Project Name	**OFFSHORE WIND & CCUS CO-LOCATION FORUM 5th PLENARY MEETING**
Meeting Venue	Held online via Microsoft Teams
Date & Time of Meeting	10:00am – 12:00pm on Wednesday 5th October 2023

Chair of the Meeting	Adrian Topham (The Crown Estate)	
Names of the Attendees	• James Musgrave – TCE • Amy Bloomfield – Clarke – TCE • Peter Lawrence – TCE • Jamie Moore – TCE • Farhad Zaidi – TCE • Abby Haines – TCE • Habtom Okube – TCE • James Musgrave – TCE • Ed Salter – TCE • Ross McWilliams – Grayling (TCE Comms Support) • Evelyn Ryan – Grayling (TCE Comms Support)	• Tristan Bromley – BEIS • Wael Khatib – BEIS • Ross Kennedy - CCSA • Sian Wilson – CES • Louise O'Hara-Murray – Marine Scotland • Nick Richardson-NSTA • Ronnie Parr – NSTA • Viana Iancu – NSTA • Lorna Bennet - ORE • Juliette Webb – Renewable UK • Benjamin Sykes - OWIC • Iain Wilson – DEFRA • George Sutton – MMO • Georgio Sutton – MMO

Item	Notes
1.0	**WELCOME AND INTRODUCTION** The Chair opened the plenary meeting by welcoming everyone. With this being a virtual meeting and including several new members brief introductions took place. He covered: • Review of the agenda • Recap of the Forum objectives – to update the new members as to the aims of this group. • Overview of the key workstreams and lead organisations, and gaps where work has not progressed yet.
2.0	**REVIEW ACTIONS & MINUTES FROM LAST MEETING** Action 1) Pre-reading to be circulated ahead of next plenary session. • Closed prior to 5th plenary meeting. Update Comms Plan to state that working groups should meet and update Forum before Plenary sessions. Action 2) Proposals for Project Management on Workstreams 7 – 10, will be sought. • OW to host a trial to gather seismic data; Forum members to speak and develop plans offline.

	Action 3) Suggest dates for next plenary meeting to be held in September / October, agree and send invite. • Closed. Action 4) Arrange Workstream 11 communication / dissemination meetings with stakeholders. • Confirmed meetings took place. Action 5) Updated Communication Policy (6) to be circulated with the minutes for review. • Updated Communication Policy (6) to be circulated ASAP for review. Action 6) TCE to update the Communications Plan to state that working groups should meet and update the forum before plenary sessions. • TCE to update the Communications Plan to state that working groups should meet and update the forum before plenary sessions. Action 7) Offshore Wind farm to host a trial to gathering seismic data, Forum members to speak and develop plans offline. • RP & BS confirmed BP & Orsted are open to collaboration, but timing presently prevents progress – open but paused during survey season. Action 8) Consider forum and meeting structure (members, meeting frequencies etc.) and feedback views. • Welcomed new members from Marine planning organisation. Closed.
3.0	**SUMMARY OF DEVELOPER WORKSHOP** It was confirmed that 8 CCUS developers and 5 wind developers attended the workshop. The purpose of the event was to provide a background to the purpose of the forum. We would like to share a redacted version of the slides and meeting minutes on TCE's website to make the Forum more transparent and demonstrate the successes of progress being made. Break out rooms with 2 – 3 CCUS developers and 1 – 2 Wind developers. Discussions were generally well received; people appreciated the chance to speak together across industries and look for incentives for coexistence. Limited input from OW as they were not aware of the challenges for CCUS. The Chair seeking forum approval that these workshops and wider stakeholder engagement is a good way to progress, get the industries talking to each other and working together to find technical solutions. The Chair proposes to send out a questionnaire to the attendees of the workshop and provide some further information for the types of people we would most like to attend future, similar events. Question raised about what exactly would be published. The Chair confirmed that minutes and slides would be published after pre-approval through the Forum before sharing on the website publicly.

4.1	**WORKSTREAM 1: COLOCATION FORUM** Common OW/CCUS co-location oversight body The Chair updated on the status of the workstreams: • Workstream 1 (CLF) remains ongoing. • Workstreams 2 and 3, due to low relevance to the forum at this time, these are not being progressed. • Workstream 4 is covered in more detail later in this meeting. Workstream 5 (Planning) would follow on from this work. • Workstream 6 on seismic work will be commented on by NSTA this meeting. • Workstreams 7 to 10 have not yet kicked off. A proposal from ETA for project management is under consideration. • Workstream 11 (wider stakeholder engagement), an initial workshop has taken place. • The Chair asked for feedback, especially regarding missing workstreams. No comments raised at this time.
4.2	**WORKSTREAM 4: SPATIAL CHARACTERISATION** The Chair shared an updated map of the seabed showing proposed OW and CCUS locations. Reiterating that the seabed in the UK is busy space – not just with current and future OW & CCUS. Clearly presenting challenges going forward and it is important to balance the needs of competing uses.
4.3	**WORKSTREAM 6: MMV (MEASUREMENT, MONITORING AND VERIFICATION)** NSTA supplied a detailed update on Workstream 6, commenting on slides (supplied with minutes). NSTA oversees 6 UKCS Active Carbon Storage appraisal license area and hope to open the 33rd O&G round this year. Maps showing carbon store license rounds – existing gas fields are in red and oil fields in green. No strong problem areas showing in the North Sea just yet. Near shore exclusion zones in Scotland. More infrastructure needed with every development. Phase 1 report was published in August. Phase 2 presented at the last meeting and aiming for publication before the end of the year. Seismic expected to be an important component of the broader MMV (Measurement, monitor, verification) technology portfolio, though actual approach is specific to each site / specific store. Ocean Bottom Nodes (OBN) – superior technology (accuracy, repeatability, 'noise') to seismic streamer. Well suited to co-location situations but 2-5 times more expensive to employ technique. Wind Farm noise still under investigation 4 technology projects are taking place within this stream:

	• MMV report by NSTA, due for publication imminently. • OBN – seismic acquisition review is complete. Proceeding case studies & assimilation underway. Publication due end 2022. • Seismic signal / CO2 detection project with IKON – to be presented in Madrid in June. Publication end of 2022. • Windfarm noise report – Report expected mid-June for review. Conclusion monitoring is going to require a range of different technologies – portfolio approach. Expectation that technology operators will mature monitoring plans. OBN is expected to between 5 – 10 times the cost of towed streamer seismic. Cost is still a major drawback to deployment for CCS. Wind farm noise is largely unknown. It is expected that turbine noise is generated at lower frequencies than the operational range of seismic monitoring. Wind turbine motion is unpredictable. Only 1 study looking at non-induced seismic source that could be attributed to the turbines. The survey is inconclusive, poor seismic sizing and not enough detail around direction and turbine motions. Member asked for confirmation as to the problems that turbine noise can cause on seismic monitoring. NSTA confirmed that it is the operational noise of the turbines (not the construction) and the impacts on the sensors. Need to find the correct seismic to get reliable results. Repeated surveys every 5 – 10 years. Lower cost lower impact technologies do not exist yet AUV and USV could be real game changers in further development. Options for future studies: • Need a controlled, passive study of wind farm noise that is synced to operational data. Looking for an opportunity for it to arise rather than pushing forward as turbine noise is not thought to be a very serious problem. • Need to investigate how to overcome the operational barriers of operating seismic monitoring in highly constrained areas. • Highest part of the cost of OBN is related to the density of the nodes being deployed. A gap identified in the developer workshop that there is not one consultancy that can be approached to complete windfarm planning surveys and seismic. Opportunity to survey the same site for both sectors at the same time. CCS Injection Induced Microseismic Flood front Monitoring – very interesting if the signal magnitude is strong enough. Seabed Gravity – Also looks promising, under investigation in Canada. Every single development is going to be developed based on the first seabed images generated. Upfront investment is required to generate the best image that will provide reliable data for the next 50 years of development.

	4D seismic does not work very well assessing large salt deposits, OBN required for greater clarity. Sparce OBN can be used to fill in more detail in area of uncertainty. Need to fund R&D to get the right project. Question asked, when are subsalt reservoirs expected to come into play. RP subsalt is not going to go away, some depleted gas fields are in subsalt areas so will need to be investigated further. The importance of obtaining detailed seismic surveys of the southern North Sea to ensure sufficient knowledge of the static description was emphasised by NSTA. The number of carbon basin licenses imply that we can take the time and detail to get the surveys as detailed as possible. If an Energy company is looking develop OW and CCS then they can complete both surveys at the same time – cross industry collaboration. The Chair explained passive seismic, and that University Trondheim was conducting research. Deeper reservoirs are difficult to characterise without 4D seismic, micro seismic monitoring of well leaks is the expected way to monitor. Member explained that maps shown already show areas of overlap of areas already developed or consented for offshore wind. Is a detailed survey going to be possible in these already developed areas. NSTA said cost is going to be the main challenge, OBN can be used, but it costs more. Sparce OBN may be the most practical. Member asked about electromagnetic methods been considered. NSTA said it is applicable for shallow targets, but not practical for the deeper wells being considered. Member asked if a leakage from a well head is detected, that shows a very slow and inadequate response. NSTA said seismic would still be subsurface (100 – 200m below the seabed) downhole deployment to enable action before a wellbore breach occurs. Member asked what NSTA would recommend for the 4 license areas in the North Sea. NSTA said seismic imaging is generally better where there is not a large salt deposit. What would be most helpful is a one stop shop for seabed surveys to cover all requirements for both OW and CCS.
4.4	**WORKSTREAM 7: CCUS AND OW SIMULTANEOUS OPERATIONS** Post-meeting discussion Chari and RUK: Suggested that a sub-group comprising the Chair, RUK, CCSA draft a proposal and prepare to steer a group Project Managed by OREC/NZTC. Initially focussing on Best Practice for Simultaneous Operations, considering typical sector traffic (considering an OWEC monitoring example). Also, to consider whether legislative change may be needed and a high-level legal view of cross-sector liability issues.
5.0	**WORKSTREAM 11: STAKEHOLDER ENGAGEMENT** Covered under Developer Workshop feedback in section 3.

5.0	**AREAS OF FOCUS AND WORKSTREAM ACTIONS** The Chair posed several questions and the opportunity to address this item as a group: • Are more regular work stream meetings desirable? • Should there be a wider range of parties involved? • Should the forum be commissioning more / further evidence projects? The default is to continue in quarterly format, to keep things moving forwards. Workstreams 7-10 have been attempted, but with various challenges to resource availability. Forum members to consider and feedback in next plenary.
6.0	**NEXT MEETING DATES** Agreed the next plenary should be in 3 months' time. Therefore, later in January / early February will be targeted. LB to send meeting date poll.
7.0	**AOB** No AOB discussed.