Meeting Notes

Project Name	**OFFSHORE WIND & CCUS CO-LOCATION FORUM 4th PLENARY MEETING**
Meeting Venue	Held online via Microsoft Teams
Date & Time of Meeting	*09:30 – 12:00 on Tuesday 15th June 2022*

Chair of the Meeting	Adrian Topham (The Crown Estate)
Names of the Attendees	▪ Sam Robertson (OREC) – Secretary ▪ Chris Gent (CCSA) – Member ▪ Juliette Webb (Renewable UK) – Member ▪ Benj Sykes (OWIC) – Member ▪ Sophia Northridge (BEIS) – Member ▪ Ellie Alexander (BEIS) – Member ▪ Tristan Bromley (BEIS) – Member ▪ Johnny Love (ORE Catapult) – Member ▪ Peter Lawrence (TCE) – Member ▪ Jamie Moore (TCE) – Member ▪ Ian Green (TCE) – Member ▪ Habtom Okube (TCE) - Member ▪ Nick Richardson (NSTA) – Member ▪ Ronnie Parr (NSTA) – Member ▪ Alana Finlayson (NSTA) – Member ▪ Viana Iancu (NSTA) – Member ▪ Joey Jones (TCE Comms Team) – Guest ▪ Ross McWilliams (TCE Comms Team) – Guest ▪ Lauren Garnet (TCE Comms Team) – Guest ▪ Lily Martin (TCE Comms Team) – Guest

Item	Notes
1.0	**WELCOME AND INTRODUCTION** The Chair opened the plenary hybrid meeting by welcoming everyone. Each attendee introduced themselves and gave a short explanation of their role in relation to offshore carbon storage and wind energy generation.
2.0	**REVIEW ACTIONS & MINUTES FROM LAST MEETING** *Action 1) Pre-reading to be circulated ahead of next plenary session.* ▪ Closed by TCE and ORE Catapult prior to 4th plenary meeting. *Action 2) Circulate ETA proposal for PM & support on Workstreams 7 – 10* ▪ Item remained open. Members agreed to discuss at end of meeting. *Action 3) Set up interim meetings with relevant parties surrounding WP4 before the next plenary session.*

	▪ The Chair confirmed the meetings took place. *Action 4) Agree date for sharing and communicating approach with Developers in May / June* ▪ To be discussed later in meeting, covered under Workstream 11 *Action 5) Suggest dates for next plenary meeting to be held in June, agree and send invite.* ▪ Closed. *Action 6) Updated Communication Policy (6) to be circulated with the minutes for review.* ▪ To be revisited at a later time. *Action 7) TCE to update the Communications Plan to state that working groups should meet and update the forum before plenary sessions.* ▪ To be revisited at a later time. *Action 8) Offshore Wind farm to host a trial to gathering seismic data, OGA to speak internally and develop plans offline.* ▪ NSTA (OGA) confirmed BP & Orsted are open to collaboration, but timing presently prevents this as BP are in the middle of a campaign.
3.1	**UPDATE FROM ACTIVE WORKSTREAMS** **Workstream 1:** *Common OW/CCUS co-location oversight body* The Chair updated on the status of the workstreams: ▪ Workstream 1 (CLF) will remain ongoing. ▪ Workstreams 2 and 3, due to low relevance to the forum at this time, are not being progressed. ▪ Workstream 4 is covered in more detail later in the meeting. Workstream 5 (Planning) would follow on from this work. ▪ Workstream 6 on seismic work will be commented on by the NSTA (OGA) this meeting. ▪ Workstreams 7 to 10 have not yet kicked off. A proposal from ETA for project management is under consideration. Workstreams are expected to kick off before the next plenary. ▪ Workstream 11 (Wider Stakeholder Engagement) - An initial meeting has taken place with a second planned for shortly after 3rd plenary. The Chair asked for feedback, especially regarding missing workstreams. No comments were raised at this time.
3.2	**Workstream 4:** *Spatial characterisation of high value CCUS and OW sites* The Chair shared the following update: ▪ The seabed in the UK is busy space – and not just with current and future offshore wind (OW) & CCUS. The UK seabed is a key resource and sites that are suited for CCUS are already 'used' to 75% for OW activity. This clearly presents challenges going forward and it is important to balance the needs of competing uses. TCE gave an ongoing activities summary:

	▪ Key Resource Assessment (for CCUS), a piece similar to the one done for OW, is aiming to understand capture, transport and storage readiness levels of potential sites. ▪ Project BOOST (Best Overall Opportunities for STorage), is ongoing between several parties involved in the Forum and is aiming to avoid conflict with OW and safeguard sufficient CCUS stores to meet needs (whilst OW flourishes and works to meet targets). ▪ The Colocation Forum is aiming to identify simultaneous measurement and development, with the aim to support & enable colocation. TCE noted that where activities take place, it is important, but also when locations can be appraised it takes time and is expensive. It was acknowledged that this needs to be accelerated to stand a chance of meeting targets.
3.3	**Workstream 6:** *Minimum requirements and technology development for MMV (Measurement, Monitoring, and Verification)* The NSTA supplied an update on Workstream 6, commenting on the slides supplied with the minutes. A general overview and reminder was provided: ▪ Seismic is expected to be an important component of the broader MMV (Measurement, monitor, verification) technology portfolio, though the actual approach is specific to each site / specific store. ▪ Ocean Bottom Nodes (OBN) is a superior technology (accuracy, repeatability, 'noise') to the seismic streamer. It is well suited to co-location situations but is 2-5 times more expensive to employ. ▪ 4 technology projects are taking place within this stream: o MMV report by NSTA, due for publication imminently. o OBN – seismic acquisition review is complete. Proceeding case studies & assimilation are underway and are due to be published at the end of 2022. o Seismic signal / CO2 detection project with IKON – to be presented in Madrid in June and published at the end of 2022. o Windfarm noise report – Report expected mid-June for review. ▪ The conclusion was that time-lapse seismic, even via OBN, while often technically superior to towed streamer seismic, in some storage situations, is not able to resolve reservoir plume movement. However, for monitoring egress of CO_2 into non-reservoir layers, short-streamer seismic is an option if wind turbine spacing is sufficient. A technical discussion on OBN node array vs 'node on a rope' followed the overview *(NB: 'acquisition area' is appx 50% larger for OBN.)* ▪ OBN costs have reduced by ~50% over the last decade and there is still some scope for further technology development to reduce costs. It was $60m for 500km2, but now $40m, and it could reduce to $10m. It was noted that it will always takes longer and therefore costs more than the streamer option. ▪ On cost models, info shared was for a single survey (however it is necessary to commit to several surveys over the monitoring period). ▪ A streamer is highly efficient in a large area but small surveys cost considerably more, relative to larger surveys. OBN is more competitive when input costs are assessed rather than purely the output costs. ▪ Against the whole CCUS project costs, OBN surveys could be 1-3% of total project cost (equating to a value of £1-5bn). ▪ OBN is a 'better' technology, but overall still considered very challenging to justify when costing 3x more, in what most consider a marginal improvement on outputs. For the vast majority of reservoirs, that improvement is not necessary. ▪ In practice, OBN can get as close as ~300m to an obstruction. In a 1km wind farm field

	there will be lots of 'holes' in the data in the shallow zones but as you get deeper these holes 'heal'. At a survey depth of 2-3km, having holes is fine, but at a few hundred metres depth, there will be limitations. ▪ Hybrid surveys may be possible in some circumstances, with a reported 25% of cost of full OBN surveys. It is good for individual isolated obstructions. The NSTA updated the group on future operational considerations and technologies: ▪ Intra-windfarm cross disciplinary HAZID was a recommended next step to answer the following arising questions: o Can a vessel get close to a turbine (e.g. radar domes fit under blades)? o What about autonomous nodes? Need orders of magnitude more but suspect on the horizon. o What are the engineering challenges, such as repeatable positions, endurance and battery life? ▪ Seismic Repeatability NOISE (difference between surveys) vs Predicted 4D SIGNAL (strength of signals): o It was explained that it is critical to predict signal noise before surveying. Good levels of noise reduction have been realised through this. 15% is now common for a streamer, down from 50% decades ago. OBN is about 5% noise. Repeatability and positioning is key to this. o The CCSA queried how increased CAPEX cost impacts the costs of storage (passed through to customer) (cost per tonne of storage). The NSTA replied that this is presently hard to say commercially, but OBN does not seem to offer value for money.
3.4	**Workstream 11:** *Wider marine engagement in co-location impacts* TCE/CES updated the Forum on stakeholder engagement: ▪ They are focused on keeping MMO and Marine Licensing Scotland advised of forum activity to date. Input from CCSA & RUK fed back that wider members should be advised and able to feed in when appropriate as well. ▪ A proposal has been worked up, with key stakeholders and a suitable agenda (circulated as pre-reading to the meeting). A 3hr session was scheduled for September. Out of scope is the licensing / leasing process as it fell out of remit of the Forum. The Chair welcomed thoughts from the forum, to which the NSTA said it was important to also pitch the advantages (as well as the problems). BEIS agreed, adding that this should be a positive meeting, focusing on solutions and opportunities. On timings, the Chair noted that CCUS developers will be very busy until 13th Sept (leasing round timings). The CCSA commented that Spirit Energy, which previously shot a 2D line through an O&G field & through a wind farm, could be invited to share learning as real life examples would be valuable.
4.0	**AREAS OF FOCUS & WORKSTREAM ACTIONS** The Chair posed several questions with the opportunity for members to address this item as a group. They were asked: ▪ 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 Chair added that the 'do nothing' was to carry on in quarterly format – this would keep things moving forwards. They added that kick off of workstreams 7-10 had been attempted but with various challenges to resource availability.

	Forum members to consider and feedback in at next plenary.
5.0	**NEXT MEETING DATES (WORKSTREAMS, NEXT PLENARY, ETC.)** It was agreed that the next plenary should be held after the stakeholder meeting (Workstream 4) so the results could be fed in. September / early October were the targets.
6.0	**AOB** No AOB was discussed. The NSTA was invited to share more on seismic surveys for those wishing to stay on. The CCSA highlighted that socialising / disseminating the emerging thinking was discussed before. They asked if assumptions and conclusions could be discussed prior to publication. The NSTA confirmed they are discussing with operators to sense check, but are happy to engage prior to the release. The CCSA agreed to liaise with members with a view to feeding in. The Chair said the initial report showed how there were problems, and questioned if it would work. They said this needed to address that it will work in some cases and both parties needed to share the message. The CCSA asked how a site will be surveyed where 4D cannot be used for monitoring. They also asked how it can be said if CO2 storage is going where it is supposed to. The NSTA said there are range of technologies, not just seismic, and the default may be another technology, although this seemed to be being pushed in UK. **MEETING END**

Owner	Action List
Chair	1. Pre-reading to be circulated ahead of next plenary session. 2. Proposals for Project Management on Workstreams 7 – 10, will be sought. 3. Arrange Workstream 11 communication / dissemination meetings with stakeholders (September). 4. Suggest dates for next plenary meeting to be held in September / October, agree and send invite. 5. Updated Communication Policy (6) to be circulated ASAP for review.
TCE	6. TCE to update the Communications Plan to state that working groups should meet and update the forum before plenary sessions.
OGA	7. Offshore Wind farm to host a trial to gathering seismic data. OGA to speak internally and develop plans offline – open but paused during survey season.
All	8. Consider forum and meeting structure (members, meeting frequencies etc.) and feedback views.
OGA	6. Workstream 6 to seek forum agreement to start prior to next plenary. 7. KD & NR to confirm acceptance of communications policy, subject to above changes. 8. Present work on types of seismic streamer (traditional and short) for monitoring.