30 January 2017: ASX ANNOUNCEMENT

Manager Companies
Companies Announcements Office
Australian Securities Exchange

Leigh Creek Energy Project - Positive Scoping Study; Pre-Feasibility Study Commenced

- **Detailed studies of syngas fired power generation and natural gas product streams completed**
- **Positive results of Scoping Study provide confidence to move to next phase**
- **Pre-Feasibility Study has now commenced**

South Australian energy company, Leigh Creek Energy Limited (ASX: LCK) ("Leigh Creek Energy" or "the Company"), is pleased to announce that it has completed a successful Scoping Study ("the Study") for the Leigh Creek Energy Project ("LCEP"). The LCEP is located in South Australia and has a 2C Syngas Resource of 2,964PJ (see Appendix 1). The Company has now commenced a Pre-Feasibility Study for the LCEP.

Scoping Study Highlights

- The Study covered a number of development cases for further processing of syngas produced from In-situ Gasification (ISG) at the LCEP with the focus being on the cases for electricity generation and natural gas production.
- Several possible options involving a scaled approach, in order to minimise up-front capital, were reviewed. The scope of those options included a power generation case ranging from 150MW to 550MW and a natural gas production case ranging from 20PJ up to 80PJ. There are no guarantees that a specific option can be supported by the Company's current 2C Resource of 2,964PJ.
- Based on the results of the Study, it is anticipated that a major portion of the current 2C Contingent Gas Resource could be converted to a 2P Gas Reserve upon completion of the Pre-Commercial Demonstration and analysis of results.
- The Study concluded that the cases for both syngas fired electricity generation and natural gas are sufficiently robust technically and financially to support advancing to the Pre-Feasibility Study ("PFS") phase and pre-commercial demonstration facility.
- The LCK Board has approved the immediate commencement of a Pre-Feasibility Study on the LCEP.

Leigh Creek Energy's Executive Chairman, Mr Justyn Peters, said: *"The completion of this study is a significant milestone because it has identified the opportunities for the Leigh Creek Energy Project and given the Company the confidence to proceed to the next stage in the Project's evaluation. As a result, the Leigh Creek Energy Board is very keen to immediately progress a more detailed Pre-Feasibility Study on the identified business opportunities."*

Cautionary Statements

The Scoping Study referred to in this announcement has been undertaken to ascertain whether a business case can be made to proceed to more definitive studies on the viability of the LCEP. The Scoping Study is a preliminary technical and economic study of the potential viability of the LCEP. It is based on a Contingent PRMS gas resource and underlying Inferred Coal Resource and on low-level technical and economic assessments. As such, the Study is not sufficient to support the estimation of coal or gas reserves, production targets, costs of production, or revenue, or to provide assurance of an economic development case. Further exploration and evaluation work and appropriate studies are required before the Company will be in a position to do any of those things.

The Scoping Study has been carried out entirely on the basis of a Contingent PRMS gas resource and underlying Inferred Coal Resource, each of which have a low level of geological confidence. These resources should not be relied on by investors when making investment decisions.

Please refer to Appendix 1 and 2 for further details of the nature of the information in this announcement.

Overview

Geology

The Project area is within the Telford Basin which has dimensions of 7.5 km x 4.5 km. Coal seams are present in the Upper, Main and Lower Series.

LCK commissioned GeoConsult in November 2015 to review the geological database and provide a resource estimate and report compliant with the Joint Ore Reserves Committee Code, 2012 Edition (JORC Code). An Inferred Resource and Exploration Target estimation has been carried out over the Project Area, and reported in accordance with the JORC Code. This estimation included an inferred ISG suitable coal resource estimate of 376.6 million tonnes (**Mt**), as announced to ASX on 8 December 2015.

The inferred coal resource completed by GeoConsult and process modelling completed by HRL allowed the LCEP to be independently assessed by MHA of Denver USA, who certified the following resources measured in petajoules (**PJ**). The Scoping Study is based on the 2C SPE-PRMS ISG syngas resource of 2,963.9 PJ, as certified by MHA Petroleum Consultants LLC of Denver, USA and announced to ASX on 8 January 2016.

Table 1 - SPE-PRMS 2C Contingent Resources of the LCEP

Area	Category	Estimated recoverable energy (PJ)
PEL 650; LCEP	1C Contingent Resources	2,747.7
PEL 650; LCEP	2C Contingent Resources	2,963.9
PEL 650; LCEP	3C Contingent Resources	3,303.1

The resources quoted in Table 1 represent the estimated recoverable energy in syngas at the LCEP. The 2C ISG gas resource of 2,963.9 PJ is reported in accordance with the Society of Engineers - Petroleum Resources

Management System (**SPE-PRMS**). PRMS is the internationally recognised standard for reporting oil and gas resources and reserves.

Based on the results of the Scoping Study, it is the Company's expectation that that upon successful completion of the Pre-Commercial Demonstration (**PCD**) the majority of the 2C Contingent Gas Resources will be upgraded to a 2P Gas Reserve.

Tenure

The LCEP contained within Petroleum Exploration Licence PEL 650 is approximately 93km^2 in area and 100% owned by LCK. The production of gas via ISG technology at Leigh Creek is regulated under the *Petroleum and Geothermal Energy Act 2000* by the Department of State Development (Petroleum) of the Government of South Australia

South Australia has a publicly enunciated supportive stance on ISG through the government publication "Roadmap to Unconventional Gas Projects" and in the South Australian petroleum legislation. South Australia is the only State in Australia where ISG has a clear legal environment and the government is supportive. South Australia has been independently ranked as one of the best places in the world to conduct energy exploration and development (Fraser Institute, Global Petroleum Survey 2015).

Environmental

Environmental studies currently underway as part of the development of the Pre-Commercial Demonstration (PCD) include air quality assessment of the existing Leigh Creek Coalfield and potential impacts from LCK's proposed PCD operations, as well as groundwater investigations into flow directions and general water quality parameters. The technical findings of these investigations will be documented in the Environmental Impact Report central to the State's approval process, which includes extensive consultation with relevant stakeholders and the local community.

ISG Design – Syngas extraction

In-situ gasification is a process used to recover the energy from coal resources that are unable to be economically mined by conventional methods. This occurs frequently because a coal resource is too deep to mine, or where the coal seam is too thin to justify the excavation expense. A 'gasification' reaction is used to convert solid coal into a mixture of valuable gases which can then be piped to the surface. The ISG process has been successfully used on coal resources as deep as 1,400 metres below the ground, meaning that ISG provides a process for extracting energy from vast coal resources that would otherwise be unrecoverable.

The ISG process works by partially oxidising the coal. The process is the same as that which was originally used to produce 'town gas' in the early 1900s, before natural gas became prevalent. Coal was mined conventionally, then gasified above the ground to allow the energy to be transported to consumers via pressurised pipes. The process involves heating the coal while starving the atmosphere of oxygen, preventing the coal from combusting. The heated coal undergoes a series of chemical reactions, primarily pyrolysis and gasification, transforming from a solid mass to a flammable gas. The underground gasification, or 'in-situ' gasification process is exactly the same albeit underground rather than at surface, Figure 1 depicts the ISG process. Rather than physically extracting the coal, wells are drilled into the coal seam from the surface, allowing the flow of gases to and from the coal seam.

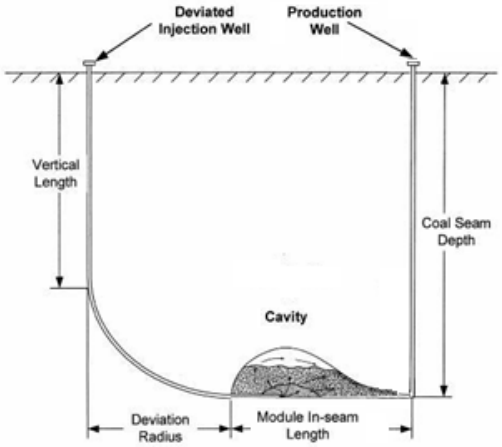

Figure 1- Notional In-Situ Gasification Diagram, Adapted from Drill Path

LCK engaged Drill Path to conduct a study related to the subsurface development of the LCEP. Two ISG gasifier designs have been reviewed for their potential application to the LCEP: (1) Linear Controlled Retractable Injection Point (**CRIP**), and (2) Parallel CRIP. Both designs have been shown to be effective for ISG and represent the preferred ISG deployment systems amongst leading developers. The Parallel CRIP is favoured for commercial operations due to its higher resource recovery combined with production stability. A single Linear CRIP style gasifier will be utilised for the Pre-Commercial Demonstration. Figure 2 depicts a typical Parallel CRIP ISG process.

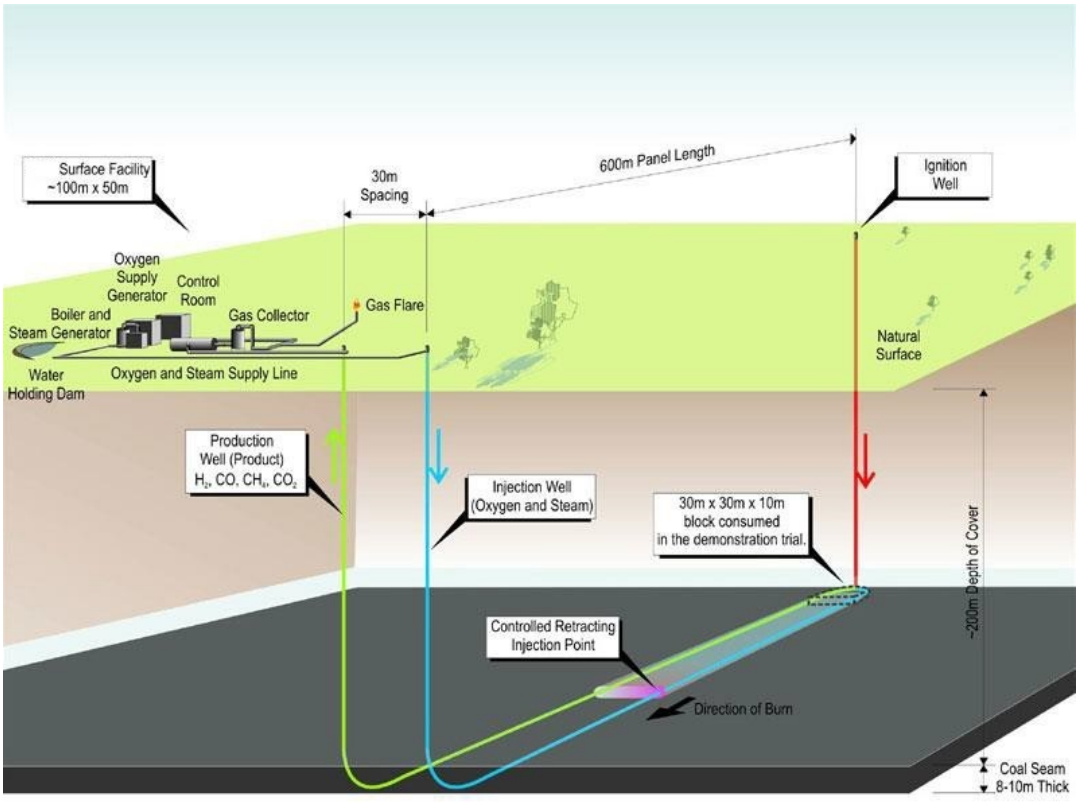

Figure 2 - Diagram of the Parallel CRIP ISG Process, Source: Carbon Energy Ltd

Natural Gas Production

Above Ground Design – Process Flow Sheet

Process modelling, design and mass balance estimates were prepared by independent, experienced process consultants Prudentia as a Class 5 estimate suitable for a Scoping Study. Natural gas can be produced from either oxygen or air blown gasification. Syngas produced from air gasification however, requires the nitrogen content (approximately 50%) to be removed to meet pipeline specification. Separation is technically challenging. In addition, the nitrogen increases the flow rate through the natural gas processing plant increasing capital costs and reducing efficiency. For these reasons oxygen blown gasification was adopted for the Study. Figure 3 illustrates the process flowsheet for the conversion of syngas to natural gas via oxygen blown gasification. The methanation process involves reacting cleaned syngas (hydrogen, methane, carbon dioxide and carbon monoxide over a catalyst to produce synthetic natural gas. The conversion rate of energy in syngas to natural gas is estimated at 88% according to the Prudentia and HRL studies.

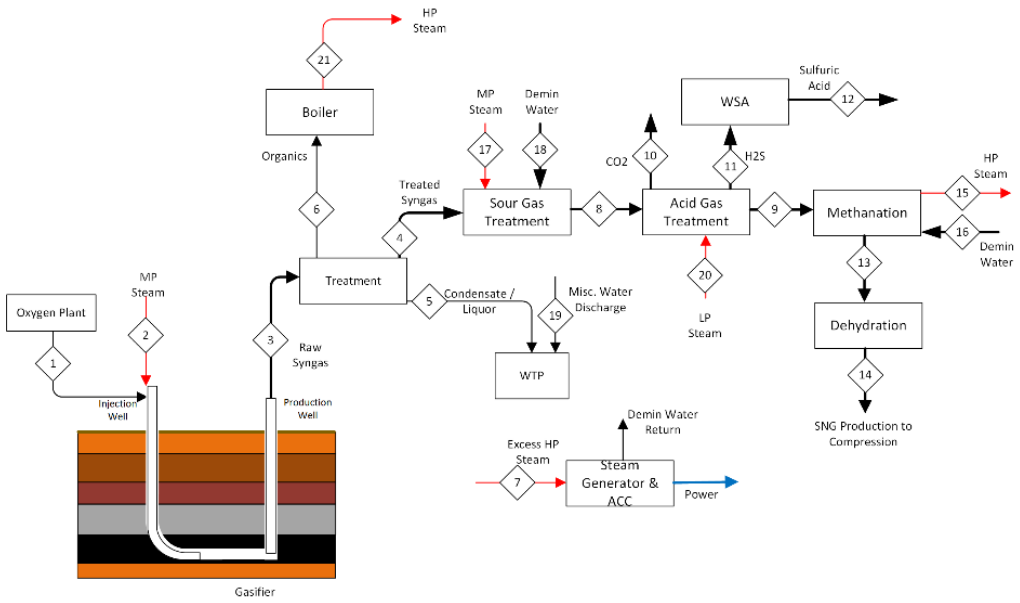

Figure 3 - Process flowsheet for conversion of syngas to natural gas, Source: Prudentia

Plant and equipment selection has been sized on the basis of up to 40 gasifiers and ISG field gathering lines supplying 2-2.5PJpa each to three syngas trains comprising raw, sour and acid gas treatment and methanation plant. Three trains have been selected based on available equipment sizing (primarily methanation plants), economies of scale balanced with allowance for some contingency in the processing flowsheet for maintenance and downtime. These three trains supply a central processing facility comprising dehydration and compression facilities for direct feed into the NG pipeline. The process also requires the use of an auxiliary power station which will be fuelled from syngas and excess steam from the methanation process.

Route to Market

A pipeline for the sale of gas from the LCEP would need to either connect to the Moomba to Adelaide Pipeline System (MAPS) or directly to the Moomba Gas Supply Hub. There are several pipeline route options from the

LCEP. A more detailed analysis of these route options and costing is proposed in the next phase of the study. Environmental and stakeholder assessments would be undertaken during the next stages of the project development.

Project Execution

Long lead items for the project include steam turbine generators, NG compressors, oxygen plant, air compressors, methanators, and the natural gas pipeline. It is estimated that the construction phase will have a 24 month lead time from final investment decision to first natural gas production however this may be shortened if long lead items are ordered in the project delivery phase. The Study reviewed options involving a scaled approach to natural gas production with an initial smaller phase of 20-40PJpa ramping up to production of up to 60-80PJpa.

There is presently a low level of geological confidence associated with the 2C Contingent Gas Resource and underlying Inferred Coal Resource on which the Study is based and there is no certainty that further exploration and evaluation work will enable the Company to announce a production target in respect of the deposit or that the deposit would support a gas processing facility capable of producing 20-80PJpa.

Development of the PCD plant is the priority for the pathway to commercial production. Tied directly to this is the involvement of a project partner which will be required during the feasibility stage for their experience and financing capacity. Other areas which require more detailed studies in the next phase include pipeline analysis, design costings, vendor engagement and 3rd party review and cost estimates. The Company's aim is to begin production in 2020.

Natural Gas Markets

The Study noted that the strong demand for natural gas domestically is underpinned by tightening of gas supply due to the recently completed Liquefied Natural Gas (LNG) facilities at Gladstone, Queensland, on Australia's east coast. The demand for natural gas for these new LNG projects is causing rapidly increasing gas prices in domestic gas markets. Gas prices are further squeezed due to moratoriums on gas exploration in Victoria and New South Wales. The resulting higher gas prices have greatly impacted Adelaide gas prices as presented in Figure 4.

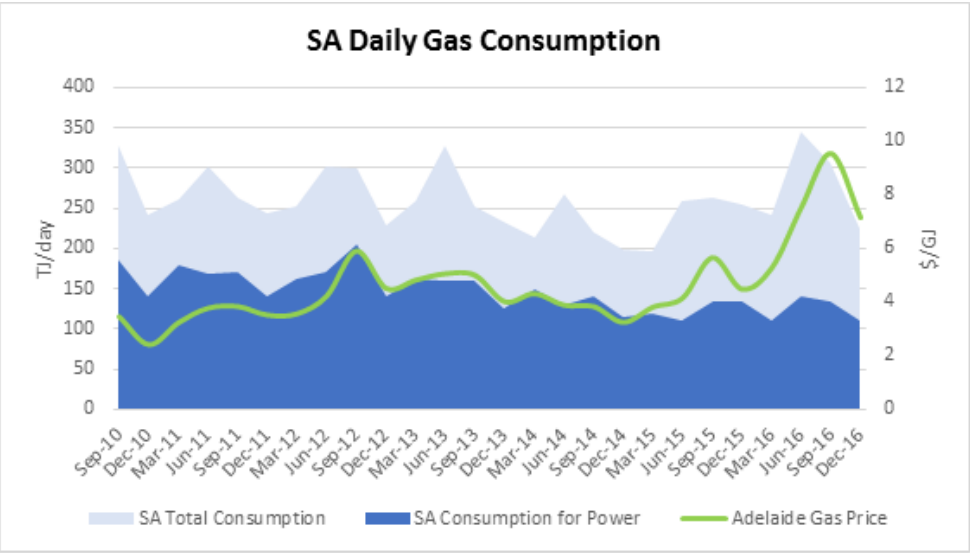

Figure 4 –SA Daily Gas Consumption and Price Source: AER

The Australian Energy Market Commission ("AEMC"), the Australian Energy Market Operator, the International Energy Agency, the Australian Consumer and Competition Commission, the Council of Australian Governments Energy Council, other commentators and national financial media all point to natural gas taking a more prominent role in Australia's energy portfolio.

Capital investment in exploring and developing additional, new supplies of natural gas in Australia is at historically low levels. South Australia is an attractive jurisdiction for gas exploration, with a clear regulatory pathway for exploration to production.

Power Generation

Above Ground Design – Process Flowsheet

Process modelling, design and mass balance estimates were prepared by independent, experienced process consultants Prudentia as a Class 5 estimate suitable for a scoping study. Air blown gasification for syngas fuel production was assumed for power generation. This alternative was chosen after feedback from gas turbine vendors and is less capital intensive for power generation than oxygen blown gasification.

Figure 5 illustrates the process flowsheet for production of raw syngas using air blowing and treatment to produce a gas suitable for the combined cycle gas turbine (**CCGT**). As shown below, following treatment to remove organics and black water, it is necessary to flow the syngas though a separate acid gas removal (**AGR**) module to remove acid forming gases before the syngas is delivered for combustion in the CCGT.

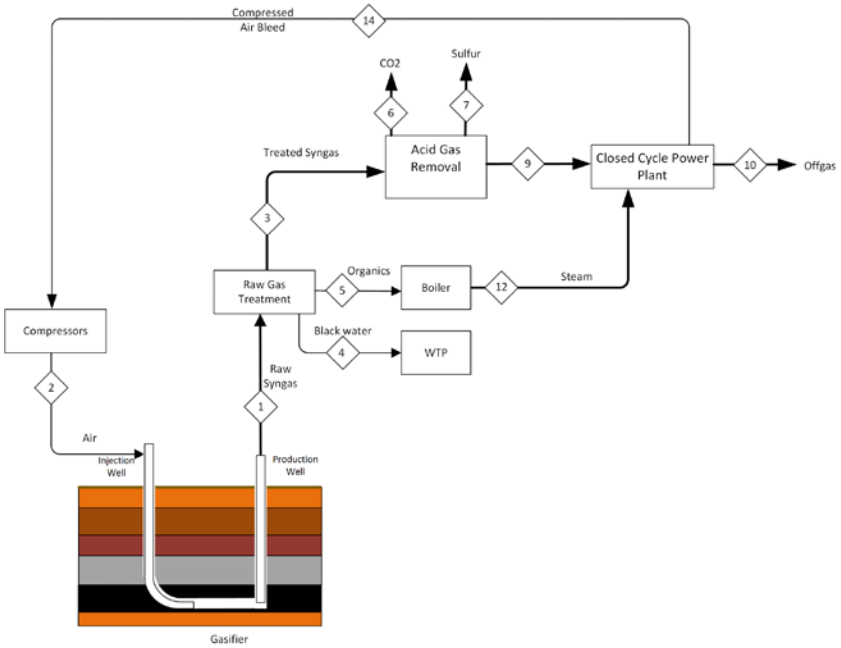

Figure 5 - Combined Cycle Power Plant Flowsheet, Source: Prudentia

Vendors are confident that this unit can operate on syngas which is a lower energy fuel than natural gas and is assumed to have a relatively high hydrogen content based on desktop modelling. Initially, a gas turbine can be operated as an open cycle to minimise capital costs. Heat recovery and a steam turbine can be added later allowing operation as a closed cycle power station.

Route to Market

The assessment studied alternatives for transmission routes and connection options for a new 275kV line from Leigh Creek. These options included an upgrade of existing 132kV line to Davenport substation (Port Augusta), a new line to Davenport substation, a connection to the Olympic Dam substation – via the BHP Davenport line, or a new line to Davenport with adjunct to southern end of BHP line (off grid).

As part of the assessment the following key factors were considered:

- Line rating (132kV and 275kV), utilisation and losses;
- Route options and easement requirements;
- Flexibility for staged transmission;
- Capital and operating cost estimates;
- Tariff estimate under third party build, own, operate and maintain (BOOM) contracting and financing model (20-year term proposed);
- Project delivery – timing.

Project Execution

Long lead items for the Project include steam turbine generators, air compressors, and a new transmission line (18 - 24 months). From Final Investment Decision to first power production, 24 – 30 months would be required, assuming that long lead equipment can be ordered early in the project delivery phase.

The study reviewed options involving a scaled approach to electricity generation with an initial phase of 150-200MW open cycle generator scaling up to an efficient 450-550MW combined cycle syngas fired generator. The Company's aim is to begin electricity production in 2020.

There is presently a low level of geological confidence associated with the 2C Contingent Gas Resource and underlying Inferred Coal Resource on which the Study is based and there is no certainty that further exploration and evaluation work will enable the Company to announce a production target in respect of the deposit or that the deposit would support a generator capable of producing 150-550MW.

Electricity Markets

From 2015 with the closure of the Northern Power Station at Port Augusta, South Australia's baseload electricity generation supply has reduced. The state has a high reliance on the Heywood Interconnector. Price concerns are being overtaken by concerns over supply reliability.

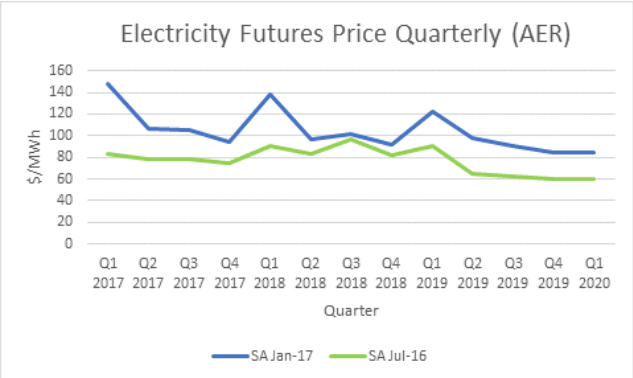

Figure 6 - SA Electricity Futures Prices

Gas fired electricity generation represented 37% of supply in FY2015 but is under threat from rising gas prices. Figure 6 shows how electricity futures prices for SA have increased further since July 2016. In addition to rising gas prices the outlook for higher electricity prices reflects closure of coal fired power generation. Since July 2016 prices in South Australia have averaged over $100/MWh.

There has been widespread coverage of the prediction of the Australian Energy Market Commission (AEMC) in its recent updates that electricity prices across most of Australia will rise by between 5% and 15% over the next two years. The AEMC also predicts that the closure of Victoria's Hazelwood power station in Q1 2017 will lead to wholesale price increases in most states.

The Study confirmed that there is a significant opportunity to provide baseload electricity to regional customers in South Australia.

Experienced Partners

A number of experienced third party consultants were utilised by LCK in key risk areas of the Study including:

- Prudentia Process Consulting Pty Ltd (**Prudentia**) – surface plant design, mass balance and class 5 capital and operating cost estimate; *Leigh Creek Energy Project Commercial Scoping Study,* 5th Dec 2016 and *Leigh Creek SNG Commercial Plant Scoping Study,* 5th Dec 2016
- Drill Path Pty Ltd (**Drill Path**) – below ground design and capital estimate; *Conceptual Subsurface Assessment for Commercial ISG Development*, October 2016
- Geoconsult Pty Ltd (**Geoconsult**) – geological model and JORC Resource estimate; *Geological and Modelling Report, JORC Resource Estimation, Project Assessment*, 8th Dec 2015
- HRL Technology Group Pty Ltd (**HRL**) – mass balance modelling and estimate of syngas quality; *Process Modelling of ISG for Leigh Creek Coal*, December 2015
- MHA Petroleum Consultants, LLC (**MHA**) – SPE-PRMS Resource estimate; *Initial PRMS ISG Gas Resources Certification, PEL 650, Leigh Creek Energy Project*, 8th Jan 2016
- ElectraNet Pty Ltd (**ElectraNet)** - South Australian Electricity Transmission Network Owner; *Leigh Creek Energy, Options for Connection*, August 2016
- Siemens Ltd, Power & Gas Division (**Siemens**) – gas turbine packages; *Budget Offer – 500MW Combined Cycle Power Station utilizing Syngas*, March 2016
- CQ Partners Pty Ltd (**CQ Partners)** – Energy Consultants; *South Australia New Entrant, Generation Report*, October 2016

Pre-Feasibility Study

Following endorsement of the outcomes of the Study by the LCK Board, the Company will now progress to completing a Pre-Feasibility Study (PFS) to provide a more detailed analysis on the preferred project options and resulting outcomes.

The PFS is sometimes referred to as the selection phase. The PFS will be conducted as two stages – firstly, to identify the preferred business case option, and then to conduct a detailed analysis overlaying the technical and engineering work with detailed commercial analysis and development. Stage 1 analysis will include modelling various combinations of sale products.

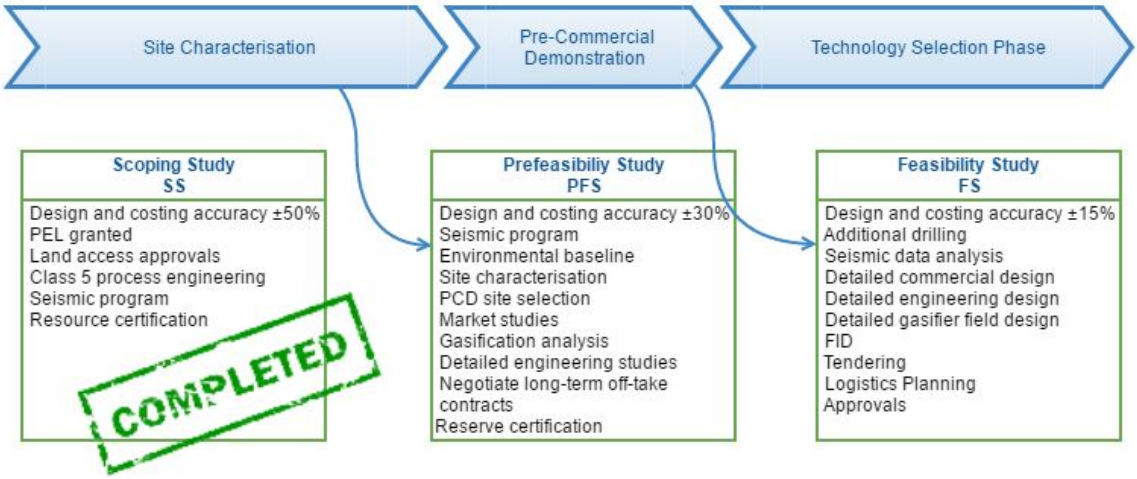

Figure 7 - Project Study and Design Schedule

The PFS incorporates the construction, commissioning, operation and decommissioning of the PCD plant and gasifier. The results of this PCD are expected in late 2017 and will inform the final stage of the PFS.

The expected outcome of the PFS will be a selected preferred case for commercial development with a +/- 30% level of accuracy. Following a positive outcome to the PFS, the preferred case will then be taken forward to the final Feasibility Study.

Summary

Completion of the scoping study and commencement of the PFS is an important stage for the development of the project. LCK is encouraged by these results and continues to move forward with the Leigh Creek Energy Project.

For further information, please contact:

Andrew Harrington
General Manager Project Finance
Leigh Creek Energy
Ph: +61 421 583 344

About Leigh Creek Energy

*Leigh Creek Energy Limited (**LCK**) is an emerging gas company focused on developing its Leigh Creek Energy Project (**LCEP**), located in South Australia. The LCEP will produce high value products such as electricity, methane and fertiliser from the remnant coal resources at Leigh Creek utilising In-Situ Gasification (**ISG**) technologies, and will provide long term growth and opportunities to the communities of the northern Flinders Ranges and South Australia.*

The Company is committed to developing the LCEP using a best practice approach to mitigate the technical, environmental and financial project risks.

Appendix 1 – Resource Compliance Statement

The information in this announcement that relates to the estimate and reporting of the Inferred Coal Resource for the LCEP was detailed in an announcement lodged with ASX on 8 December 2015 and is available to view at www.lcke.com.au. The Company confirms that it is not aware of any new information or data that materially affects the information included in that announcement and that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

The information in this announcement that relates to the 2C Contingent Gas Resource was detailed in an announcement lodged with ASX on 8 January 2016 and is available to view at www.lcke.com.au. The Company confirms that it is not aware of any new information or data that materially affects the information included in that announcement and that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed. All estimates are based on the deterministic method for estimation of petroleum resources.

Appendix 2 – Forward Looking Statements

This announcement may contain forward looking statements. Forward-looking statements include, but are not limited to, statements concerning the Company's planned mining and exploration programs and other statements that are not historical facts. When used in this document, the words such as "could", "plan", "estimate", "expect", "intend", "may", "potential", "should" and similar expressions are forward-looking statements.

In addition, estimates of resources could also be forward-looking statements. Although the Company believes that its expectations reflected in these statements are reasonable, they may be affected by a variety of changes in underlying assumptions which could cause actual results or trends to differ, including but not limited to: price fluctuations, actual demand, currency fluctuations, drilling and production results, reserve estimates, loss of market, industry competition, environmental risks, physical risks, legislative, fiscal and regulatory developments, economic and financial market conditions in various countries and regions, political risks, project delay or advancement, approvals and cost estimates amongst other items, and the cumulative impact of items.

For a more detailed discussion of such risks and other factors, see the Company's Annual Reports, as well as the Company's other filings. Readers should not place undue reliance on forward looking information. The Company does not undertake any obligation to release publicly any revisions to any forward –looking statement to reflect events or circumstances after the date of this announcement, or to reflect the occurrence of unanticipated events, except as may be required under applicable securities laws.