



Acorn CCS Virtual Townhall Webinar – 2nd September 2020

Question and answer responses (questions marked * are those updated in October)

A huge thanks to every one of you who made the effort to attend the first Acorn CCS Virtual Townhall Webinar.

We were delighted to receive a total of 479 registrations and 391 live attendees who submitted over 100 questions during the online presentation. The webinar recording is now available to watch in your own time using the following link: www.theacornproject.uk/townhall-video/

Due to the high levels of engagement during the project webinar we were unable to address all the questions that were submitted live on air. All these questions have now been reviewed and filtered through to the relevant teams within the project. Below we have grouped the questions into key themes and tried to address the key points raised. Our intention is to create a slightly shorter version of this document with some of the most frequently asked questions and share this on the Acorn Virtual Townhall website shortly.

As we mentioned during the webinar, we hope this is the start of an ongoing dialogue and would strongly encourage you to submit any further feedback or questions directly to our team: comms@theacornproject.uk.

If you require further information, or do not feel like we have adequately addressed your question, then please message using the email address above.

Many thanks again for your interest and support.

Best wishes,

Kirsty Lynch

Communications Director,

Pale Blue Dot Energy

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Question and answer responses (updated with follow up questions Oct 2020)

Key Topic/ Question	Answer
CONTACTING US/ REGISTERING INTEREST	
Where can I view the webinar again?	The webinar recording is now available to watch in your own time using the following link: www.theacornproject.uk/townhall-video/
How do I get my company added to the Acorn potential vendor database?	The key procurement activity on Acorn CCS will begin later in 2021 and will continue throughout 2022 and 2023. If you are interested in being kept informed about procurement opportunities, we are asking companies to register their details on our potential vendor database. This can be accessed using on the PROCUREMENT SECTION of the website or by using this DIRECT LINK TO THE FORM .
I live close to St Fergus and I would like to understand more about the project and how it might impact me. What is the best way to get in touch?	If you have specific feedback or questions that you feel that we have not addressed yet, please get in touch directly with us: comms@theacornproject.uk . We are beginning to plan our next round of community engagement and are exploring options to do smaller group meetings specifically with local community groups and interested individuals. If you would be interested in participating in a smaller group discussion, please contact us on the email above.
CONTRACTS/ JOBS AND OPPORTUNITIES	
Will Acorn set a benchmark for CCS that will maximise opportunities for the Scottish and UK supply chain? How many local jobs are being created for our community to ensure a just transition?	We are very conscious of the supply chain opportunities that this project presents, and we are keen to maximise the value of the project to UK Plc.. At this stage in the project it is not possible for us to specify numbers around local job opportunities, but we are working with Scottish Enterprise and other partners in order to support the mobilisation and readiness of the local supply chain to take advantage of opportunities as they arise. Right now, it might be worth taking a look at the existing funding opportunities (www.findbusinesssupport.gov.scot) and general support and advice available through Scottish Enterprise (www.scottish-enterprise.com)
What are the likely number of jobs that will be created both during peak construction and operation? What skills requirement do you envisage and how will it differ from oil and gas?	We do not have detailed estimates on job figures yet, however based on forecast spend over the construction period an estimate of around 500 – 850 jobs would be expected in construction. As a comparator, the Peterhead CCS project estimated a construction workforce of circa 400-500 people. When the project is in operation, a reasonable estimate would be 50-100 jobs, depending on shift patterns. In addition, there would be the associated maintenance and operations contracts within the supply chain.
Which contractor is supporting the current FEED activity?	Costain are carrying out our main FEED activity.
IMPACTS AND SAFETY AT ST FERGUS	
How much disruption do you expect at St Fergus village and the surrounding towns?	The construction of the project will require a workforce and construction activity to be undertaken at the St Fergus gas terminal. The main access route to the project would be the A90 and given the ability for the gas terminal to already accept HGV's we are not currently expecting to have to modify the junctions. This all means that most of the activity for the project will be out with the village and the surrounding area. We will also have a Construction Environmental Management Plan and traffic management in place to reduce the potential effects during this period.

	<p>There is potential that some of the workforce required will be from outside the local area and therefore require accommodation in and around the local area to St Fergus. The construction work is expected to take 24 months approx.</p>
<p>What are the ongoing traffic impacts of material and waste transportation during the operational phase of the project?</p>	<p>We will be developing our best estimates of operational traffic in this current phase of project development. However, the expectation at this time, is that operational traffic would be similar to the current service traffic flows to the various St Fergus gas plants. The CCS infrastructure proposed has limited reliance on frequent deliveries or waste movements, meaning the spread of traffic over the period of a month would be low.</p>
<p>Will this project bring additional risks to the St Fergus community and the village?</p>	<p>There should be no direct impacts to the St Fergus community as the project will be contained within St Fergus gas terminal complex. The St Fergus gas terminals are currently designated as top tier COMAH facilities, meaning they are governed by some of the strictest health and safety requirements. The CCS project would be managed to these same standards. Whilst the handling of CO2 is not currently considered a COMAH activity, Pale Blue Dot Energy as a responsible operator, is undertaking the design development with the same approach as if it were a COMAH facility. The handling of CO2 does not present the same hazards as the hydrocarbons which are currently managed at the site (i.e. it is not flammable or explosive). However, CO2 does have factors which need to be carefully managed and controlled (i.e. in high concentrations CO2 can act as an asphyxiant) so in future, the hazards considered at the site will change, however, the need for us to manage all risks to be As Low As Reasonably Practicable (ALARP) will remain.</p>
<p>Will any of the infrastructure for the various planned phases be built South of the Blackwater Burn?</p>	<p>The proposed site locations for Acorn CCS phase 1 project are NSMP north and NSMP south as shown in the townhall material. The location of future phases of development have not been selected. However, to date, we can say that no site options beyond the southern security fence line of the St Fergus gas terminal or outside the Reserved Area (R1) for oil and gas development in Aberdeenshire Council Local Plan have been identified for possible locations for future phases of development.</p>
<p>Is this project planning to use renewable energy from land wind turbines or offshore renewable energy?</p>	<p>The project will not have a direct connection to renewable energy sources. The power supply will be from the national grid and we are keen to pursue a green energy tariff. We are also continuing to explore options for efficiency within the project which could include using some waste heat from the carbon capture process to generate our own electricity.</p>
<p>Is Pale Blue Dot or the Acorn Project part of the St Fergus Energy Park development that is currently going through planning?</p>	<p>No. The Energy Park is an entirely separate project, being progressed by another party, to develop wind and solar energy on land outside of the terminal complex. Neither Pale Blue Dot or the Acorn Project are connected to the St Fergus Energy Park.</p> <p>As noted during the webinar, Pale Blue Dot Energy is keen to see all forms of low carbon technologies being progressed and for the North East of Scotland to be recognised as a hub for the energy transition. As shown by the public record, this was the basis on which we offered support to the St Fergus Energy Park Application. We made no comment on the planning merits or technical aspects of the project. As with our project, we would expect any energy transition project to be robustly evaluated for its safety and environmental performance prior to approval.</p>
<p>*Are you carrying out social impact studies?</p>	<p>Impacts on the surrounding community in relation to noise, air quality, traffic and health will all be assessed. These will consider the potential impacts during construction and operations. The planning applications will also include consideration of employment opportunities during both construction and operation and how this could impact people in the area. The Scottish Government and Scottish Enterprise are currently undertaking</p>

	a wider economic impact assessment into CCS in Scotland – this report is expected to be published in Q1 2021.
CO2 CAPTURE	
What is the expected volume of CO2 from the St Fergus Complex and where is it coming from?	This first phase of Acorn CCS expects to capture and store approximately 300,000 tonnes of CO2 per year. This relatively modest volume in phase 1 will bring the Goldeneye pipeline into use for CO2 transport which has an estimated capacity of around 5Mtpa.
The use of amines in an absorber tower is well-established technology, new technologies are starting to emerge, is the project looking at the potential to utilise alternative capture technologies?	Yes, we did consider other solvents and capture technologies. Multiple technologies were reviewed against the project value drivers; two different technologies were reviewed in an initial expression of interest process. An amine was preferred for this first phase project as it is the best known and most mature technology.
Has the CO ₂ capture technology and supplier already been selected?	After reviewing a number of options, we have selected an Amine-based technology for our carbon capture process. The procurement process for the carbon capture vendor is underway.
What is the concentration of the CO2 stream being injected?	The CO2 stream exported through the Goldeneye pipeline will be >99% CO2.
How will you separate oxygen from the carbon dioxide downstream of the carbon capture unit?	Oxygen removal can be achieved using catalytic oxygen removal.
What heat recovery technology are you using, and does it offer the possibility of further reduction of GHG emissions?	Waste heat captured using waste heat recovery units (WHRU) from the combustion emission sources will be used in the plant to reduce emissions where practical. This includes the heat required in the amine plant itself.
PIPELINES AND SUBSEA INFRASTRUCTURE	
<p>What is the process for converting existing pipelines for the transport of CO2?</p> <p>Are you using it beyond its design life?</p> <p>How do you make sure it is in good condition and what checks are in place to maintain it?</p> <p>What sort of pressure will the CO2 be at when it leaves St Fergus?</p>	<p>There will be little, if any, physical change to the pipeline. We will complete an Intelligent Pipeline inspection in this current phase of project development. This will provide additional confidence in relation to the status of the pipeline. When commissioning, the priority will be to effectively dry the line – our options for this are being developed.</p> <p>We are intending to operate the pipeline beyond its initial design life, but engineering assessments have been completed which will enable us to extend the design life of the pipeline, these assessments will be confirmed by the intelligent pipeline inspection prior to use.</p> <p>It is important to remember that the Goldeneye pipeline is 20" diameter, circa 15mm steel pipeline with concrete coating and has not been in active service for its design life, during which it has been sealed and filled with inhibited sea water. A key aspect we are considering is the state of the anodes. These may need additional provision to support the design life extension of the pipeline but current research indicates they should be sufficient until 2040.</p> <p>Following the pipelines reintroduction to operating service, a risk based inspection regime will be put in place to ensure the integrity of the pipeline going forward, this regime will be updated from the results from the inspections.</p>

	We are currently working on a normal operating export pressure of 90 barg with a maximum export pressure expected to be 108 barg. The original design pressure of the Goldeneye pipeline was 132 barg.
What is the confidence level in estimating overall costs for repurposing the existing pipelines (incl. Feeder 10) for CO2 transportation?	Our priority In Phase 1 of the Acorn Project is on repurposing the Goldeneye pipeline, which has been well matured to FEED level previously. We are undertaking an Intelligent Pipeline Inspection run during this phase of the project, that will be important to support our cost estimations. Further pipeline reuse will learn from this process.
What is the capacity (in tonnes of CO2/year) of the storage pipeline?	The Goldeneye pipeline is estimated to have a capacity of approximately 5 million tonnes CO2/ year.
Please advise what pressure class of piping will be installed both on and offshore?	Offshore facilities are typically designed for a selected design pressure. The original Goldeneye pipeline design pressure was 132 barg. Discrete components such as flanges will be selected to the appropriate ANSI or API class. The onshore connecting pipeline connecting the compression plant to the offshore pipeline will be rated to the same or higher pressure as the offshore pipeline. The balance of the onshore pipe work will be designed to the appropriate ANSI or API class. There will be multiple different pressures from atmospheric to pipeline pressures.
How much new subsea infrastructure is required?	The new subsea infrastructure will include a pipeline end manifold, connecting spools, the subsea christmas tree and the power, control and communications umbilical for the well.
Which other nearby pipelines are also suitable for transporting CO2 - what are the key things you look for when choosing a pipeline?	We consider the Atlantic and Cromarty and Miller pipelines to have good potential for reuse for CO2. These pipelines were in active service for periods significantly less than their design life, have been well preserved, were designed for transporting sour gases and have good access to our storage area and other known potential storage sites.
Managing corrosion will be critically important for the pipelines you are using. Can you provide more information on how you will dehydrate the CO2 you are transporting through these pipes?	The dehydration of the CO2 stream will be undertaken by either molecular sieve or TEG technologies. Both are established and well understood technologies that can achieve the dehydration levels required to meet the specified pipeline compositional specification.
What Flow Assurance analysis has been performed on the existing pipelines to ensure they are safe to transport CO2?	OLGA Flow Assurance modelling has been used by our FEED contractor Costain. Also, we will comply with the requirements of the Pipeline Safety Regulations (SI 825/1996) and the BSI ISO 27913:2016 Carbon Dioxide transportation and geological storage - Pipeline transportation systems.
To connect the pipeline to the wells, does the infrastructure require the use of the existing Goldeneye platform, including topsides and jacket?	No, we are not proposing to use any of the existing Goldeneye field development other than the Goldeneye pipeline.
*In what phase will the CO2 be transported offshore?	Liquid phase.
*In an earlier webinar it was mentioned that inhibition for hydrates in the pipeline was required? This suggests water is present which doesn't seem right?	No hydrate inhibitor is required for the pipeline as the CO2 will be essentially dry. The issue is within the well bore where there is a small potential for backflow of water from the reservoir into the well. The project is therefore currently maintaining an option for hydrate inhibitor injection into the well.
*CO2 is very miscible. In the reservoir is there any risk of it coming back into the production wells that are plugged? Does the	The abandoned Goldeneye reservoir is now largely full of formation water with a small residual gas concentration. The formation water flooded the reservoir due to expansion of the aquifer when the gas was withdrawn during the production of the Goldeneye Field. When CO2 is injected it will

method of well closure need to take account of this?	rise to the top of the structure and start to fill the entire closure of the reservoir displacing the formation water back into the water leg. This CO ₂ will come into contact with all of the previous production wells which have all been abandoned in a way that is CO ₂ compliant (ie suitable for this duty).
What companies will you be working with to ensure future pipeline integrity & cleanliness prior to the introduction of CO ₂ and how will the installation of the new subsea manifold at the Goldeneye well location be managed?	<p>The project already has a contract in place for an intelligent pipeline inspection of the Goldeneye pipeline to be undertaken during FEED. This will be an important step in confirming the integrity of the pipeline.</p> <p>The supply chain for subsea manifold installation and future pipeline cleaning, drying, commissioning and maintenance contracts has not been defined yet. If you have an interest, we would suggest registering your company and interest on our potential vendor database: DIRECT LINK TO THE FORM.</p>
CO₂ STORAGE AND STORAGE SAFETY	
How does 30Mt of CO ₂ storage compare with how much CO ₂ is created yearly in the UK?	30Mt is the estimated total storage for the first storage location within the Acorn CO ₂ Storage Site (the Goldeneye store) that we are progressing as part of the phase 1 Acorn CCS project.
When do you expected that all reservoirs will be filled with CO ₂ ?	In relative terms to the UKs annual CO ₂ emissions of over 400Mt this is small. However, the resource within the complete Acorn CO ₂ Storage Licence is expected to be around 150Mt and if we look at the expected resource available in the known offshore CO ₂ storage locations within 50km of the existing St Fergus pipeline corridor there is a massive 23.8Gt of expected CO ₂ storage potential – that is approximately 65yrs worth of the UKs CO ₂ emissions.
What is the yearly injection capacity of CO ₂ ?	In Phase 1 of the project we will inject approximately 800,000 tonnes of CO ₂ per year. Once this capacity is met, further wells will be required.
Is this new well a subsea well?	Yes, the Acorn CCS project will not be using any existing offshore wells or platforms. It will be a new subsea well that is developed.
Were any of the existing wells considered for re-use rather than drilling a new well?	The existing wells at Goldeneye have now all been plugged and abandoned so would be challenging to access. Additionally, the Goldeneye wells were controlled from the platform, which is due to be decommissioned shortly. The new well brings many advantages to the Acorn Project. Unlike the previous hydrocarbon production wells, its location, design and metallurgy have all been selected to maximise the storage resource and allow safe injection of CO ₂ .
Is injection into saline formations part of the future storage resource?	Yes, we do anticipate injection into the wider saline formations in future stages of development. The Acorn CCS Phase 1 project includes a single well, future wells would be progressed to meet CO ₂ storage demand.
*What is it about the geology of the former Goldeneye Field that makes you believe it is such a good site?	<p>The geology in the abandoned Goldeneye Field provides a large proven closure (which will provide a large CO₂ store), it has high permeability (which minimises the number of wells required), it has proven dynamic flow performance (which confirms very good connectivity with the aquifer) and from a well perspective all of the wells within Goldeneye have been abandoned in a way that is CO₂ compliant.</p> <p>Comprehensive reservoir characterisation studies of the Acorn CO₂ Storage Site have been performed which have subsequently been assured in an independent verification report from the British Geological Survey confirming its suitability for CO₂ storage: https://core.ac.uk/download/pdf/33453373.pdf</p>
What kind of studies and partnerships have you used to	The Goldeneye structure has undergone significant subsurface characterisation by Shell UK during the abandoned field's production life,

<p>ensure that the reservoir isolated is safe to store CO₂ and that there won't be leakages from the site?</p>	<p>from previous CCS projects and as we have been developing the Acorn Project. The work builds on studies assured by the British Geological Survey and also the wealth of subsurface and technical experience brought by the study partners. All of these studies conclude that the geology of the Acorn site is suitable for the safe storage of CO₂.</p>
<p>Are there any challenges/ concerns about existing well abandonments that could provide a leak path for the injected CO₂?</p>	<p>Existing well abandonment is one of the key factors we have to consider in verifying the suitability and integrity of the Goldeneye field structure to be a good CO₂ store. The original exploration and appraisal wells in the Goldeneye storage structure, which we are targeting during Phase 1 of the project, has been subject to detailed study by Acorn and during previous projects (such as Peterhead CCS). More recently, Shell UK plugged and abandoned the development (production) wells in this location with CCS in mind. The abandonment of these development wells has also been subject to a further assessment and thus we have a high degree of confidence regarding all the well abandonment in this location.</p>
<p>Will you monitor the CO₂ injected into the reservoir to prove that it is going where it is meant to and not leaking? If so, how?</p>	<p>Yes, for us to be awarded our CO₂ storage permit we require a Measurement Monitoring and Verification plan to be submitted and accepted by the Oil & Gas Authority. This will include a range of survey techniques to monitor the CO₂ within the store and at the seabed including seismic surveys and Remote Operated Vehicle photographic surveys.</p> <p>We are building on lessons learned from other CCS sites and a recent study of the Goldeneye area by STEMM-CCS, which included the evaluation of some monitoring techniques.</p>
<p>*At what point will measurement and allocation be considered?</p> <p>What challenges are foreseen in CO₂ measurement and integrity management given that the current infrastructure is designed in for hydrocarbons?</p>	<p>Metering, including fiscal, allocation and ETS requirements, are already being considered. A full chain metering philosophy will be produced in the coming months.</p> <p>The challenges include measurement of low pressure flue gas /CO₂ gas, liquid phase CO₂ measurement and subsea single phase measurement of liquid phase CO₂, and compositional monitoring of CO₂ for detection of levels of impurities.</p>
<p>What material selection in well bore construction needs to be considered to ensure lifelong integrity and zero corrosion issues for carbon storage wells?</p>	<p>The main issues in material selection within the well are:</p> <ol style="list-style-type: none"> 1) To select corrosion resistant alloys (CRAs) in locations where there is potential for moisture to enter the well bore such as during extended shut-in periods 2) To select materials which can tolerate the potential low temperatures which could be experienced in the well bore during certain well operating scenarios
<p>Do you anticipate specific challenges associated with injection into a depleted gas field (e.g. Joule Thomson cooling at sandface)? If so, how will this be managed?</p>	<p>The management of the Joule Thomson effect and the behaviour of dense phase CO₂ throughout the system is an important factor in designing the project. It is mitigated in the management of pressures and injection rates through the well design.</p>
<p>What is the longer-term plan for the CO₂ captured in the store areas? Not just for 100 years, but for 1000 years' time?</p>	<p>The CO₂ once injected will remain within the geological store, deep underground. We have undertaken modelling simulations out to a 1000 years to ensure the CO₂ remains in situ.</p>

What is the projected end of field life when all reservoirs are deemed full?	The end of life of the development is entirely dependent on the rate at which CO ₂ is injected and this will depend on the number of CO ₂ customers and the volume they wish to store. We anticipate the store may inject for up to ~25 years.
BUILD OUT	
Have you engaged with or do you have plans in place with the petrochemical/chemical companies based in Grangemouth for the stage of the project that involves them?	Pale Blue Dot and the other Acorn parties are all part of NECCUS which is leading the initiative to form a low carbon industrial cluster in Scotland. NECCUS also includes industrial emitters within Grangemouth and we do have ongoing dialogue with these parties.
Will there be any option made available for other large generator sites to tie into this project? In particular, I am thinking about capturing CO ₂ from Peterhead Power Station?	Yes, the intent of the Acorn Transport and Storage hub is to be available to connect in any industrial emitters in Scotland and beyond. Peterhead Power Station is a key electricity generation site in the region and in close proximity to St Fergus so the potential for connecting any future Carbon Capture process that SSE look at with the Acorn Facilities is definitely there.
It sounds like most of the technology to deliver Phase 1 of the project is well understood. Are there any gaps or areas which need accelerated development or opportunities for new technology in future phases?	Yes, we are looking to progress all the Phase 1 project with well understood technologies. In future phases we may pursue technologies which are currently in development, for example, renewable power for a local control buoy option at the well.
The Acorn process conceptually appears to involve import of 'gas' for processing followed by 'export' to the Acorn CO ₂ Storage Site. Is the intent to measure 'import' and 'export' quantities of gas?	The Acorn Project hopes to create a CO ₂ transport and storage hub in the north east of Scotland. As the phase 2 projects develop then captured CO ₂ from various locations around the UK and Europe could be imported to St Fergus. It is anticipated that the majority of the CO ₂ processing will be done at source so that supplies of CO ₂ to St Fergus meet the required storage specification. For both commercial and legislative reasons the effective measurement of CO ₂ through the full chain will be required.
ACORN HYDROGEN	
Is the aim solely to generate hydrogen for input into the grid or are you exploring the possibility of producing ammonia as a fuel?	The Acorn Hydrogen project is at an earlier stage than Acorn CCS. We are currently working through our Concept Select phase for Acorn Hydrogen and reviewing several route to market options. Two of these involve haulage by a) road tanker / tube trailer and b) ship. In both cases hydrogen could be converted to ammonia which is easier to ship in bulk where a pipeline option is not available.
If you are blending hydrogen into the national gas grid, does this not reduce the energy released from the gas, diluting volumes to get the same heat? Will this therefore result in any clear CO ₂ reduction?	On a unit volume basis, the heat energy of hydrogen is less than natural gas. Thus, a larger volume of hydrogen is required to deliver the same energy / heat output as natural gas. However, there will be a clear and significant CO ₂ reduction given that unabated combustion of natural gas releases the CO ₂ at the point of use whilst hydrogen releases no CO ₂ upon combustion. The key here is that where hydrogen is produced through the reforming of natural gas the CO ₂ must be permanently separated from the atmosphere using CCS.
Given how much smaller hydrogen molecules are compared with Natural Gas how are leaks mitigated?	Hydrogen is a hazardous substance which requires careful control and management to ensure it is used safely. Whilst there are some specific characteristics of hydrogen (e.g. small molecule size), safe operation of hydrogen is not new. Hydrogen has been used successfully in industrial processes for over a century. Hydrogen is also currently being transported through 1000s of km of pipeline around the world. As such the successful containment and safe usage of hydrogen is understood and proven with

	'hydrogen ready' equipment commercially available to address these characteristics.
RELATIONS WITH OTHER PROJECTS AND GOVERNMENT	
Much of this project has similar scope and ambitions to Norway's Northern Lights project, especially the pipe to storage infrastructure. Is there is collaboration between the two projects to share and benefit from mutual learnings?	Yes, we have a good relationship with the Northern Lights Project and we have been very supportive of each other. We fully expect this relationship to continue as both projects progress.
There are other regional developments in the UK looking at developing CCS hubs like Humberside and Teesside which were referenced in your first slide as potential providers of CO2. If those other regional developments go ahead, does that in anyway jeopardise the economic viability of Acorn?	No. It is really important for the UK's Net Zero targets that we see all these regional developments or CCS clusters progress. We are keen to take a collaborative approach between the different clusters in UK and Europe as well to reduce costs associated with CCS overtime and to ensure that holistic solutions are found. The reality is that the quantity of CO2 that requires management is significantly greater than just the clusters being progressed in the UK and The Acorn project will be able to support a wide range of potential CO2 sources in the future.
Do Pale Blue Dot and Acorn intend to conduct research and issue grants to solve big research problems in North Sea CCS?	Pale Blue Dot Energy is a private organisation and so it is unlikely we will be issuing research grants, however we are really proud of the successful collaborations that we have had in the past with a number of Universities and of the supported grant funded activities that we have used to progress the project, such as the ACT Acorn project. We have been part of many multidisciplinary studies with research and industry partners - a selection of these have been put into the public domain and have been the subject of peer reviewed scientific papers.
How critical has the role of the Scottish Government been in advancing CCS's role in achieving NetZero and what would you say is the role going forward?	The Scottish Government have been long term supporters of CCS and are very supportive of the Acorn CCS project - as you can see from the quote from Minister Wheelhouse on the Acorn CCS Townhall website.
*It was mentioned that a multi-cluster group meets regularly, it would be good to understand who is hosting these meetings, and if the group could be contacted, to make sure efforts are not being duplicated in other projects-sharing information etc.	A number of the UK's carbon capture and storage project representatives meet regularly in a multi-cluster meeting to provide updates and share learnings from their projects and identify areas for collaboration. All of the clusters receive a blend of public and private sector funding, so achieving value for money is a common objective. This effort is supported by the Industrial Decarbonisation Research and Innovation Centre (IDRIC) which is conducting research on behalf of the UK to support all of the clusters and other industrial decarbonisation projects.
FINANCE AND MODELLING	
How is this project financed?	Acorn CCS is currently funded with grant support from the Department of Business Energy and Industrial Strategy, and from the EU Connecting Europe Facility (which the Acorn project is eligible for as a EU Project of Common Interest). This grant support is match funded by our industry partners.
What economic framework needs to be in place to enable the second phases of the project?	Each of the future phase elements of Acorn will be progressed through their own project maturation process to achieve Financial Investment Decision. The likely economic frameworks for each project will be different, but they all will rely on viable business models supported by the UK Government.
Could you share what kind of commercial models you are looking into for the detailed phase of the CCS project? On what basis	The nature of the commercial model is subject to ongoing dialogue, so we cannot discuss this publicly yet.

will carbon producers pay for the processing and storage of the carbon? How will it all be measured and what cost per tonne of CO2 are you using as a basis for the project economics?	However, it is worth noting that the UK Government (BEIS) has recently (August 2020) issued its response to CCUS business model consultation and it is now available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909706/CCUS-government-response-business-models.pdf
Does CCS offer a financial gain for stakeholders by reducing EU-ETS reporting limits? Generators of CO2 will not need to report the tonnage of CO2 that is exported offshore?	CCS as a process is explicitly included within the EUETS. Emissions which are captured and stored are not considered to have been emitted to atmosphere. Equally, should there be venting/leakage from the CCS process, this needs to be calculated and declared.
What are the roles of the different partners on the project?	Pale Blue Dot is the lead project developer on Acorn and to date we have benefitted from both financial support and technical expertise from our industry study partners - Shell, Total and Chrysaor. Commercial discussions are ongoing about the future makeup of the entity that will take this project into construction and operation.
ENVIRONMENT	
Do you see this project extending the lifespan of fossil fuels past 2045 if the plants created rely on LNG to create the hydrogen?	For current UK fuel, heat and power requirements, the Acorn Project does not intend to extend the life of fossil fuels but instead aims to establish a short to medium term bridge to address emissions from industrial and other hard to decarbonise sectors ahead of renewable forms of energy and their associated routes to market and intermittency solutions being deployed at scale.
TIMELINE	
What gate approvals does the project need to get through before it will be sanctioned to begin construction? Does this differ to other UK CCS projects?	This project is following a normal major project development process. The next step after the Front End Engineering and Design (FEED) activity that we are currently undertaking is Final Investment Decision. All the current UK carbon capture and storage projects will have to factor in the requirement for Government support to this new industry as an extra dynamic in the project development process.
When is the first injector well scheduled to be drilled?	The project is looking to achieve first injection of CO2 in line with Government targets to have CCS infrastructure operational by the mid 2020s. This means the first well is likely to be drilled between 2022 and 2024 depending on rig availability and a number of other factors.