Issues and “Unburnable Fossil Fuels, Leave it in the Ground and Divestment” How CCUS fits in.

Michael E. Moore

VP Energy Commodities and Advisory Services
FearnOil Inc. a division of Astrup-Fearnleys

December 6th, 2016 Midland, Texas
What does “de-carbonization of energy (fossil fuels) by 2050…..” mean?

http://newsroom.unfccc.int/paris/
$2.2 Trillion Fossil Fuel Assets At Risk

Investors and markets are at risk from $2.2 trillion of stranded fossil fuel assets

- Coal is the most carbon intensive fossil fuel. No new coal mines will be needed and nearly $220bn of projects are at risk.
- Oil demand will peak around 2020 and more than $1.4 trillion of projects are at risk.
- Growth in gas will disappoint industry expectations, especially in expensive LNG. Planned spending of more than $520bn is at risk.

Which are the companies with most financial exposure?

We identified the 20 companies with most capex in the danger zone.

Top 3:
- Shell
- Exxon
- Pemex

Oil and gas majors’ potential investment on projects that won’t be needed in a 2°C scenario: 20-25%

Which are the countries with most financial exposure?

- Canada: $220bn
- Russia: $147bn
- US: $412bn
- China: $179bn
- Australia: $103bn

Do the 2°C stress-test

- Institutional Investors: Derisk portfolio by identifying companies aligned with a 2°C demand scenario or engaging with those that are not
- Companies: Provide information on the decisions taken to align corporate strategy with a 2°C demand scenario
- Governments: Stress test national resources, infrastructure and energy plans against a 2°C demand scenario
- Analysts & Advisors: Provide sensitivity analysis of which stocks are more resilient to a 2°C demand scenario

Source: "The $2 trillion stranded assets danger zone: How fossil fuel firms risk destroying investor returns", Carbon Tracker 2015

The report can be downloaded at http://www.carbontracker.org/report/stranded-assets-danger-zone/
Six Oil and Gas Majors Call for Carbon Pricing June 1, 2015

• Major oil and gas companies BG Group plc, BP plc, Eni S.p.A., Royal Dutch Shell plc, Statoil ASA and Total SA, today announced their call to governments around the world and to the United Nations Framework Convention on Climate Change (UNFCCC) to introduce carbon pricing systems and create clear, stable, ambitious policy frameworks that could eventually connect national systems. These would reduce uncertainty and encourage the most cost effective ways of reducing carbon emissions widely.

• The six companies set out their position in a joint letter from their chief executives to the UNFCCC Executive Secretary and the President of the COP21. This comes ahead of the UNFCCC’s COP21 climate meetings in Paris this December.

• With this unprecedented joint initiative, the companies recognise both the importance of the climate challenge and the importance of energy to human life and well-being.

IMF: The Price of Oil and The Price of Carbon


• “The human influence on the climate system is clear and is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.” —Intergovernmental Panel on Climate Change, Fifth Assessment Report

• Fossil fuel prices are likely to stay “low for long.” Notwithstanding important recent progress in developing renewable fuel sources, low fossil fuel prices could discourage further innovation in and adoption of cleaner energy technologies. The result would be higher emissions of carbon dioxide and other greenhouse gases.

• **Policymakers should not allow low energy prices to derail the clean energy transition. Action to restore appropriate price incentives, notably through corrective carbon pricing, is urgently needed to lower the risk of irreversible and potentially devastating effects of climate change.**
Decarbonization: “leave it in the ground”, divestment and unburnable fossil fuels...
In 2013---Turning Point

November 7\textsuperscript{th} 2013 'Unburnable' carbon fuels investment concerns - Investors group with €7.3 trillion of assets asks energy giants about their exposure and response to the risk of falling demand for oil and coal.

http://www.theguardian.com/sustainable-business/unburnable-carbon-investment-agenda
Norway Confirms $900bn Sovereign Wealth Fund's Major Coal Divestment

May 27th, 2015

• The decision to divest Norway’s $945m fund from coal assets was made on 27 May, when an agreement between political parties was reached. It was formally passed by a parliamentary vote on Friday. Svein Flaatten, of the governing Conservative party, said coal investments were both a global warming risk and financial risk. A global deal to cut carbon emissions at a crunch UN summit in December could leave some fossil fuel reserves unburnable and worthless.

• Norway’s parliament has formally endorsed the move to sell off coal investments from its $900bn sovereign wealth fund, the world’s biggest.

• It is the largest fossil fuel divestment yet, affecting 122 companies across the world, and marking a new success for the fast-growing and UN-backed climate change campaign.

• A new analysis said the fund would sell off over $8bn (£5bn) of coal-related investments as a result.

• The biggest single sell-off from Norway’s fund will be the UK utility SSE, in which the fund holds $956m of shares. The fund is also set to sell its $49m stake in Drax, which runs the UK’s biggest coal-fired power station.

• Other major energy companies identified in the analysis by German and Norwegian NGOs are Germany’s E.ON ($685m) and RWE ($320m) and the Danish company Dong ($30m), which is often associated with wind energy but has a significant coal business.

• Sweden’s Vattenfall and Italy’s Enel are also set to be affected by the coal ban as are 35 groups in the US, including Duke Energy ($434m). A dozen coal-related companies on China are set to lose their Norwegian investment, as are eight in Japan and five in Australia.

Ambitious Plan To Keep Fossil Fuels In The Ground

• By Carolyn Lochhead February 13, 2016
• Rep. Jared Huffman of San Rafael introduced the House version of the Keep It in the Ground Act on Thursday. In the Senate, the legislation is co-sponsored by Sen. Barbara Boxer of California.

• It would block all new leases for coal, oil, gas, oil shale and tar sands on public land, including millions of acres the federal government owns in the West.

• The legislation would also slap a moratorium on new leases for offshore drilling — and end current leases that are not producing fuel — in the Pacific Ocean and the Gulf of Mexico, where the nation’s oil and gas industry is centered. And it would prohibit all offshore drilling in the Arctic and along the entire Atlantic seaboard.

Movement Against US Shale Gas

• Segolene Royal told lawmakers May 10, 2016 she is willing to find a “legal way” to prevent the import of non-conventional US LNG and asking French companies in contact with Cheniere Energy to look for other sources of supply producing only conventional gas.

Beyond Coal, Oil and Natgas

• April 19th, 2016 Mark Hand SNL S&P Global Market Intelligence spoke with Lena Moffitt of Sierra Club
https://www.snl.com/InteractiveX/articleabstract.aspx?id=36149158&KPLT=8

• The Sierra Club's top priority in recent years has been shutting down coal-fired power plants across the U.S. The group's Beyond Coal effort has been described as "the most extensive, expensive and effective campaign in the environmental group's 123-year history."

• Hoping to build on the success of its Beyond Coal campaign, the Sierra Club launched initiatives targeting both oil and natural gas. In late 2014, the Sierra Club decided to merge its Beyond Natural Gas and Beyond Oil efforts into a campaign called Beyond Dirty Fuels.

• We are doing everything we can to bring the same expertise that we brought to taking down the coal industry and coal-fired power in this country to taking on gas in the same way. I look forward to seeing the same success brought to taking down gas plants to ensure that we're actually moving to a 100% clean energy future. That is the one Sierra Club policy that we are all working toward: getting us to 100% clean energy, which, of course, would include no new gas.
CCUS Value Chain

• Coal and natgas producers can utilize CCUS to provide a low carbon pathway for their continued production in power and industrial applications
• In turn Oil and NGL producers can/do/could utilize the captured CO$_2$ to provide low carbon feed-stocks for refineries and petrochemical processes
• In turn the refineries and petrochemical industries can provide a lower carbon product
• Provides a counter to shutting fossil fuels in.
CO₂ – A Valuable Resource
Fossil Fuels, CCUS & Commodity CO$_2$ For Utilization & EOR

- CO$_2$ utilization as a commodity feedstock
- Conventional mature MPZ CO$_2$-EOR
- CO$_2$-EOR in ROZ under MPZ and green field fairways
- CO$_2$-EOR in Shale
Physical CO₂: A Valuable Commodity

Source: [www.netl.doe.gov/research/coal/carbon-storage/research-and-development/co2-utilization](http://www.netl.doe.gov/research/coal/carbon-storage/research-and-development/co2-utilization)
The Global CO$_2$ Initiative

www.co2sciences.org/

- The Global CO2 Initiative was created to realize the ambitious goal of capturing 10% of global CO2 emissions and transforming it into valuable products.

- CO2 Sciences, Inc., our innovation platform, is designed to aggressively catalyze innovative research in carbon capture and reuse by granting $100 million per year for ten years to scientific research.

- In parallel, the Global CO2 Initiative will accelerate the commercialization of carbon capture and transformation products and services. We will partner with investment funds, joint ventures and corporations to invest in companies to enable them to grow market demand for carbon-based products.

- In order to achieve these ambitious goals, we have brought together a multidisciplinary group of the world's leading scientists and business leaders.
National Coal Council
CO₂ Building Blocks Report-Assessing CO₂ Utilization Options


• “CO₂ Building Blocks: Assessing CO₂ Utilization Options” – that calls for support for RD&D and adoption of incentives to advanced carbon dioxide (CO₂) utilization technologies. The report identifies CO₂ for enhanced oil recovery (CO₂–EOR) as the most immediate, highest value opportunity to utilize the greatest volumes of anthropogenic CO₂ and thereby incentivize the more rapid deployment of carbon capture utilization and storage (CCUS) technologies to control emissions of CO₂ from fossil generation and industrial sources.
National Coal Council Report

“Leveling the Playing Field for Low Carbon Coal”

• National Coal Council--A Federal Advisory Committee to the U.S. Secretary of Energy. The NCC provides advice and guidance on a continuing basis as requested by the Secretary of Energy on the general policy matters relating to coal

• Report issued the Fall of 2015

• Policy Parity
Monetizing Carbon Emissions
International Carbon Markets

http://newclimateeconomy.report/economics-of-change
China Announces World’s Largest Cap & Trade Program


• Sept 24, 2015 Chinese President Xi Jinping announced that China will develop a carbon trading system as a way to reduce the country’s greenhouse gas emissions.

• The announcement, made jointly with U.S. President Barack Obama, comes as both countries prepare to strike a global carbon emissions agreement at the Paris climate negotiations in December. The U.S. and China are the top greenhouse gas emitting nations in the world.

• China plans to launch the world’s largest emissions trading program in 2017, creating a carbon market for electric power generation, steel, cement and other industries producing most of the country’s greenhouse gas emissions. The program is meant to complement the Obama administration’s Clean Power Plan, which was finalized in August and aims to slash carbon emissions from electric power plants by 32 percent below 2005 levels by 2030.
France Seeks German Support for Carbon Emissions Floor Price

• French Environment and Energy Minister Segolene Royal plans a domestic floor price for carbon of about five times the current European level and hopes Germany and other European nations will follow.

• “The idea is that we decide on it together with Germany, and that we create a momentum for other European countries,” Royal said Tuesday in an interview in Paris.

• The price, about 30 euros ($34) a ton, will be included in the finance bill for next year, she said.

Global Storage Standards

• ISO work underway to provide a global standard for the use of captured CO\textsubscript{2} in EOR and storage.

• Kipp Coddington and US CO\textsubscript{2} EOR interests have been spearheading these efforts for the past several years.
Today

• We have a “Trifecta” of very cheap fossil fuels.
• At same time global movement to push fossil fuels away.
• Vello in his first 8 pages shows the size of using CCUS to provide CO₂ for US lower carbon energy independence--80 billion bbls not imported.
• Fred told us about the new political arena in Washington with the new Trump administration.
• Brad shows us the intense interest in Congress to find a process to advance CCUS.
• DOE through its research, partnerships and projects giving confidence to utilization and storage.
• Ongoing and constantly improving work on showing verifiable low carbon processes via “Life Cycle Analysis”
• US technology innovation constantly upping the ante.
• US political climate dramatically changed on November 8th.
• And so have the opportunities....
The Astrup Fearnley group represents over a century of history, growth and excellence in the area of shipping services. This fascinating legacy is a success story created by generation after generation of the Astrup Fearnley family. We believe it is a story worth telling.

Fearnleys traces its history back to the year 1869 when its founder, Thomas Fearnley, established a shipbroking and agency business in Christiania, as the city of Oslo was known in those days. The little company soon prospered and engaged in, among others, the trade in lumber, wine, pitch and ice.

In connection with its trading activities the company bought shares in vessels and chartered vessels. Although the company began by chartering sailing vessels, by 1880 the age of the steamship had clearly begun. By 1881 the partnership of Fearnley & Eger established the Christiania Steamship Company which contracted two newbuildings at the the Kockums Shipyard in Malmø, the 1235 deadweight ‘Oslo’ and the 1215 deadweight ‘Bygdøy’.

By the end of the 1880s the company had contracted a further six units. In the beginning of the 1900s Fearnley & Eger became, more or less, a shipowning company and invested in ever larger units. The company engaged in both liner and tramp activities and survived the two world wars. In addition to these shipowning activities, the firm continued to engage in developing its skills in the area of shipping services and was engaged primarily in the area of dry cargo shipbroking. As the tanker industry started to develop at the beginning of the 20th century, Fearnleys became enthusiastically involved in this new field of endeavour. Later on, when the transportation of gas by sea became an important area of commerce, Fearnleys developed a broking department which specialized in this new commodity. All in all, the history of the company has been closely focused on the concept of innovation; whenever new ideas and new industries developed which required seaborne transportation, Fearnleys was quickly on the scene.

As the 20th century progressed, the need for brokerage services for the transportation industry became so great that Fearnleys began to develop these (along with related ancillary services) as its principal business area. Always on the cutting edge of new trends, the company became involved in car carrier transportation in the 1960s, offshore and rig broking in the 1970s, coinciding with the onset of the development of the Norwegian continental shelf offshore oil fields, and energy trading and financial services in the 1980s. Fearnleys was also a pioneer in the development of transportation industry research and consultancy services, and has been involved in monitoring and analysing shipping markets since the early 1960s when Fearnresearch was first established. Now at the dawn of the 21st century the little company which started in Christiania in 1869 is firmly established in every corner of the world and assumes a global perspective on transportation much to the benefit of its worldwide customer base.

http://astrupfearnley.no/
Questions & Thank You!

Michael E. Moore

- VP Energy Commodities and Advisory Services
- FearnOil Inc. (a division of Astrup-Fearnleys)
- http://astrupfearnley.no/

- mmoore@fearnoil.com  Tel: 281-759-0245
LCA CCUS

How Green is My Oil?
A Detailed Look at Carbon Accounting for CO₂-EOR Sites

Nicholas A. Azzolina and David V. Nakles (The CETER Group, Inc.)
Wesley D. Peck, John A. Hamling, and Charles D. Gorecki (EERC)
L. Stephen Melzer (Melzer Consulting)

Presented at the
21st Annual CO₂ Flooding Conference
December 8, 2015
Midland, Texas

Given 12-8-15
Midland Texas
CO₂ Conference
Week on the
"Life Cycle
Analysis of CO₂-
EOR/CCUS