EDISON

Carbon Energy

Initiation of coverage

Commercialising UCG

Oil & gas

Carbon Energy (CNX) has developed its unique keyseam underground coal gasification (UCG) technology, which enables synthetic natural gas to be continuously manufactured at costs that are competitive with most alternative gas sources. CNX has begun to receive fees under its first licensing agreement and further licencing opportunities are progressing. This technology is globally significant and offers the potential to diversify sources of gas and ameliorate supply shortages.

Year end	Revenue (A$m)	PBT* (A$m)	EPS* (c)	DPS (c)	P/E (x)	Yield (%)
06/12	0.1	(17.5)	(2.3)	0.0	N/A	N/A
06/13	0.6	(16.4)	(2.1)	0.0	N/A	N/A
06/14e	6.5	(6.4)	(0.5)	0.0	N/A	N/A
06/15e	5.4	(5.9)	(0.5)	0.0	N/A	N/A

Note: *PBT and EPS are normalised, excluding intangible amortisation, exceptional items and share-based payments.

Continuous gas manufacture at low cost

CNX's keyseam UCG technology has a significant advance over earlier UCG technologies in that it is a continuous rather than a batch process. It achieves consistency of production and the ability to customise the gas specification. Gas as syngas can be used directly for power generation, ammonia production, or converted to pipeline-quality synthetic natural gas (SNG), which can be directed to natural gas networks. The process can use stranded or deep coal, which would otherwise be uneconomic to extract. Total operating costs including capital allocation are very competitive relative to the rising cost structures of many gas projects. Dewatering or fracking is not required.

Licensing financially attractive and repeatable

Having developed the technology, CNX is now pursuing pathways to monetisation. The company has established its first licensing agreement and has started to receive fees from the first commercial project to use the technology, which is in Inner Mongolia, China. Licensing agreements, which do not require capital from CNX, can be readily replicated and the company is in discussions with other parties. These agreements, which incorporate service and technology fees and ongoing royalties, are financially attractive. In parallel, CNX is also planning to develop its own syngas reserves in Queensland. This would require capital, but would offer a higher return than licensing agreements.

Success-based valuation at significant premium

The keyseam technology has been proven, but we expect the re-rating of CNX shares to be driven by catalysts that relate to milestones being achieved, such as government approvals, production in projects under licence and the award of new technology agreements. We have determined a success-based valuation of A$0.21/share comprising approximate technology development costs of A$0.11/share and a A$0.10/share DCF valuation for the licensing agreement in Inner Mongolia, China. This is a significant premium to the current share price.

2 June 2014

Price	**A$0.013**
Market cap	**A$16m**
	US$0.90.A$
Net cash (A$m) 31 March 2014	5.4
Shares in issue	1,257.1m
Free float	27.0
Code	CNX
Primary exchange	ASX
Secondary exchange	N/A

Share price performance

%	1m	3m	12m
Abs	(7.1)	(27.8)	(54.6)
Rel (local)	(7.2)	(28.5)	(59.2)
52-week high/low	A$0.035		A$0.013

Business description

Carbon Energy (CNX) has developed the keyseam underground coal gasification (UCG) technology at its Bloodwood Creek site. It is seeking to monetise its technology and has started to receive fees from its first technology agreement. Additional licensing agreements are being negotiated.

Next events

June quarter 2014	July 2014

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Investment summary

Company description: Scalable alternative gas supplier

CNX's wholly owned proprietary keyseam underground coal gasification (UCG) process produces syngas from coal, with particular application to stranded or deep coal deposits. Syngas can then be used to 'manufacture' SNG. The costs of SNG production from syngas are extremely competitive with most alternative gas sources. Under licensing agreements or direct project ownership, the company is uniquely placed to deliver a scalable alternative source of gas to domestic, power generation or industrial users.

Valuation: Little in the price for the technology or licence fees

CNX's valuation is dependent on the ongoing achievement of milestones. The technology has delivered proof of concept at its Queensland site, but still needs to demonstrate decommissioning of the coal panels has occurred and a rehabilitation plan to obtain approval from the Queensland government to initiate a commercial UCG project at the site. This may be achieved by the end of CY14. Receipt of fees from the Inner Mongolia, China technology agreement is performance related and will add impetus to the technology as this project advances.

We have reviewed the valuation of the technology itself, the value of licensing agreements, the value of ownership in a standalone project and the value of conventional Surat Basin coal deposits it wishes to divest. We have determined a success based valuation of A$0.21/share comprising approximate technology development costs of A$0.11/share and our A$0.10/share NPV valuation of the Master Technology Licence Agreement for the Inner Mongolia, China, project. The NPV for a standalone project could be >A$160m (Exhibit 4), but we have not included a standalone project in our valuation as there is no certainty of timing, funding or equity level. We have not included a value for the Surat Basin coal deposits as the market for thermal coal assets is currently very depressed.

Financials: Fee revenue starting to build

We estimate a cash balance of around A$3.1m by the end of FY14 and effective debt of A$10.0m (convertible notes). Revenue in the form of service and technology fees from the technology agreement in Inner Mongolia, China, is starting to build. However, depending on the extent of new licensing agreements being signed up and additional fee revenue being derived, our cash flow projections indicate CNX may need to raise some additional equity by the end of FY15.

Sensitivities: Affected by many external factors

CNX is generating income from licence agreements, but is not currently generating income from its own operating activities.

- **keyseam technical issues:** keyseam has demonstrated proof of concept, but development approvals in Australia are subject to decommissioning and rehabilitation hurdles and public acceptance.
- **Government/political issues:** these range from the local approval decisions on keyseam activities to international conflicts that may have an impact on the geography of energy supply.
- **Funding:** CNX's ability to advance its technology and develop its own cash flow generating activities is dependent on the reliability of its technology partners and availability of funding.
- **Global energy environment:** whether licensing its technology to others or selling keyseam UCG gas at export parity prices, CNX's revenue potential is sensitive to the global energy price environment, supply/demand dynamics, exchange rates and the global economy.
- **Alternative energy sources:** CNX's business could be affected by technology breakthroughs that lead to the development of alternative energy sources.

Company description: Game-changing technology

In many jurisdictions, gas supplies are depleting, heavily skewed to a risky source or reliant on unpopular coal seam or unconventional production methods. keyseam technology requires a low-surface footprint and does not involve dewatering or fracking. There are many energy deficient regions of the world that have unused stranded or deep coal deposits that keyseam can use. The costs of keyseam make the technology financially attractive.

What the company does

Compared to UCG batch processes, the keyseam process has a point of difference, in that it is a continuous process. This delivers advantages in process control, consistency of throughput, customisation of product and lower costs. Once the process has been initiated, production can be maintained, typically for around 10 years, using the same initial injection and production wells.

The process produces syngas, which can be used directly in power generation or ammonia production or converted to SNG at a surface plant. The SNG is pipeline-grade methane and can be added to natural gas pipe networks for transport to customers. An advantage of taking the final product to the methane stage is the potential to obtain prices linked to international benchmarks.

CNX has a broad geographic base. It has commenced delivery of its first commercial-scale UCG project in Inner Mongolia, China, under a licensing agreement. It has also signed an MOU to become a technology partner in a UCG project in Argentina and has entered into an agreement to become a technology partner in a project in Chile. It is also planning to develop its own project in Australia.

Group strategy

CNX's strategy is to continue to develop and commercialise the keyseam technology. There are two primary routes to monetisation, either by licensing the technology or direct project ownership.

CNX is already receiving service fees from its licensing agreement in Inner Mongolia, China. Under this model, CNX does not invest its own capital. It receives technology licence fees when milestones are met and royalties and service fees for the project life. Agreements may specify royalties on gas sales (syngas or SNG) or power sales (MWh). The licensing model can be easily replicated.

Direct equity ownership in a keyseam project offers the best potential financial return but the capital cost of the injection and production wells and surface processing plant would have to be funded.

Technical and engineering expertise

CNX has a large team of professionals dedicated to all aspects of the keyseam UCG technology.

- **Morne Engelbrecht (MD and CEO)**, chartered accountant: over 13 years of Australian and international oil and gas experience. He has held several senior financial and commercial management roles where he was responsible for operations and multi-billion dollar projects.
- **Dr Cliff Mallett (technical director)**, geologist: worldwide chairman of the UCG Association, which is run from London. One of the most highly regarded UCG experts in Australia and worldwide, with over 30 years' coal mining experience, including over 15 years dedicated to advancing the development of UCG process technology.
- **Terry Moore (general manager, operations)**: electrical, mechanical and civil and construction of projects from concept to commissioning and production.
- **Justin Haines (general manager, technical services)**, geologist and project manager: responsible for the implementation of CNX's proprietary technology.

The keyseam process explained

UCG has a small surface footprint, can extract energy from stranded or very deep coal deposits, maximises resource efficiency when compared to coal seam methane (also known as coal seam gas or CSG), with output of up to 20 times more energy and does not require pumping of groundwater or fracking. Despite its positive features, UCG's global advancement has been limited by the fact that it is still a developing technology, and there are readily available energy alternatives and complex regulation.

Overview

UCG was first developed in the former Soviet Union in the 1930s. Since that time there have been many variations of the basic process, primarily using a batch model.

CNX's proprietary UCG technology keyseam, which is a controlled retraction injection point (CRIP) process, was developed after 10 years of research and development with Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). Over 60 UCG global projects were investigated. It involved five years of in-field trials and over A$100m of investment.

A key differentiating element of keyseam is that it is a continuous process. Under this process, gasification dynamics can be controlled and customised leading to consistency of product. There is a single 'reactor' that retreats along the coal seam, which uses the same horizontal injection well (for air or oxygen injection) and the same production well (for the syngas product) throughout the life of the coal panel. A single coal panel can have an operating life in excess of 10 years.

This contrasts with most batch processes where there are numerous 'reactors', each with a life of approximately one month and requiring individual re-ignition. As well as requiring numerous costly individual reactor developments, there is less control of the underground opening created, less interaction between the coal and the hot gases and a less consistent product stream.

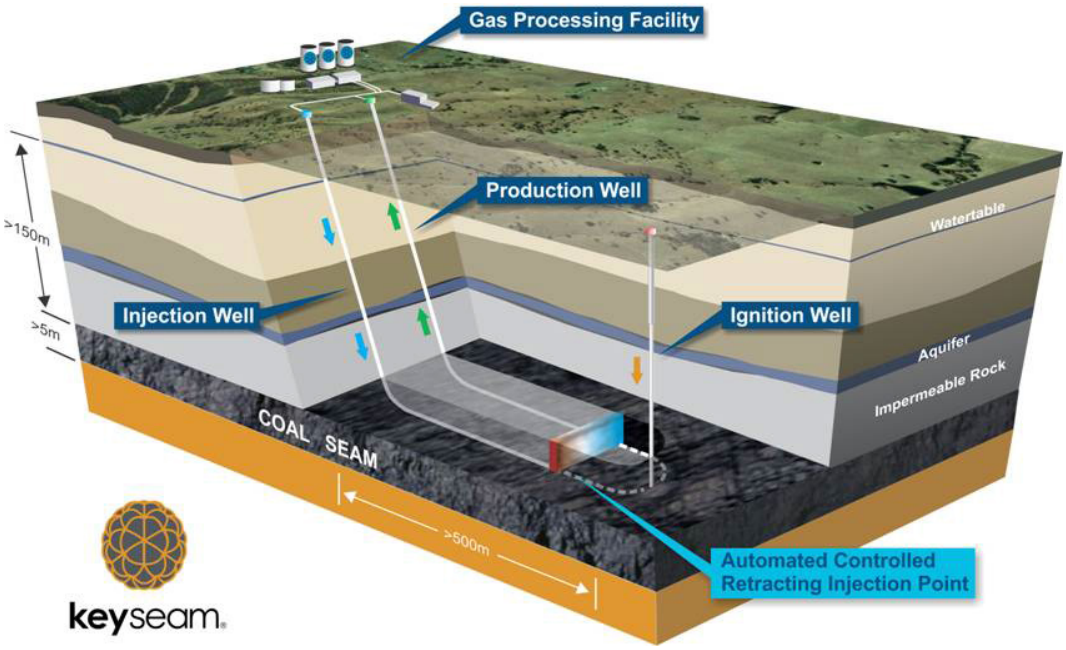
Description of the keyseam process

The keyseam Parallel CRIP method uses a 'streaming' reactor model for the gasification face. Features of the process include the following:

- Horizontal injection and production boreholes, drilled in virgin coal, may be as long as horizontal in-seam drilling can achieve and may be over 1km in length. The gasification process is largely independent of the length of the horizontal boreholes.
- The horizontal boreholes are connected to the surface oxidant injection and syngas processing facilities by vertical boreholes, which are remote from the gasification reactions.
- Because the horizontal in-seam wells are embedded in virgin coal and the vertical wells are distant from the gasification areas, the wells are isolated from possible strata movements above and surrounding the expanding cavity. The vertical section of the product well is further protected from the high temperature impact of the syngas product by traversing a significant length of horizontal borehole before entering the cased vertical production well.
- The flow path between the horizontal boreholes creates a single gasification face. The hot gases are held against the fresh coal by the pressure differential between the boreholes.
- Gasification conditions remain relatively constant throughout the extraction of the coal panel, which can be in excess of 10 years. There is no need for re-ignition during the gasification process.
- The length of the gasification face (ie width of the coal panel) is the horizontal distance between the horizontal injection and production boreholes. This length is governed by the maximum stable face length for given conditions of flow rate, injection gas, coal thickness and water inflow. A 30m panel width was successfully used in CNX's trials at Bloodwood Creek.

- The process involves the continual retraction of the injection point as the gasification face retreats between the injection and production boreholes. No re-ignition is needed.
- Injection flow rates can be optimised for maximum gasification efficiency or customised for a specific syngas composition. Parameters can be maintained and replicated in other panels.
- The keyseam method allows all the coal between the horizontal boreholes to be extracted, creating a rectangular-shaped extraction panel. This ensures the maximum coal recovery.
- Because of the known location, shape and rectangular dimensions of the reactor cavity, computer modelling of supporting coal pillars and fracture propagation in the roof can assist in maintaining reactor cavity integrity and location selection for UCG panels.

Exhibit 1: Schematic diagram of the keyseam UCG process



Source: Carbon Energy

Proof of concept

keyseam UCG technology has been demonstrated at CNX's Bloodwood Creek site, near Dalby, Queensland. Two UCG panels, Panel 1 and Panel 2, produced a high-quality syngas.

Proof of concept was achieved during the Panel 2 trial, which operated continuously for 20 months and gasified 13,000 tonnes coal, forming a cavity of approximately 8,500m^3. Outcomes included:

- consistent production of high-quality syngas at a 12-month average of 6.45 MJ/Sm^3 HHV;
- no physical intervention or re-ignition required once reactor initiated;
- no impact on groundwater quality or quantity beyond trial area;
- containment and control of the gasification process; and
- reliable operation of internal combustion engine-driven electricity generators and reliable export of electricity to the local electricity grid.

UCG applications

The high-quality syngas produced by the keyseam process is not a saleable product, rather a feedstock that can be converted to an end-product. It can be used directly in an electricity power plant or used in ammonia-based chemicals such as explosives and fertilisers. Syngas has a high hydrogen content, so ammonia production from syngas is cheaper than using natural gas.

However, it is financially more attractive to convert the syngas to pipeline-quality synthetic natural gas (SNG), which can be fed into pipeline networks or used to produce liquefied natural gas (LNG). A conversion plant would be located close to the syngas product well. SNG can also be used to produce synthetic liquid fuels such as diesel, jet fuel, naphtha and blend stocks.

Commercialisation of the keyseam process

CNX has two pathways to commercialise its keyseam technology. One is to seek global opportunities to license the technology. The other is to commercialise its own coal reserves.

Licence agreements

CNX's preferred model is a Master Technology Licence Agreement, where remuneration is received from a licensing fee payable in stages when technical milestones are achieved, ongoing fees to provide engineering services for the project life, and a royalty on gas produced.

In November 2013, CNX started delivery, over three years, of its first commercial-scale UCG SNG project, located in Inner Mongolia, China. Using this project as a guide, the receipt of the first Stage 1 services and licensing fee instalment triggers the start of the first phase of technical services and engineering works by the CNX team. The balance of Stage 1 fees are payable progressively. Additional technology licensing fees are payable on achievement of milestones over stages 2 and 3. Total fees payable to CNX for the Inner Mongolia, China project are A$8.25m for Stage 1 and A$7m over stages 2 and 3. We present an indicative valuation for this agreement in Exhibit 2. SNG prices are market oriented and regulated by government. We assume an SNG price of US$5/GJ.

- **Stage 1** – a single UCG panel is constructed and operated and the results used to confirm the site characterisation before starting commercial-scale underground and above-ground designs.
- **Stage 2** – construction and operation of two additional panels to confirm Stage 1 results.
- **Stage 3** – construction and operation of a 30PJ/year SNG commercial facility.

Exhibit 2: Indicative valuation of Inner Mongolia, China licence agreement

					Average year
Domestic gas price (US$/GJ)					5.0
Price (A$/GJ)					5.6
SNG (PJ)					30.0
Revenue (A$m)					166.7
	Stage 1	**Stage 2**	**Stage 3**		
Engineering services fees	5.25				
Technology licensing fees	3.00	4.00	3.00		
Total fee income	8.25	4.00	3.00		
CNX royalty at 5% (Edison assumed)					8.3
Total income	8.25	4.00	3.00		8.3
Tax	2.47	1.20	0.90		2.5
Cash flow	5.77	2.80	2.10		5.8
NPV at 10% discount rate	A$127.3m	A$0.10/share			Costs and revenues unescalated

Source: Carbon Energy, Edison Investment Research

In July 2013, CNX signed an MOU to become the technology partner to a commercial UCG project in Argentina that would generate 300MW of electricity from syngas. In October 2013, CNX entered into an agreement with Antofagasta Minerals in Chile with the objective of becoming a technology partner in a UCG project supporting a 250MW power station.

Queensland keyseam project

In addition to income from service, licensing and royalty fees, CNX also wishes to generate earnings from direct equity ownership in projects using its keyseam technology. This has the potential to be more valuable as it is long-term, scalable and can offer global energy pricing.

The Queensland government has very strict requirements for the commercial application approval of the keyseam UCG technology, one of which is that it must be able to demonstrate decommissioning of Panel 2. CNX is now working to demonstrate successful decommissioning and planning for rehabilitation should it be required. The results from the analysis of samples from the various phases of a coal core and sampling programme will be interpreted by independent environmental and site remediation experts. CNX will finalise the rehabilitation plan and agree the environmental values to be applied to the site.

At its Bloodwood Creek site near Dalby, Queensland, CNX is proposing a 25PJ/year SNG project that could be in production in 2017, subject to approvals.

- **Infrastructure**: the location is close to major power lines and the Roma-Brisbane gas pipeline is at the northern end of CNX's leases. The leases are also close to the QGC pipeline to Gladstone. There is an industrial-grade water supply and easy access to road and rail routes.
- **Substantial reserves in Surat Basin:** the project will source its syngas from the reserve in MDL374 (see Exhibit 3) in the company's wholly owned 1,063km^2 of exploration leases. These are presented in accordance with the Society of Petroleum Engineers' guidelines.

Exhibit 3: Bloodwood Creek MDL374 UCG syngas reserves

Category	Gross gas volumes (PJ)
1P reserve (proven)	11
2P reserve (proven and probable)	1,362
3P reserve (proven, probable and possible)	3,285

Source: Carbon Energy

- **Improved panel development time**: the project would involve 47 coal panels with dimensions 1,000m long, 30m wide (the gasification face) in a coal seam approximately 10m high. The panels could be drilled in a modular fashion, for example 10 panels at a time. Advances in drilling technology mean that the lead time to drill 47 panels could be less than 12 months.
- **Rapid ignition period**: syngas production would commence within five days of ignition. Oxygen injection would be used as this produces a high calorific value (CV) gas. A low CV syngas using air injection can only be used for electricity generation.
- **Surface plant produces SNG:** syngas output would be 38PJ a year. This is converted to 25PJ/year SNG at approximately 65% efficiency after accounting for power (syngas generation) and processing losses. This is directed into natural gas pipe networks. Syngas is mainly carbon monoxide (CO) and hydrogen (H_2) with some methane (CH_4). SNG, like natural gas, is pipeline-quality methane (CH_4).
- **Longest lead time items:** the oxygen plant (for the syngas facility) and the end-use plant would have the longest lead times on a project, generally around two years.
- **Long life, consistent production rate**: once established, a keyseam operation is expected to provide consistent production for a minimum of 20 years, depending on flow rate and panel length. A typical commercial operation could comprise a 47-panel system with a life per panel in excess of 10 years. New coal panels would then be drilled, taking about six months, in advance of production from the old panels ceasing. We estimate a drilling cost for the replacement panels of less than A$20m (in today's dollars). It is anticipated there would be no interruption to supply in switching between old and new panels as the production rates in old panels would gradually be reduced and the production rate of the new panels is gradually increased, thus providing a seamless transfer from old to new panels.
- **Potential for export netback prices from SNG sales**: the easiest and most remunerative pathway to market is the sale of SNG under long-term contracts that relate to export netback prices referenced to the Japan Customs-cleared Crude (JCC) oil price. Contract terms vary, but indicative SNG prices would be A$8.00/GJ to A$10.00/GJ over a JCC oil price of US$100-120/bbl. The revenue derived from selling gas exceeds the potential revenue from producing and selling electricity using unprocessed syngas by a wide margin.

Valuation of a 25PJ/year keyseam project

We have modelled the proposed project on the basis of preliminary assumptions that include a capital cost of A$750m, to include an oxygen plant and power station for site needs, and a contract SNG price of A$8/GJ. Exhibit 4 shows an average year in a 20-year life project.

Exhibit 4: Bloodwood Creek keyseam UCG project

		Average year
Long-term contract price - SNG (A$/GJ)		8.0
Implied coal price (A$/t)		86.9
Implied coal price (US$/t)		78.3
As Received (AR) coal (mt)		2.3
Syngas (PJ)		38.0
SNG (PJ)		25.0
Earnings (A$m)		
Revenue		200.0
Operating costs		50.0
Royalties at 7%		14.0
EBITDA		136.0
Depreciation		38.5
EBIT		97.5
Operating costs (A$/GJ)		2.00
Depreciation (A$/GJ)		1.50
Total (A$/GJ)		3.50
NPV at 10% discount rate	A$160.1m	Costs and revenues unescalated

Source: Carbon Energy, Edison Investment Research

keyseam UCG in the East Coast gas market

keyseam UCG can readily 'manufacture' significant increments of additional gas from known coal resources at costs that provide high margins at market prices.

Big lift in East Coast gas demand due to LNG projects

Current East Coast of Australia gas demand is approximately 700PJ/year with NSW and Queensland accounting for around 150PJ and 210PJ of this demand respectively. With the planned commissioning of three LNG projects at Gladstone, gas demand has the potential to rise to over 2,500PJ/year by 2020 (Ai Group AGL Gas Summit, 12 July 2013, assumes eight-train, 32Mtpa LNG scenario). This would require an additional 1,800PJ/year of gas supply. While it is possible that domestic demand could fall to around 600PJ/year due to a reduction in gas-powered generation and industrial demand, this is still a massive overall increase in demand.

Uncertainty on costs and sustainability of East Coast supply

Additional CSG or conventional gas sources may be required to avoid supply shortfalls.

- **Conventional gas fields:** these now have relatively low reserves.
- **Non-conventional gas sources:** these still have technical risk and production uncertainty.
- **Rising gas production costs:** according to IES Advisory (2013), the current average cost of new unconventional and CSG gas is approaching A$5/GJ. Core Energy Group (2013) believes the long-run marginal cost for new supply beyond 2017 will be A$6-8/GJ (2013 dollars).
- **Declining flow rates:** CSM fields with the best flow rates are usually developed first.
- **Restrictive policy on NSW CSG developments related to community concerns:** NSW is sourcing 95% of its gas from Queensland and Victoria. Contracted supply drops off over the 2015-17 period leaving a supply void.
- **Environmental constraints:** CSG and non-conventional gas production may also be affected in other states and regions by environmental concerns related to water table issues and fracking.

Carbon Energy to fill the gas supply gap?

With keyseam, gas can be effectively 'manufactured' on demand to meet supply shortfalls and ultimately become a key component of the gas supply chain. Key commercial elements include:

- **Plentiful known coal resources available:** keyseam is very well suited to coal resources that otherwise cannot be extracted such as deep or stranded deposits. Compared to conventional gas exploration, additional exploration is only needed for site selection.
- **Locational diversity:** there are suitable coal resources in all Australian states, many of which are located close to existing natural gas pipelines.
- **Scalable:** production rates are scalable and flexible and are a function of capital invested rather than resource availability or exploration intensity.
- **Short lead time:** lead time to establish production from the first keyseam panel is around 18 months for the plant and less than 12 months to drill the boreholes to scale up to a 25PJ/year facility.
- **Competitive costs of production:** given rising cost trends for new gas, keyseam SNG will be increasingly competitive with total costs including capital expected to be below A$4/GJ (excluding any carbon tax).
- **Flat costs of production:** compared to the cost pressures of conventional gas or CSG, a keyseam operation, once established, is expected to have few upward cost pressures.
- **Consistent production:** unlike conventional gas wells where flow rates are a function of geology and decline with time, keyseam flow rates are maintainable at a consistent flow rate.
- **Water table:** there is no expensive water pumping and no drawdown of the water table.
- **Fracking:** there is no need for expensive and controversial fracking of the coal.
- **Annuity style cash flow:** the keyseam operation is designed to provide consistent annuity style cash flows for an extended period. The only significant additional cost is the need to drill out new coal panels, approximately every 10 years, at c A$20m (in today's dollars), to replace the old panels. This annuity style income may be attractive to co-investors such as pension funds or a utility.

Valuation

The CNX valuation is dependent on the ongoing success milestones of monetising the keyseam technology, providing confirmation of its high potential. Based on development expenditure, CNX's keyseam technology could be worth around A$0.11/share. An indicative value of a single licensing agreement, delivering to its design parameters, could yield an additional A$0.10/share. Equity in a keyseam could be almost double this for the same production rate, but it would need funding. CNX also has Surat basin coal assets, which may be monetised when thermal coal prices recover.

Valuation of the technology

keyseam technology was developed following 10 years of research with the CSIRO, five years of in-field trials and over A$100m investment in technology development. The respective December 2013 book values of deferred exploration and evaluation costs and intangible assets relating to this work were A$90.0m and A$47.6m, a total of A$137.6m or A$0.11/share. While this does not exactly equate to the value of the technology, it is indicative of the required expenditure to replicate it.

Valuation of a licence agreement

In its licence agreement as exclusive UCG technology partner for the Zhengzhou Coal government-approved commercial-scale project in Inner Mongolia, China, CNX is due to receive milestone-based total engineering and licence fees of A$8.25m for Stage 1 (last payment mid-CY14) and a

total of A$7.0m for Stage 2 and Stage 3. Once first revenue from the minimum 30PJ/year project is generated, CNX will receive ongoing royalties and payments for ongoing engineering support (to be determined).

Licence value is dependent on project performance. Based on assumed domestic gas revenue of US$5/GJ and a royalty estimate of 5% of revenue, we value the agreement at A$127.3m (A$0.10/share) (see Exhibit 2). Royalties for an earlier licence agreement with Shanxi Coal, since deferred, had a higher inferred royalty rate, so our royalty assumption could be conservative.

Importantly, these licence agreements can be replicated in many jurisdictions, although project terms may differ. CNX has also entered into technology partner agreements in Argentina and Chile involving power-generation projects where payment may be linked to a long-term power price.

Valuation of equity in a keyseam project

CNX is pursuing the commercialisation of its own keyseam project based on its reserves at Bloodwood Creek. For commercialisation, the Queensland government still needs to give its approval for the decommissioning and rehabilitation process. Project ownership conveys a higher valuation than licensing as it provides access to all the cash flow. However, it requires significant capital investment. To fund this, CNX could sell equity in the project and use debt financing. It would levy service and technology fees plus royalties from its partners. In Exhibit 4, we provide an indicative valuation of A$160.1m for a fully funded Bloodwood Creek project based on 100% equity.

Monetisation of Surat Basin thermal coal assets

CNX has a total JORC resource of 2.0bn tonnes of thermal coal in the Surat Basin. These are considered non-core and PCF Capital Group has been appointed by CNX to conduct a sale process. However, indicative offers have not reflected CNX's view of their long-term value.

Financials

Revenue has commenced from technology fees, but another equity raising may still be required in FY15.

Earnings

CNX received technology service fees for the Inner Mongolia, China UCG project of A$0.70m, and A$1.1m in Q2 and Q3 of FY14 respectively. A further A$1.4m (before withholding taxes) remains due and payable in the current half year. Full payment will trigger commencement of the final two stages of Stage 1, worth an additional A$5.1m in engineering and technology licensing fees.

Cash flow

CNX is beginning to derive a cash flow stream from technology licence and service fees as above. In the December half, CNX also received a A$3.78m R&D tax incentive rebate relating to FY13 R&D expenditure. Depending on future R&D expenditure and eligibility, CNX may receive future tax incentive rebates. CNX also raised approximately A$1m cash by selling its holding in Energia Minerals and the sale of its residual interest in gold tenements at Laverton to Focus Minerals.

Balance sheet

In the December half, the company raised A$8.8m of new equity comprising A$7.8m from a one-for-two non-renounceable rights issue and A$1.0m from a private placement to a new cornerstone investor, Holder East Capital. Part of the raising was applied to repay the A$3m balance of the Credit Suisse debt facility. In 2012, CNX completed an A$10m convertible note facility with Pacific

Road, maturing in January 2017. The facility is convertible to ordinary shares at any time at A$0.15 per share. Interest is charged at 5% pa, paid quarterly by issuing additional shares to Pacific Road. At the end of Q314, CNX had A$5.4m cash, a liability of A$10m for the convertible notes assuming they are not converted and no ordinary debt. Ordinary shares on issue were 1,257.1m. In our forecasts, we have estimated the additional shares that will be issued to satisfy the interest payment for the Pacific Road convertible notes.

Exhibit 5: Financial summary

A$'000s	2010	2011	2012	2013	2014e	2015e
30-June	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS						
Revenue	354	73	117	596	6,481	5,401
Cost of Sales	(11,119)	(11,349)	(12,489)	(9,395)	(7,963)	(4,000)
Gross Profit	(10,765)	(11,276)	(12,372)	(8,799)	(1,483)	1,401
EBITDA	(14,068)	(15,197)	(17,645)	(11,981)	(5,482)	(5,949)
Operating Profit (before amort. and except.)	(14,198)	(15,340)	(17,735)	(12,078)	(5,615)	(6,084)
Intangible Amortisation	0	0	0	0	0	0
Exceptionals	4,502	(1,280)	(1,412)	(18,885)	1,623	0
Share based payments	(2,075)	98	304	(280)	(240)	(250)
Operating Profit	(11,771)	(16,521)	(18,843)	(31,243)	(4,232)	(6,334)
Net Interest	950	680	280	(4,342)	(777)	200
Profit Before Tax (norm)	(13,248)	(14,660)	(17,455)	(16,419)	(6,392)	(5,884)
Profit Before Tax (FRS 3)	(10,820)	(15,841)	(18,563)	(35,584)	(5,009)	(6,134)
Tax	0	0	0	0	0	0
Profit After Tax (norm)	(13,248)	(14,660)	(17,455)	(16,419)	(6,392)	(5,884)
Profit After Tax (FRS 3)	(10,820)	(15,841)	(18,563)	(35,584)	(5,009)	(6,134)
Minorities	0	0	0	0	0	0
Associated company income	0	0	0	0	0	0
Net income (norm)	(13,248)	(14,660)	(17,455)	(16,419)	(6,392)	(5,884)
Net income (FRS 3)	(10,820)	(15,841)	(18,563)	(35,584)	(5,009)	(6,134)
Average Number of Shares Outstanding (m)	609.5	698.5	743.6	779.5	1,265.6	1,291.1
EPS - normalised (c)	(2.2)	(2.1)	(2.3)	(2.1)	(0.5)	(0.5)
EPS - normalised and fully diluted (c)	(2.2)	(2.1)	(2.3)	(2.1)	(0.5)	(0.5)
EPS - (IFRS) (c)	(1.8)	(2.3)	(2.5)	(4.6)	(0.4)	(0.5)
Dividend per share (c)	0.0	0.0	0.0	0.0	0.0	0.0
Gross Margin (%)	N/A	N/A	N/A	N/A	N/A	N/A
EBITDA Margin (%)	N/A	N/A	N/A	N/A	N/A	N/A
Operating Margin (before GW and except.) (%)	N/A	N/A	N/A	N/A	N/A	N/A
BALANCE SHEET						
Fixed Assets	139,913	169,467	173,696	147,237	144,460	139,059
Intangible Assets	2,500	24,219	54,815	47,624	47,571	47,500
Tangible Assets	133,089	142,204	117,153	99,613	96,888	91,559
Investments	4,324	3,045	1,727	0	0	0
Current Assets	19,002	10,320	6,769	1,965	3,309	763
Stocks	0	0	0	0	0	0
Debtors	128	521	498	109	110	110
Cash	18,874	9,799	6,271	1,773	3,124	578
Other	0	0	0	84	75	75
Current Liabilities	(4,125)	(1,438)	(1,313)	(5,688)	(637)	(2,100)
Creditors	(4,125)	(1,438)	(1,313)	(1,090)	(637)	(2,100)
Short term borrowings	0	0	0	(2,997)	0	0
Provisions/other				(1,601)	0	0
Long Term Liabilities	(40)	(2,175)	(8,384)	(8,495)	(8,450)	(14,609)
Long term borrowings	0	0	(5,375)	(6,179)	(6,179)	(6,179)
Other long term liabilities	(40)	(2,175)	(3,008)	(2,316)	(2,271)	(8,429)
Net Assets	154,750	176,174	170,767	135,020	138,681	123,113
CASH FLOW						
Operating Cash Flow	(12,793)	(18,203)	(17,637)	(5,768)	(4,900)	(2,499)
Net Interest	325	724	428	188	111	115
Tax	0	0	0	0	0	0
Capex	(544)	(572)	(486)	(1,051)	(129)	(150)
Acquisitions/disposals	(3,216)	(10,553)	(3,963)	202	438	(12)
Equity financing, other	14,704	20,205	8,265	0	8,828	0
Dividends	0	0	0	0	0	0
Other	(1,349)	(676)	9,864	1,931	0	0
Net Cash Flow	(2,873)	(9,075)	(3,528)	(4,498)	4,349	(2,546)
Opening net debt/(cash)	(21,747)	(18,874)	(9,799)	(895)	7,404	3,055
HP finance leases initiated	0	0	0	0	0	0
Other	0	0	(5,375)	(3,801)	0	0
Closing net debt/(cash)	(18,874)	(9,799)	(895)	7,404	3,055	5,601

Source: Company accounts, Edison Investment Research

EDISON

Contact details	Revenue by geography
Level 9, 301, Coronation Drive, Milton, QLD 4064 Australia +61 (0)7 3156 7777 www.carbonenergy.com.au	N/A

CAGR metrics		Profitability metrics		Balance sheet metrics		Sensitivities evaluation	
EPS 2011-15e	N/A	ROCE 14e	N/A	Gearing 14e	N/A	Litigation/regulatory	●
EPS 2013-15e	N/A	Avg ROCE 2011-15e	N/A	Interest cover 14e	N/A	Pensions	○
EBITDA 2011-15e	N/A	ROE 14e	N/A	CA/CL 14e	N/A	Currency	◖
EBITDA 2013-15e	N/A	Gross margin 14e	N/A	Stock days 14e	N/A	Stock overhang	○
Sales 2011-15e	N/A	Operating margin 14e	N/A	Debtor days 14e	N/A	Interest rates	◖
Sales 2013-15e	N/A	Gr mgn / Op mgn 14e	N/A	Creditor days 14e	N/A	Oil/commodity prices	◖

Management team

MD & CEO: Morne Engelbrecht

Mr Engelbrecht is a chartered accountant by profession. He has over 13 years of Australian and international oil and gas and resources industry experience. He is responsible for the strategic direction, company expansion and setting the base for the commercialisation of the keyseam technology.

Technical director: Dr Cliff Mallett

Mr Mallett is the worldwide chairman of the London-based UCG Association. He is one of Australia's most highly regarded UCG experts. He is responsible for the ongoing development of CNX's UCG technology. He also assesses potential coal deposits for keyseam and expansion of CNX's global project portfolio.

General manager, operations: Terry Moore

Mr Moore has over 15 years' experience as a senior manager in the engineering sector with experience in projects from concept to commissioning and operational readiness. He leads a growing team of project, environment and safety professionals.

General manager, technical services: Justin Haines

Mr Haines has 23 years' experience as a geologist. He is responsible for the implementation of the company's proprietary technology across the global projects and management of the Technical Services Group, which delivers engineering, geological, hydrogeological and project management services.

Chief financial officer: Catherine Costello

Ms Costello has more than 18 years' international experience in the mining and engineering sectors. Her experience extends to global listed entities undergoing significant growth. She has held senior management roles with Ausenco, Lihir Gold and Placer Dome.

General council and company secretary: Tracy Bragg

Ms Bragg has nearly 15 years' experience in contract and commercial law, specialising in delivering major projects with long-term operations. She oversaw the delivery of in-house legal, company secretarial and corporate governance services to Trility, an Australian water company, and was appointed to its board.

Principal shareholders	(%)
Kam Lung Investment Development Company Limited	13.74
Pacific Road	7.19
Incitec Pivot	6.04

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