MORECAMBE

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Morecambe Offshore Windfarm: Generation Assets

Examination Documents

Volume 9

Responses from the Applicant's to Spirit Energy Deadline 1 Submissions Appendix B: Effect of Proposed Morecambe Offshore Windfarm on Offshore Oil and Gas Operations

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MORECAMBE OFFSHORE WINDFARM

Effect of Proposed Morecambe Offshore Windfarm on Offshore Oil and Gas Operations

Flotation Energy Limited

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Objective:

Assessment of likely safety impact of the proposed Morecambe Offshore Windfarm on existing oil and gas operations.

Prepared by:	Verified by:	Approved by:
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Acronyms

Acronym	Meaning
ACOP	Approved Code of Practice
ALARP	As Low as is Reasonably Practicable
CA	Competent Authority
CAT	Commercial Air Transport
ERRV	Emergency Response and Rescue Vessel
HSE	Health and Safety Executive
ICP	Independent Competent Person
IMC	Instrument Meteorological Conditions
IRPA	Individual Risk per Annum
MAFD	Maximum Allowable Finish Date
MOWL	Morecambe Offshore Windfarm Limited
MOWF	Morecambe Offshore Wind Farm
NUI	Normally Unattended Installation
ORA	Operational Risk Assessment
POB	Persons on Board
RTB	Return to Base
SAR	Search and Rescue
SECE	Safety and Environmental Critical Element
VMC	Visual Meteorological Conditions
UKCS	UK Continental Shelf

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1 INTRODUCTION

This report evaluates the potential effect to the helicopter operations associated with a number of offshore oil and gas installations situated in close proximity to the Morecambe Offshore Windfarm Project. Based upon the Helicopter Access Reports produced by Anatec /1/ and AviateQ 2/, it has been identified that the range of environmental conditions in which helicopter flight operations to nearby oil and gas facilities can be carried out would be reduced due to the wind turbines.

The facilities are operated by Spirit Energy with the permanently manned platform complex CP-1 being the hub of the operation (CPC-1 comprises CPP-1, AP-1 and DP-1). Work parties fly from CPC-1 to the Normally Unoccupied Installations (NUIs) for up to 12 hours before returning to CPC-1. Flights at CPC-1 and the NUIs Calder and DP-6 are potentially affected by the Project. Flights to DP-8 and DPPA are potentially affected as personnel travel there via CPC-1. These facilities are collectively termed the 'affected assets' for this purpose of this report, following the terminology used by Spirit Energy in their representations.

Specifically, the effect of the wind turbines is that the availability of Commercial Air Transport (CAT) helicopters to access these installations could be restricted to daytime Visual Meteorological Conditions (VMC) due to the obstacle clearance needed at night or in bad weather being impinged on by the windfarm and specifically, the high turbine blades (~300m above sea level).

This report evaluates the effect of the project on helicopter operations associated with the offshore installations with respect to:

- Increased risks associated with the possibility of additional helicopter flights to the NUIs if a greater number of shorter visits (restricted to VMC conditions) to the NUIs are needed.
- Evacuation in the event of an emergency.
- Maintenance of safety critical equipment.
- Overall impact on the safety case.

This report is written for an audience that is technically literate, but which is not experienced in oil and gas operations. Therefore, some of the key concepts are explained before addressing the situation at Morecambe.

Apart from Vantage[1] data (helicopter flight recording system used across the oil and gas industry – see below), DNV has not been provided any information from Spirit (via Morecambe Offshore Windfarm Limited - MOWL) beyond that in written submissions to the DCO Examination process. Therefore, this report is based on this information provided by Spirit in the DCO Examination process together with experienced oil and gas knowledge of offshore operations and especially NUIs combined with publicly available knowledge of the South Morecambe operations.

None of the conclusions in this report depend on the details of the operation of the affected assets unless they are being operated in an unusual manner that is not evident from the Vantage data (e.g. overnight stays on the NUIs). Equally, it is not dependent on the details of the flight restrictions, just noting that a fraction of flights may be affected in the context of the overall flight schedule being variable.

[1] Vantage is a Persons on Board (POB) tracking system that is widely used by oil and gas companies to track personnel movements to and from offshore installations. It is accessed by helicopter operators as part of their system for managing passengers. As such, it contains flight data that can be used to track the dates, times and destinations of flights. Vantage also contains an up-to-date list of those on board an offshore installation and therefore has a role to play in emergency response. Only the flight timings and routings from vantage were provided to MOWL. No data on POB on the helicopters was provided.

2 BACKGROUND

2.1 OFFSHORE OIL AND GAS OPERATIONS IN MORECAMBE BAY

2.1.1 Permanently Staffed Platforms

Spirit's oil and gas operations in Morecambe Bay are based around the permanently staffed CPC-1 installation. This installation processes oil and gas and condensate from wells on the CPC-1 complex and from the DP (drilling platform) NUIs, the latter being conveyed to CPC-1 by subsea pipelines. With CPC-1 being manned 24/7, any issue on it can be dealt with almost immediately by the skilled persons aboard, though specialist tasks will often be carried out by vendors who typically visit for shorter periods than the main workforce. The main workforce will work a 2 or 3 week rota of 12 hour days. They then have leave ashore of 2 or 3 weeks. If the rota is 2 weeks offshore, 3 weeks onshore, the pattern is more complex, but its detail does not affect this analysis.

Maintenance is planned well in advance, but there is always flexibility as to when it is carried out as there is no effort required to get to the worksite (because it is permanently staffed) and plans can be easily changed other than for maintenance that requires major outages of equipment. This is typically planed for the summer, when gas demand is lower and the weather is better (e.g. crane operations are more likely to be curtailed in winter due to high winds).

CPC-1 acts as a hub for the maintenance of the Calder, DP6, DP8 and DPPA normally unattended (NUI) installations in the Morecambe Bay area.

2.1.2 Normally Unattended Installations

Normally unattended installations are designed to be operated remotely, either from another offshore installation or from an onshore facility. In the Morecambe Bay area the Calder, DP6, DP8 and DPPA installations are operated from the CPC-1 platform. CPC-1 also collects fluids from the DP6, DP8 and DPPA installations where they are processed before being piped onshore. The Calder platform has a dedicated pipeline to the Barrow terminal where its well fluids are processed. These fluids do not pass through the CPC-1 complex.

Normally unattended installations (NUIs) have minimal processing facilities to minimise the need for personnel to visit the installation. Typically, they have a small number of wells, each with a flowline to a common manifold to collect the fluids from each well, valving and an export riser which is connected to a subsea pipeline. Some NUIs have accommodation facilities to allow maintenance crews to stay overnight. Others have basic accommodation for use in emergencies only, which is understood to be the case for Calder. With the development of subsea technology, the function of many NUIs is now carried out by subsea wells that are tied back to a central production installation. It would not be economic to make this magnitude of change at Morecambe Bay.

Maintenance is planned in advance and is normally carried out on a campaign basis to make best use of the different trades required. This means that work is batched and carried out over a period of days or weeks. Maintenance is typically weighted towards the summer months to take advantage of longer days and better weather. Additional short duration visits may be required for minor repairs, to top up chemicals or bleed down well annuli[2] that have become pressurised. Finally, short duration visits may be required to reset equipment that has tripped and which – for safety or asset protection reasons – cannot be reset remotely. This would most commonly happen if a shutdown has been caused by the:

- Platform Emergency Shutdown System operating, which shuts down the process if the process conditions (pressure, temperature, or level in vessels) near their safe limits for whatever reason. In such an instance, an offshore visit would be required to check that restarting the platform would not result in an unsafe condition.
- Fire and Gas system, when the system determines correctly or otherwise that there is a fire, or gas release.

[2] A well anulus is the annular space between the production tubing, which carries the well fluids, and the casing that provides structural integrity to the well. If an annulus is pressurised it is because there is a problem with the well integrity – often leaking production tubing or failed packers, which themselves seal the bottom of the annular space in this case.

- Systems that ventilate an equipment volume to preventative flammable atmosphere from building up from small, operational releases through, for example, seals. Such systems are less likely to be on a NUI, but may exist for compressor turbines, which may be on CPP-1.

Further, it may be the case that safety systems such as the fans that provide the positive pressurisation of the temporary refuge (TR) to prevent gas, or smoke ingress in an emergency, or equivalent area on a NUI (which may not have a TR), cause a platform shutdown should they fail. The TR being a safe refuge to allow personnel to muster and make a decision on further action is a key safety measure and its impairment (e.g. through failed fans) is safety critical.

2.1.3 Helicopter Operations

Helicopter operations in Morecambe Bay are operated by an 8-seater AW169 helicopter based at Blackpool Airport, it is understood that the operator of the CAT helicopters only has a single AW169 based at Blackpool Airport and that the closest other CAT helicopters that are routinely used in servicing oil and gas operations are based on the east coast (Great Yarmouth, Humberside and Aberdeen). This helicopter is also understood to be shared with other oil and gas Operators in the area.

A proportion of the flights are simply return flights to CPC-1 to take personnel there from Blackpool for their 2 or 3 week shift and these people may never visit the NUI. One some days no other platforms are visited.

For taking persons to the NUIs, the vast majority of the flights are from Blackpool to CPC-1 to pick up an intervention crew who board the helicopter and are flown to Calder, DPPA, DP6 and DP8 as required. The helicopter then returns to Blackpool mostly via CPC1 potentially also taking other work parties to other NUIs. In some cases, more than one work party may go to the same NUI. This pattern is flown again at the end of the day to pick up personnel from the NUIs.

The number of return flights each year on average over the period 2018-2024 visits to each NUI currently in operation is given below:

NUI	CAL	DP6	DPPA	DP8	All NUIs	Average NUI
Average Number of Days Visits Occur on per year	95	74	161	124	454	114
Average Number of Flights per year	112	100	254	174	640	160

Table 1: Average number of days per year NUI is visited

In an average year, the number of currently operating NUIs visited each day is given below.

Number of NUIs Visited	Average number of days in the year
0	64 (18%)
1	160 (44%)
2	130 (36%)
3	11 (3%)
4	0

Table 2: Average number (and percentage) of days per year currently operating NUIs are visited

This shows that if flying to a NUI is affected, it is almost equally likely to be one or two NUIs. Visiting more NUIs in the same day is less frequent, though this does change as decommissioning occurs with the NUI that is being decommissioned being frequently visited while others are visited as normal.

The time spent on the NUI can be estimated from the Vantage data and this varies over the year as shown in Figure 1.

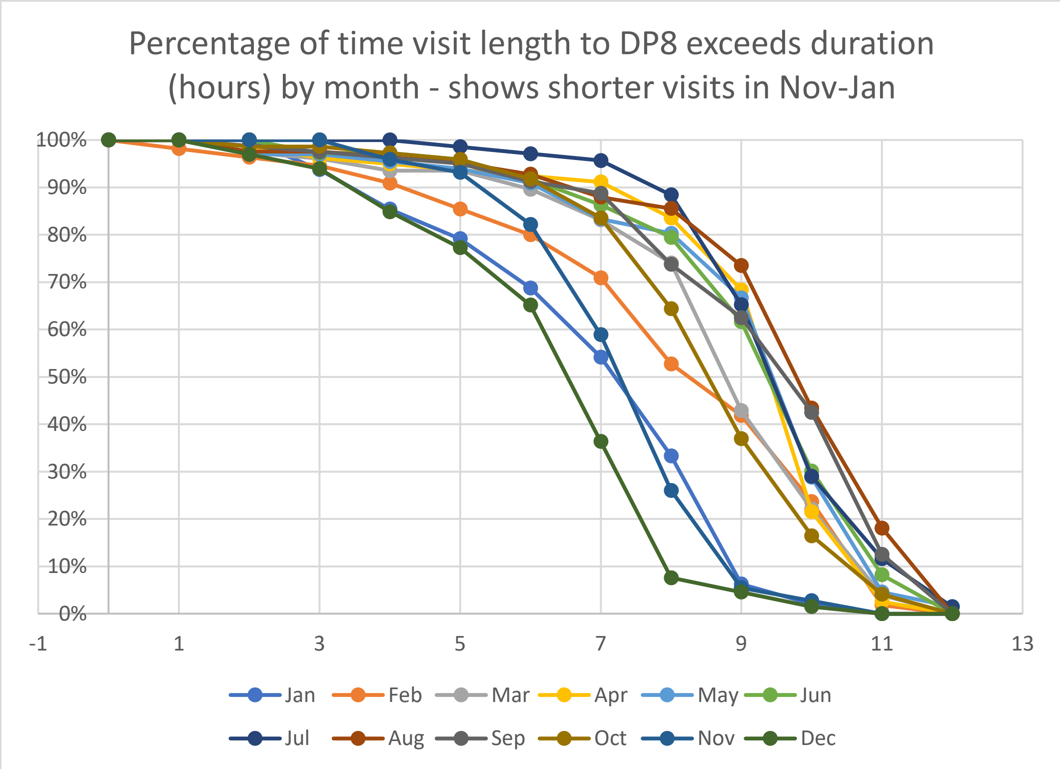

Figure 1: Percentage of visits above specified number of hours (DP8)

This data assumes that:

- Personnel leave or arrive at the NUI at the midpoint of the overall flight (from Blackpool to Blackpool); and
- Personal are at the installation the whole time between the first and last visits to the platform in a particular day (there being no overnight stays).

The data shows that visits are already dependent on hours of light available. This is further shown in Figure 2 by comparing the average visit time with available light (sunrise at sunset) at Blackpool.

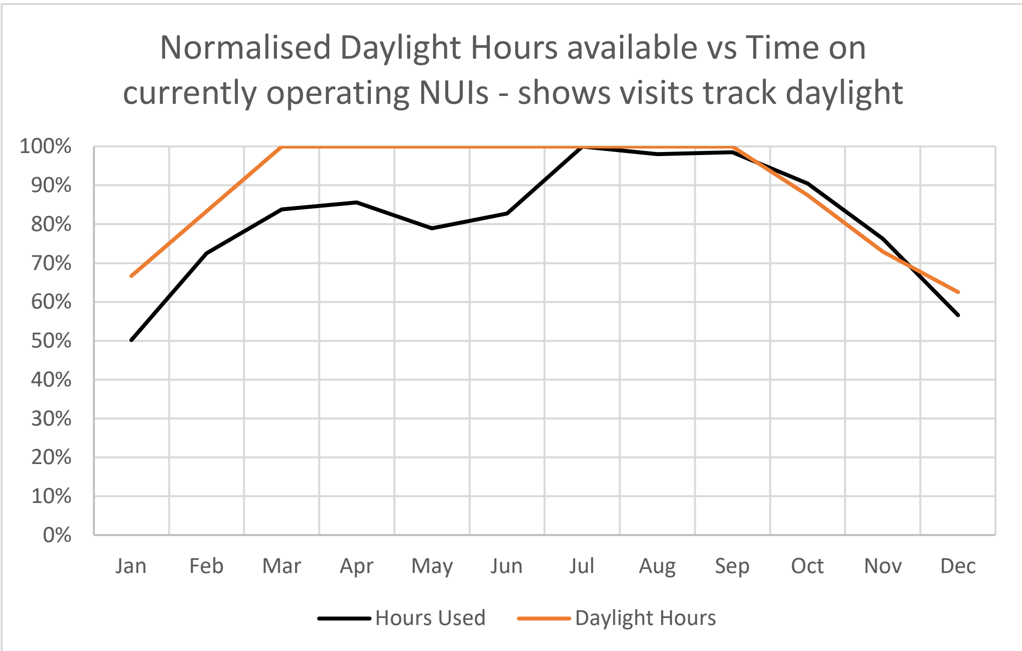

Figure 2: Average NUI visit time compared to daylight available (subject to 12 hour maximum)

There are some flights flown directly from Blackpool to DP6 and DP8 with the helicopter then returning to Blackpool. There are also instances of flights between NUIs: the reason for this is not available to DNV.

There is a high degree of variability in the monthly number of visits to each NUI as shown in Appendix A.1 (noting the dip in flying during COVID) and also Appendix A.2, which shows the total risk from all flying activities in terms of the potential number of fatalities. DNV have no direct knowledge of why this is the case, it could be postulated that periods of higher manning are to do with either campaign maintenance, or small projects. It is notable that all NUIs have months in which there are a minimal number, or zero visits.

2.2 Overview of Offshore Safety Legislation

2.2.1 Regulations

Offshore safety is governed by the Health and Safety at Work etc Act 1974. The premise of the 1974 Act is that those creating the risk are responsible for managing it. Employers have a duty to ensure, so far as is reasonably practicable:

- *the health, safety and welfare at work of all his employees*
- *that persons not in his employment who may be affected thereby are not thereby exposed to risks to their health or safety*

"So far as is reasonably practicable" requires the employer to balance the benefit in risk reduction against the cost in terms of money, time and trouble.

By virtue of The Health and Safety at Work etc. Act 1974 (Application outside Great Britain) Order 2013 there are two key sets of regulations that are relevant to this report.

- The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 (SCR 2015) /3/
- Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER 1995) /4/

Regulations are law and compliance is mandatory. PFEER 1995 has an approved code of practice and meeting it ensures compliance with the regulations (see Section 2.2.2).

There is guidance to the safety case regulations that provides advice on legal compliance.

Safety cases must be accepted by the Competent Authority (CA) – in this case the Health and Safety Executive – prior to the introduction of hydrocarbons to an offshore installation. The case is accepted as opposed to approved by the CA. This means that the onus is on the installation dutyholder to ensure that the appropriate risk assessments have been carried out and that the case for safety is robust. The CA will assess the case but is not required to address each aspect of it in depth. SCR 2015 details:

- What is deemed to constitute a major accident.
- What must be included in a safety case.
- The process for submitting a safety case for acceptance.
- The process of revising a safety case.

PFEER 1995 addresses specific measures that must be taken to prevent fires and explosions and to ensure effective emergency response should a major accident occur. Some regulations are absolute meaning that they must be complied with to the letter. An example is Regulation 11(2) which sets out requirements for visible and audible alarms. Other regulations are subject to the concept of "as low as is reasonably practicable" where the benefit in terms of risk reduction can be weighed against the cost in terms of money, time and effort. Examples include Regulations 12 and 13 which address the survivability of equipment should a major accident occur.

The terms "so far as is reasonably practicable" and "as low as is reasonably practicable" are equivalent.

2.2.2 Approved Code of Practice

Approved Codes of Practice are approved by the Health and Safety Executive (HSE) Board with the consent of the Secretary of State. They provide practical advice on how to comply with regulations and legal compliance can be achieved by following it. However, an ACOP has a special legal status. If a dutyholder is prosecuted for an alleged breach of health and safety law and it was proven that the ACOP was not complied with, then the onus is on the defendant to prove that he has complied with the law in some other way. The burden of proof is the balance of probabilities.

2.2.3 Guidance

Guidance is issued by the Competent Authority and also by various industry bodies. Compliance with guidance – whether provided by the regulator or the industry – is not mandatory. However, meeting guidance is generally Good Practice and this is the first test of whether a risk is ALARP.

3 POTENTIAL EFFECT ON INSTALLATION RISK LEVELS DUE TO INCREASED HELICOPTER FLIGHTS

3.1 Individual Risk per Annum

History has shown that offshore oil and gas operations can be dangerous and the volumes of flammable material on any offshore installation mean that the offshore oil and gas industry is a “high hazard industry”. Like any worksite, there is the possibility of occupational accidents e.g. slips and trips, but there is also the possibility of a gas release that if ignited could have very serious consequences. For this reason, it is required to determine the risk to person working on the installation and compare the risk tolerance criteria described in Section 3.3.

This is done through calculation of the individual risk per annum (IRPA), which is the statistical probability of a person being killed as a result of work activities in any given year. Different group of workers e.g. production operators, technicians, domestic staff are subject to different risk levels due to the nature of their work activities. It is therefore standard practice to calculate the IRPA for each group of workers on an offshore installation. Worker groups are generally split into production operators, maintenance technicians, catering/office staff, deck crew and construction staff.

3.2 Contributions to IRPA

IRPA is typically assessed by the different hazards that people are exposed to. The risk associated with these categories is calculated separately and then summed up to give the total IRPA. This is done separately for each worker group.

The different hazards at, which are relatively common across the industry, are:

- Fire and explosion
- Helicopter transport – typically calculated for take-off/landing and cruise flight then added together
- Ship collision
- Structural failure
- Occupational – every day risks slips trips and falls type risks to which workers could be exposed.

3.3 Risk Tolerance Criteria

Once risk has been calculated, it must be compared to risk tolerability criteria to determine if the risk is tolerable or not. In the UK, the HSE document Reducing Risks, Protecting People /5/ sets out the accepted risk tolerance criteria. For IRPA, the upper bound of tolerability is a risk of fatality to an individual of 10^{-3} or one in one thousand per year. Any risks above this level would need to be mitigated irrespective of the cost.

If a risk is considered to be tolerable then, it needs to be as low as is reasonably practicable (ALARP). This means implementing all risk reduction measures that are reasonably practicable. A risk reduction measure is reasonably practicable if it is required to meet Good Practice, or the benefit it provides in terms of risk reduction is not grossly disproportionate to its cost in terms of time, money and effort /5/.

In determining tolerability, risk is considered in its entirety and not by the individual risk categories detailed in section 5.2 of this report.

3.4 Representative Installation Risk Levels

Table 3 provides examples of IRPA for production technicians on a range of UKCS oil and gas installations. The data has been taken from the relevant safety cases and the installations have been anonymised. There is significant variation in risks, many of which are due to the assessment technique used, but it generally shows the overall proportion of risk that helicopter transportation provides.

Installation	A	B	C	D	E	F	G	H	Average Across All Installations
Installation Type	Manned	Manned	Manned	Manned	Manned	Partially manned	NUI	NUI	
Well fluid type	Gas	Heavy oil	Oil/Gas	Oil/Gas	Gas condensate	Gas condensate	Gas condensate	Oil/Gas	
Fire/Explosion	4.99E-05	9.95E-05	1.62E-04	3.19E-05	1.72E-05	6.62E-05	1.70E-05	6.23E-05	6.33E-05
Helicopter Transport	3.40E-05	1.77E-05	2.90E-05	2.51E-05	4.07E-05	5.70E-05	6.41E-05	4.30E-05	3.88E-05
Ship Collision	1.00E-05	1.44E-05	1.00E-05	2.92E-06	1.10E-06	1.14E-04	8.80E-06	1.10E-05	2.15E-05
Structural Failure	4.50E-07	0.00E+00	1.60E-05	4.33E-05	1.28E-05	1.80E-05	1.51E-05	1.70E-06	1.34E-05
Occupational	1.20E-05	9.01E-05	1.30E-05	1.30E-05	8.11E-05	2.05E-05	5.10E-05	1.20E-05	3.66E-05
Total	**1.06E-04**	**2.22E-04**	**2.30E-04**	**1.16E-04**	**1.53E-04**	**2.76E-04**	**1.56E-04**	**1.30E-04**	1.74E-04
% Risk from helicopter transport	**32.0%**	**8.0%**	**12.6%**	**21.6%**	**26.6%**	**20.7%**	**41.1%**	**33.1%**	**24.5%**

Table 3: IRPA Levels for a Series of Representative Offshore Installations

The risk of helicopter transportation is proportional to the time flying plus the number of take-off and landings, which are the most dangerous parts of the flight. For the short flight between Blackpool and CPC-1 and even more so between CPC-1 and the NUIs, the risk is dominated by the take-off and landings as the flight time is very short.

For someone working on CPC-1 on a standard offshore rota, the helicopter transportation risk would be less than an average North Sea worker due to the short flight time. For someone regularly going to the NUIs, the risk would be higher due to the number of take-offs and landings.

The proportion of the risk due to helicopter transportation on a NUI may be higher than average because less time spent on the installation means that the risk from being on the installation is lower.

For the affected assets, the risk on the NUIs is unlikely to be reported separately in the safety case. It is normal that the safety case covers the whole operation over multiple platforms.

3.5 Effect of Morecambe Offshore Wind Farm

3.5.1 Current Risk of Helicopter Operations

The current helicopter transportation risk to people who visit the NUIs can be estimated from the flight data, though the number of up to 8-man helicopter passenger groups (termed NUI work parties here for convenience) that this is spread over is not known to DNV and is estimated.

The number of NUI work parties is at least 3 as there are times when there are this many helicopter trips to a NUI in a morning and later in the day to pick-up. There are also back-to-backs who are on the leave part of their rota ashore. Different workscopes will also need different skill sets and so taking these factors together, 10 NUI work parties is estimated. This means that each person takes a tenth of the total yearly number of flights between CPC-1 and the NUIs.

Those people will also take ~10 return trips between Blackpool and CPC-1 each year for the normal crew change, though this is a smaller contributor to helicopter risk due to the short flight time.

From historical data, each short flight to a NUI is calculated to give a risk of 9.2×10^{-7} per flight. There have been no fatal helicopter crashes in UK offshore operations for over 10 years and crashes most recently outside this window occurred in poor weather, in which it is less likely that the Morecambe Bay helicopters would be flying. Therefore, this is a conservative figure.

With 640 flights per year (see Table 1), each person who visits a NUI takes 64 flights per year, a risk of 5.9×10^{-5} per year. The Blackpool element adds 1.4×10^{-6} and so the total transportation risk is 7.3×10^{-5} per year. This is slightly above any of the numbers in Table 3 because of the large number of take-off and landings from visiting the NUIs. This difference may also be affected by using the most recent helicopter transportation data in this report, which has no recent events and so just improves (lower number).

3.5.2 Additional Flights

If a flight is delayed because of weather, there is no change in risk as there is no change to the number of flights. This is irrespective of whether the flight was cancelled because of weather in which flying was not possible either before or after the MOWF is installed. It is normal to plan for weather many days in advance so that if it is likely that a flight cannot occur, appropriate plans are made.

If work is urgent for whatever reason, there is a possibility that with reduced flying hours, two visits to a NUI are required for a workscope rather than one. This in itself would create issues as the workscope would have to be left overnight in a safe condition. In this case and also now, it is preferable for the Operator to arrange for the work to be done in as a few a number of shifts as possible.

Analysis of Vantage data (see Figure 1) shows that the time spent on each NUI is highly variable day-to-day and over longer timescales (an exact analysis cannot be carried out as the purpose of each flight is unknown). This shows that Spirit's normal business is to be flexible. Within this, there is a clear pattern that summer visits are longer whereas winter visits are shorter (see Figure 1 and Figure 2). Shorter visits would have to occur in the winter due to the VMC requirement, but this is already largely the case as demonstrated by the Vantage data.

Analysis of the Vantage data shows that the vast majority of visits to a NUI are executed through single return flight from CPC-1 to a NUI. Less than 10% of helicopter flights take a route between two NUIs (for example taking a maintenance crew from a workscope on one NUI to another workscope on another NUI immediately after). A very small number of flights have a more complex routing. This means that the conservative approach to considering an extra flight is appropriate i.e. rather than an additional flight amongst a complex and higher risk routing with a large number of flights between NUIs, what was going to be a single return flight to a NUI becomes two return flights to the same NUI over 2 days i.e. the flight risk to do that workscope is doubled. An extra flight just due to reduced daylight is less likely: reduced hours on the NUIs is already in the Spirit planning and there is significant variation in the time spent on them across the year. If this time is further reduced due to weather, there is the possibility of an extra visit (and hence flight) being required.

As above, using historical UK data on fatal helicopter crashes, the additional individual risk from a short return flight is ~ $9.2x10^{-7}$.

3.5.3 Risk Impact

3.5.3.1 Tolerability

Assuming conservatively from Table 3 that the risk from all hazards to a worker who visits the NUIs is $3x10^{-4}$ per year, a figure just above all the risk values quoted, the additional flight risk for the overall risk to be intolerable is $7x10^{-4}$ per year.

Thus, the tolerability limit would only be threatened if an individual took an extra $7x10^{-4}$ / $9.2x10^{-7}$ = 764 return flights in a year. This is not possible and so the tolerability limits cannot be threatened by any additional restrictions caused by the MOWF.

3.5.3.2 Materiality

For the increase in the number of flights to have a material impact on the risk, an average individual would have to take maybe the same number of flights again that they already take i.e. 64. The word “maybe” is used as there is no quantitative test of materiality of a risk change. Neither aviation analysis suggests this level of impact to all workers and flights.

Further to this, as given in Table 1, on average over the last seven years for the currently operating NUIs, 454 visits are made i.e. a little over one per day (this varies between zero and four and may include more than one visit to the same NUI i.e. a work party larger than 8 people). Considering this variable flight pattern and the ability of the Operator to successfully plan for such variability, it is not considered credible that any change could be considered material.

Further to the above, the overall month-to-month pattern of flying is highly variable, with some NUIs not visited in a particular month whereas in other months, they may be visited for 20 or more days (see Appendices A.1 and A.2). Thus, the variability in helicopter usage (and hence risk) is far greater than the occasional additional flight.

Therefore, it is considered that even using conservative, industry helicopter failure data, the additional risk presented by the occasional additional flight is not material and falls far short of any potential impact on risk tolerability.

Further discussion of materiality is given in Sections 3.6 and 6.

3.6 Conclusion

It is concluded that due to the proximity of the proposed windfarm, an increase in the number of helicopter flights will not result in a material increase in transportation risk to the personnel on board the affected assets. Furthermore, the overall risk levels are dependent on a number of factors, of which helicopter transport is only one, which further minimises the overall magnitude of the change.

Furthermore, the dutyholder of the affected assets is already taking all reasonable steps to reduce risks to ALARP – including transportation risk. This is evidenced by the fact that they have accepted safety cases. There are no further steps that the dutyholder will need to take as a result of the proposed windfarm. There is a change to environmental conditions in which a flight can occur, but this is a not a material change as the basis on which the safety case has been acceptance does not change and the risks on the affected assets will remain ALARP.

4 EFFECT ON SAFETY CRITICAL MAINTENANCE

4.1 Definition of Safety Critical Maintenance

Regulation 2 of The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 /3/ defines a Safety and Environmental Critical Element (SECE) as follows:

"safety and environmental-critical elements" means such parts of an installation and such of its plant (including computer programmes), or any part of those –

(a) the failure of which could cause or contribute substantially to a major accident; or

(b) a purpose of which is to prevent, or limit the effect of, a major accident.

Safety critical maintenance is defined as any form of maintenance carried out on a SECE.

4.2 Examples of Safety and Environmental Critical Elements (SECEs)

The objective of some SECEs is to prevent a major accident occurring. Examples include:

- Hydrocarbon containment – pipework and vessels
- Primary structure – the jacket or hull of the installation
- Lifting equipment
- Electrical equipment that is designed to be used in a potentially flammable atmosphere – known as Ex equipment.

Other SECEs are designed to detect or mitigate an accident once it has occurred. Examples include:

- The firewater system (often NUIs do not have firewater systems)
- Emergency shutdown systems
- Fire and gas detection systems
- Lifeboats.

SECEs often have in-built redundancy to ensure that they are sufficiently reliable – see Section 4.4 for examples.

4.3 Planned Safety Critical Maintenance

Preventative maintenance of SECEs to test their operation and prevent future failure is typically scheduled to occur every 6, 12 months, or on a longer frequency. Thus, for any item of equipment, it is known years in advance what maintenance will be carried out on it. Specific planning when layout and materials to carry out the work are considered is generally planned at least a number of months in advance (maybe a 90 day plan) and longer than this for more critical items. The purpose of the maintenance is to ensure that equipment remains fit for purpose and will operate properly when it is required to do so.

Maintenance intervals are set conservatively. This, together with equipment redundancy, ensures that delays to safety critical maintenance will minimally increase on risk. Furthermore, much preventative maintenance consists of inspection and testing – it does not necessarily involve changing components.

Typical maintenance intervals are:

- Inspection of lifeboats: 6 or 12 monthly with some parts 24 months.
- Fire pump maintenance: 6 monthly.
- Testing of fire and gas systems and emergency shutdown systems: 12 monthly.
- Testing of emergency shutdown valves: 12 monthly.
- Inspection of electrical equipment for use in potentially flammable atmospheres: 24 or 36 monthly.
- Inspection of vessels and pipework: 5 yearly.

Planned maintenance is carried out by the installation core crew with support from specialist vendors. For a permanently staffed installation such as the CPC-1 complex, delays in helicopter flights will not have a material impact on maintenance tasks as the crew will already be on the installation. For NUIs there may be delays to maintenance if helicopters cannot fly at night or in IMC. Section 4.5 of this report details mitigation measures that can be taken to minimise such delays and Section 4.7 concludes that there is no material increase in safety risk as a result of such delays.

4.4 Safety Critical Breakdown Maintenance

Breakdown maintenance is carried out on demand. Equipment is designed to be fail-safe such that its failure does not lead to a dangerous situation and its resolution is not necessarily a safety issue, though this may require some degree of shutdown. There are few safety system failures that would directly give a shutdown. Possible causes are real demands on or failures in the fire and gas system; the ability of deluge system to maintain pressure; process parameters nearing unacceptable limits or the failure of instrument air.

In some cases, and more so on larger manned platforms such as CPC-1, equipment redundancy ensures that a failure does not result in a platform shutdown and by implication, not a significant change in risk. For example:

- For all assets (NUIs and CPP-1):
    - Fire and gas systems have sufficient detectors such that several detectors will cover one area. Hence the failure of one detector does not affect the system's ability to detect a gas release or fire.
- For the CPC manned installation (which has more safety systems than a NUI, which may not have, for example, deluge):
    - There is generally more than one fire pump, and each fire pump is normally capable of meeting the entire firewater system demand.
    - PFEER 1995 Regulation 15 requires that there is sufficient lifeboat capacity for 150% of the maximum complement of the installation. The intent of the law is that there is a lifeboat seat for each person on board with the largest lifeboat out of service.

Where there is no redundancy and a safety critical system fails, the Operational Risk Assessment (ORA) that is carried out typically by experienced persons offshore and onshore, may conclude that the resultant risk needs to be removed and the only way to do this may be to shutdown. So, if there is a single firepump on a NUI and it fails, the NUI would likely to be shutdown before any person visits it. Shutting down the NUI before any visits is an asset protection measure as no persons would be at risk before the visit. A failed firewater pump on CPC-1 is more likely to just represent a loss of redundancy and slightly altered operations until it is repaired e.g. starting a firepump when flying is occurring to ensure that a pump works during the relatively high risk activity of landing, or take-off.

4.5 Mitigation Measures

The following mitigations are commonly used to prevent maintenance becoming overdue or to mitigate the effects of overdue maintenance.

- When maintenance is scheduled, each maintenance activity is allocated a maximum allowable finish date (MAFD). The maintenance is only considered to be overdue if this date is exceeded. Maintenance activities are then allocated a "window" – which may be up to a month before the MAFD. Thus, there is sufficient time allocated to mitigate for foreseeable delays – including bad weather.
- In the case of NUIs, a degree of flexibility is required to ensure that the day chosen for maintenance activities has suitable weather. Thus, availability of accurate weather forecasts is essential. Preventative maintenance can preferably be scheduled for the summer months when the days are longer and there is a greater likelihood of good weather. Maintenance visits should be made on days with weather that will not suddenly worsen needing a short notice flight to disembark people from the NUI and this will almost always be VMC from the perspective

of helicopter flying. This maximises time on the installation and will minimise the potential for a crew to have to remain on the installation overnight.

- Carrying out a deferral risk assessment in the event of a maintenance routine becoming overdue. Suitable mitigating measures may include rescheduling of maintenance or operational restrictions such as preventing work that might involve incendive sparks.
- Ensuring that a suitable stock of spare parts is available.

4.6 Verification Activities

Regulation 9 of the 2015 Safety Case Regulations requires that a verification scheme is established to ensure that the Safety and Environmental Critical Elements (SECEs) are suitable for purpose by design and that they remain suitable for purpose through maintenance. Verification is a formal process that is governed by a written scheme of verification. Verification activities are carried out by an Independent Competent Person (ICP) and involves reviewing maintenance records, witnessing maintenance activities and carrying out functional testing of SECEs.

Maintenance is carried out by the installation dutyholder who will also carry out assurance activities – in the form of inspection, testing and audit – to ensure that the maintenance activities are effective in controlling risk. Verification is an independent check that maintenance and assurance is being carried out effectively by the installation dutyholder. It is effectively a third line of defence. Any delays caused to verification activities will not result in additional risk because verification activities are an additional check and do not themselves involve any form of preventative or corrective maintenance.

4.7 Conclusion

Maintenance activities are planned well in advance with flexibility to vary the plan according to weather conditions and this makes it practical to minimise the number of overdue maintenance activities. For many aspects, equipment redundancy ensures that overdue maintenance will not, in the short term, result in increased risk. Finally, preventative maintenance activities usually only involve inspection and testing and therefore any delay will not result in an increased level of risk.

Reduced access to the affected assets when the weather is IMC will not result in SECEs being unfit for purpose as a result of deferred maintenance nor will it materially increase risk levels. This applies both to permanently staffed installation and to NUIs.

5 EVACUATION OF INSTALLATIONS IN AN EMERGENCY

5.1 Legal Definitions

Regulation 2 of The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER 1995) /4/ defines two means of abandoning an offshore installation in an emergency.

- Evacuation is defined as a planned and controlled means of leaving the installation that does not involve directly entering the sea. This would normally be done by helicopter or lifeboat.
- Escape is defined as the process of leaving the installation in an emergency when the evacuation system has failed. This may involve directly entering the sea.

Although PFEER 1995 requires a means of evacuation to be provided, it does not specify the means of evacuation.

5.2 Preferred Means of Evacuation

The preferred means of evacuation from an offshore installation is by helicopter. If helicopter evacuation is not practical, then lifeboats will be used. Although helicopter evacuation is the preferred means, it is likely to be slow – helicopters have a limited capacity and there is only one shared helicopter (with 8 seats) available at Blackpool. Furthermore, the nature of the emergency may make the use of helicopters impractical. In the case of a fire, helicopter evacuation may be impractical because:

- Smoke or flame may obscure the helideck making an approach impossible.
- The heat of a fire will reduce air density. This will reduce the helicopter's performance, most likely below a safe level.
- Smoke ingestion may result in engine failure.

In the event of an errant vessel – defined as a passing vessel as opposed to an attendant one – colliding with the installation it is unlikely that there will be sufficient helicopter capacity available to evacuate the entire crew of the installation in a timely manner.

Thus, lifeboats are likely to be used as they can evacuate the entire crew within an hour from initial identification of the emergency and far less than this on a NUI. The operation of a lifeboat is not affected by the MOWF Project.

5.2.1 Previous Offshore Emergencies

Table 1, below, lists a number of offshore emergencies and the means of evacuation used. This illustrates the point that, in each case, helicopter evacuation was impractical.

Year	Installation	Nature of Emergency	Means of Evacuation Used	Reason why Helicopters were not used
1988	Piper A /6/	Hydrocarbon release, fire and explosion	Uncontrolled	Impairment of helideck by fire and smoke
1988	Ocean Odyssey /7/	Blowout	Controlled - lifeboats	Impairment of helideck by fire and smoke
2005	Bombay High /8/	Attendant vessel collided with riser causing fire	Uncontrolled - two of eight lifeboats launched	Impairment of helideck by fire and smoke
2010	Deepwater Horizon /9/	Blowout	Controlled - lifeboats	Impairment of helideck by fire and smoke

5.3 Role of Emergency Response and Rescue Vessel (ERRV)

Each installation has a ERRV attending it. The ERRV provides a number of safety related functions, namely:

- Recovery of personnel in the event of evacuation, escape or persons falling overboard.
- The recue of personnel from a helicopter ditching in the vicinity of the installation.
- Acting as a place of safety for the above. This includes the provision of medical facilities and for the care of survivors.
- Mitigating the threat from passing vessels that present a collision risk to the installation.

The function of the ERRV is not affected by the MOWF Project.

5.4 Evacuation in the Event of Injury or Illness

The evacuation of personnel in the event of injury or illness will normally be by SAR helicopter for the following reasons:

- SAR helicopters are permanently equipped with stretcher access. A CAT helicopter would have to have its seats removed to allow a stretcher to be secured aboard– something that is time-consuming to achieve.
- SAR helicopters are staffed with paramedics. CAT helicopters are not.
- SAR helicopters may fly in weather that CAT helicopters will not fly in.

CPC-1 will have a trained medic aboard able to deal with more minor ailments and illness reducing the demand on any emergency SAR requirement.

5.5 Precautionary Downmanning

Precautionary downmanning is common practice when a non-emergency situation makes it desirable to reduce the platform crew to the minimum required for safety operations. An example may be an issue with the potable water system, or galley. Non-essential personnel will be transported onshore at the first convenient opportunity. However, as this is not an immediate emergency, the normal helicopter operator is used and so for CPC-1, this process would take days and thus only slightly affected by any flying restrictions. Downmanning of a NUI is not relevant as they are only ever manned with one or two crews.

It must be emphasised that precautionary evacuation takes place in non-emergency situations. Thus, in such an instance, the presence of a windfarm and any slight delays will not create a problem for emergency response as no emergency exists.

5.6 Conclusion

Previous incidents have shown that evacuation by helicopter from an offshore platform is unlikely and evacuation by lifeboat is a far more likely scenario. Furthermore, in the Morecambe Bay fields, evacuation by CAT helicopter is unlikely due to the limited capacity of the helicopter (the AW169 has only 8 seats). Even if helicopters are used, it is more likely that it will be an SAR helicopter which is not subject to the same weather restrictions as a CAT helicopter /10/. The windfarm will comply with MGN654 /11/ therefore SAR operations will be possible. Finally, if the weather is below VFR minima it is unlikely that helicopters will be a viable means of evacuation anyway – even if there is no windfarm in the vicinity.

It is therefore concluded that:

- The proposed windfarm does not impede emergency response on any of the nearby oil and gas installations.
- There will be no need to revise the emergency response sections of the safety case as a result of the proposed windfarm.
- The proximity of the windfarm will not result in the dutyholder of the affected assets breaching any health and safety legislation.

6 POTENTIAL SAFETY CASE IMPACT

6.1 Safety Case Material Change

The relevant legislation governing material change to an offshore installation, or its operation is addressed in Regulation 24(2) of The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015. A material change is likely to be one that changes the basis on which the original safety case was accepted. Before such a change is made the safety case must be resubmitted to the competent authority for assessment and acceptance prior to the changes taking effect. The onus is on the installation dutyholder (the operator in the case of a production installation) to identify any such changes.

Whether a change to operations is material is generally a qualitative decision, although it may make use of quantitative data. If a change is considered by the dutyholder to be material, then the revision of the safety case will detail the nature of the change and what control measures have been taken to ensure that the risks remain ALARP.

6.2 Examples of Material Change

The following are examples of material changes.

- Introduction of a new hazard e.g. hydrogen sulphide caused by the souring of wells.
- An increase in the hydrocarbon inventory e.g. a new subsea tie-back.
- Introduction of a new activity e.g. the use of a walk to work vessel to transfer additional personnel to the installation.
- A permanent increase in the number of persons on board.
- A change in owner or operator.
- The extension of use of an installation beyond its original design life.
- The decommissioning of a production installation.

Further examples are given in the paragraph 293 of the guidance to Regulation 24 of the 2015 Safety Case Regulations.

6.3 Likely Impact on the Safety Case

The basis of safety of the installation is not changed by the potential for a slight change in helicopter operations that is considerably less than the natural variation in the activity of the course of a year. This is because:

- The change in risk is small (though there are no quantitative criteria formally used to determine materiality – see Section 3).
- No new risk reduction measures can be put in place, and no changes to the way in which operations are carried out other than a change to the definition of safe flying conditions.
- As described in section 4 of this report, delays to maintenance give a minimal increase in risks due to equipment redundancy and the ability to reschedule maintenance so that the maximum allowable finish date is not exceeded.
- Section 5 of this report demonstrates that the presence of the windfarm will not have any material impact on emergency response or to the evacuation of any installation in an emergency.

Transportation risks are not significantly elevated following establishment of the windfarm. With sufficient planning, there will be no significant effect on safety critical maintenance.

Therefore, it is concluded that the presence of the windfarm will not represent a material change to the Morecambe Bay offshore installation safety cases and thus they will not need to be submitted to the Competent Authority. The safety case will need to be updated to reflect the slight change in operations, but this is a very minor task.

7 FINANCIAL COSTS RELATED TO PROXIMITY OF THE WINDFARM

Outside of the safety questions, there is the potential for increased costs due to delayed helicopters. This may be an additional flight, extra time for persons needing to work around an affected flight and in some circumstances lost production.

[redacted]

[redacted]

[redacted]

[redacted]

8 CONCLUSION

The analysis contained in this report reaches the following conclusions, with respect to the effect of the proposed Morecambe Offshore Wind Farm on the current oil and gas operations:

- There is no material increase in risk to personnel from additional helicopter flights.
- Maintenance activities are planned well in advance with flexibility to vary the plan according to weather conditions thus there should be no adverse impact on safety critical maintenance.
- There will be no impact on emergency evacuation and escape from either CPC-1 or any of the NUIs.
- There will be no significant increase in risk to personnel on either CPC-1 or any of the NUIs nor any significant change in the way that the helicopter operations are managed. There will be no new risk reduction measures introduced and no change to the demonstration that the risk is ALARP other than the additional helicopter weather restrictions. Thus, there will be no need to submit a material change to the installation safety case(s). Minor revisions will suffice.
- [redacted]

9 REFERENCES

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/7/ Health and Safety Executive, Offshore Technology Report OTO 96 009, Ocean Odyssey Emergency Evacuation, An Analysis of Survivor Experiences, April 1997

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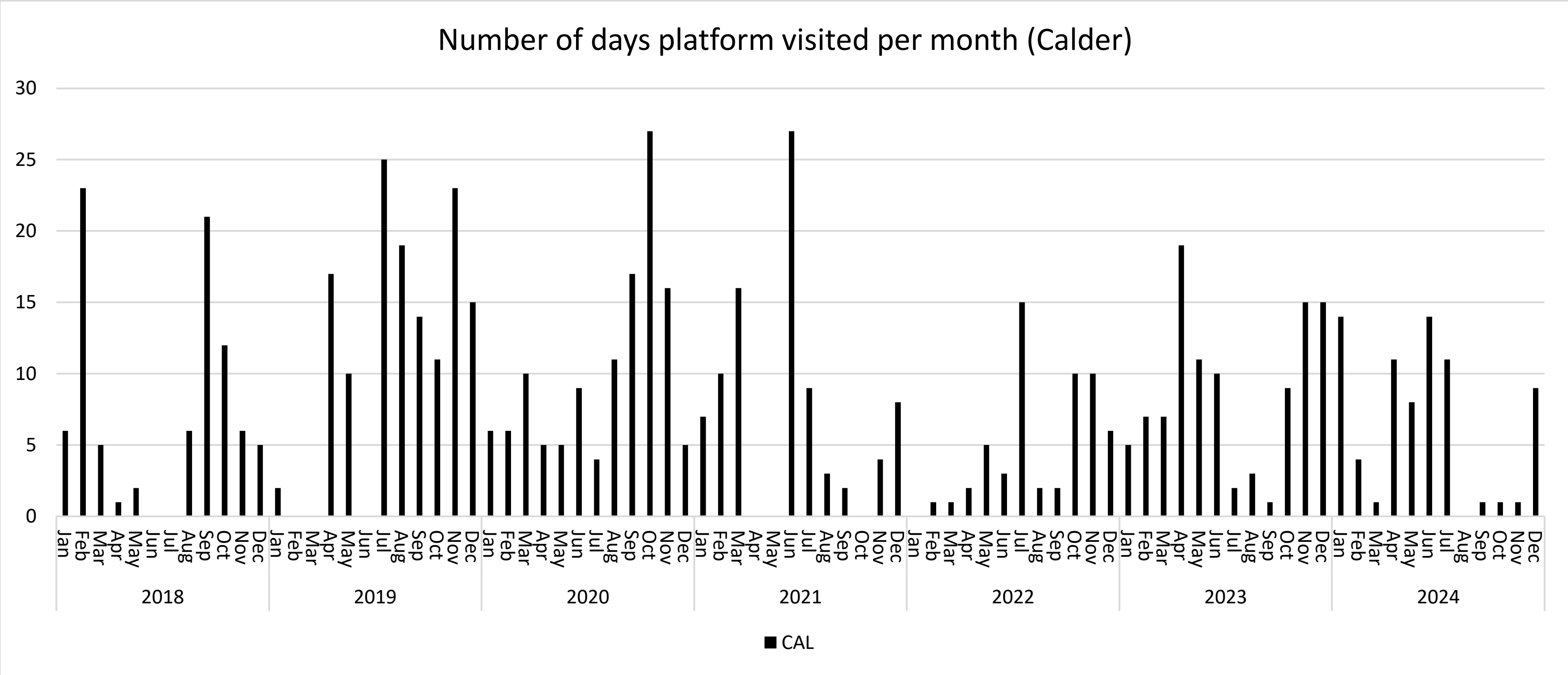
/11/ Maritime and Coastguard Agency, Marine Guidance Note 654 Safety of Navigation: Offshore Renewable Energy Installations – Guidance on UK navigational practice, safety and emergency response, April 2021

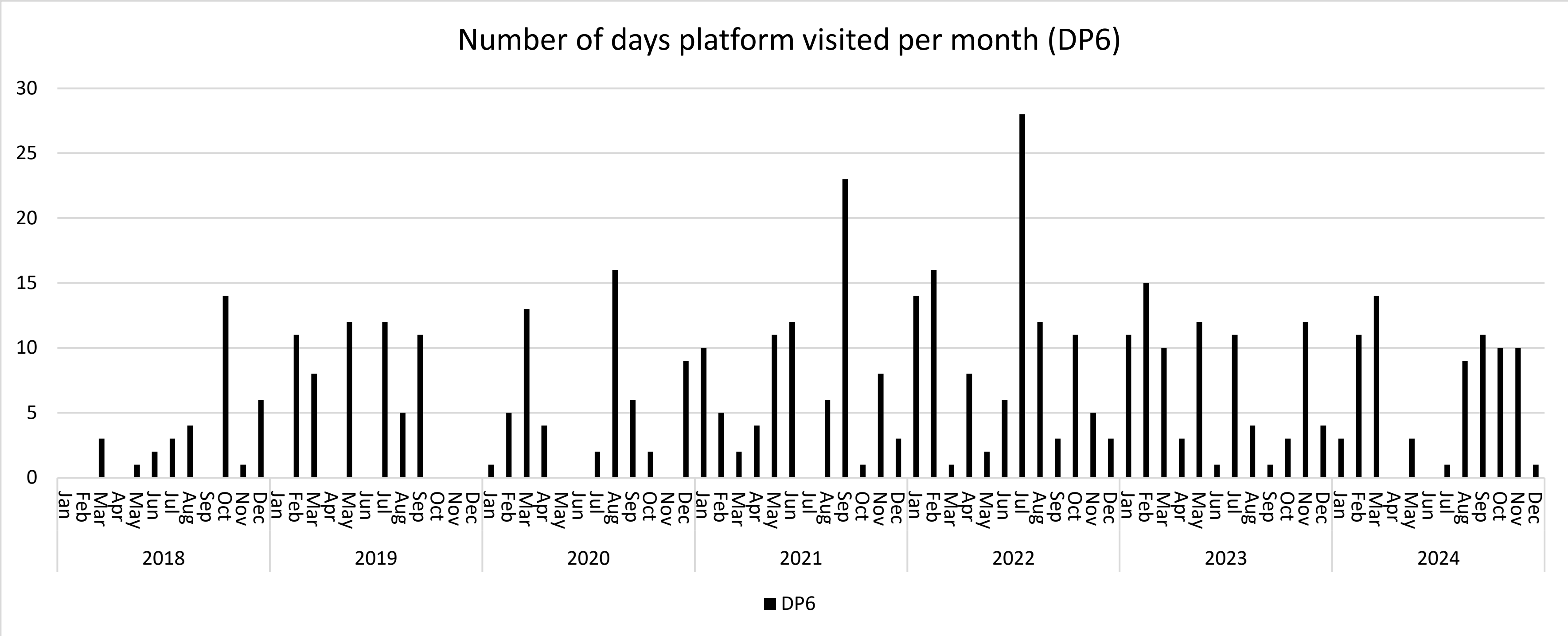
/12/ Wood Mackenzie, Asset Report – Calder, May 2024

/13/ Wood Mackenzie, Asset Report – South Morecambe, June 2024

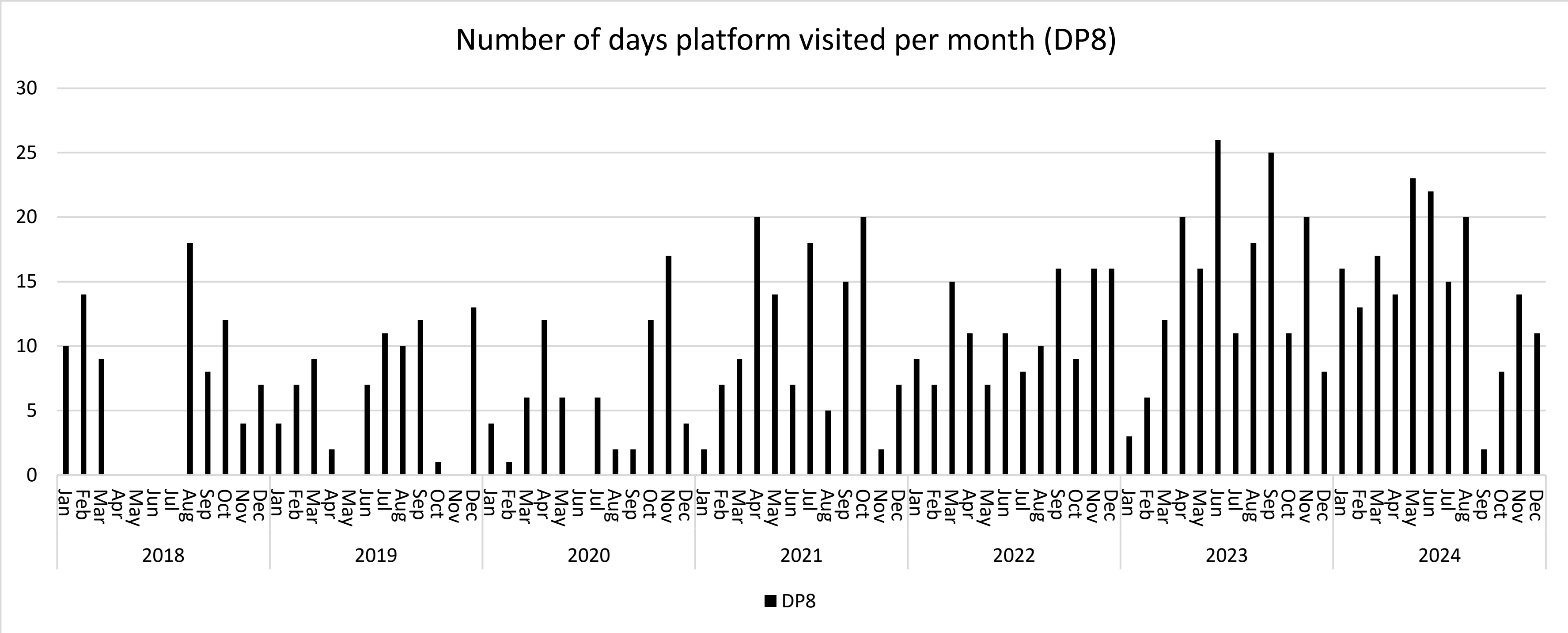
APPENDIX A DIAGRAMS

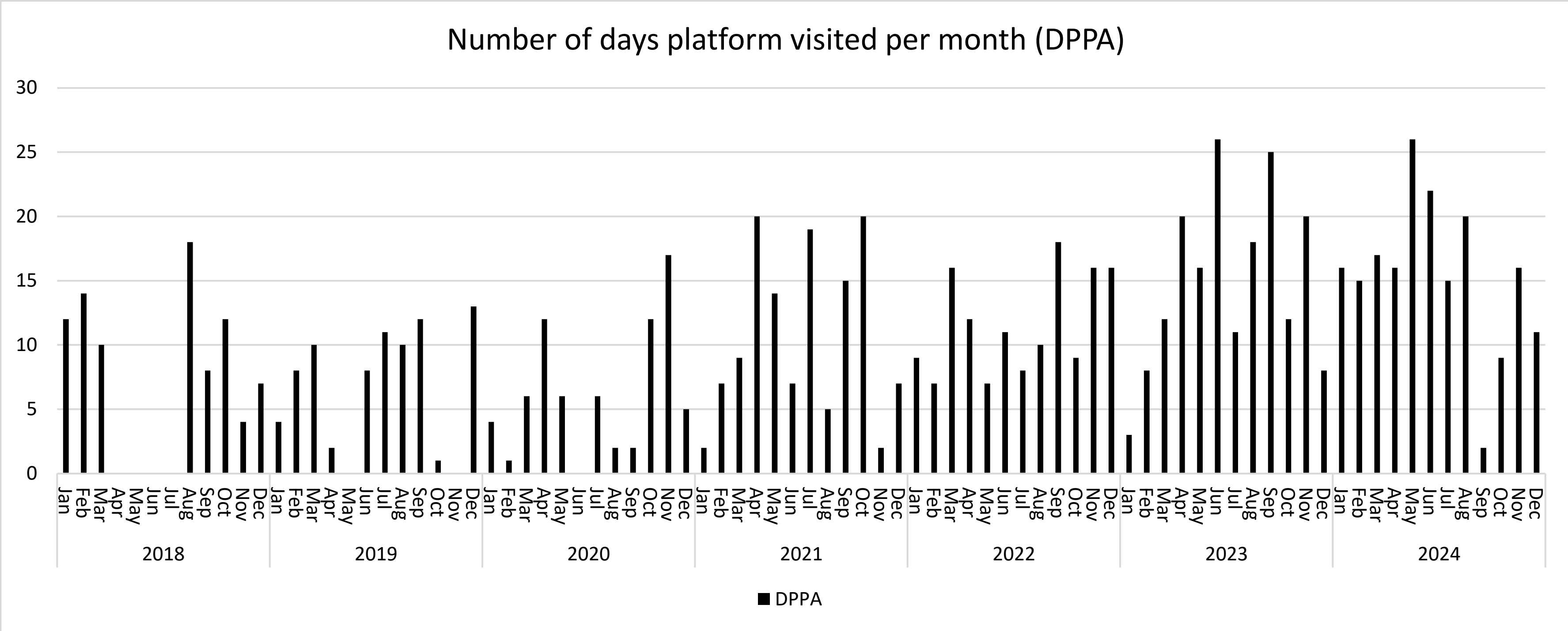
A.1 VARIABILITY IN FLYING



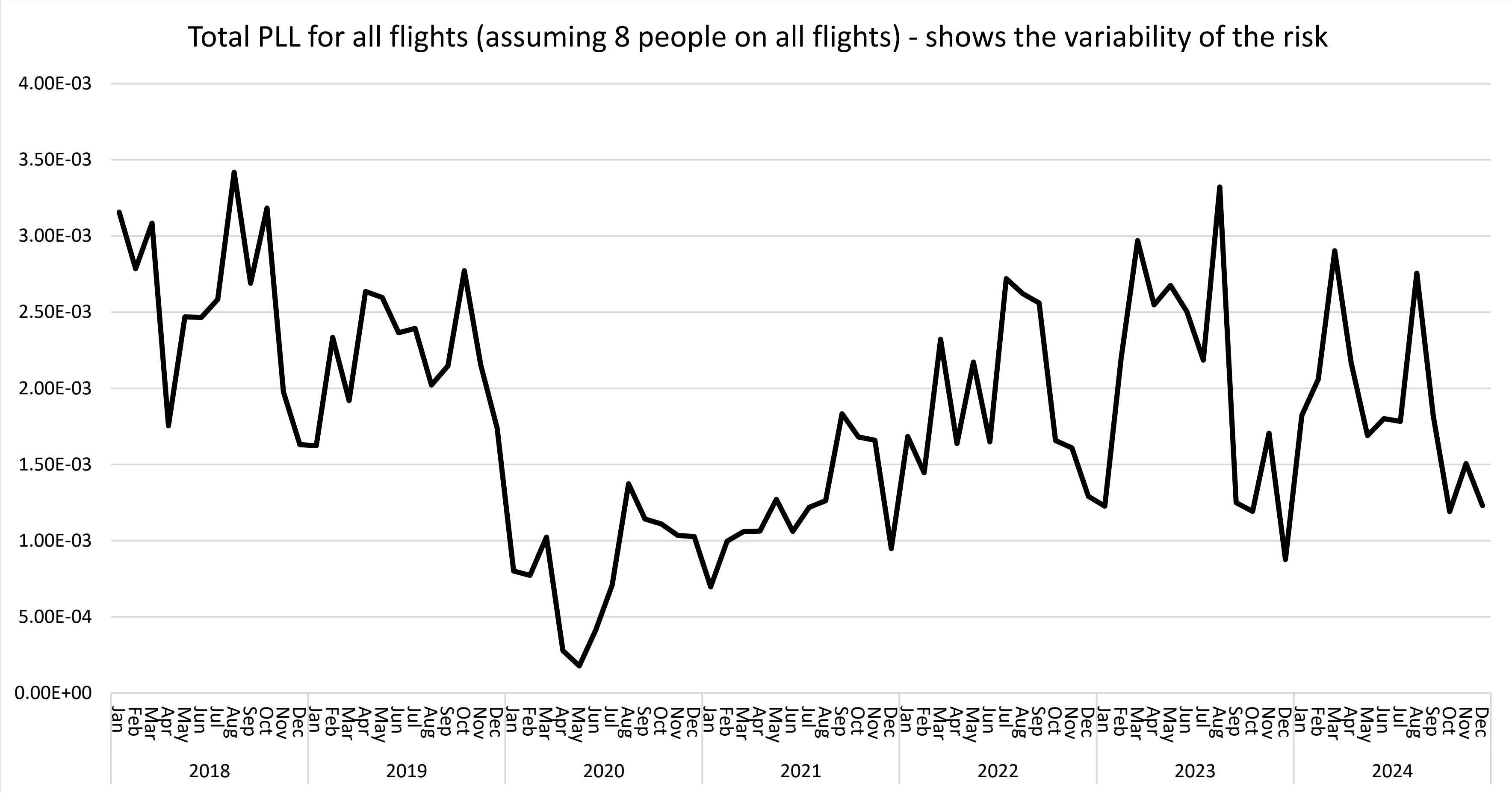


Number of days platform visited per month (DP6)
30
25
20
15
10
5
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2018
2019
2020
2021
2022
2023
2024
DP6


Number of days platform visited per month (DP8)
30
25
20
15
10
5
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2018
2019
2020
2021
2022
2023
2024
DP8


Number of days platform visited per month (DPPA)
30
25
20
15
10
5
0
2018
2019
2020
2021
2022
2023
2024
DPPA

A.2 TOTAL PLL FOR ALL HELICOPTER ACTIVITIES



The PLL data excludes sectors from Blackpool to CPC-1 and vica versa.

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