

Cluff Natural Resources Plc ('CNR' or 'the Company')

Initial Coal Resource Estimate for Kincardine Licence Area, Scotland – Intention to seek planning permission to build the first Underground Coal Gasification plant in the UK

Cluff Natural Resources Plc, the AIM quoted natural resources investing company, announces an initial JORC resource estimate of 335 million tonnes of coal of which 247 million tonnes is measured and indicated, within its 100% owned Kincardine Licence in the Firth of Forth, Scotland. This initial resource estimate is a key step towards building the UK's first deep offshore Underground Coal Gasification ('UCG') demonstration project.

Overview

- **Independent Consultant confirms a JORC Compliant Resource of 335 million tonnes of coal of which 247 million tonnes is measured and indicated**
- **at the Kincardine Licence Area, Firth of Forth, Scotland**
- **Two coal seams alone identified 43 million tonnes of coal in place ('CIP') - meeting CNR's key coal quality criteria for a fully commercial UCG project**
- **This CIP, which is considered suitable for UCG, contains 1,471.5 petajoules (PJ) of energy which is equivalent to approximately 1,395 billion cubic feet ('BCF') of natural gas-in-place on an energy equivalent basis¹**
- **CNR to work closely with residents, local authorities, regulators and other stakeholders throughout the site selection and planning process for the UK's first deep offshore UCG project**

Commenting CNR's Chairman and Chief Executive Algy Cluff said: "This report supports the Company's UCG licence selection and forms the basis for future investment in Scotland while proving the performance of the deep UCG process in a UK context. The development of UCG at the Kincardine Licence Area would result in the creation of new jobs, help protect existing industry as well as create significant supply chain benefits. The emerging UCG industry has a significant role to play in unlocking the UK's most abundant indigenous energy resource which, with the imminent closure of the last deep coal mines, is now otherwise effectively beyond reach. The deep offshore UCG projects being undertaken by CNR have significant environmental, safety, and when combined with carbon capture and storage, climate change benefits compared with coal mining and coal-fired power generation. We believe that UCG will help provide a cleaner energy, diversity of supply and energy security for the UK, and we look forward to updating the market on our developments at our Kincardine Licence area with respect to this."

Summary of the Coal Resource Estimate

¹ 1.055 Petajoule = 1 BCF

Independent Consultant confirmed a JORC Compliant Resource of 335 million tonnes of coal of which 247 million tonnes is measured and indicated and more than 43 million tonnes of coal is suitable for UCG within the Kincardine Licence area. This supports previous UCG feasibility studies completed by the Coal Authority, the Department of Trade and Industry and the Department of Energy and Climate Change in the UK on the Kincardine Licence area. On an energy equivalent basis this coal resource represents 1,395 BCF of natural gas. To put this in context, 1 BCF of natural gas is enough to meet the entire combined energy needs of approximately 11,000 homes for one year or the average annual energy output of 49 of the largest onshore wind turbines.

JORC Resource Estimate - Kincardine Licence area (CNR 100% interest)

JORC Resource Category	Coal in place (Tonnes)			Coal in place Energy (PJ)		
	Low	Mid	High	Low	Mid	High
Measured	93,071,712	125,566,705	157,382,680	3,177	4,324.4	5,485.1
Indicated	31,071,539	121,360,416	147,251,452	3,221.6	4,165.6	5,112.5
Inferred	68,448,674	87,733,865	106,447,335	2,322.5	3,002.2	3,683.8
Total	256,177,324	334,660,987	411,081,466	8,721	11,492.3	14,281.4

In the course of the geological review of the Kincardine Licence area, specific areas of coal in two separate coals seams have initially been identified by the Company as particularly suitable for locating a UCG demonstrator and future commercial UCG developments. The estimated volumes of coal identified and the energy contained within this coal volume are as follows:

Summary of UCG Coal-in-place (CNR 100% interest)

Coal in place (Tonnes)			Coal in place Energy (PJ)		
Low	Mid	High	Low	Mid	High
28,684,340	43,223,905	48,817,334	970.2	1,471.5	1,682.4

The tonnages of coal suitable for UCG in just these two separate coal seams have the potential to support a significant long term commercial UCG development within the Kincardine Licence Area. With this in mind, CNR plans to progress the environmental and site-specific evaluations required to support a planning application for a pilot-scale demonstration project.

A summary of the environmental and commercial advantages of UCG compared to conventional coal mining, as prepared by the Company is provided in Appendix 1 to this announcement.

CNR will work closely with residents, local authorities, regulators and other stakeholders throughout the site selection and planning process to ensure that adequate controls and oversight are in place to give the public confidence in the UCG process. It is expected that the above ground footprint of the demonstrator, and future commercial scale developments, can be located on existing industrial or brownfield sites adjacent to the Firth of Forth with no material adverse impacts on local residents. All actual gasification of coals will take place hundreds of metres beneath the Firth of Forth itself and therefore not anticipated to materially impact the onshore area.

The Kincardine Licence is located in a heavily industrialised region of central Scotland and is adjacent to a major petrochemical complex at Grangemouth, the Longannet coal-fired power station and a number of other energy-intensive industries which could benefit from a new low cost source of fuel gas and petrochemical feedstock.

Stuart Haszeldine, Professor of Carbon Capture and Storage at the University of Edinburgh said, “CNR’s offshore deep UCG is a bold and innovative proposal, which could help to regain energy security and value through low-carbon production of fossil fuel. Domestic coal resources exist which are sufficient to supply many decades of secure energy production and feedstock. But those resources will remain inaccessible until new extraction technology is deployed such as UCG, and unless the produced carbon is captured after use.”

“Fuel and feedstock extracted from coal by underground gasification will be much cleaner than importing coal because most of the engineering occurs deep below ground offshore. Underground gasification will have less impact on the public than other forms of unconventional gas extraction.”

“Carbon capture is essential to link, and balance between, carbon production and carbon storage. Positioning underground gasification in Central Scotland gives easy and unique access to well understood transport pipelines and reliable sites for CO₂ storage deep beneath the North Sea.”

The estimates of coal volumes, tonnages and energy equivalents stated herein are based on, and fairly represent, information and supporting documentation prepared by David Goold of Belltree Group Ltd, Edinburgh, UK (the “Independent Consultant”). Mr Goold is a Geologist with over 30 years of experience, including 15 years working on coal based resource projects in Western Europe and has consented to the use of the estimates and supporting information contained herein in the form and context in which it appears. The Resources Statement prepared by Mr Goold in accordance with the JORC Code, 2012 Edition, is reproduced in Appendix 2 to this announcement.

Andrew Nunn is a "Qualified Person" within the definition of the Guidance Note for Mining, Oil and Gas Companies, March 2006, of the London Stock Exchange and has reviewed and approved the information contained within this announcement. Andrew Nunn is a Chartered Geologist and is the Company's Senior Project Manager.

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NOTES FOR EDITORS

Cluff Natural Resources currently holds eight UK licences for Deep Underground Coal Classification (UCG) covering a total area of 61,274 hectares.

Glossary of key terms

- **Coal in place:** designates all the coal which is physically present in a given zone and meets certain geological criteria, regardless of any consideration on what is economically recoverable or not. This coal in place is given with conditions on the depth of the coal seams and their thickness.
- **Coal in place Energy:** refers to the total expected energy value of the coal in place
- **Inferred resource:** is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence

- **Indicated resource:** is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence
- **JORC:** The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, as published by the Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia
- **Kincardine Licence Area:** is the company's 100% working interest in a UCG licence area of 3,687 hectares in the Firth of Forth, Scotland
- **Measured resource:** is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence.

Appendix 1

Environmental Advantages of UCG vs Conventional Coal Mining

Coal, both carbon unabated and abated, will contribute significantly to primary electricity generation in the UK for the foreseeable future. Therefore coal will have to be imported from coal producing countries or mined locally from extensive indigenous reserves to support this generating capacity, however the structural decline of the UK's conventional coal mining industry makes the latter unrealistic. It is considered [by the Company] that a well regulated indigenous UCG project would have significant environmental benefits when compared to conventional coal fired power generation or the surface gasification of coal with combined cycle power generation (IGCC).

The gasification of coal produces Syngas which a mixture of combustible gases composed mainly hydrogen, carbon monoxide, methane and carbon dioxide. It can be fired directly with air in boilers to raise steam for power generation, used in combined cycle gas turbines (CCGT) or supplied to the petrochemical, steel or chemicals industry for the manufacturer of plastics, liquid fuels and fertilisers. Syngas can also be decarbonised, partially or completely, for UCG-CCS to be an effective low carbon solution to power generation.

Indigenous deep offshore UCG production has benefits over the conventional coal industry at the production, beneficiation, transport and electricity generation phases.

Production Benefits

- Surface footprint for a long term commercial UCG project is much smaller - typically 2 or 3 well pads for a UCG project as opposed to large footprint required for surface infrastructure or opencast void, solid waste management (i.e. coal tips), coal washing, handling and tailings facilities required to support a conventional mining project.

- Noise, dust, traffic and visual impacts of a UCG project are significantly less than those associated with conventional coal mining projects.
- UCG production has significant health and safety advantages – no people required to work underground, less exposure to particulates and dust and limited exposure pathways to organic contaminants associated with deep coals.
- Underground and some surface coal mines have significant issues with fugitive methane emissions, whereas there are negligible fugitive emissions associated with UCG projects
- Given the offshore location of the UCG reaction chamber all subsidence, if any, will occur offshore and the design will ensure that land-based infrastructure are not affected.
- Lifecycle CO₂ footprint for drilling UCG wells is significantly less than that required to construct and operate either surface or underground mining operations.
- Risk of uncontrollable underground fires is prevented in deep UCG projects as the availability of oxygen to sustain the pyrolysis and gasification process, is controlled via small diameter boreholes from the surface and can be easily shut-off. Once oxygen present in the system after shutdown is consumed the gasification reactions cease. This is a very different scenario to where uncontrolled coal mines fires have occurred historically where multiple large diameter shafts or drifts which make it difficult to control airflows to the coal in an emergency situation.
- No displacement of environmental liability - indigenous UCG production will be subject to strict UK and EU environmental regulation which will ensure all potential adverse impacts are identified and mitigated against at the project design phase – this is in comparison to the majority of imported fuels which are can be produced under regimes with less rigorous environmental controls.

Beneficiation Benefits

- Washing and preparation of mined coal uses large amounts of fresh water which requires treatment and disposal whereas the majority of water used in the UCG process is sourced from adjacent saline aquifers and is recycled throughout the UCG project lifecycle.
- Surface gasifiers also require additional and significant volumes of water to support the gasification process post-coal preparation.

Transport

- Solid coal product is required to be transported to its final destination via road, rail and/or sea which has a significant carbon footprint in its own right. In comparison indigenously produced syngas via UCG can be transported to its required destination via pipeline.

Electricity Generation

- Unlike traditional coal fired power stations or surface gasification projects, UCG operations do not generate significant volumes of solids or ash which then require disposal or storage.

- UCG derived syngas is ideally suited to pre-combustion removal of CO₂. When combined with carbon storage or utilisation technologies, the CO₂ footprint for UCG is equivalent to that of conventional natural gas fired power generation.
- Mercury, particulate (PM10's), SO_x and NO_x emissions from conventional coal fired power stations contribute 1,600 premature deaths in the UK per year. Oxygen fed UCG to electricity projects produce negligible amounts of these pollutants when compared to traditional coal fired power generation.
- Reduced SO_x emissions to air compared to conventional coal fired power generation - UCG derived syngas is ideally suited to preliminary clean-up removing sulphur and other impurities pre-combustion. This improves overall emissions performance compared to coal fired power generation and has significant commercial benefits over flue gas clean-up technologies.

Economic Advantages of UCG

- Limited infrastructure is required for UCG production when compared to conventional mining.
- Establishing UCG production infrastructure is significantly cheaper than establishing a surface gasifier and shortens the value chain when compared to surface gasification to electricity projects.
- UCG can unlock a key indigenous energy resource which is currently stranded due to the terminal structural decline of UK's mining industry.
- All technology is effectively repurposed from conventional oil and gas or petrochemical industries
- Increases UK security of supply by utilising indigenous resources and diversification of supply
- Supports the UK Government's gas generation strategy by displacing imported coal
- Resource recovery utilising UCG is significantly greater than for either coal bed methane (CBM) or conventional mining.
- Pre-combustion clean-up of syngas, including carbon capture, is well established technology and has significant cost advantages over flue gas clean-up and post-combustion capture.
- UCG based syngas generation projects can be economic on smaller scales than surface gasifiers due to lower capital costs
- The produced syngas has a range of commercialisation options from electricity generation, CHP plants, methanol production, synthetic liquid fuels, hydrogen generation through to synthetic natural gas depending on market conditions and requirements
- Establishment of a new UCG industry in the UK will create new employment opportunities with skills requirements similar to other industries currently in decline in the UK including coal mining, oil & gas and the petrochemical industries.
- Provides supply chain opportunities which have significant synergies with some existing supply chains as well as new opportunities

- Estimates suggest that hydrogen from syngas can be generated at a significant cost advantage than via current steam reforming methods
- Being at the forefront of a technologically driven industry brings with it significant opportunities for export of both materials and skills to elsewhere in the EU and further abroad.

The above summary has been prepared by the Company utilising industry and governmental reports and other publically available sources.

Appendix 2

Please refer to the following link for the full statement including pictures and diagrams:

http://www.rns-pdf.londonstockexchange.com/rns/5268W_-2014-11-7.pdf

Statement of Resource Associated with the Kincardine UCG Licence

In accordance with your request, Belltree Ltd (Belltree) has conducted a geological and volumetric assessment of the coal resource for the Kincardine Underground Coal Gasification (UCG) licence held by Cluff Natural Resources (CNR) in the Midland Valley of Scotland. A full report ('The Report') has been compiled listing all data sources, definitions and methodologies. This Statement provides a summary of the findings.

Objectives and Scope

Belltree was commissioned to undertake a geological review of the licence leading to an estimation of resources contained within it. The contractual rights to the licence have not been examined by Belltree, nor has the actual degree or type of interest owned been independently confirmed. The data used in Belltree's estimates were obtained from CNR, public data sources and the non-confidential files of Belltree and were accepted as accurate. Supporting geological and work data are supplied with the final report.

Licence Background

The Kincardine UCG licence covers an area of 37.6 km² of tidal estuary waters in the Firth of Forth, in an area where coal has been mined underground for at least 300 years. The licence straddles two well-documented coalfields in the Midland Valley of Scotland: to the west lies the Clackmannan Coalfield of the Stirling and Falkirk districts; and to the east lies the Dunfermline Coalfield of Fife. For the purposes of the evaluation, an Area of Interest (AOI) has been defined which encloses the licence and has been the focus of an intensive data gathering exercise.

The numerous coals contained within the AOI bear characteristics of both the Clackmannan and Dunfermline coalfields and a confusing array of seam names and correlations has resulted. All the coals are of Namurian age (Upper Carboniferous) and belong to two

geological formations: the Upper Limestone Formation and the Limestone Coal Formation with the bulk of the resource held in the latter. The diagram (which can be viewed in the PDF link above) lists the main geological horizons of interest in the licence area together with the average thickness and range (coals highlighted in red often attain thicknesses in excess of 1.8 m and are the main seams worked underground within the licence and AOI).

Extensive abandoned workings exist in these coal seams from outcrop to depths of about 700 m below sea level. Beyond this depth, a significant virgin coal resource remains in numerous seams of coal, some of which attain thickness in excess of 1.8 m.

Three colliery complexes were predominantly responsible for deep underground extraction on the licence: Longannet in the west; Valleyfield in the north and Kinneil in the south. The following figure shows the extent of known underground workings in and around the Kincardine licence.

To date, no UCG activities have taken place on the licence. Adjacent acreage has been the subject of Coalbed Methane (CBM) and conventional Oil & Gas drilling, and seismic acquisition during the past three decades. Underground coal mining ended in 2001 with the closure of Longannet Colliery resulting from accidental flooding of the workings.

Data Sources

In order to create a robust framework for the resource estimations, Belltree acquired and interpreted a large amount of public domain material from a variety of sources including, but not restricted to: British Geological Survey (BGS) surface geology mapping and memoirs; economic memoirs; coal exploration borehole and 2D seismic data from the BGS; oil & gas and coalbed methane well data from agents of DECC; 2D seismic data shot for oil & gas exploration from agents of DECC; and mine abandonment plans purchased from the Coal Authority. Data were also supplied to Belltree by CNR and comprised: selected coal seam geochemistry derived from National Coal Board archive, geological reports and seismic interpretations relating to mine planning at Longannet Colliery obtained from the archives of the National Mining Museum.

Structural Interpretation

Key to the resource estimation has been a structural interpretation of the licence area. This combined data from numerous boreholes within the AOI and a new interpretation of public 2D seismic shot during the 1980s for coal and oil & gas exploration. A map showing the location of seismic lines, key boreholes and data points can be viewed in the PDF link above. The seismic data quality was deemed to be adequate but would benefit considerably from reprocessing. Structure maps were prepared for key surfaces (top Upper Limestone Formation, top Limestone Coal Formation and top Lower Limestone Formation) and isochore maps created for the Upper Limestone Formation and Limestone Coal Formation. Major faults were mapped where data density and resolution allowed but a complete structural interpretation is limited by the relatively low density of the seismic lines. The existence of

unmapped major faults is certainly possible and, on the basis of mine abandonment plans, sub-seismic faulting (<30m throw) will definitely exist and would be currently undetectable even in areas where existing 2D seismic coverage is good.

Coal Quality

The excellent quality of the Namurian coals in the Clackmannan and Dunfermline Coalfields has been established through many decades of mining and many hundreds of coal property analyses are available for samples taken in or in close proximity to the licence. Volatile matter is generally high though variable between sample locations in the same seam (20-43% dry ash-free); sulphur content is very low (commonly <2% air dried for the Limestone Coal Formation coals, <1% for the Upper Limestone Formation coals); and ash content is also low (<8% air dried for the Limestone Coal Formation coals, <23% air dried for the Upper Limestone Formation). Calorific values are also good; for example, two of the thickest and most laterally continuous coals in the licence area, the Wester Main Coal (Limestone Coal Formation) and the Upper Hirst Coal (Upper Limestone Formation) have averages of 34.8 MJ/Kg (dry ash-free) and 32.9 MJ/Kg (dry ash-free) respectively.

Resource Estimation

The estimates of coal resource in The Report have been prepared in accordance with the definitions and guidelines set out in the '*Australian Code of Exploration Results, Mineral Resources and Ore Reserves*' and '*Australian Guidelines for the Estimating and Reporting of Inventory Coal, Coal Resources and Coal Reserves*' commonly known as JORC. A summary of the JORC definitions and methodology required for JORC compliance are set out in the Resource Estimation section of The Report and all working data are provided in Appendix documents.

Two different types of resource estimation were requested by CNR:

- 1) An overall estimate of in-place coal conforming to universally accepted UCG screening criteria (e.g. depth, thickness, geochemistry) for all unmined coal occurring on the licence without regard to recovery and accessibility factors which might be imposed by regulators or required for technical reasons; and
- 2) An estimate of in-place coal for those seams which occur in panels that are not compartmentalised by faulting, attain a minimum thickness of 1.8 m, and form a developable area which allows for horizontal and vertical buffers from abandoned mine workings, medium and large-scale faults and the licence boundary.

For the first resource requirement, Belltree estimates that the mid case total resource for all coals within the Kincardine licence to be **334.65 MT** (equivalent in energy to 11,492.2 PJ). A more detailed breakdown of the mid case resource categories held in each formation are provided in the following tables. Definitions of the JORC resource categories are provided in The Report.

Significant areas of two of these coal seams (the Upper Hirst and Wester Main coals) comply with the second resource requirement. They fulfil UCG coal quality criteria as well as displaying consistent thickness in excess of 1.8 m over panels which, on the basis of available low-resolution data, appear to have good lateral continuity. These zones of Upper Hirst and Wester Main coal have sufficient vertical separation to be exploited separately and contain estimated mid case resources of **17.2 MT** (567.0 PJ) and **26.0 MT** (904.5 PJ) respectively. High, mid and low case resources for these two panels are presented in the following tables.

The resources have been estimated using probabilistic methods and make no assumptions about exploitation method or technology. Given the site-specific nature of UCG commerciality and limitations of the available dataset, no geological risk assessment has been conducted for the licence which would address the probability of success for the commercial development of the resource and which would raise some of the JORC 'Resource' to 'Reserve' category. The resources in the report are estimates only and should not be construed as exact quantities. Since no UCG drilling activities have taken place, the resource estimates are based on criteria derived by analogy with properties having similar geological characteristics elsewhere. As more exploration data becomes available it may be necessary to revise these estimates.

In evaluating the information at our disposal, we have excluded from our consideration all matters as to which the controlling interpretation may be political, socioeconomic, environmental, legal, or accounting rather than geological. As in all aspects of geological evaluations, there are uncertainties inherent in the interpretation and therefore our conclusions necessarily represent informed professional judgement.

Conclusions

Data volume and quality have been sufficient for the purposes of a resource estimation for the Kincardine UCG licence requested by CNR. Significant total coal resource has been identified in seams sufficiently thick and laterally continuous to warrant evaluation by a production test. The existence of panels of coal apparently undisturbed by major faulting is indicated by interpretation of low density 2D seismic.

While the in-place coal volumes for the licence are capable of supporting a UCG development, there remains a number of potential drilling and production risks which need to be addressed through an appropriately staged data gathering programme. This could be carried out in conjunction with a UCG pilot to technically de-risk full-scale commercial development plans.

Belltree Statement of Independence

Belltree Ltd was established in 2007 and has its main office in Edinburgh, Scotland. The company performs consulting reservoir engineering and geological evaluations for conventional oil and gas operators, unconventional oil and gas operators (CBM, UCG, shale

gas and hybrid play gas), financial institutions, private companies and government bodies throughout the world. Belltree's staff and associates work as a team to provide the integrated expertise required for exploration, complex field studies, resource evaluations and operations support.

This report has been written by Mr David Goold with geological and geophysical contributions from Belltree staff and associates. Mr Goold occupies the position of Chief Geoscientist at Belltree and has over 30 years of industry experience, 15 years of which has been in coal mining geology, coalbed methane and shale gas evaluations in Western Europe. He has conducted coal geology studies and drilling evaluations for coal basins in Upper Silesia, Lower Silesia, Saxony, North Rhine Westphalia, Saarland, Alsace, Campine, the UK East Midlands, Lancashire, Cumbria and the Midland Valley of Scotland. Mr Goold has a Bachelor of Science degree (with Honours) in Geology from Glasgow University, a Master of Science Degree in Geology from Glasgow University and a Master of Science Degree (with Distinction) in Software Engineering from the University of Stirling. Neither Mr Goold nor any person or company involved with the compilation of this evaluation has, or expects to receive, any direct or indirect interest in the securities of CNR or its subsidiaries.

****ENDS****