

# Clean Global Energy Limited (ASX: CGV)

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SPECULATIVE BUY @ \$0.12

## DEVELOPING CHEAPER, CLEANER ENERGY

ASX Code	GGV
Issued Capital	140.7 m shares
	5.4 m unlisted options
Market Value	\$14 million
Share Price	\$0.098
1-Year High/Low	\$0.16/\$0.046
Cash Reserves	\$0.84 million
Top 20 Hold	61.8%
Major Shareholder	CTL Global LLC 6.53%



### Key Points:

- Business model utilises essentially uneconomic coal to produce a feedstock for energy generators at a low capital cost. Proprietary technology, Controlled Retractable Injection Points (CRIP), enables the company to provide greater control and efficiency to a process that has operated for over 60 years. Extensive trials in Spain fully met stringent European environmental laws.
- Recent agreements in North America place the company at the forefront of commercialising underground coal gasification (UCG) in the western world. This involves a partnership with Fortune 500 US energy multinational, the AES Corporation.
- Financial modelling of this project, the Oklahoma Energy Project, indicates strong investment returns for two stages of growth following establishment of an initial plant. Development to full capacity, supplying Syngas for a 300MW plant, sees an NPV of US\$140.8 million, IRR of 20.4% and payback of 9 years on investment of US\$140 million.
- Binding Heads of Agreement to provide US\$20b Indian energy major, Essar, with UCG technology and expertise under a Technology Licence Agreement. CGE will be free-carried for 20% equity through to a commercial UCG Syngas plant, when CGE will pay for that equity at cost (~US\$30m), which should have a valuation of at least US\$100m based on NPV modelling. First licence fees expected within six months.

### **Introduction**

Clean Global Energy aims to become a major global alternative energy company by utilising underground coal gasification (UCG) to release untapped energy from coal that is typically uneconomical to mine through conventional processes.

### **What is the UCG Process?**

UCG converts coal into a product commonly known as "Syngas" without the need for mining. Gasification converts hydrocarbons into Syngas at elevated pressures and temperatures and can be used to create many products including electric

power, chemical feedstock, liquid fuels, and hydrogen gas.

Gasification provides numerous opportunities to reduce pollution as compared to more familiar industries, especially with respect to emissions of sulphur, nitrous oxides, and mercury. Otherwise unmineable deep or thin coals are potentially valuable for UCG.

***The UCG process has significant advantages over other methods of extracting energy from coal in that it allows coal to be processed underground,*** thus eliminating expensive mining operations and minimising ground disturbance, in order to produce a low cost industrial gas. The gas can then be used in either power generation or in the further production of liquid petroleum products.

The UCG process has been in use since 1964 in Angren, Uzbekistan where it is still used today converting brown coal to Syngas for use in the nearby power station. The Angren UCG operation is the last remaining commercial UCG plant from the former Soviet Union's UCG program of over sixty years.

#### **CGE's unique CRIP Technology**

CGE's UCG technology uses an advanced process known as Controlled Retractable Injection Points (CRIP) which provides greater control and efficiency in the UCG process. ***The CRIP UCG process was successfully trialled in a €17m European trial in Spain which was headed by CGE's Technical Director, Dr Michael Green.*** Dr Green has continued to advance the CRIP technology, which he is currently implementing in commercial projects throughout the UK and Europe. Dr Green is a globally recognised leading authority on UCG.

#### **Oklahoma Energy Project**

CGE has recently entered into a Memorandum of Understanding (MOU) crucial to placing the company at the forefront of commercialising UCG in the western world. Firstly, the company has an agreement in place to acquire the permitted Cavanaugh coal mine site in Oklahoma. This acquisition will provide a minimum resource of 20

million tonnes of coal suitable for UCG for a consideration of US\$20 million and includes an option to acquire adjoining tonnages of similar size.

The mine site is located 24 kilometres from the Shady Point coal fired power station that is owned by The AES Corporation and which is the subject of the second agreement. Under this second agreement the company, through a US incorporated entity (CGEI), will initially provide sufficient Syngas to Shady Point for 25MWe of electrical power production by mid to late 2012 (Stage 1).

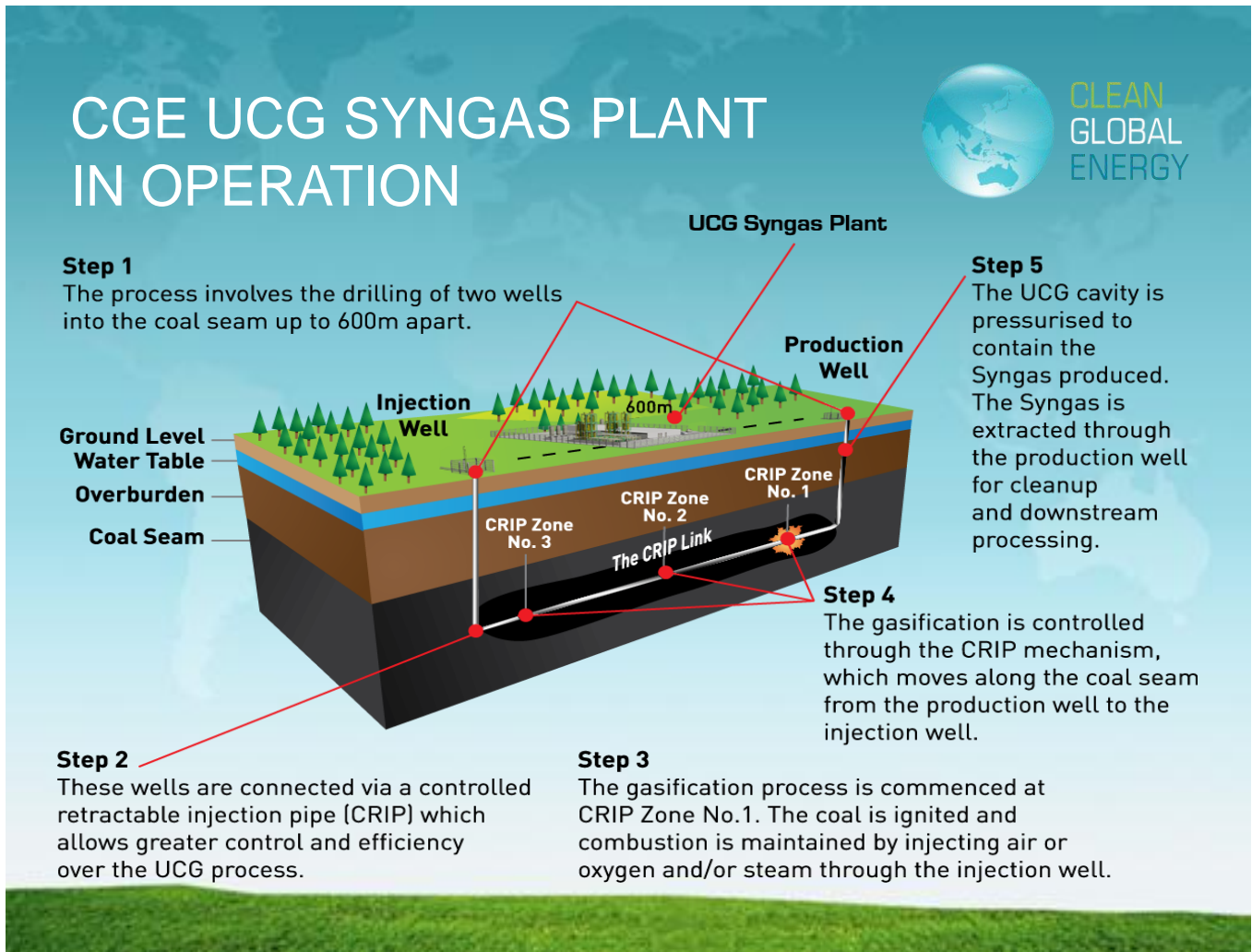
This will be followed by Stage 2 which will work towards expanding the UCG plant to generate enough Syngas for 100MWe of co-fired power and then Stage 3, the final expansion to generate enough Syngas for 300MWe. Stage 3 envisages Shady Point adding a new combined cycle gas-fired generator to the existing generating capacity.

***The estimated UCG project cost for the full 300MWe Syngas plant is approximately US\$140 million and projected revenues at full production are in excess of US\$41 million per year.*** Full production is envisaged by mid-2015. Funding of the Syngas project is proposed to be achieved through CGEI.

Announced in December 2010, both MOU's have a 120 day period in which the parties will work toward a binding agreement. During this time regulatory amendments and approval to use the mine site for UCG production are being sought, along with easement access for a 24 kilometre pipeline, and funding commitments.

The securing of a permitted mine site with all the historical data, gives the project certainty in undertaking UCG activities on the site, and being able to deliver UCG Syngas within a relatively short period of time.

CGE's UCG Syngas plant in operation



Financial modelling of Stages 2 and 3 - Summary

	Stage 2 – 100MWe	Stage 3 – 300MWe
Capital Cost (US\$m)	76	140
NPV(11) (US\$m)	88.54	140.84
Cash Inflow Year 1 US\$m	20.31	42.81
Gross Margin Year 1 US\$m	17.84	29.86
Annual Net Income Year 1 US\$m	11.85	18.24
IRR (%)	22.28	20.37
Payback (years)	8	9

### Financial Modelling of Oklahoma Energy Project

Financial modelling of Stage 2 (100MWe) and Stage 3 (300MWe) shows strong returns on the investments involved (above Table). The modest capital outlays, a feature of this technology (see chart Page 4), is returned in both cases in a relatively short period of time, considering the life expectancy and importance of a power station. ***The annual net income in Year 1 after taking into account administration, depreciation and insurance is a healthy US\$11.8 million and US\$18.2 million respectively.***

### Indian UCG deal with US\$20b Essar Group

CGE has entered into a binding Heads of Agreement with Mumbai-based oil, gas and power multinational, Essar, to provide its UCG technology and expertise, under a Technology Licence Agreement (TLA). ***Essar, a US\$20B Indian energy major, is one of India's largest private sector companies*** and is engaged inter-alia, in the business of oil and gas exploration and production, refining of crude oil, manufacturing, processing, transmission, distribution and marketing of petroleum products.

Key terms of the agreement are commercial in confidence, however under the agreement CGE will be required to deliver and operate a pilot and subsequent commercial UCG plant. Under the TLA CGE will hand over operations of the plant to Essar within 3 years of commissioning the commercial plant. The TLA is triggered if Essar is granted a UCG block/s by Coal India Limited, its subsidiaries or any other body corporate or government authority.

While the final bidding approvals are not yet complete, both Essar and CGE are confident of obtaining approved UCG blocks. CGE is currently assisting Essar to complete the bidding approval process, during which time CGE will generate fee based income under the HoA. We expect CGE to be generating its first license and service fees within the next six months.

***Essar will free carry CGE for 20% equity through to a commercial UCG Syngas plant, at which time CGE will pay for that equity at cost (~US\$30m) which***

***should have a valuation of at least US\$100m based on NPV modelling.*** Anticipated revenue streams for each potential project are as follows: Licencing and project management fees during design, construction and commissioning (US\$50m to US\$60m); and Production royalties of US\$15m to US\$20m after achieving commercial production.

Together with its Oklahoma project with US energy giant, AES Corporation, the agreement with Essar is further proof that major international energy companies understand CGE's position at the leading edge of global commercial UCG technology and projects.

### South East Queensland Project

CGE's activities in Australia were initially focused on south east Queensland, where the company now holds eight granted coal tenements covering 3,280 square kilometres and a further twenty one competing applications covering 2,976 square kilometres. Following recent drilling within EPC 1506 (Maryvale), located about 18 kilometres north east of Warwick, the company has delineated a JORC Inferred Resource of 38 million tonnes of coal within an area of approximately 8.2 square kilometres.

The coal is within the Bulwer Coal Seam which is approximately 3.2 metres thick. A secondary target, Condamine Coal Seam, has also been identified and correlated across much of EPC 1506. This seam has been intersected in several drill holes at depths approximately 100 metres deeper than the Bulwer Coal Seam. The Condamine Coal Seam intersections have been typically greater than 5 metres thick; however, at this stage it has been excluded from the resource and target coal estimates.

The JORC Inferred Resource estimate of 38Mt is considered to be conservative, and solely based on the continuous Bulwer Coal Seam. Significantly, CGE has been advised that drilling an extra three core holes could result in the target tonnage being expanded to between 150 million and 183 million tonnes excluding the Condamine Coal Seam and with the resource open to the north.

The potential for these coals to be converted into Syngas for consumption at the nearby Millmerran and Swanbank power stations appeared promising. CGE has, however, elected to place further drilling on hold as a result of the increasingly uncertain permitting environment for UCG operations in Queensland, where three pilot plants have been established.

The Queensland government released a policy paper relating to UCG trials in February 2009 under which the permitting procedures for any new trials were established. In July 2010 the trial plant at Kingaroy operated by Cougar Energy (ASX: CXY) was shut down by the Department of Environment and Resource Management (DERM) following reports of contaminants including toluene and benzene in groundwater bores near the plant.

In late January 2011 the Queensland government announced that CXY could not demonstrate that it could operate its project without significant environmental damage and therefore the trial would remain closed. The government said however that it remained committed to the nascent industry and that the other two plants could continue to operate.

A number of public statements by both DERM and the Queensland Minister for Climate Change and Sustainability have indicated that no new projects in Queensland will be contemplated until the findings of an Independent Expert Panel are delivered to government. These findings are not due until March 2012 which is when the next State election must be held.

The company will continue to provide advice and expertise from CGE available to this panel and the Queensland government, as necessary and as requested, to ensure that the cleaner coal advantages inherent in the UCG process, are fully understood. Once this issue is resolved CGE intends to complete the drilling program and may also investigate EPC 1508 (Leyburn), also within the

Surat/Clarence Moreton Basin, which has a potential UCG target of 400 million to 500 million tonnes.

The company has also identified conventional coal targets within the Bowen Basin, specifically EPC 1751 and EPC 1864. A drilling program to test the primary target, Blair Athol Coal Measures, and secondary target, Reids Dome Beds equivalent, has been formulated.

#### **Gippsland Project, Victoria**

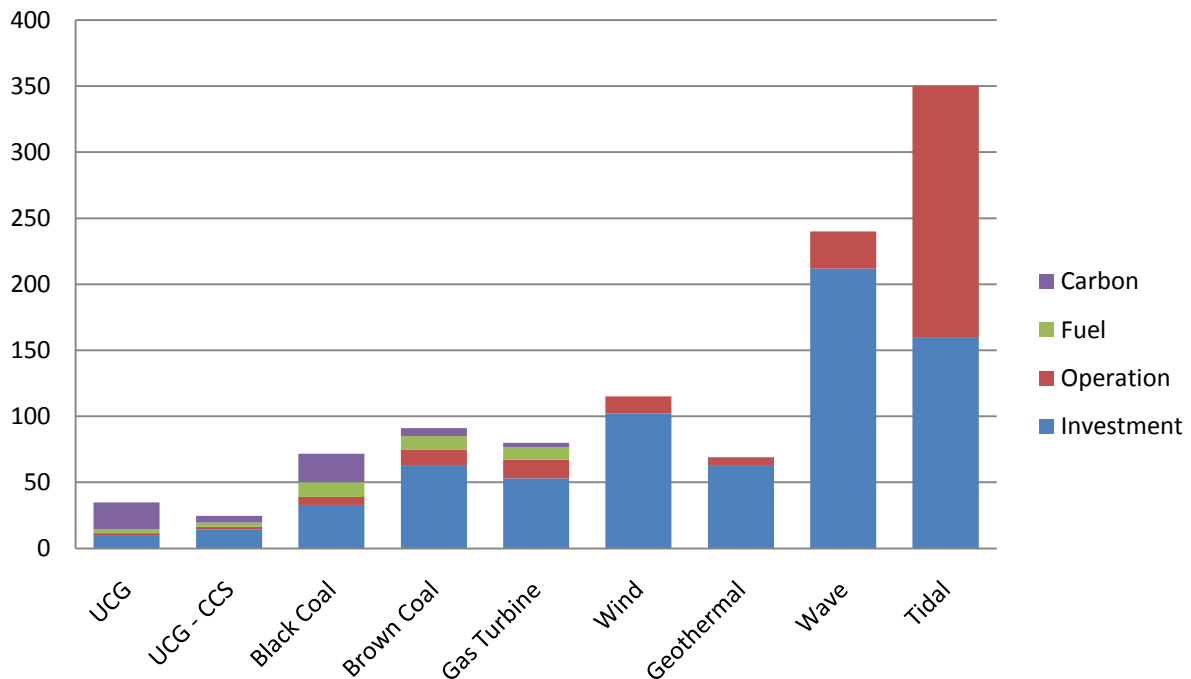
CGE has identified a potential UCG opportunity in Gippsland, Victoria. The project is based on known black coal deposits in the Wonthaggi area where over 16 million tonnes of coal has been extracted historically. In addition the Victorian government is building a Desalination Plant in the local area and is seeking cleaner alternative power sources than those supplied by the predominately brown coal fired power stations in the nearby Latrobe Valley.

EL 5270 was granted in June 2010, covers approximately 900 square kilometres and contains numerous exploration and other wells. An initial review by the company of existing mining and borehole data has been completed and has identified numerous occurrences of black coal over the entirety of the lease. Nearby water bore data is inconclusive and is indicating that the geology is complex and structurally controlled.

Regional studies are indicating that coals are better developed and thicker at depth towards the centre and north-east of the lease and are generally thinner towards the south west where the old workings are situated. Further study is now required to identify any potential drilling targets to identify coal suitable for UCG.

The review has also identified near surface brown coal deposits that may be amenable to traditional mining and above ground gasification. Boreholes indicate that a 15 metre thick lignite seam may be constant over a 15 square kilometre area between 30 metres and 60 metres deep.

### Energy Generation Costs - US\$/MWh



(The Energy Generation Costs chart: UCG – Syngas without carbon capture storage; UCG – CCS – Syngas with carbon capture storage; Black Coal – ultra super critical efficiency and air cooled; Brown Coal - ultra super critical efficiency, air cooled and carbon capture storage; Gas Turbine – air cooled at peak load)

### Clean Global Energy Tenement Schedule

Tenement	State	Area (sq km)	Project Name	Status
EPC1507	OLD	490	Biloela	Granted
EPC1751	QLD	148	Capella	Granted
EPC1508	OLD	429	Leyburn	Granted
EPC1506	QLD	48	Maryvale	Granted
EPC1539	QLD	458	Maryvale 2	Granted
EPC1864	QLD	682	Pumpkin Hill	Granted
EPC1745	QLD	166	Western Creek	Native Title
EL5270	VIC	938	Wonthaggi	Granted
EPC2210	QLD	32	Kooringa	Granted
EL5282	VIC	108	Bass Coast	Competing Application
EPC2004	QLD	202	Blair Athol	Competing Application

EPC1986	QLD	147	Cape River	Competing Application
EPC2006	QLD	55	Claremont	Competing Application
EPC2110	QLD	532	Cooyar Creek	Competing Application
EPC1612	QLD	77	Dalby	Competing Application
EPC2094	QLD	48	Glenrowan	Competing Application
EPC1748	QLD	336	Kumbarilla	Priority Application
EPC1978	QLD	61	Macalister	Competing Application
EPC1982	QLD	90	Macalister	Competing Application
EPC2027	QLD	147	Mantuan	Competing Application
EPC1861	QLD	183	Mt Hope	Priority Application
EPC1592	QLD	119	Mt Fort Cooper	Competing Application
EPC2095.	QLD	55	Nine Mile	Competing Application
EPC2091	QLD	51	Parker Creek	Priority Application
EPC1637	QLD	192	Pentland	Competing Application
EPC2029	QLD	381	Wallumbilla	Competing Application
EPC2009	QLD	61	Washpool Lagoon	Competing Application
EPC1973	QLD	48	Woolcamp Lagoon	Competing Application
EPC2174	QLD	60	Tamrookum	Competing Application
EPC2185	QLD	20	Fairhill	Competing Application
EPC2213	QLD	15	Chinchilla	Competing Application
EPC2209	QLD	28	Taroom 1	Competing Application
EPC2208	QLD	82	Taroom 2	Competing Application
<b>Total</b>		6,992		

#### **EOI with Nagarjuna Fertilisers to develop UCG projects in India**

CGE has received an invitation to collaborate with Hyderabad based Nagarjuna Fertilisers and Chemicals Ltd, to participate in the development of UCG projects in India. Conditions for UCG in Indian lignite blocks are similar to those in the coal tenements held by CGE in Victoria, and CGE would

apply similar site selection methods in India to those already developed in Australia.

Accordingly, CGE has proposed a Memorandum of Understanding (MOU) to work with Nagarjuna to formalise a relationship to procure UCG blocks to develop, construct, commission and operate a UCG plant to produce Syngas to use as feedstock for power generation and other uses. CGE's primary role

would be to deliver and operate a pilot and subsequent commercial UCG plant.

Under the MOU, CGE would work with Nagarjuna, which includes a licensing agreement if one or more of the UCG blocks are granted to Nagarjuna or its nominees, to submit a bid to Rajasthan State Petroleum Corporation Ltd for off-take of UCG Syngas.

**China Joint Venture**

CGE is in discussions regarding funding of a joint venture in China. Progress has been slower than CGE's management expected, however this has more to do with the often protracted process of doing business in China than the project itself.

CGE has been actively pursued by a number of Chinese companies to undertake UCG projects as its business profile in China rises. These discussions are at various levels and are very positive, however the timing of any formal agreements, or results from, these discussions is still unknown.

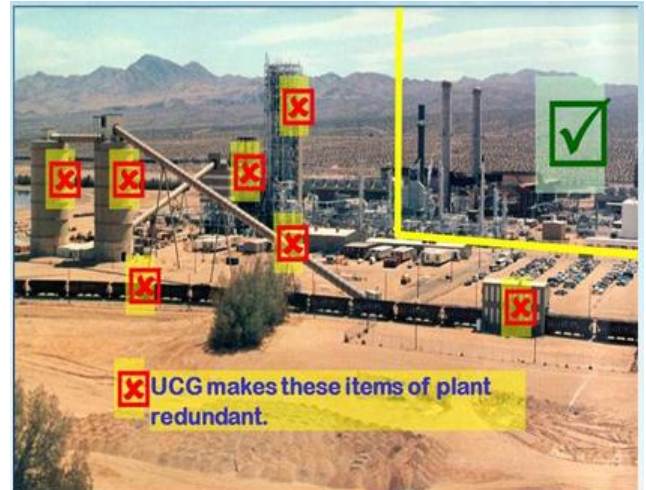
**Advancement of UGC Technology and Application**

Clean Global Energy Limited has entered into agreements with Australian and United States based universities to undertake further research into the technical and environmental applications of underground coal gasification and carbon capture and storage.

CGE has provided grants to the Australian Centre for Sustainable Mining Practices and the School of Mining Engineering, at University of NSW (UNSW) and the Colorado School of Mines (CSM) a state mining university in Golden, Colorado.

These universities will focus on the further development of CGE's advanced Linear CRIP UCG technology, in particular its application in deep coal seams where disused UCG cavities may be suitable for Carbon Capture and Storage (CCS). Other areas of focus will be on advanced water management techniques surrounding the UCG reactors and disused cavities, hydrology, low carbon emissions, and on-line support to control the UCG process in our future commercial operations.

CGE will bring the two schools together to formulate the research program, building on complimentary skills within both faculties, as well as forming a combined advisory panel to deliver research-backed information and support for CGE's commercial strategies and operations.



Commercial UCG activity is increasing globally in many areas around the world including Australia, New Zealand, North and South America, UK, Europe, Africa, India and China. CGE is fast becoming an internationally recognised UCG company with projects in some of these countries. Having leading universities, such as UNSW and CSM, providing research, development and support to CGE further enhances its international credentials as a leading, global UCG company.

CGE's proposed activities also include a focus on generating fee-based revenue from a licencing model for international projects, with a licencing model to include a one-off project licence fee, service fee, equity and ongoing royalty upon commercial production of UCG Syngas.

**Possible Corporate Activity**

Given the company's relatively low cash levels, we anticipate a capital raising to be a top priority for the company. This could be conducted domestically or internationally. We also believe the company might consider an overseas listing, particularly in North America, given the importance of its Oklahoma Project.

## Summary

**The company's main focus is the Oklahoma Energy Project which provides a real opportunity for CGE to demonstrate both the economic viability and the environmental benefits of its UCG Syngas technology.** To this end the company needs to progress the MOU into a binding agreement and to put in place funding arrangements which it has indicated would be through a US incorporated entity, CGEI. What equity the parent would retain in its subsidiary has not been outlined.

The financial benefits outlined are impressive with net income in Year 1 representing 8.4 cents per share (on CGE 100% equity basis) for the Stage 2 100MWe plant alone. This initial operation is modest, the Liddell power station for example has a capacity of 2,000 MW and on the first day of February this year Sydney drew a record peak of 14,108 MW of power. **This demonstrates the market potential for a successful technology to displace a portion of traditional coal-fed power generation.**

Other forms of alternate energy, except geothermal, are clearly uneconomic and involve substantial capital investment. Geothermal ticks the right boxes but is site specific and has proven technically challenging given the depth of drilling involved.

**The company's other particularly exciting deal is the binding Heads of Agreement with US\$20b Indian multinational group, Essar, to provide its UCG technology and expertise, under a Technology Licence Agreement (TLA). Essar will free carry CGE for 20% equity through to a commercial UCG Syngas plant, at which time CGE will pay for that equity at cost (~US\$30m) which should have a valuation of at least US\$100m based on NPV modelling.**

**Accordingly, we believe that Clean Global Energy is a stock to watch. The company represents a fabulous opportunity for investors to gain exposure to the world's burgeoning demand for cleaner energy, utilising the company's in-house skill base and growing alliance with major energy companies in two of the world's biggest energy-consuming nations. Furthermore, the company's modest**

**market value means it is highly leveraged to future commercial success.**

## Board and Executive Team

### **John Harkins, Executive Chairman & CEO**

Senior Vice President of a US gasification company. Former Director of Linc Energy, led its successful IPO. Former CEO of CARE Super.

### **Dr Michael Green, Executive Director & Technical Director**

One of the world's leading UCG specialists. Former, Director of the successful European UCG trials in Spain, 1992 - 1998.

### **Domenic Martino, Non-Exec. Director**

Former CEO of Deloitte Australia. Former Director and Chair of CSG companies, Sydney Gas Ltd and Blue Energy Ltd. Current Chair of Australian Resources Ltd.

### **Alison Coutts, Non-Exec. Director**

25 years' experience in international engineering, project management, strategy consulting (BCG) and finance.

### **Paul Hubbard, Non-Exec. Director**

Former senior executive with Woolworths and BMP in Human Resources. Pioneered management courses for BMP and other leading corporations.

### **Wayne Rossiter, Chief Financial Officer**

A mining engineer and a chartered accountant for over 20 years, held senior finance and management roles in Core Mining, Sino Gold Mining, Cockatoo Coal and Roc Oil.

### **Wayne O'Brien, General Manager, Business + Operations**

Former CFO of Linc Energy, in part responsible for its successful IPO, new UCG reactor and early stage GTL plant.

### **Dr W. Mark Hart, VP US Business**

Coal, Gasification and Syngas specialist with experience in US, Europe and Latin America with NRG Energy, Cypress, Springvale Coal (Aus.), Newmont Mining and West Hawk.

**Gerry Briggs, Project Manager**

Former project manager for Linc Energy, in part responsible for construction of new UCG reactor and plant. Expert in developing green field projects.

**Carl D'Silva, Exploration & Geology Manager**

Exploration, mining and CSG geologist with

experience in PNG, Indonesia and Australia. Previously worked for Santos, Chevron, Arrow Energy and Eastern Star Gas.

**Recommendation**

Should CGE be successful in establishing and demonstrating a UCG Syngas plant in North America, it could rapidly open up opportunities worldwide. This includes revenue from not only establishing and operating plants that supply Syngas, but also revenue streams from licencing the technology. The company's other exciting initiative is in India, where a similar arrangement provides potentially lucrative exposure to one of the world's biggest markets for energy. Accordingly, we recommend Clean Global Energy as a **SPECULATIVE BUY**.

**Disclosure**

Gavin Wendt (who is a Financial Services Representative with Summit Equities Ltd ACN 097 771 634, and is a consultant with Mine Life Pty Ltd ACN 140 028 799) was commissioned by The Capital Group to compile this report, for which Mine Life Pty Ltd has received a consultancy fee. At the date of this report, Gavin Wendt and his associates hold no shares in Clean Global Energy. Although the information contained in this publication has been obtained from sources considered and believed to be both reliable and accurate, no responsibility is accepted for any opinion expressed or for any error or omission that may have occurred therein.

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