gasified. These are the sections that will become the CO₂ storage areas.

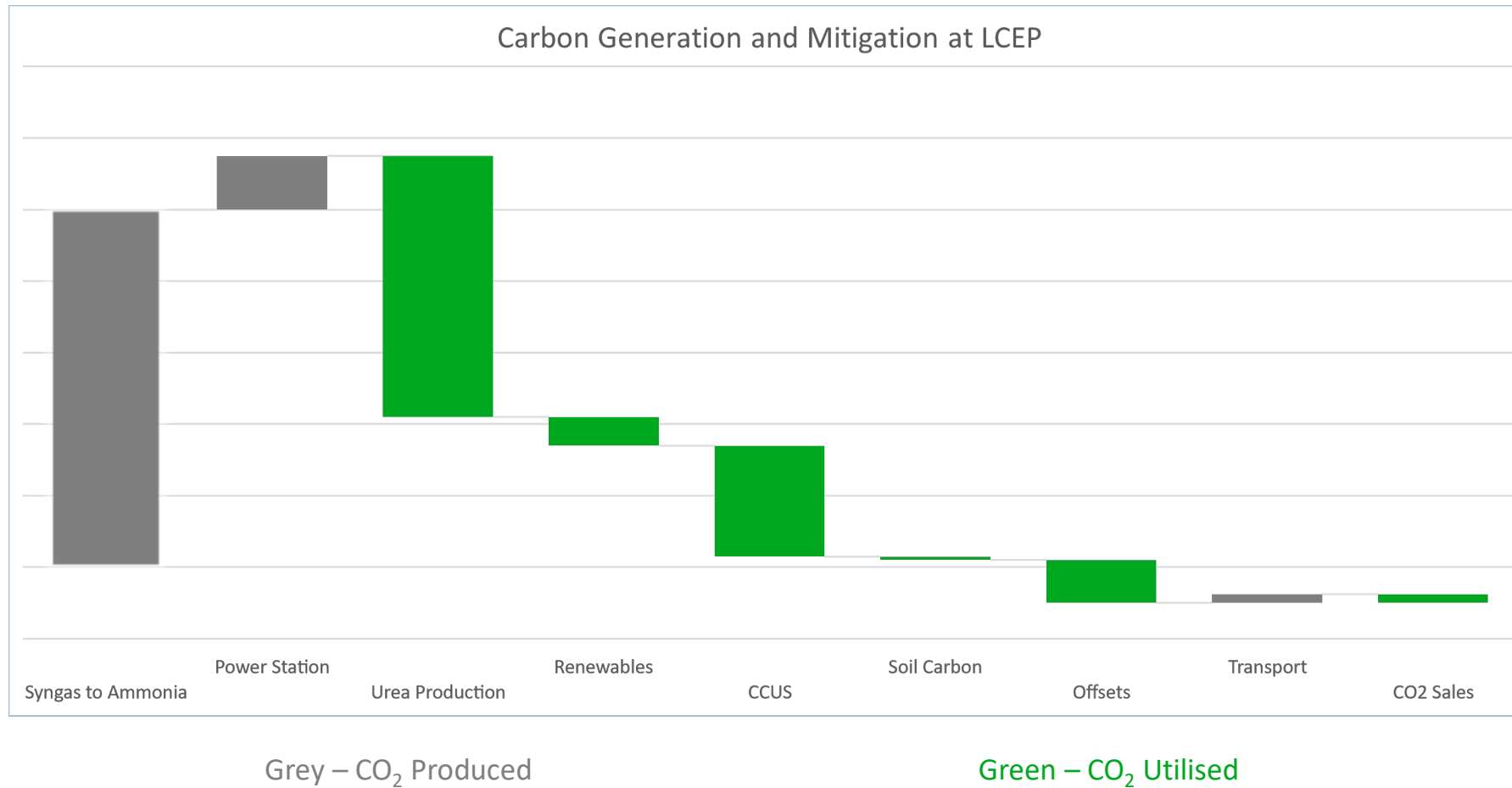


2022 Carbon Neutral *by design*



- CCUS is feasible and is proceeding at LCEP
- Geologically stable province using proven engineering technology to capture and store CO₂
- No requirement to transport CO₂ for storage, insitu process allows for cost-effective method
- Urea production utilises approximately 75% of the CO₂ during the process reducing emission for capture
- ISG allows LCK to utilise the coal resource in a cleaner, more sustainable way well into the future
- Australian agriculture, import replacement, reducing the carbon footprint of Australian agriculture
- Long life, 30 years plus underpinned by globally competitive production economics with a feedstock cost of \$1/GJ, globally competitive plant
- This project will create long term Australian jobs

INTEGRATED UREA PRODUCTION



LEIGH CREEK ENERGY

WE SUPPORT



Thank you