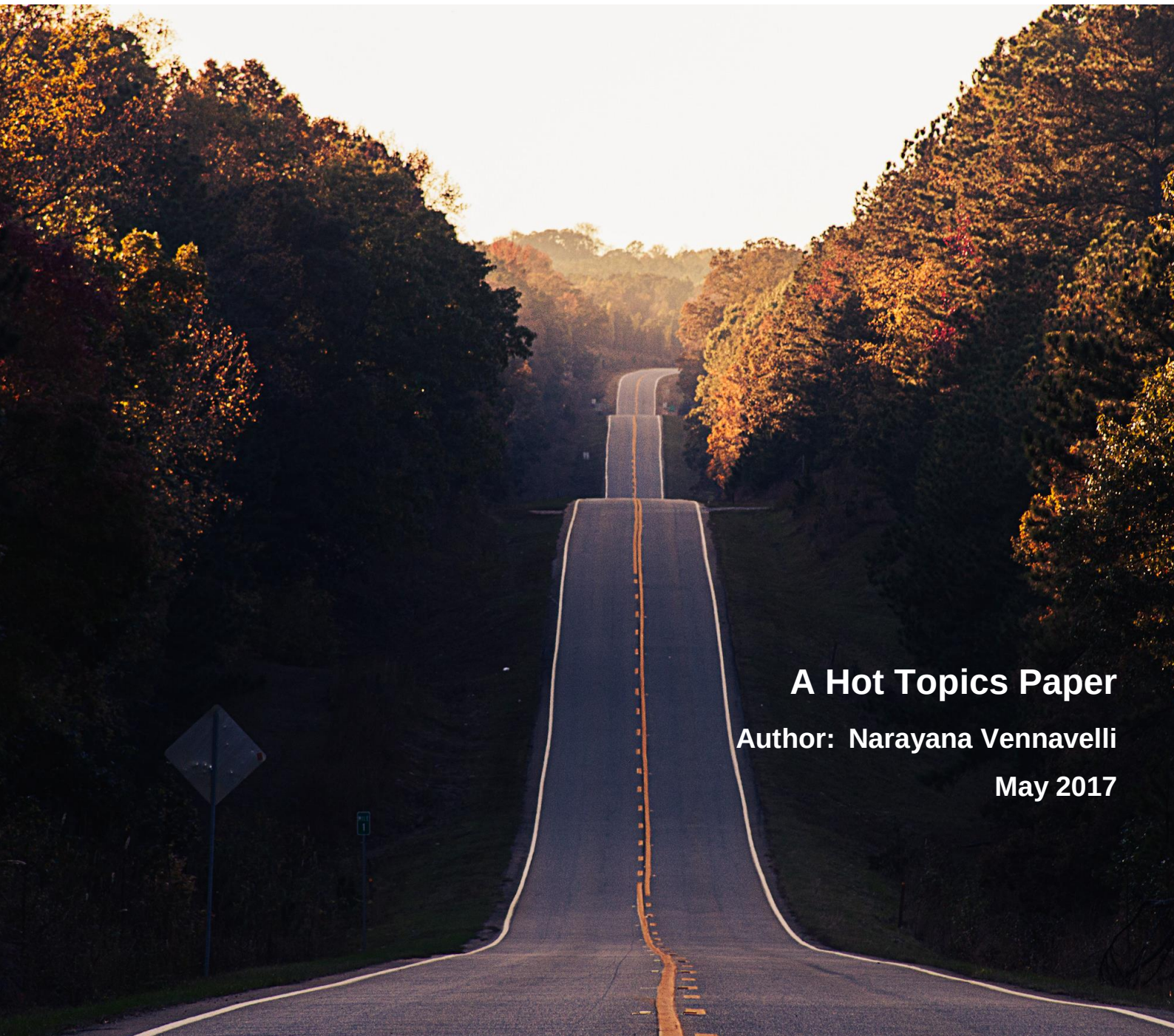
Cranfield School of Management

Doughty Centre for Corporate Responsibility

Stranded Carbon Assets Debate: Negotiating Change in Energy Industry



A Hot Topics Paper

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Foreword

Professor David Grayson CBE

Director of The Doughty Centre for Corporate Responsibility

The concept of “Stranded Assets” first really registered with me five years ago, when a friend sent me a link to an article in RollingStone. The article1 was headlined: “Global Warming's Terrifying New Math.” It was written by Bill McKibben, an American environmentalist, author, and journalist who has written extensively on the impact of global warming. McKibben looked at scientific estimates of how many more gigatons of carbon dioxide could be put into the atmosphere by mid-century and there still to be some reasonable hope of staying below an average increase of two degrees in global temperatures.

This is the concept of the Carbon Budget. McKibben then compared this remaining Carbon Budget with the amount of carbon already contained in the proven coal and oil and gas reserves of the fossil-fuel companies, and the countries. Using data from the Carbon Tracker Initiative, McKibben concluded: “We have five times as much oil and coal and gas on the books as climate scientists think is safe to burn.” If true, this would have huge implications for the market capitalisation of oil and gas companies – and – why the Math(s) would be terrifying – big knock-on impacts on the value of pensions and other financial products which typically will have significant exposure to Oil and Gas companies, as they cope with the financial consequences of Stranded Assets. The issue, therefore, is not just environmental and scientific but also financial and economic. Big Time.

The concept of Stranded Assets in the energy sector is, of course, a highly controversial debate. Fortunes hang on the debate. Understanding such debates and how they might play out in the coming decades, goes to the heart of challenges that leaders will face. I was delighted, therefore, when one of our current Cranfield MBA students: Narayana Vennavelli, decided to explore further the Stranded Assets debate as his assignment for the

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[1] http://www.rollingstone.com/politics/news/global-warmings-terrifying-new-math-20120719

Challenges for Leaders II module. In particular, that Narayana framed the topic in the context of principles of change-management.

The growing divestment movement and the increasing focus of international regulatory authorities on the potential *financial* implications of energy stranded assets are a clear indication that this is indeed a Hot topic.

About the Author

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Narayana Vennavelli is currently a Full-time MBA student at Cranfield School of Management. He previously obtained his Master of Science degree in Natural Gas Engineering from Texas A&M University-Kingsville, USA and Project Management Professional (PMP®) certification from PMI, USA. He is also a member of Institute of Chemical Engineers, UK.

He has approximately 11 years of experience in design of oil & gas, refinery and petrochemical projects in USA, Middle East, Europe and India working for a world class engineering organization. His professional interests include Process Engineering, Project and Engineering Management.

Executive Summary

Climate change is fundamentally threatening the very existence of fossil fuel industry. There are growing concerns among stakeholders that significant amount of the recoverable assets shown on companies' books cannot be monetized in order to meet carbon budgets. This is generating a debate whether the companies holding these "stranded assets" are overvalued and may have to write off about two-thirds of their assets.

This situation presents not only a technological challenge for leaders to deliver a fair value to all stake holders, but also a leadership challenge to manage change while minimizing disruptions to business as usual.

This report attempts to explain the issue of "Stranded Assets" in simple terms, discuss the perspectives of both proponents and opponents of this theory. and proposes a plan for managing change and engagement with stake holders using Stakeholder Analysis Matrix as well as Change Management frameworks.

Governments and intergovernmental organizations should lead the transition into a low-carbon sustainable future. Change management models can be useful tools for devising strategies to guide the process.

Objective

The objective of this report is to explain the concept of "Stranded Assets" from layperson's point of view, discuss the proponent's and opponent's perspectives, and understand how to engage with stakeholders in managing change using the tools of stakeholder analysis and the Kotter's Change Model.

Background: Recent Trends in Energy Industry

Climate change due to human activity is one of the most serious issues that the world is facing right now. There is a growing realization among all stake holders such as governments, fossil fuel companies, investors, scientific community as well as general population that status quo cannot continue and more action is required. Below are some significant events that happened over the past few years that capture the industry trends in recent years:

- The Governor of Bank of England has recognized in 2014 that not all fossil fuels can be burnt if we are to prevent climate change (Reference 11)
- Citi's Energy Darwinism II report published in August 2015 has concluded that action on climate change will be slightly cheaper than a no action scenario (Reference 4)
- Wood Mackenzie Ltd identified $200 billion of Oil and Gas capital expenditure as cancelled in 2015 (Reference 4)
- In its 2013 Sustainability Report, BP agreed that the entire known reserves cannot be burned if we are to meet the 2°C goal, but that applying it to company value oversimplifies the problem (Reference 14)
- Very recently (27 February 2017), new Chairman and CEO of ExxonMobil has spoken in support of Paris Agreement on climate change and has backed a carbon tax (Reference 5).

These events point out that there is a sense of urgency building up in moving to a lower carbon economy.

The Concept of Carbon Budget

Intergovernmental Panel on Climate Change set up by UN, calculated a tolerable limit for temperature rise above pre-industrial levels that could be acceptable without experiencing the effects of climate change: 2°C. In order to

limit the temperature increase to 2°C above pre-industrial revolution levels, International Energy Agency (IEA) estimates that the greenhouse gas (GHG) emissions should be restricted in such a way that their concentration in atmosphere does not exceed about 450 ppm of carbon dioxide equivalent. This scenario is known as 2-degree scenario (2DS) for short (Reference 1).

This roughly means that the amount of GHG emissions that can be released into atmosphere is equal to 565 Gigatons of carbon dioxide equivalent by 2050 and 1000 Gigatons by the year 2100 (Reference 1,2). This "carbon budget" includes all types of fossil fuel that is currently under use which is predominantly coal, oil and natural gas.

The Stranded Assets Debate

What is a Stranded Asset?

According to a seminal article by Al Gore & David Blood published in Wall Street Journal in 2013, which attracted a lot of attention on this issue, "A stranded asset is one that loses its economic value well ahead of its anticipated useful time" (Reference 3). The article argues that stranding of fossil fuels may occur due to three reasons:

1. Tightening government regulations
2. Renewable energy resources are becoming more cost competitive and in combination with their ability to offer more stable long term prices, could shift capital allocation away from fossil fuels
3. Socio-economic pressures such as environmental campaigns and changing public opinions can create a situation where "fossil fuel companies could lose their license to operate" resulting in stranding of the assets

Argument: "Stranded Assets are Real"

The total amount of "proven reserves" of various forms of fossil fuel (i.e. the quantified reserves that are confirmed as available for production using current technology), that are listed as assets on company books which when burned produces GHG emissions that are estimated to be approximately five times of the allowed carbon budget of 2DS case amounting to 2795 Gigatons of CO2 equivalent (References 2).

This means that if we are to realise the 2DS scenario envisaged by IEA and thereby avoid irreversible environmental damage, almost two thirds of these assets cannot be burned. Hence these assets cannot be monetized and should be discounted from the balance sheets of companies that own them.

As per Paris Accord adopted in December 2015, Governments have pledged individual national contributions of carbon budget. However, one source estimates that the amount of voluntary carbon budget agreed mean that the 2 DS scenario carbon budget is achieved by the year 2030 itself (Reference 13).

The risk perception of such assets is gaining strength due to the following reasons among others:

- Tighter regulations and policies as more governments across the world acknowledge and take more action on climate change
- Increased perception of environmental responsibility and financial risk on the part of investors
- Improvements in renewable technologies such as solar and wind power (although not mature enough to compete with fossil based energy yet) and electrical vehicles are creating alternative path for sustainable future of energy
- There is a general acceptance within fossil fuel industry that the industry is contributing to climate change and current situation is unsustainable.

The proponents of “Stranded Assets” concept argue that market has not yet factored in the risks associated with this situation and hence companies’ market capitalization is significantly lower than what is currently shown on the books. Hence, they say that similar to the housing bubble in USA a few years ago, there is a “carbon bubble” which is building up and which will burst sooner or later leading to destruction of investor wealth. They propose that all these companies should correct their books by adjusting the value of the assets prone to stranding.

They postulate that there are enough reserves already on the books of companies that new exploration is no longer required. It is estimated that top 200 oil, gas and mining companies in the world allocated US$ 674 Billion in the last year alone in finding, developing and extracting new assets (Reference 8). They believe that this expenditure will eventually become stranded destroying wealth of investors.

However, the risk is not the same for all the carbon assets. Coal, Oil sands and other more polluting fuels have higher risk of being stranded than the lesser polluting counterparts such as natural gas and the former will be affected more by any tightening of regulations. In fact, IEA as well as most analysts expect natural gas to grow significantly by 2050 in the energy mix.

Counter Argument: "Stranded Assets are a Myth"

There are, however, a number of people believe that the theory of stranded assets is not valid. These "opponents" do not dispute that burning of carbon based fuels is causing climate change, although there are a very small minority who actually question that CO2 emissions cause climate change, such as current Head of USA's Environmental Protection Agency (Reference 7).

Simply put, they dispute the methods of calculating the numbers for the emissions (which is very complex) to arrive at the conclusions, which they believe, have huge uncertainties and hence invalidate the whole argument. They say that given the exponential energy needs caused by growing population as well as economic growth, there are simply no alternatives and hence there is no risk that these assets could become stranded. They generally view the debate as alarmist and impractical.

For example, in response to growing concerns of "carbon bubble" & "stranded assets" from its shareholders, Royal Dutch Shell plc issued a public letter dated 16 May 2014 (Reference 7). In this letter, Shell acknowledged that climate change caused by fossil fuels is real and that "the steps undertaken to tackle the issue are currently at a low level" but it cannot be resolved as fast as is envisaged in 2DS scenario. It argued that given the dependency of the world on fossil fuel, it may take several decades to develop alternative infrastructure that is not fossil fuel dependent and that by investing in technologies such as natural gas and CCS (Carbon Capture and Sequestration) and improving energy efficiency of its operations, it is actively managing its CO2 footprint

It went on to explain that its policies are in line with IEA's new policies scenario (Reference 1). This is a key statement to note because IEA's "new policies scenario" assumes that the world would try to reduce carbon emissions by 2100 but fails to achieve 2-degree scenario (Reference 1). Shell clarified in the same letter that it does not believe that the regulatory frameworks of various governments are aligned to meet 2DS case (Reference 7).

Similarly, a 2014 report by energy consultant IHS disagrees that there is a "Stranded Assets" situation coming in Oil and Gas industry any sooner (Reference 8). It disputes the methodology used to define "Proven Assets", which it believes, inflates the near term risk, besides noting that the methods for calculating estimates of future emissions use simplistic mathematical models to evaluate complex scenarios.

It also supported the views expressed in Shell's 2014 letter that current infrastructure is too dependent on fossil fuels that dictating sudden transition through government policies and regulations will be hazardous and hence, has to be through a gradual process dictated by market forces.

Wide deployment of CCS technology to capture and store CO2 is one of the main mitigation that the proponents recommend to meet carbon budget targets. Coal produces approximately 41% of world's electricity versus only 20% by natural gas while producing twice as much CO2 as natural gas (Reference 10).

However, there is widespread scepticism about the technology's promise. Over the past decade and a half, more than US$ 24 billion has been spent by governments in carbon capture and sequestration projects but only one power plant in entire world (in Canada) is functional as of 2016 with heavy subsidization while more than a dozen such plants in UK have been scrapped (Reference 10). The Carbon Tracker Initiative calculated that in the best-case scenario, CCS technology can extend carbon budget by 12-14% (Reference 12). Oil major BP has invested significantly invested in this area but has scaled back the activities due to less than satisfactory results (Reference 14).

Critical Analysis of Arguments

There is almost universal agreement from both sides i.e. proponents as well as opponents (including those within fossil industry) that a transition from carbon based fuels to clean energy options should happen.

However, this change is particularly hard on the fossil fuel industry as their very existence is challenged on a fundamental level. Hence a significant level of resistance can be expected from them as external forces are driving change.

There is merit in arguments about the financial risk of the so-called "stranded assets". It is the fiduciary duty of fossil fuel industry to justify that there is no or minimal financial risk to investor wealth.

However, we should be careful to not force an imperfect method of evaluating these stranded assets on fossil fuel companies. This ultimately hurts not only the companies involved, but also the large section of investors which may include pension funds.

Forced undervaluation can also hurt long term investments in fossil industry causing disruptions to energy supply resulting in crisis.

There is general acceptance that current infrastructure (such as transportation, battery storage etc.) is not ready for such a transition and requires a significant improvement in sustainable energy technology. This gap in technology is causing misalignment in achieving a consensus on a timeline for the transition, which fossil fuel industry uses as justification to continue investments in resources such as coal and oil sands.

Another point of disagreement is on the estimation of emissions. Fossil industry should be more constructive in defining evaluating criteria and methodology for calculation of emissions. Policy bodies and intergovernmental organizations such as IPCC and IEA should also facilitate setting up a framework in defining the measurement and forecast of emissions.

Planning for Change

There is no clear answer to this debate yet. In the current context, understanding the stakeholders and their impact (as a function of power, interest and attitude) is crucial for any constructive engagement in taking the debate forward.

Stakeholder Analysis

The stakeholders involved in the process are:

1. Governments (and Intergovernmental organizations such as UN, IEA etc)
2. Fossil Fuel Companies
3. Renewables Companies
4. NGOs and environmental community
5. Investors in Fossil fuel companies
6. Consumers

Table 1: Stakeholder Analysis Matrix for Change towards Renewables

Stakeholder	Power	Interest	Attitude	Expected Behaviour
Governments	High	High	Positive	Drive change by formulating and enforcing policies while regulating the pace of change to avoid disruption to normal business
Fossil Fuel Companies	Medium	High	Negative	Maintain status quo; resist change; may involve in political resistance to fight external pressure
Renewable Energy Companies	Low	High	Highly Positive	Excited about the change; Try to expand; may try to form a coalition with NGO & Scientific Community and Governmental organizations
NGOs & Scientific Community	Medium	High	Highly Positive	Build support for change; shape public and government opinions
Investors in fossil fuel companies	High	High	Slightly positive	Increasingly concerned about carbon bubble; gradual divestment from fossil fuel may occur over period of time;
Consumers	Low	Medium	Neutral	Only concerned about price of energy

From the above, it can be seen that it is the governments (in coordination with Intergovernmental organizations such as UN and IEA) that have maximum capacity to drive the change. They have the power and capacity, by the way of framing policies and regulations as well as enforcing them, to set the pace of change and regulate it so that there is no disruption to business as usual, while making sure the carbon budgets are adhered to as much as possible. They also have to exercise good discretion in resisting political pressures from the powerful fossil fuel industry lobby for the larger good of all the stakeholders.

Strategizing Using Kotter's Change Model Framework

Having identified the leader of change, we can proceed to formulate a strategy by adapting Kotter's Change Model framework. Kotter's model is a convenient tool for this scenario because:

- It provides a robust and proven framework for a top-down enforcement of the change, which is the case for a government led energy transition scenario.
- It helps us with a good starting point to analyse the context of the change process, and prepare strategies for a gradual change.

Below is a high-level plan on how the transition to a sustainable energy framework can be achieved using the framework:

1. ***Establishing a sense of urgency:*** In this case urgency refers to preparing and enforcing stricter policies and regulations to optimize energy mix in such a way that avoidable carbon emissions are cut down. A good example would be changes such as discouraging new coal plants, encouraging investments in solar and wind power etc. where existing technology can be leveraged to improve emissions record by better prioritization.
2. ***Forming a powerful guiding coalition:*** In the context, the coalition would be other governments, regulatory bodies which set standards such as IEA, IPCC (UN) etc. By closely working with these bodies to promote standardization of policy changes, adopting world-wide regulations, auditing processes, resistance from stakeholders affected by the change (i.e. fossil fuel industry) can be minimized.
3. ***Creating a vision:*** It is explained earlier that most fossil fuel industry players are not benchmarking their internal policies against 2DS case, but a lesser defined and more flexible "New Policies Scenario". There is an incoherence in the application of these scenarios across the industry. Hence governments can layout a clear vision of emissions scenarios that companies have to align with, which can form a standard rather than a recommended practice.
4. ***Communicating the vision:*** The communication shall be in the form of official policies, regulations and standards
5. ***Empowering others to act on the vision:*** This involves creating a sustainable clean energy infrastructure by encouraging clean technologies (through tax cuts, R&D spending etc.) not only in solar

and wind power, but also in cleaner carbon technologies such as natural gas.

6. ***Planning for and creating short term wins:*** Examples of specific short term wins could be for governments to
    a. stop capital investments for dirty carbon technologies such as subcritical coal power plants that operate on 25% efficiency or less in the next 5 years
    b. Persuade financial institutions to develop acceptable methodologies to report stranded assets
7. ***Consolidating improvements and producing still more change:*** The process of improving energy mix is an iterative one with gradual shift dictated by market forces as well as governmental control. These policies have to be updated keeping in mind contextual factors balanced by the concept of “fairness to all”.
8. ***Institutionalizing new policies:*** This step goes hand in hand with the previous step since government largely plays a regulatory role.

Conclusion

The Stranded Assets debate has no clear answer and governments should take the lead in coordinating the issue of stranded assets as well as transition to a low carbon economy. Change management models are useful tools to guide the process of managing the change to low-carbon future as well as ensuring a fair return to all stakeholders.

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