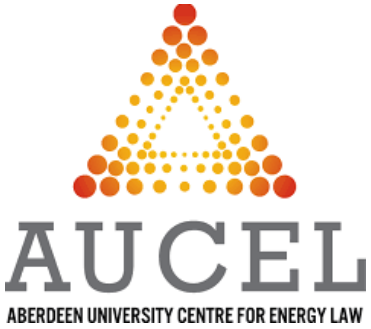

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Proposed Framework for Offshore Clean Energy Infrastructure in Australia

BY

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Proposed Framework for Offshore Clean Energy Infrastructure in Australia

Submission to the Department of Industry, Science, Energy and Resources

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INTRODUCTION

With climate change topping the list of the most severe global risks in the 2020 Global Risk Report,[1] there is a growing awareness of the implications of fossil-based energy sources, there appears to be a global shift towards renewable energy and other clean energy sources. Amongst these forms of clean energy, there is a growing appetite for offshore wind energy in Europe and other parts of the world. While there is a growing body of research on the measure to encourage the growth of offshore wind as well as reduce the ecological impacts, there is very little legal analysis on how to regulate the health and safety implications of installing, operating and decommissioning such potentially high-risk offshore energy facilities. Following the request from the Australian Government for comments on its proposed Offshore Clean Energy Infrastructure Regulatory Framework, this submission will consider the regulation of offshore wind activities in Commonwealth Waters. Rather than only undertake a critique of the proposed framework, this submission seeks to identify regulatory gaps, particularly with respect to health and safety in the offshore wind sector. It will suggest the adoption of a robust offshore risk governance regime that is analogous to offshore petroleum safety case regime that has been implemented in petroleum jurisdictions including Australia. In undertaking this analysis and draw upon lessons from the UK offshore energy risk governance regimes for both oil and gas and wind.

Australia has traditionally relied on its significant hydrocarbon and coal resources and until recently, was less enthusiastic to encourage the development of offshore clean energy. Perhaps owing to the significant contributions of its onshore wind and solar energy options.[2] It can be argued that this shift towards clean energy is perhaps influenced by it being a signatory to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Furthermore, with long-term targets to reduce Green House Gas emissions to 26% - 28% by 2030,[3] one can understand the basis for such considerations. The approval of its first offshore wind energy project and the efforts to develop an Offshore Clean Energy Infrastructure Regulatory Framework is a reaffirmation of not just the reality of energy transition in Australia but around the world. In fact, over the last 20 years, wind power has been the fastest growing electricity generation technology in Europe and other parts of the world including US and China.[4] From the foregoing, it is not difficult to see the justification for Australia's interest. While the discussion on how to encourage and promote the development of these clean energy sources abound, there is very little research on regulating the potential safety risks and that is the focus of this paper.

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[1] World Economic Forum " The Global Risk Report" (2020) online at <https://www.weforum.org/reports/the-global-risks-report-2020> accessed on the 5th February 2020.

[2] Australia has the highest uptake of solar globally and onshore wind power generates nearly a quarter of all the renewable electricity in Australia's National Energy Market. See, Tim Buckley "Australia's First Offshore Wind Project; A Step in the Right Direction" (2019) Institute of Energy Economics and Financial Analysis online at <https://ieefa.org/wp-content/uploads/2019/11/Australias-First-Offshore-Wind-Project-a-Step-in-the-Right-Direction_Nov-2019.pdf> accessed on the 4th February 2020.

[3] Australia's 7th National Communication on Climate Change "A Report Under the United Nations Framework Convention on Climate Change", December 2017. Page 11 online at <https://unfccc.int/sites/default/files/resource/0512739_Australia-NC7-BR3-3-Aus%20NC7%20BR3.pdf > accessed on the 4th February 2020.

[4] Eleonora Messali and Mark Diesendorf, "Potential Sites for Offshore Wind Power in Australia" (2009) 33(4) Wind Engineering 335-348.

It is accepted that offshore wind and other marine renewable energy sources are an environmentally friendlier option to fossil fuels, but the uncertainties and possible occupational health and safety risks associated with this modern, complex and fast growing industry could lead to severe accidents offshore if not addressed.[5] According to the European Risk Observatory Report by the European Agency for Safety and Health at Work in 2013,[6] significant health and safety risks are associated with offshore wind energy operations and currently challenges are plaguing the industry.[7] Such challenges include:

- ❒ increase in offshore wind energy related accidents,
- ❒ skills shortages,
- ❒ lack of offshore safety data, and
- ❒ inadequate procedures and standards.[8]

While these may appear to be non-legal challenges, they raise valid concerns about the role of regulation as an instrument of social engineering in ensuring that offshore wind energy operations are carried out in the safest possible manner.

It is suggested that the apparent benignity of offshore wind is a result of an erroneous impression that the offshore wind energy operation is simple, leading to the current regulatory attitude in some jurisdictions.[9] The European Agency for Safety and Health at Work suggests the contrary, arguing that offshore wind energy industry is a complex, hazardous and fast developing industry which, if not adequately understood and regulated, could lead to a superficial understanding of the industry and its inherent health and safety risks. According to the British Safety Council, offshore wind energy is a medium risk activity, and can be classified as high risk depending on the nature of the generation and the location offshore,[10] since 'as wind farms are developed further from shore, and correlatively the environmental conditions become more unpredictable and hostile, these risks will increase'.[11]

This submission is divided into three main parts. The first section introduces the issues and provides a basis for subsequent discussions while examining the growth of offshore wind energy in Australia. In the second section, this submission will analyse the safety related challenges plaguing the industry more generally and a functional comparative analysis of how that relates to the offshore petroleum industry. Finally, while drawing lessons from the

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[5] Peter Atkinson, 'Securing the Safety of Offshore Wind Workers' (2010) 11(3) Renewable Energy Focus 34.
[6] European Agency for Safety and Health at Work, 'Occupational Safety and Health in the Wind Energy Sector: European Risk Observatory Report' <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15 February 2020.
[7] European Agency for Safety and Health at Work, 'Occupational Safety and Health in the Wind Energy Sector: European Risk Observatory Report' <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15th February 2020.
[8] European Agency for Safety and Health at Work, 'Occupational Safety and Health in the Wind Energy Sector: European Risk Observatory Report' <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15 February 2020.
[9] European Agency for Safety and Health at Work, 'Occupational Safety and Health in the Wind Energy Sector: European Risk Observatory Report' <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15 February 2020.
[10] Chris Warburton, 'The Winds of Change: The Regulation of a Lower Risk Sector' (2012) <https://sm.britsafe.org/winds-change-regulation-lower-risk-sector> accessed 15 February 2020.
[11] Chris Warburton, 'The Winds of Change: The Regulation of a Lower Risk Sector' (2012) <https://sm.britsafe.org/winds-change-regulation-lower-risk-sector> accessed 15 February 2020.

offshore petroleum experience, this submission recommends regulatory reconfigurations and interventions that could be adopted in developing and further strengthening a robust offshore clean energy governance regime.

1. OFFSHORE WIND AND OTHER CLEAN ENERGY SOURCES IN AUSTRALIA

While being dependent on conventional sources of energy, there is a realisation that to develop a sustainable energy industry and reduce the impact of global warming resulting from fossil-based use, there requires a radical shift towards clean energy. The growth of the offshore wind energy industry in Europe has been remarkable. While there are other sources of clean energy in Australia, there is also the drive to develop its offshore wind energy industry, as indicated by the 'Star of the South' consortium which seeks to establish Australia's first windfarm off the Gippsland coast, and is expected to cost about AU$8bn and it should generate about 2.2 gigawatt (GW) of electricity.[12]

Investigations into the potential and suitability of offshore wind technology in Australia have provided some encouraging results. The research revealed "several locations for the implementation of offshore wind technology in Victoria amongst other states and territories".[13] Initial research revealed that at the time constructing an industrial scale offshore wind technology was not economically viable, with[14] Wawryk acknowledging that "the cost if foundations and turbines, installation, maintenance and repair, and decommissioning are all higher in the marine environment and tend to be more expensive the deeper the water and the further the distance from shore".[15] Wawryk adds that "In many coastal areas in Australia, the continental shelf falls steeply, making the water deep and correspondingly offshore wind energy more expensive[16]. While this is argument is understandable, some significant progress has been made in this regard in the light of technological advancements using floating turbines and perhaps a better understanding of the industry that has in many ways reduced the cost of offshore wind energy development. It is for this reason that the Australian Government has approved its first offshore wind energy project.

2. UNDERSTANDING OFFSHORE WIND ENERGY RELATED RISKS: A LIFECYCLE ANALYSIS

This section critically evaluates the key health and safety elements related to the offshore wind energy life cycle. This analysis will provide the necessary awareness to policy makers and regulators on the health and safety risks associated with offshore wind energy development. This information will inform the suitability or otherwise of the suggested health and safety regulatory regime to accommodate and effectively provide critical health

[12] Tim Buckley "Australia's First Offshore Wind Project; A Step in the Right Direction" (2019) Institute of Energy Economics and Financial Analysis online at <https://ieefa.org/wp-content/uploads/2019/11/Australias-First-Offshore-Wind-Project-a-Step-in-the-Right-Direction_Nov-2019.pdf> accessed on the 4th February 2020.
[13] Stephen Christos "Investigation of the Potential to Implement Offshore Wind Energy Technology in Victoria, Australia" (2015) A Master's Thesis Submitted to the Department of Earth Sciences, Uppsala University, Sweden.
[14] ibid
[15] Alexander Wawryk, "Legal Framework to Develop Offshore Wind in Australia" in Anton Ming-Zhi Gao and Chien-Te Fan (eds), The Development of a Comprehensive Legal Framework for the Promotion of Offshore Wind Power: Lessons from Europe and Pacific Asia (Wolters Kluwer 2017) 164.
[16] Ibid.

and safety regulatory requirements covering the entire wind energy life cycle, from project definition to decommissioning.

Starting with the design phase, although there are minimal health and safety risks to personnel and other sea users in relation to this phase, it is considered as the best phase to 'design out' hazards, therefore timeously mitigating work-related accidents throughout the turbine's life cycle.[17] Firstly and technologically, the design has to take into account the fatigue characteristics of the materials and the structural properties of the installation as well as the extreme weather conditions that the installation will be exposed to.[18] This will enable inclusion of unique features and modifications specially designed for the offshore wind and marine energy sector.[19] For example, the need to incorporate corrosion protection or fitting wind turbine with a lift which could help prevent climbing, thereby reducing great implications and health and safety risks on the workers' body, especially as offshore wind turbines are higher than those onshore.[20]

In terms of regulation, an effective health and safety regulatory regime must have adequate health and safety risk assessment tools which have been identified to help reduce the hazards and risks within the design stage and 'design out these risks'. One tool, which can be supported by regulation besides the Quantitative risk assessment (QRA), is the 'Hazards in Design' assessment (HAZID) 'which can be used throughout the stages of the design process to look at the failure of components and systems and to assess the consequent effects on personal safety.'[21] It involves a 'consultation of experts from various disciplines about the design, so that problems can be identified and appropriate modifications made at an early stage'.[22] The consenting and licensing regime, which is a key component of this phase should also including a "permit system" which means that the approval of a "safety plan" will be a condition precedent for the granting of government consents.

In relation to the construction, operation and maintenance as well as decommissioning stages, there are various critical health and safety issues and associated risks that reveal that these operations are complex, hazardous and therefore deserving of a robust health and safety regulatory regime.

Firstly, these phases require the constant movement and transportation of wind turbine components and personnel, which creates significant health and safety risks especially in the offshore environment.[23] Transporting several 100-metre tall wind turbines along with hundreds of personnel over a period of time to a remote, hazardous offshore environment is no small feat and requires considerable planning and risk mitigation measures.[24] The absence of adequate health and safety planning and mitigation measures during transportation could lead to significant economic as well human risk. In this regard, there are reported cases of such economic loss, as turbine sections have been lost at sea along

[17] RenewableUK, 'Offshore Wind and Marine Energy Health and Safety Guidelines' (2014) 114 <http://www.sgurrenergy.com/wp-content/uploads/2015/09/offshore-marine-h-s-guidelines-21840.pdf> accessed 15th February 2020.
[18] Ibid.
[19] Ibid.
[20] Ibid.
[21] Ibid.
[22] Ibid.
[23] Ibid.
[24] Ibid.

with a 58 million Euro barge.[25] The European Risk Observatory Report reveals that transport is the single biggest cause of fatalities for workers.[26] This is because during transportation of offshore wind farm components and workers by vessel, there is exposure to a number of potential hazards including heavy weather conditions, stranding or collision or fire.[27] Other significant health and safety hazards encountered during these phases include falls from heights, falling structures, loads or objects during lifting operations and mechanical hazards caused by contacts with moving parts.[28] There is also the likelihood of electrical hazards such as shocks or electrostatic phenomena, fire or explosion of turbines caused by combustible materials or a vessel, and there are hazards from manual handling, fatigue from climbing ladders or working in a confined space.[29]

These hazards and more have the potential to cause significant loss of life and property, especially as evacuation under challenging weather conditions could be difficult.[30] Tower collapse as a result of improper installation, blade failure or tower strike are other significant health and safety risks which could also endanger the lives and property of other users of the sea.[31] More specifically, some examples of hazards encountered during the development of an offshore wind farm include:

- falls from heights,
- mechanical hazards such as contact with moving parts,
- blade failures,
- ice throws,
- ship collision, personnel transfer accidents or men overboard which may occur during marine operations and transportation,
- electrical hazards, and
- Fire or explosion of turbine or vessel.[32]

Others might include issues relating to manual handling, ergonomics, the risk from working with dangerous substances, working in confined spaces, and exposure to noise and vibration.[33] While these risks are not exactly new, the fact that they occur in a remote and unpredictable offshore environment makes it more challenging, especially during emergency evacuations. Bass Strait is well known as a fierce, unpredictable wind and storm environment, where events can develop quickly and cause crisis situations for marine traffic. Such risk and consequence was demonstrated in the 1998 Sydney to Hobart yacht race, which resulted in the loss of six lives and five yachts.

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[25] Ibid.
[26] ibid.
[27] European Agency for Safety and Health at Work, 'Hazard Identification Checklist: Occupational Safety and Health (OSH) Risk in the Wind Energy Sector' 34 <https://osha.europa.eu/en/publications/e-facts/e-fact-80-hazard-identification-checklist-occupational-safety-and-health-osh-risks-in-the-wind-energy-sector> accessed I5th February 2020.
[28] European Risk Observatory Report, *Occupational Safety and Health in the Wind Energy Sector* (2013) 34 <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15th February 2020.
[29] Ibid.
[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Ibid.

The growth of wind energy has seen a corollary increase in wind energy related accidents. For instance, the Caithness Windfarm Information Forum (CWIF) reports that there have been 1,951 wind energy accidents (analysing onshore as well as offshore) with 165 fatalities since 1970,[34] with most of these accidents occurring within the last 8 years when the wind energy industry began to expand. According to CWIF, 'as more turbines are built, more accidents occur'.[35] This is demonstrated in the incidence of accidents, 'with an average of 21 accidents per year from 1996-2000 inclusive; 57 accidents per year from 2001-2005 inclusive; 118 accidents per year from 2006-10 inclusive, and 164 accidents per year from 2011-15 inclusive'.[36]

Analysis by the European Agency for Health and Safety at Work reveals that since 1970, there have been 104 fatal incidents causing 144 deaths.[37] Of those that died, 87 were support workers and 57 occurred to members of the public, some of who were transport workers.[38] Importantly, wind energy health and safety risks do not just occur to workers but also to members of the public and if it is sited offshore, it could cause severe health and safety risks to other users of the marine space.

To further demonstrate the increase in health and safety incidents for wind installations,, according to the Caithness Wind Farm Information Forum (CWIF) 2016, globally wind energy accidents had increased to 2,231 as at 31st March, 2018.[39] Fatalities had also increased to 184; 112 to wind farm workers and 84 to other members of the public.[40] It is pertinent to add that despite these significant figures that demonstrate the increase in wind energy related accidents, the CWIF opines that these figures represent a "tip of the iceberg" and only represent 9% of the total number of wind energy related incidents.[41] The tables below show the increase in accidents and fatal accidents by the year.[42]

[34] Caithness Windfarm Information Forum, 'Summary of Wind Turbine Accident Data to 31st May 2017' <http://www.caithnesswindfarms.co.uk/AccidentStatistics.htm> accessed 15th February 2020.
[35] Ibid.
[36] Ibid.
[37] European Risk Observatory Report, *Occupational Safety and Health in the Wind Energy Sector* (2013) 14 <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 15th February 2020.
[38] European Risk Observatory Report, *Occupational Safety and Health in the Wind Energy Sector* (2013) 14 <https://osha.europa.eu/en/publications/reports/occupational-safety-and-health-in-the-wind-energy-sector> accessed 24 April 2018. See also Caithness Windfarm Information Forum, 'Summary of Wind Turbine Accident Data to 30th September 2016' <http://www.caithnesswindfarms.co.uk/AccidentStatistics.htm> accessed 25th February 2020..
[39] Caithness Windfarm Information Forum, 'Summary of Wind Turbine Accident Data to 30th September 2016' <http://www.caithnesswindfarms.co.uk/AccidentStatistics.htm> accessed 15th February 2020.
[40] Ibid.
[41]Caithness Windfarm Information Forum, 'Summary of Wind Turbine Accident Data 31st March 2018' <http://www.caithnesswindfarms.co.uk/AccidentStatistics.htm> accessed 15th February 2020.
[42] Ibid.

Total number of accidents: 2231

Year	Before 2000	2000-2004	05	06	07	08	09	10	11	12	13	14	15	16	17	*18
No.	109	243	71	83	125	131	131	120	170	168	174	164	153	164	181	44

Number of fatal accidents: 137

Year	Before 2000	2000-2004	05	06	07	08	09	10	11	12	13	14	15	16	17	*18
No.	24	12	4	5	5	11	8	8	15	16	4	2	7	6	9	1

The CWIF argues that these figures represent only ten per cent of accidents, which suggests that they are far from comprehensive.[43] For example, CWIF only has a record of 142 UK accidents; meanwhile RenewableUK in 2011 reported that 'around 1,500 accidents and other incidents had taken place on wind farms between 2007 and 2011' and this included 'four deaths and a further 300 injuries to workers'.[44] This in itself demonstrates a fundamental problem with the availability and incomprehensibility of safety data that should assist the industry in drawing lessons. Although efforts have been made to resolve this through the industry's G+ Annual Health and Safety Incident Data Report,[45] this only started in 2013 and is restricted to member data.

According to the G9's first Annual Data Report in 2013 which was predominantly safety data from the UK, it recorded 616 incidents which included 66 lost work day incidents, 30 medical treatment injuries, 61 first aid, 345 near hits and 102 hazards with no fatalities.[46] In 2014, there were 994 incidents, which represent a 55.7 per cent increase from 2013.[47] It represents 44 lost workday incidents, 54 medical treatment injuries, 95 first aid cases, 655 near hits and 97 hazards.[48] Furthermore, the 2015 G9 Health Report reveals that there were 790 offshore wind energy health and safety incidents.[49] While there is a reduction in the number of reported incidents between 2014 and 2015, there was a significant increase in the number of hazards and near hits when compared to 2014. While there were no fatalities

[43] Ibid.
[44] Ibid.
[45] G+ Annual Health and Safety Incident Data Report <https://www.gplusoffshorewind.com/work-programme/hse-statistics/gplus-2016> accessed 15th February 2020.
[46] G9 Offshore Wind Health and Safety Association, 'Annual Incident Data Report' (2013) 4 <http://www.g9offshorewind.com/data/assets/pdf_file/0011/106121/G9report-finalversion-WEB.pdf> accessed 15th April 2020.
[47] G9 Offshore Wind Health and Safety Association, 'Annual Incident Data Report' (2014) online at <https://www.gplusoffshorewind.com/?a=633572> accessed 24th February 2020
[48] Ibid.
[49] Ibid.

in 2015, the industry experienced 41 lost workday incidents, 31 medical treatment injuries, 55 first aid cases, 262 near hits and 398 hazards.[50]

By 2016, G9 had fully rebranded and was known as G+, which meant and expansion to include offshore companies operating around the world. Therefore, the figures from this period represented the incidents in Northern Europe covering the 35 sites operated by formerly G9 but now G+ member companies. According to the 2016 report, there were 987 incidents. 2017[51] recorded 2200 incidents while 2018[52] had 854 reported incidents. Despite the inconsistencies and insufficient safety data and incident reporting mechanism, it is clear from the above numbers that offshore wind energy related accidents are on the rise. According to the Equinor EHS manager, 'the number of serious incidents and accidents in the offshore wind industry are too high when compared to offshore oil and gas'.[53] For this reason, she suggests that health and safety lessons from offshore oil and gas can be applied to the offshore wind energy industry.[54] Therefore, this thesis advocates the possible adoption of the offshore oil and gas safety case regulatory model to the offshore wind energy industry.

There are several reasons for the health and safety challenges in the offshore wind energy industry more generally and some commentators have shared their views. According to Peter Finn, the EHS Manager for GE Energy,[55] he suggests that as larger turbines are installed further offshore, more challenges will arise, especially regarding onsite accommodation, the need for better emergency response and the logistics of spare parts delivery.[56] He adds that 'this will result in more turbines, more technicians, more transfers and thus an increased risk of incidents'.[57] Another salient cause of these accidents is that the industry currently suffers from a significant gap in the availability of skilled workers. It therefore implies that with inexperienced workers being involved in the processes of constructing and operating offshore wind farms, the likelihood of accidents will increase. This issue is identified in the area of vessel transfer and transportation in general. Steven Clinch, the Chief Inspector of Marine Accidents UK explains that owing to the skills gap, the crews that man offshore wind farm transportation vessels are recruited from the fishing or

[50] G9 Offshore Wind Health and Safety Association, 'Annual Incident Data Report' (2014) online at < https://www.gplusoffshorewind.com/?a=633571> accessed 24th February 2020
[51] G9 Offshore Wind Health and Safety Association, 'Annual Incident Data Report' (2014) online at < https://www.gplusoffshorewind.com/?a=633567> accessed 24th February 2020

[52] G9 Offshore Wind Health and Safety Association, 'Annual Incident Data Report' (2014) online at < https://www.gplusoffshorewind.com/?a=638861> accessed 24th February 2020
[53] <http://www.offshorewind.biz/2012/08/16/denmark-wind-energy-update-releases-offshore-wind-health-and-safety-information-pack/> accessed 15th February 2020.
[54] Ibid.
[55] OffshoreWind.biz, 'Denmark: Wind Energy Update Releases Offshore Wind Health and Safety Information Pack' (2012) <http://www.offshorewind.biz/2012/08/16/denmark-wind-energy-update-releases-offshore-wind-health-and-safety-information-pack/> accessed 17th February 2020.
[56] Ibid.
[57]

leisure industry, without recognising that skills required for the various industries differ.[58] He adds that the:

> [S]kills gap is likely to grow as the renewable energy industry moves even further offshore in the future. As such, there is a clear potential for rise in the number and severity of accidents unless action is taken to ensure that vessels' crews have the necessary competencies needed to operate their crafts safely.[59]

Some industry stakeholders have expressed concerns over the increase in offshore wind energy related accidents. Anne Marit Hanssen, the Environmental Health and Safety Manager for Statoil (now Equinor), opines that 'the number of serious incidents and accidents in the offshore wind industry are too high when compared with offshore oil and gas'.[60] For this reason, she adds that there are significant lessons to be drawn from the oil and gas industry.[61] Despite the prevailing challenges in the offshore wind energy industry, the situation appears to be worsened by the safety culture and attitude to safety of some companies. In the words of Andrew Linington, a spokesman for Nautilus:

> Operators who apply high safety standards are losing out to companies that cut corners… [T]he situation is frighteningly similar to the boom in North Sea oil in the 1970s. Back then people were warning of poorly enforced standards, but it wasn't until 167 men died in the Piper Alpha disaster that anything was done to clean up the industry.[62]

This paper acknowledges the benefits of renewable energy and supports the development of offshore wind energy in particular. Offshore wind energy as an energy source could contribute significantly to the economic, social and energy security challenges. Also, its role in combating climate change and meeting renewable energy targets cannot be overstated. Be that as it may, it is important for stakeholders and the general public to be aware of the health and safety implications of offshore wind energy as this will guide policy makers and regulators in making informed decisions in solving the challenge of increases in accidents that have been worsened by skills gaps and sparse safety data and information. To resolve these challenges, it is critical to acknowledge them and include in the development of any regulatory framework. Unfortunately, some industry stakeholders think the problems are exaggerated while others deny it.[63] Despite this situation, this submission seeks to identify and argue for the strengthened role of safety regulation in this regard and perhaps provides some conclusions that might be beneficial to the Australian Government in the design of its Offshore Clean Energy Regulatory regime, particularly with respect to prioritising the health and safety of offshore wind energy workers and other users of the marine space.

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[58] Maritime Accident Investigation Branch - Accident Report No 23/2013, Page (i) <https://assets.publishing.service.gov.uk/media/547c6f44e5274a429000001b/W9IPReport_Web.pdf> accessed 15 February 2020.

[59] Ibid.

[60] OffshoreWind.biz, 'Denmark: Wind Energy Update Releases Offshore Wind Health and Safety Information Pack' (2012) <http://www.offshorewind.biz/2012/08/16/denmark-wind-energy-update-releases-offshore-wind-health-and-safety-information-pack/> accessed 15th February 2020.

[61] Ibid.

[62] Will Crisp, 'Offshore Wind Farm "Wild West" of Renewable Energy, Union Warns' *The Guardian* (14 February 2014) <https://www.theguardian.com/environment/2014/feb/14/offshore-windfarms-renewable-energy> accessed 15th February 2020.

[63] Ibid.

ANALYSIS OF SPECIFIC OFFSHORE WIND ENERGY RELATED ACCIDENTS

From the above analysis of offshore wind energy health and safety risks across its life cycle, it is evident that these risks could lead to serious accidents and in some cases death. A point in case was the night on Saturday 13th July 2013, when a 26-year-old British diver was killed in an accident on the German Riffgat offshore wind farm.[64] The incident occurred during a routine offshore wind cable operation where 'two divers were underwater guiding the placement of six-tonne concrete mats over subsea cables when one was trapped under the mat'.[65] Onshore, several fatal incidents have also occurred. On the 15th of March 2017, a 37-year-old contractor died after falling into an onshore wind turbine tower during the construction of Scottish Power's 239MW Kilgalioch wind farm in southwest Scotland.[66] Less than two weeks later, on the 29th March 2017, another fatal accident occurred at Scottish Power's Whitelee Wind farm in east Renfrewshire, where a Spanish worker fell from a turbine during maintenance work.[67] The police, with the support of the Health and Safety Executive (HSE), shut down the site for a thorough investigation.[68] These fatalities have led to calls from the Unite Workers Union (UWU) for a safety review. According to Steve Dillon, the UWU regional co-ordinating officer,

> In recent years there have been far too many deaths and injuries involving windfarms. These installations are usually in remote locations and there is a concern that these tragedies have not received the same focus if it had occurred in more populous areas. Swift action needs to be taken to improve workers' wellbeing and to understand how and why these incidents occurred. The HSE needs to bring all concerned to learn the lessons and improve safety and welfare in this sector.[69]

It is imperative to analyse specific accidents, since they serve as a yardstick for determining not just the health and safety risks, but also the prevailing safety culture and any systemic failures on the part of industry. What follows is an analysis of two separate accidents that occurred on the 21st of November 2012 involving contact between a floating target and a wind farm passenger transfer catamaran *Windcat 9* (incident 1), and contact Between the *Island Panther* with wind turbine 1-6 at Sheringham Shoal Wind farm (incident 2).[70]

Incident 1, involving the *Windcat 9*, occurred at 17:12 on the 21st of November, 2012 as the 'wind farm passenger transfer catamaran made… contact with a floating target in Donna Nook Air Weapons Range while on passage to Grimsby'.[71] This holed the port hull, causing

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[64] ReNews, 'Diver Killed on Riffgat' (2013) <http://renews.biz/46035/diver-killed-on-riffgat-offshore-farm/> accessed 15th February 2020.
[65] Ibid.
[66] BBC News, 'Worker dies in Kilgallioch Wind Farm Accident (2017) <http://www.bbc.co.uk/news/uk-scotland-south-scotland-39294942> accessed 15th February 2020
[67] Health and Safety at Work 'Two falls from wind turbines trigger Unite call for safety review' (2017) online at https://www.healthandsafetyatwork.com/work-at-height/two-fatal-falls-wind-turbines-trigger-unite-call-safety-review accessed 24 April 2018.
[68] (n.66)
[69] (n.67)
[70] Maritime Accident Investigation Branch (MAIB), *Combined Accident Report* (2013) <https://assets.publishing.service.gov.uk/media/547c6f44e5274a429000001b/W9IPReport_Web.pdf> accessed 15th February 2020.
[71] Maritime Accident Investigation Branch (MAIB), *Combined Accident Report* (2013) 2 <https://assets.publishing.service.gov.uk/media/547c6f44e5274a429000001b/W9IPReport_Web.pdf> accessed 15th February 2020.

extensive flooding of the vessel. On board were three crew and twelve wind farm technicians. Fortunately none of the crew or passengers were hurt.[72] The incident was caused by the lack of focus and concentration by the master while demonstrating how to adjust the plotter's range to a trainee.[73] But of particular importance to this submission are the findings of the investigation report, which states that:

> The investigation found that the master did not hold the correct qualifications and that navigation practices, including passage planning and monitoring, use of lookouts and knowledge of the navigation equipment were weak. In addition, the company's crew assessment procedures were not followed and the master had not been formally assessed to determine his suitability for his role. It also noted that the best practice guidance for managers and crew of offshore renewable energy passenger transfer vessels was limited and disparate, and there was no integrated method of promulgating lessons learned to the industry.[74]

The second incident, which occurred at 18:11 on 21 November 2012, the same day, involved a wind farm passenger transfer vessel Island Panther which involved a heavy collision with offshore wind turbines 1-6 in the Sheringham Shoal Wind farm at a speed of about 12 knots.[75] Although there were no fatalities, the 'impact caused the five persons on board to be forced out of their seats and sustain various injuries'.[76] Coupled with extreme weather conditions and the unlit transition piece of the turbine, investigations revealed that 'the accident occurred because the master relied too heavily on visual cues and had made insufficient use of the lookout and navigation equipment available'.[77] There was also insufficient training, particularly regarding the 'use of navigation equipment and no formal assessment of new masters, allowing the possibility of ingrained poor working practices being passed on'.[78]

Both incidents concluded that there were weak formal assessments (as no formal assessments of the vessel had taken place), particularly between April and November, and the master of Windcat 9 'had never been formally assessed to determine his suitability for the role'[79] which could lead to severe health and safety risk to the passengers on board. Furthermore, 'Windcat9 had not been subjected to a full vessel or radio and navigational mini audit, so the master's potential additional navigation training requirements had not been identified'.[80] The Report, amongst several recommendations, suggested the need for a robust and amended safety management system and further argues for the widespread benefit in sharing safety lessons learned throughout the offshore renewable sector rather than the more organisational-specific approach available at the time.[81] More specifically,

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[72] Ibid.
[73] Ibid.
[74] Ibid.
[75] Ibid.
[76] Ibid.
[77] Ibid.
[78] Maritime Accident Investigation Branch (MAIB), *Combined Accident Report* (2013) 63 <https://assets.publishing.service.gov.uk/media/547c6f44e5274a429000001b/W9IPReport_Web.pdf> accessed 24 April 2018.
[79] Ibid.
[80] Ibid.
[81] Ibid.

considering the synergy and similarities between the offshore wind and offshore oil and gas, it may beneficial to do a functional comparative analysis between both industries as a justification for drawing regulatory lessons and arguing that both industries should be regulated in the same way.

ANALAGOUS OCCUPATIONAL HEALTH AND SAFETY RISKS IN THE OFFSHORE WIND AND OFFSHORE OIL AND GAS ENERGY INDUSTRIES

While it is admitted that offshore oil and gas is more volatile, it is evident both offshore wind and oil and gas share several health and safety risks and synergies. It is for this reason that Albrechtsen reasons that since offshore wind is not the first to experience health and safety challenges, experience transfer from other industries like oil and gas could improve offshore wind energy safety.[82] This is all the more so as the oil and gas industry's understanding of seabed geology, meteorological conditions, and the effects of both on design and operation of offshore petroleum operations is proving beneficial to the offshore wind industry.[83] Furthermore, the use of jack-up vessels and different foundation types by the offshore wind industry, which were first developed by the oil and gas industry, further illustrates the synergy between both industries.[84] Therefore, with decades of offshore oil and gas industry operations, developed best practice and a robust health and safety regulatory regimes, regulatory lessons and models, including the safety case, can be successfully applied to the offshore wind energy industry with very little modification.

OFFSHORE WIND VERSUS OFFSHORE OIL AND GAS: THE DIFFERENCES

The presence of volatile hydrocarbons is a significant difference between offshore oil and gas operations and offshore wind, with the potential for catastrophic hazards and accidents on offshore oil and gas platforms obviously much higher than on offshore wind turbines. Arguably, this is fundamental reason for the benignity that disguises the health and safety risks posed by offshore wind energy development. While this may appear to be a valid argument, it is important to note that there are several offshore energy related accidents that have nothing to do with oil and gas explosions and spills. An example would be the Alexander Kielland accident in 1980, where 123 men died after an accommodation platform collapsed owing to structural failure.[85] Although some of the dangerous equipment such as "pigs",[86] gas compressors and pipeline pumps used on offshore oil and gas installations are

[82] Eirik Albrechtsen, 'Occupational Safety Management in the Offshore Wind Industry-Status and Challenges' (2012) 24 Energy Procedia 313-321, 319.
[83] Markian Melnyk and Robert Anderson, 'Offshore Power: Building Renewable Energy Projects in U.S Waters' (Pennwell Corporation 2009) 32.
[84] ibid
[85] BBC, '1980: North Sea Platform Collapses' <http://news.bbc.co.uk/onthisday/hi/dates/stories/march/27/newsid_2531000/2531091.stm> accessed 15 February 2020.
[86] A 'pig' is a maintenance tool that is forced through the oil and gas pipeline by using a 'pig launcher' either for clearing the pipeline or for inspecting it.

not required for offshore wind energy,[87] cranes, which are a major source of frequent injuries and fatalities in offshore oil and gas platforms, are also used in offshore wind.[88]

Although offshore wind turbine contain fewer workers at a given time, reduce the consequences of human error or harm,[89] the standard of caution and risk mitigation should not be reduced on the basis of the number of people. Since both industries have similar risk, the same measure taken to protect more workers on offshore oil and gas installations should equally be taken to protect the few in the offshore wind energy industry. This is because while there may be fewer people on offshore wind installations, the cumulative risk over a period could equally be as significant when compared with offshore oil and gas.

HAZARDS OF OFFSHORE OIL AND GAS FACILITIES RELEVANT TO OFFSHORE WIND FARMS

Many offshore oil and gas hazards and associated risks are similar to those of offshore wind farms. Table 2 below is a functional comparative analysis of the hazards, detailing specific hazards and analysis of risk comparing wind installations and oil and gas installations. The National Academy of Sciences Transportation Research Board Report on worker health and safety on offshore wind farms adopted this approach.[90] According to the Board's analysis, although the offshore oil and gas industry is more volatile, it shares sufficiently similar health and safety risks with offshore wind. Therefore, with the experience from operating offshore for several decades, there are significant regulatory lessons that can be drawn and adopted in the offshore wind energy industry.

[87] The Transportation Research Board, 'Workers Health and Safety on Offshore Wind Farms' (Special Report 310 2013) <http://www.nap.edu/catalog/18327/worker-health-and-safety-on-offshore-wind-farms-special-report-310> accessed 15 February 2020.
[88] The Transportation Research Board, 'Workers Health and Safety on Offshore Wind Farms' (Special Report 310 2013) <http://www.nap.edu/catalog/18327/worker-health-and-safety-on-offshore-wind-farms-special-report-310> accessed 15 February 2020.
[89] Ibid.
[90] The Transportation Research Board, 'Workers Health and Safety on Offshore Wind Farms' (Special Report 310 2013) <http://www.nap.edu/catalog/18327/worker-health-and-safety-on-offshore-wind-farms-special-report-310> accessed 15 February 2020.

Hazard	Relative Risk (Wind vs Oil and Gas)	Comments
Electrical injury	Higher	Higher-voltage equipment and all activities related to this equipment.
Personnel transfers	Higher	More boat transfers expected for a worker on offshore wind turbines. Oil and gas platform boat landings and helipads are larger than those for wind monopoles. Helicopters are used more often for oil and gas.
Awkward postures	Higher	Generally, more room to perform tasks is available on oil and gas platforms.
Confined space entry	Similar	Wind turbines have more confined spaces and must be entered more frequently; regardless, confined space entry for both oil and gas and offshore wind carries inherent risk and can have serious consequences.
Falls into water	Similar	Activities in locations where falls into water are likely are similar.
Diving	Similar	Similar activities and frequencies.
Manual material handling	Similar	Similar needs for upgrades or maintenance requiring manual handling of equipment and materials.
Long-term physical wear and tear	Similar	Relatively little climbing is required for offshore oil and gas workers but shifts and work schedule may be longer.
Mechanical hazards (e.g., pinch points)	Similar	Both installations require work on machines that pose dangers to workers
Slips and trips	Similar	Common hazards in all workplaces.
Exposure to heat and cold	Similar	Both wind and oil and gas facilities have limited climate-controlled spaces.
Falls from heights	Similar	More climbing and higher climbing is required for activities on wind turbines; however, a higher exposure rate for personnel on oil and gas platforms may exist.
Fire	Lower	Oil and gas facilities process flammable materials.
Explosion	Lower	Oil and gas facilities process flammable materials.
Crane lifts	Lower	Oil and gas facilities generally have permanent cranes that are used more frequently than those that may exist on wind turbines.

Table 2. Risk from Typical Hazards for an Offshore Wind Farm Worker Compared with Those for an Offshore Oil and Gas Worker[91]

[91] The Transportation Research Board, 'Workers Health and Safety on Offshore Wind Farms' (Special Report 310 2013) <http://www.nap.edu/catalog/18327/worker-health-and-safety-on-offshore-wind-farms-special-report-310> accessed 15 February 2020.

Table 2 above demonstrates that some risks such as electrical injury, personnel transfers and awkward posture are higher in offshore wind than offshore oil and gas. Others are similar, while fire, explosion and crane lifts are higher in oil and gas than offshore wind. Furthermore, research into the comparison in foundation designs between offshore oil and gas platforms and offshore wind turbines reveals that significant similarities and therefore 'design and construction experiences from the offshore oil and gas industry can be used to aid foundation design for offshore wind energy'.[92]

3. REGULATORY ALTERNATIVES FOR HIGH AND MAJOR HEALTH AND SAFETY RISK INDUSTRIES: A FOCUS ON OFFSHORE WIND

Regulation continues to play a significant role in mitigating health and safety risks in high and major risk industries, be it nuclear, railway, aviation and even offshore petroleum. Despite this, it is important to note that regulating the energy industry could present significant challenges and the offshore wind energy industry is not an exception. This is due to the complex and technologically evolving nature of the industry which, in some cases, leaves regulation struggling to catch up. Therefore, designing a robust health and safety risk governance regime would require not just an understanding of the various regulatory tools at the disposal of government and regulators but the complex interconnection between those regulatory alternatives and other non-regulatory factors like market forces and the inevitable commercial/economic tensions (tensions between safety and cost). Such understanding would eventually assist regulatory experts in ensuring that when designing offshore energy health and safety regulatory regimes, there is an appropriate balance within a required regulatory space where both private and public tools can be effectively utilised.

Over the years, the oil and gas industry in several jurisdictions have utilised different regulatory regimes; most times prompted by incidents. For example, in the United Kingdom, the safety case approach was only adopted in the aftermath of the Piper Alpha disaster. The safety case regulatory approach is acknowledged as the most effective model for the regulation of high and major risk industries, especially when compared with other regulatory models such a prescriptive and self-regulation. Regulatory expert Freiberg explains that under the safety case regime, the following requirements must be fulfilled:

> [I]dentifying hazards and assessing risks; implementing measures to eliminate the hazards and control the risks; creating a comprehensive and integrated system for the management of those hazards and risks; and establishing a system for the monitoring, audit, review and continuous improvement of the facility in order to reduce risks to as low a level as is reasonably practicable.[93]

The Australian Safety case, modelled off the UK Safety case implemented in the wake of Piper Alpha, [94] is a risk mitigation and management tool backed by regulation that 'presents

[92] James Schneider and Marc Senders 'Foundation Design: A Comparison of Oil and Gas Platforms with Offshore Wind Turbines' (2010) 44(1) Journal of the Marine Technology Society 32-51.
[93] Arie Freiberg, *The Tools of Regulation* (The Federation Press 2010) 35.
[94] For a detailed comparison of both regimes, see Tina Hunter and John Paterson "Offshore Petroleum Facility Integrity in Australia and the United Kingdom: A Comparative Study of Two Countries Utilising the Safety Case Regime" (2011)

a clear, comprehensive and defensible argument supported by calculation and procedure that a system or installation will be acceptably safe throughout its life (and decommissioning)'.[95] According to the UK Ministry of Defence Ship Safety Management Handbook:[96]

A safety case is a comprehensive and structured set of documentation that is aimed at ensuring that the safety of a specific vessel or equipment can be demonstrated by reference to:

- Safety arrangement and organisation.
- Safety analyses
- Compliance with standards and best practice.
- Acceptance tests
- Audits
- Inspections
- Feedback
- Provision made for safe use including emergency arrangements.

More recently, the United Kingdom Office of Nuclear Regulation Guide provides a more comprehensive definition of the safety case as it states that:

> A safety case is a logical and hierarchical set of documents that describes risk in terms of the hazards presented by the facility, site and the methods of operation, including potential faults and accidents, and those reasonably practicable measures that need to be implemented to prevent or minimise harm. It takes experience from the past, is written in the present, and sets expectations and guidance for processes that should operate in the future if the hazards are to be controlled successfully. The safety case clearly sets out the trail from safety claims through arguments to evidence.[97]

This involves rigorous risk assessments and analysis of all possible scenarios under which a catastrophic incident might occur, and the measures taken to eliminate or at least mitigate such a risk to a level that is as low as reasonably practicable (ALARP).

In analysing the major accidents that have occurred, such as the Piper Alpha and the Clapham Rail disaster, Kelly opines that the underlying cause was not the absence of safety standards or the complete ignorance of safety concerns, but rather attributable to the absence of a systematic and comprehensive consideration of safety.[98] The safety case is a a systemised and comprehensive consideration of safety in a facility and activity, and it is for this reason that it has been adopted across several industries, including nuclear, defence,

[95] Timothy Kelly, 'A Systematic Approach To Safety Case Management' (2003) Society of Automotive Engineers (SAE) International <https://www-users.cs.york.ac.uk/tpk/04AE-149.pdf> accessed 15 February 2020.
[96] United Kingdom Ministry of Defence, 'JSP 430- Ship Safety Management System Handbook' (1996) Ministry of Defence cited in Timothy Kelly, 'A Systematic Approach To Safety Case Management' (2003) Society of Automotive Engineers (SAE) International <https://www-users.cs.york.ac.uk/tpk/04AE-149.pdf> accessed 15 February 2020.
[97] The United Kingdom Office of Nuclear Regulation Guide (2016). <http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-051.pdf> accessed 15 February 2020.
[98] Timothy Kelly, 'A Systematic Approach To Safety Case Management' (2003) Society of Automotive Engineers (SAE) International <https://www-users.cs.york.ac.uk/tpk/04AE-149.pdf> accessed 15 February 2020.

railway, offshore petroleum and aerospace.[99] While there may be several safety cases tailored and structured to suit the various industries, the guiding principles remain the same, geared towards achieving health and safety regulatory requirements and assuring stakeholders that all safety objectives are met.

From a technical perspective, the safety case is a highly proactive risk mitigation model. This means that 'the safety case should be initiated at the earliest possible stage in the safety programme so that hazards are identified and dealt with while the opportunities for their exclusion exist'.[100] This is not just a proactive requirement of the safety case but it also demonstrates that it must be integrated with the development lifecycle of a facility to ensure a seamless development of the safety case from one phase to the next.

Having discussed the technical and definitional features of the safety case, it is imperative to consider the safety case as a regulatory tool for safety in high-risk industries, using the UK safety case regime as an example.

The UK safety case regulatory regime evolved with the 1992 Regulation[101] and then reviewed in 2005[102] and most recently, following the Macondo disasters and the European Union Offshore Safety Directive, there is the current *Offshore Installations (Offshore Safety Directive) Safety Case etc. Regulations 2015*. (UK) Although both the 2005 and 2015 regulations are substantially the same, the 2015 regulation applies to external waters, that is the territorial sea or on the continental shelf while the 2005 regulation applies in internal waters only. The 2015 regulation combines health, safety and environmental requirements into what is called the major hazard report or the "corporate major accident prevention policy"[103] while still retaining the requirement to prepare a safety case as was required in the 2005 safety case regulation.

A pertinent aspect of the safety case for the purpose of offshore energy is that in the case of a non-production installation, a safety case is equally produced to show that 'all major hazards have been identified for all operations the installation is capable of performing'.[104] In simple terms, this means that even where an offshore installation is not a production or exploration platform, with no exposure or risk arising from hydrocarbons, there is still a requirement to present a safety case to obtain regulatory permission for the activity on that installation.

More particularly, the safety case is required to include a 'summary of how any safety representatives for that installation were consulted about revision, review or preparation of the safety case'.[105] The safety case must also include relevant diagrams of the installation. Owing to the complexity and uncertainty of the marine environment, the safety case must

[99] Timothy Kelly, 'Arguing Safety-A Systematic Approach to Managing Safety Cases' (PhD thesis, University of York 1998).
[100] Timothy Kelly, 'A Systematic Approach To Safety Case Management' (2003) Society of Automotive Engineers (SAE) International <https://www-users.cs.york.ac.uk/tpk/04AE-149.pdf> accessed 15 February 2020.
[101] The Offshore Installations (Safety Case) Regulations 1992.
[102] The Offshore Installations (Safety Case) Regulations 2005.
[103] Offshore Installations (Offshore Safety Directive) (Safety Case etc) Regulations 2015 ('SCR 2015'), reg 7.
[104] SCR 2015, reg 16(1)e
[105] Offshore Installations (Safety Representatives and Safety Committees) Regulations 1989, reg 23(2)(c)(i).

also contain details of meteorological, oceanographic, seabed and subsoil conditions.[106] Regarding emergency response, the safety case should also include details of various safety and emergency response equipment and procedures.[107]

While the content of the safety case regulation as discussed above is a testament to its comprehensiveness, various levels of scrutiny further strengthen the regulation. One of which is the provision for audit. It describes this process as an objective and systematic assessment of the adequacy of the management system.[108] It is carried out by persons who are sufficiently independent of the system although the duty holder may employ them.[109] Another relevant level of regulatory scrutiny is the requirement for independent verification schemes. Although such verification schemes are included in the 2005 UK safety case regulation, in the 2015 regulation, the verification schemes have now been extended to include not just health and safety critical elements but equally environmental.[110] The verification scheme is a requirement where an independent and competent person is invited by the operator to verify that such critical elements of the installation are 'suitable' and 'remain in good repair condition'.[111] To achieve this, the verifier would examine and test the equipment where appropriate and make recommendations in a report to the operator who would be required to take remedial actions.[112] It is important to note that the 'verification scheme is drawn up by or in consultation with the verifier', and 'any reservations expressed by the verifier as to the content of the scheme' are noted.[113] The Regulation defines a verifier as 'an independent and competent person who performs functions in relation to verification schemes'.[114] Regarding the issue of independence, it adds that 'such a person is only to be regarded as independent insofar as there are essentially no circumstances where their objectivity would be compromised by their having any responsibility for the issues they are verifying'.[115] The matters to be included in the verification scheme include:

- The selection principles utilised by the duty holder in relation to a verifier;
- Arrangements for communicating appropriately with the verifier;
- The nature and frequency of examination and testing;
- Arrangements making and keeping of records relating to the verification scheme, as well as communicating relevant information to the appropriate level in the duty holder's management system [116]

[106] John Paterson, 'Health and Safety during Decommissioning' in Marc Hammerson and Nicholas Antonas (eds), *Oil and Gas Decommissioning: Law, Policy and Comparative Practice* (2nd edn, Globe Law and Business Limited 2016) 154.
[107] Ibid.
[108] Ibid, 160.
[109] SCR 2015, reg 16 (3).
[110] SCR 2015, reg 9.
[111] SCR 2015, reg 9 (1)A and B.
[112] SCR 2015, reg 9(2)e.
[113] SCR 2015, reg 9(3).
[114] SCR 2015, reg 2(1).
[115] SCR 2015, reg 2 (7); See also John Paterson, 'Health and Safety during Decommissioning' in Marc Hammerson and Nicholas Antonas (eds), *Oil and Gas Decommissioning: Law, Policy and Comparative Practice* (2nd edn, Globe Law and Business Limited 2016) 160.
[116] Regulation 10 (1) and Schedule 4, Part 1; See also John Paterson, 'Health and Safety during Decommissioning' in Marc Hammerson and Nicholas Antonas (eds), *Oil and Gas Decommissioning: Law, Policy and Comparative Practice* (2nd edn, Globe Law and Business Limited 2016) 160.

The value of workforce involvement is recognised as an important aspect of the safety case regulatory regime. The duty holder is required to inform employees, persons contracted and their employees of 'details of arrangements made by the competent authority' regarding 'the confidential reporting of safety and environmental concerns' and in relation to 'the investigation of such concerns while maintaining the anonymity of the individual in connection with the confidential reporting of those concerns'.[117] This not only enhances the participation of workers and employees but also provides some form of checks on the operator. The safety case is equally viewed as a "living document" because it is subject to 'ongoing review and updating to take account of changing circumstances and knowledge'.[118] Regulation 23 requires that the 'duty holder must thoroughly review a current safety case no more than five years after the date on which the safety case was first accepted by the competent authority'.[119] It is important to note that the competent authority could equally require a review of the safety case at any time.

Furthermore, while companies remain competitors, the safety case regulation encourages companies to collaborate, which in turn enhances knowledge gathering and sharing. This is given regulatory underpinning in regulation 31(1), which provides that:

> Every duty holder must cooperate with the competent authority to establish and implement a priority plan for the development of standards, guidance and rules which will give effect to best practice in major accident prevention, and limitation of consequences of major accidents should they nonetheless occur.[120]

It further adds that 'every duty holder must participate in the preparation and revision of standards and guidance on best practice in relation to control of major hazards throughout the design and operational lifecycle'.[121] In doing this, it must consider and give priority to several issues such as:

> Effective risk management; management and supervision of major hazard operations; competency of key post holders; reliable decision making; effective integrating safety and environmental management systems between operators and owners and other entities involved in oil and gas operations; key performance indicators; improving well integrity, well control equipment and barriers and monitoring their effectiveness; improving primary containment; improving secondary containment that restricts escalation of an incipient major accident, including well blow-out; and reliability assessment for safety and environmental-critical systems.[122]

The above further demonstrates the comprehensive nature of the safety case. While some requirements may appear prescriptive, it is important to note that it remains the

[117] Regulation 31 (1) a & b.
[118] John Paterson, 'Health and Safety during Decommissioning' in Marc Hammerson and Nicholas Antonas (eds), *Oil and Gas Decommissioning: Law, Policy and Comparative Practice* (2nd edn, Globe Law and Business Limited 2016) 160.
[119] SCR 2015, reg 23.
[120] SCR 2015, reg 32(1).
[121] SCR 2015, reg 32(2).
[122] SCR 2015, schedule 11; See also John Paterson, 'Health and Safety during Decommissioning' in Marc Hammerson and Nicholas Antonas (eds), *Oil and Gas Decommissioning: Law, Policy and Comparative Practice* (2nd edn, Globe Law and Business Limited 2016) 162.

responsibility of the duty holder to provide the details of the safety case requirements. This therefore maintains the goal-setting nature of the regulatory architecture. Despite the safety case/goal-setting approach being one that places the responsibility for health and safety on the duty holder with minimal regulatory bureaucracy on the part of the regulator, the importance of regulatory scrutiny and oversight is not ignored.

The 2015 UK regulation empowers the regulator to prohibit operations where 'the competent authority is of the opinion that the measures for preventing or limiting the consequences of a major accident proposed in a safety case are insufficient to fulfil the requirements set out in the relevant statutory provisions'.[123] Therefore, where the competent authority has determined 'that an operator no longer has the capacity to meet the requirements of the relevant statutory provisions', it is duty bound to inform the licensing authority immediately.[124] In such a situation, the licensing authority 'must terminate the appointment of the operator'.[125]

The above analysis of the safety case regulatory regime as one that is robust justifies the suggestion that it should be adopted in the regulation of offshore wind health and safety. The absence of the much-needed regulatory scrutiny and oversight through independent verification schemes, auditing and permissioning without undermining the responsibility of the duty-holder is a significant feature of the safety case. Such regulatory scrutiny is the difference between an effective and weak regulatory regime, which could be susceptible to regulatory capture, especially where compliance challenges exist. It is for these reasons that Hunter and Paterson have suggested that the safety case regulatory model is the most 'advanced means of regulating offshore health and safety'.[126] The safety case is an example of "good" regulation which, according Fiona Haines, 'is that which…transformed in a process of evolution which creates a race of efficient, demonstrably effective rules,…regulatory structures and processes that are robust, transparent, accountable and forward looking' and therefore a 'natural outcome of rigorous regulatory reform processes'.[127] As will be seen below, the safety case regulatory model is borne out of the UK's long and rigorous regulatory reform experiences

Having discussed the safety case in detail earlier, it is important to note that such a regulatory approach is independent of the industry in which it is used. This implies that irrespective of the industry and its application, there is a common principle that runs through all safety cases. It is that the safety case was designed to place primary responsibility on the companies who created the risk and to ensure that they comply with and fulfil those responsibilities. As for its application to the oil and gas industry, Michael Barsa and David Dana have explained that by the adoption of the safety case:

> Companies were to articulate and justify safety goals, identify hazards and obstacles to hazard reduction, and then implement, test, and continually modify practices to ensure goals are being met. Regulators would act as sounding boards, collaborators, and co-venturers in the achievement of safety-but would no longer

[123] SCR 2015, reg 26 (1).
[124] SCR 2015, reg 6.
[125] SCR 2015, reg 8(2).
[126] Tina Hunter and John Paterson, 'Offshore Petroleum Facility Integrity in Australia and the United Kingdom: A Comparative Study of Two Countries Utilising the Safety Case Regime' (2011) 9(6) Oil, Gas & Energy Law 2.
[127] Fiona Haines, 'The Paradox of Regulation: What Regulation Can Achieve and What Regulation cannot' (Edward Elgar Publishing Limited 2011) 13.

> simply prescribe the practices the companies ought to follow. The ambition of the safety case approach was (and is) that companies would come to "own" safety and incorporate it into their culture, rather than regarding safety as a matter of complying with externally-imposed, legalistic rules. By internalizing safety into their culture, companies better understood the technical and other realities on the ground (or under it!) in a way regulators could not, the companies were in the best position to establish and maintain practices that were more effective and flexible than anything that regulatory agencies on their own could have devised"[128]

The above explanation suggests that although the responsibility for health and safety predominantly rests with the companies, there was collaboration and cooperation with the regulator to ensure that the goal of reducing risk to as low as reasonably practicable was achieved. It is important to emphasise that such collaboration should not in any way jeopardise the supervisory function of the regulator but should in fact enhance it. It is this enhanced regulation of the petroleum industry that should now be applied to the offshore energy industry to ensure that the health and safety of those working to develop offshore energy industries have the same health and safety protection as those in the well-established offshore petroleum sector

4. RECOMMENDATION

From the above consideration of health and safety, regulation and the safety case, it becomes apparent that there are significant similarities between offshore wind and offshore oil and gas.

This proven analogous nature of the two industries justifies the assertion that the regulatory framework that has been established for offshore petroleum regulation in Australia under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 *(Cth) and associated regulations, including the safety case, should be extended to the regulation of health and safety (both in terms of process safety as well as personal safety) for offshore energy.*

[128] Michael Barsa and David A Dana, 'Where the Extraction Frontier meets the Safety Frontier: Deepwater Horizon, Safety Cases and NEPA-AS-Contract' (2011) 6 Environmental and Energy Law and Policy Journal 43, 44.