

XROTOR

X-shaped Radical Offshore Wind Turbine for Overall Cost of Energy Reduction

D7.3

Year 2 Report on Workshop Design Recommendations

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X-ROTOR Consortium



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About X-ROTOR

X-ROTOR: “X-shaped Radical Offshore wind Turbine for Overall cost of energy Reduction” is a Horizon 2020 funded project which aims to develop a disruptive new offshore wind turbine concept.

The X-ROTOR project is led by University of Strathclyde (UK) in partnership with Norwegian University of Science and Technology (Norway), Delft University of Technology (Netherlands), University College Cork (Ireland), Fundacion Cener National Renewable Energy Centre (Spain) and GE Renovables España (Spain).

As the effects of climate change are becoming ever more visible, Europe has raised its target for the amount of energy it consumes from renewable sources from the previous goal of 27% to 32% by 2030. Offshore wind energy can play a key role in achieving the EU target and contribute to the required 40% reduction in CO₂ emissions. However, to achieve the previously mentioned targets the cost of offshore wind must be reduced. The X-ROTOR concept provides a direct route to drastically reducing both capital and operating costs of energy from offshore wind.

The project runs for three years from January 2021, during which time, the concept will be developed through a holistic consideration of technical, cost, environmental and socio-economic impact aspects.

If proven feasible, X-ROTOR will, as a disruptive new offshore wind turbine concept, create new opportunities for the European wind energy industry and play an important role maintaining the EU’s position as global technological leader in renewable energy, reducing greenhouse gas emissions and decarbonising the EU economy.

For more information see <https://xrotor-project.eu>

Description of the deliverable and its purpose

This deliverable reports on the workshop engagement used as part of the X-ROTOR project. It provides a summary of the feedback received from both Group 1 and Group 2, as well as recommendations for the development of the X-ROTOR concept.

List of acronyms and abbreviations

ASD	Asynchronous Structured Dialogue
DoA	Description of Action
GHG	Greenhouse Gases
IET	Islay Energy Trust
LCOE	Levelized Cost of Electricity
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
UCC	University College Cork
UoS	University of Strathclyde
WESC	Wind Energy Science Conference
XRC	X-ROTOR concept

1 Introduction

An important element of the X-ROTOR project is the capture of stakeholder perspectives to feed into the design and development process. This is being realised through engagement with two key stakeholder groups, namely: prospective host communities whose work and lives would be directly affected by potential deployment of such technologies, and the wider wind energy community who have a professional interest in the development of novel turbine designs such as the X-ROTOR concept.

The first group, the prospective host communities (societal stakeholders), are being engaged to better understand their practices, attitudes, and values of relevance to the novel wind turbine design, and to examine how – from their perspective – the X-ROTOR design compares with conventional turbine designs

The second group, the wider wind energy community (industry stakeholders) are being engaged to ascertain their opinions and preferences on design (and related) issues including: turbine rating, siting, support structure (fixed/floating), shore-side facilities, installation requirements and operations and maintenance (O&M) practices.

In the first year of the project these groups had to be engaged remotely due to the impact of the COVID-19 pandemic and the associated travel and social interaction restrictions. The stakeholder workshops were therefore reimaged as asynchronous structured dialogues following the modified Delphi-panel approach after Revez *et al.* (2020). As outlined in D7.1, this first year of engagement was intended as a soft launch, with the aim of strengthening the project long-term through fostering meaningful links and encouraging the development of a genuine relationship between the project officials and the stakeholders.

Group 2 had been mainly concerned with financial and practical issues and not so concerned with host community or environmental impacts.

This report outlines the approach taken for the stakeholder workshops and related engagements in the second year of the project. The intention was to build on the activities undertaken in year one replicating the approach where it made sense and amending where it added value to the process.

2 Focal Groups

2.1 Group 1 Societal stakeholders

2.1.1 Background

In a previous report (D7.1), Deeney & Dunphy (2021a) outlined the approach and methods to be used within the project to identify and convene stakeholder communities. Over the course of the project, it is planned to involve c. 50 people (from five different host communities and at least three different European countries and comprising at least 30% female) in these societal stakeholder engagements – this lends itself to capturing a diversity of opinion, insights from which will benefit the project.

D7.1 envisaged the recruitment and engagement of a principal host community¹, which will be the focus of the engagement. This would be supplemented by less intensive engaging of a further four satellite (or secondary) communities who will present opinions and ideas from other geographical areas, which would be recruited on a phased basis. This arrangement was decided upon as it means it is possible to focus the effort and resources of the research on a host community which is most relevant, while also listening to other communities.

It was planned that all engagement to be remote in year one (due to the pandemic) followed in subsequent years by face-to-face engagements of the principal community if circumstances permitted. The engagement of the secondary communities was to remain primarily remote for practical reasons (but perhaps supplemented by in person engagement where opportunities arose).

In the first year, stakeholders from three communities in Ireland, Spain and the United Kingdom were engaged in an asynchronous structured dialogue. These engagements provided insights on the participants' perceptions and attitudes relevant to the design of the X-ROTOR off-shore wind turbine concept. It was evident that their principal concerns were associated with the environmental impact of offshore wind farms and with the impact on fishing. It was therefore considered important that these topics be investigated further in the second-year engagement.

As the University of Strathclyde is leading the development of X-ROTOR, a Scottish coastal community in a small town or island which has a good variety of people living close to a proposed potential site for testing or deployment. Accordingly, Isle of Islay in Scotland, was selected as the primary community and it was here that the second-year engagement focused, with an in-person workshop held in late 2022.

2.1.2 Isle of Islay

As described above Islay was chosen for the focus group for several practical reasons. It is near to the University of Strathclyde and would be a possible location for testing of the X-ROTOR. The government of Scotland has just leased seabed off the northeast of Islay for offshore wind, and therefore the people are aware of and engaged in offshore renewable energy. Central to this engagement is the Islay Energy Trust (IET) which has a membership of several hundred local people. The IET operates a wind turbine in the centre of the island which is owned by the community. Islay is an island which, like many islands, experiences

¹ The principal community was intended to be one which would be likely to eventually play host to X-ROTOR technology whereas the satellite communities would be secondary choices for deployment of the technology.

intermittent power outages, the people are therefore more conscious of the benefits of having electricity than one might expect of people living in a city who would take a constant electricity for granted.

Islay is also one of six islands chosen by the Scottish government to be part of programme that aims for the islands to be carbon neutral by 2040. The importance of this designation, and one of the reasons Islay was selected to be our host community in Year 2 of the X-ROTOR project, is indicated succinctly by a statement from Rural Affairs and Islands Secretary Mairi Gougeon when she spoke before Parliament saying:

“Scotland is at the forefront of climate change mitigation and adaptation at the global level, and I’ve always believed that our islands will contribute significantly to the country’s net zero commitment. I was pleased to announce at COP26 that we are taking this ambition further than the original commitment, now aiming to support six islands in their journey towards carbon neutrality by 2040. This project is another testament to Scottish islands being in the vanguard of innovation, leading the way in the journey to net zero while supporting other areas across Scotland” (Scottish Government, 2022, p. 1).

The result of this designation for Islay is that it in effect makes the small island a microcosm for the global energy transition writ large. Islay’s economy is largely based on the whisky industry (agriculture and fishing are the two other predominant economic drivers). Many residents feel that this industry is exploitive (see focus group remarks) and that their continued growth (9 distilleries in 2019 -- (Derbidge, 2019), 12 now, 3 more under construction) will make it even harder for the island to make its emission goals. These distilleries require a lot of thermal energy which is currently being met by fossil fuels².

The distilleries are not taking the lead on the de-carbonizing efforts, the people are. So this island of roughly 3,000 people (Islay.com, 2022) will have to find a way to convince industry to supplant fossil fuel consumption associated with the distilleries with either green electrical heat pumps or locally produced biofuels (or possibly synthetic fuel made with green hydrogen). In much the same way as populations all over the world have to make sacrifices to meet emission standards necessitated by the fossil fuel dependency of exploitative economic actors, Islay not only has to confront increasing emissions but must confront issues of environmental justice as well. Their approach has been to establish the Islay Energy Trust (a community energy organization) and advocate for energy democracy. The X-ROTOR concept may help them reach their goal of carbon neutrality by 2040 and that is one of the reasons we chose Islay for the host community.

Unlike other Group 1 participants, the residents of Islay are not particularly concerned with the additional employment offered by offshore wind. Islay has a thriving distillery industry and has a labour shortage. It also has stress on its infrastructure and so does not see an immediate need for jobs from new offshore wind developments. The people are however aware that if an offshore windfarm lands its energy on the island before transmitting it to the mainland grid, then they have increased energy security.

2.2 Group 2 Industry stakeholders

The wider wind community were also planned to be engaged remotely at first. followed by a combination of physical and online meetings coinciding with suitable conferences to facilitate participation (Deeney &

² Estimated to be in the region of 340 GWh/yr

Dunphy 2021a). This ‘industry’ community is not defined by location but rather is based upon the individuals’ connection to the wind power industry, they are therefore consequently very geographically dispersed. The target engagement over the life of the project was similar in scale to group 1, with a target of c. 50 participants from at least five sectors and of which the members are at least 30% female.

The objective of this engagement with the industry stakeholders is to identify factors influencing purchasing decision for turbines in addition to Levelized Cost of Electricity (LCOE) most commonly cited. While D7.1 acknowledged that the face-to-face engagement would perhaps be the ideal mode of engagement, this was not possible in the first year due to the COVID related restrictions and is in any event difficult because of the wide geographical dispersal of the possible participants.

We noted in reporting year-one engagement with group 2 that it was not possible to utilise personal invitations to prospective participants at conferences and trade fairs, which under normal circumstances would have been a primary route of recruitment. Nevertheless, it was possible to engage remotely with some of the target group as reported and analysed in D7.2 (Deeney & Dunphy 2021b). In this second year of engagement, reaching this cohort has proved more than a little challenging, which we expect is due to remote engagement no longer being a novelty³ for these stakeholders while face-to-face engagements were still complicated from post COVID reluctance and residual restrictions. Underlying these difficulties is time pressure for members of the energy community and the lack of any immediate benefit for their businesses. However, some remote engagement proved possible⁴, and this was supplemented by informal engagement at conferences and seminars, which proved quite useful.

3 Methodology

3.1 Societal Stakeholder (Group 1) Engagement

3.1.1 Focus group as a research tool

An in-person focus group was held for the primary host community on the Isle of Islay, Scotland during the month of November. The workshop was organised and realised by a team with members from both University College Cork (UCC) and the University of Strathclyde (UoS).

In the first year of X-ROTOR a survey tool was used with the group 1 participants. Surveys are great tools for getting at what people may think or feel about a certain topic, but some things may be too new or novel for most people to have formed an opinion about them. This is where a focus group can be useful. These small, safe settings allow people to explore different perspectives on an issue and do a better job of revealing detailed information and providing thoughtful insight (Gibbs, 1997).

³ During the COVID pandemic we noticed a phenomenon whereby the travel restrictions and lockdowns actually worked in some respect to help engagement with certain previously hard to reach people. These people would have previously been extremely busy, perhaps travelling a lot and otherwise protected by a screen of administrative assistants – in some instances became more available for engagement and through some reason (whether boredom or curiosity) more interested in talking.

⁴ While engagement to date has been quite useful there is a need for a ramping up on numbers in 2023 to better inform the project design process and to reach the targets we have set ourselves.

For participants to feel comfortable and for the researcher to explore some issues in depth, these groups work best if the participants are of a relatively homogenous group and if the questions are few in number (Morgan, 1996). As regards the participants, this should be a group of at least five people and no more than ten (Masadeh, 2012). This will allow for some diversity of opinion while also allowing for each person ample time and space to express themselves. The homogeneity of the group is important because it allows the researcher to focus on how a planned programme, policy, or project will affect a specific demographic or subset of the population. It also allows for the participants to feel a comfort level in the shared experiences of their fellow participants (Freeman, 2006). It will usually take more than one focus group for the results to be valid, most often three or four (Masadeh, 2012).

3.1.2 Organisation

The timing and location of the focus group was decided in consultation with the Islay Energy Trust. This avoided arriving on the island at the same time as other commercial bodies which may cause confusion to the people. The venue was a community hub (Ionad Chaluum Chille Ìle) used for local activities and was, therefore, not aligned with a specific business interest or political opinion on the island. Arrangements for refreshment were made with a local provider.

3.1.3 Recruitment and organisation

As described in section 3.4 of D7.1, a variety of methods were used to raise awareness about and recruit participation in the focus group. This included: advertising in the local newspaper *The Ilead*; social media messaging; engaging in local forums; using gatekeepers (e.g., local clergy, politicians, Islay Energy Trust); snowball (referral) recruitment; etc. In addition, A communication campaign was implemented targeting community organisations on Islay with customised email requests for their participation. Organizations contacted included those representing fishers, crabbers, senior citizens, the disabled, environmentalists, people of faith, economic developers, etc. These outreach activities directed people to the project website's registration page for the focus group. This explained the purpose of the focus group and allowed people to register online.

Fifteen participants were recruited for the workshop which enabled three sub- groups to be formed, with a member of the UCC/UoS research team serving as a facilitator in each one. The element of homogeneity pulling everyone together is that they were all members of the small coastal community of Islay and they each had an interest in learning about new renewable energy ideas that might work for their community.

3.1.4 Meeting structure and discussion prompts

The discussions were introduced briefly and guided by the three team members present⁵. Sound recordings were made, which subsequently informed this report.

As alluded to above, the community engagement meeting was divided into two major parts. The first part involved open discussions. We had three groups operating simultaneously and we had three areas of discussion around which we elicited comments. Following the advice of Krueger, (1997) and Krueger & Casey (2015), we limited the discussion areas to three, namely: their feelings on climate change; their opinions

⁵ Peter Deeney(UCC); A. Luke Smith (UCC); Nicola Baxter (UoS)

about offshore wind energy development; and stories about their lives near the ocean. We actively sought input from every member at the table on each topic.

To get the discussions started, we listed a number of statements on the presentation screen for this session that the participants could use as a springboard to discuss whether they agreed with the particular prompt or not. This activity was not structured to talk about each of the prompts, if any of them, rather it was intended to help participants think of discussion points if they did not already have an idea of what they wanted to say. We did receive positive feedback from a few participants regarding these prompts for their encapsulation of different perspectives on the issues at hand.

Figure 1: Climate Change and Energy Prompt

Tell us what you think about climate change – the statements below are just examples of different perspectives. You do not need to embrace any of them, or you can believe more than one. **We want your thoughts**

- Climate change is a serious problem
- Scotland needs to generate more electricity
- I use more energy now than I did ten years ago
- Global warming is a hoax
- Energy companies are trying their best to reduce carbon emissions
- Energy companies are a big part of the problem and will not change
- People are the problem. Energy companies are just meeting our demand for electricity
- The climate problem is systemic and needs system-wide changes. Individual humans are not to blame and cannot fix the problem in isolation
- Global climate change cannot be stopped
- Environmentalists need to concentrate on more direct issues like drinking water and air quality
- Global climate change has to be stopped and we have the ability to do it
- I am less concerned with climate change than I am about bringing jobs and income into my community

Figure 2: Offshore Wind Energy Discussion Prompt

Same thing here. Below are just some statements we have heard about OWE. Please talk about any of these, all of these, or add something new

- Offshore wind farms are good
- Offshore wind turbines are a serious problem for fishing
- Offshore wind turbines damage leisure and tourism
- Offshore wind turbines disturb wildlife
- Offshore wind can create jobs for people living along the coast
- Offshore wind turbines are a problem as they kill seabirds
- Offshore wind can generate electricity cheaply
- Offshore wind turbines are noisy

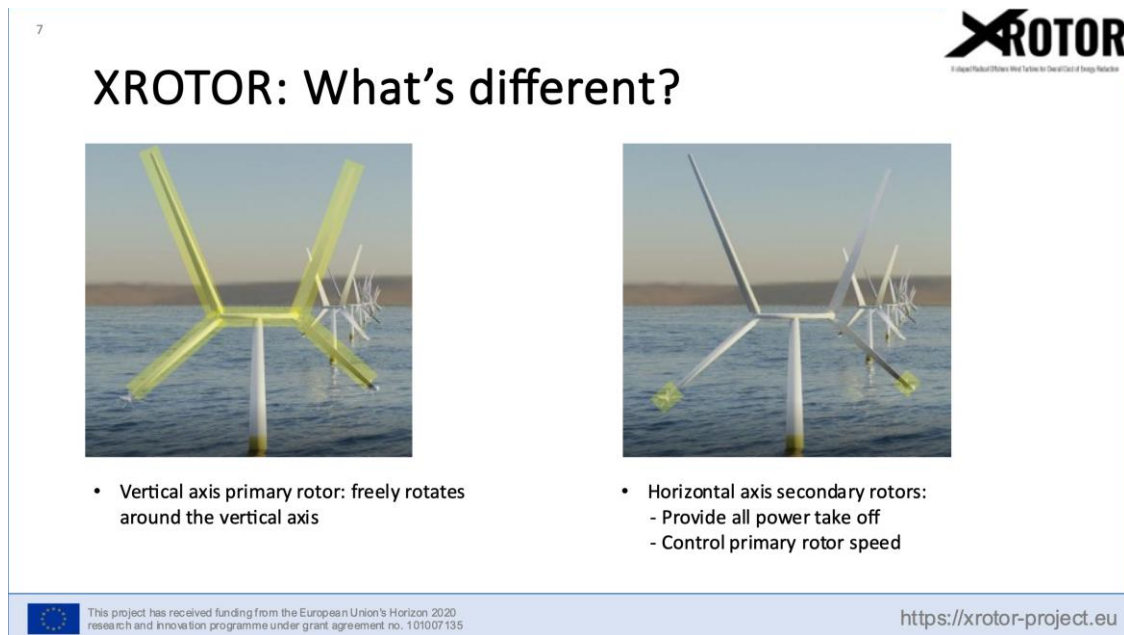
For the third part of the discussions, we wanted the participants to talk about their relationship with the ocean. Though at first this might seem to be irrelevant to X-ROTOR, there is a theoretical reason behind this approach. Though the not-in-my-backyard (NIMBY) idea is often cited as a reason people object to renewable energy development close to where they live, most scholars feel this pejorative explanation does not get to the root of why people may favour renewable energy in general but object to it in their neighbourhood (Devine-Wright, 2011). A theory which has gained some ground in offering a more workable approach is the social representations theory (SRT). The scholar most closely associated with this idea is Serge Moscovici, though many others have written on it. Basically, the use of this approach is that it grounds opposition to new renewable energy projects not in a derogatory rendition of peoples' motives, but as a natural product of the way people incorporate change. What SRT proposes is that people come to accept the new idea through a process of making the unfamiliar familiar. This is accomplished through a process of how they represent their reality not only to themselves, but maybe even more fundamentally in how they represent their reality to each other (Moscovici, 2001). By eliciting the participants' stories of their lives near the sea we hope to gain a sense of how they represent reality emotionally, how they represent what is emotionally important about the reality of their lives on the coast. If we know that, we may be able to get an idea of how to represent X-ROTOR in a way that is consistent with their own perceptions about what is most important to the participants about living near the sea.

Figure 3: Sea Stories Prompt

In this session of the workshop, we really want to get a sense from you of what it is like to live and work near the sea or even on it. Your life is rich with stories that at least touch upon some aspect of what it is like to live, work, and play in and around the ocean. Will you pick one of these stories and share it with us? It doesn't have to be anything fantastical, dramatic, or adventurous; just choose a regular old story that kind of embodies or exhibits in some way the emotional connection you have with this place where you live. Details really make a story like this, so try to include as many as you can remember.

The final part was concerned with the X-ROTOR design. The concept was presented through a very visual presentation and through use of a scale model. Following which there was a very lively two-way discussion (c. 45 minutes) from which a great deal of insight was garnered.

Figure 4: Slide from the X-ROTOR design presentation



3.2 Industry stakeholders (Group 2) Engagement

In addition to the ongoing remote engagement participants (including on the survey, the analysis of which is reported in D7.6 on attribute matching), several meetings of wind energy professionals were used to provide opportunities for informal (albeit structured) dialogue. The first such meeting was the Wind Energy Ireland Annual Conference in Dublin in April 2022. The UCC team presented a poster about X-ROTOR project⁶; this proved an ideal opportunity to engage with some of the hundreds of delegates which attended and capture some of their thoughts on key attributes for wind turbines. While there were industry respondents, this conference provided an opportunity to engage with policy makers, politicians⁷ and wind developers. There were approximately 400 delegates at this, the largest wind energy conference in Ireland. This facilitated informal discussions with developers who were interested in new technologies such as X-Rotor but not keen to risk investing in them until they had been proven.

A second meeting was around the NUI funded End-of-Life Issues for Wind Farms hybrid conference hosted by University College Cork at the end of May 2022. This event attracted an international participation including representatives from the wind industry, regulators, government agencies and researchers. It dealt with issues around the circular economy, the difficulties of recycling wind turbine components. The conference proved an ideal opportunity in a semi-formal setting to engage with, and elicit opinions and perspectives from, a range of wind industry actors on issues around the X-ROTOR concept. As one of the authors of this report convened this conference, this facilitated good discussions with key attendees both during and at the fringe of the conference.

⁶ Deeney, P. and Dunphy N.P. (2022). 'Stakeholder Engagement for a New Offshore Wind Turbine', Wind Energy Ireland, Dublin. 13 & 14 April.

⁷ Including Mary Lou McDonald, T.D. leader of the opposition in the Dáil (Irish lower house of parliament).

The third meeting was the Meitheal na Gaoithe Irish Wind Farmers Association Annual Conference held in Kilkenny, Ireland during October 2022. Most of the attendees were owner/developers and representatives of service providers to the wind industry. There were also researchers and academics. A team member presented a poster at this conference. The focus of the conference was on government interventions in the electricity market and state aid rules within the EU. It was possible at this conference to discuss concerns with owner/developers. Most owner/developers were happy with the electricity market but were conscious of future price movements and the likely reduction of the market price of electricity as more renewables came online. While this was not an immediate concern given the war in Ukraine and the consequent increase in gas and electricity prices, it was a concern for the future of the wind industry.

4 Results

4.1 Societal stakeholders (Group 1) findings

The first result was that there had been a very strong response to the invitations sent out to the community. This indicated a strong interest in offshore renewable energy. Participation level was very good. 15 people from the local community attended the focus group meeting and were willing to express their ideas and listen to others including the presentation on X-Rotor. Among the attendees were a local councilperson, one of the Argyll-Bute council members, an engineer with a PhD, another engineer early in his career, the editor of the local paper, a board member of the Islay Energy Trust, a TV reporter from BBC-Alba, an oyster farmer, the head of a local retirement organization, an environmentalist associated with Scotland's Carbon Neutral Islands initiative, and a number of curious citizens.

4.1.1 Climate change – Consensus topics throughout the three focus groups

Across the groups it was clear that the participants believed in the reality of climate change. People said that they had seen evidence such as retreating glaciers in Iceland and changes in the timing of weeds, butterflies and frogs locally. Also, it had been a long time since there had been snow on Islay and there was a shortage of mackerel and lobster that they attributed to climate change and not overfishing. There was also a sense that the distilleries needed to do more. Only one of them claimed to be eco-friendly, but with all the transport to and from the mainland most thought even this was just an example of greenwashing.

4.1.2 Climate change – Divergent topics

Focus Group C expressed a pessimistic view of the ability of society to successfully combat climate change. One member said we had 200 years of backlog to claw back, and another said that the real problem was China and that Scotland was really small fish in comparison, much less Islay. There was a suggestion of one way to address climate change. This speaker suggested that we should institute a labelling system on all products similar to the product's nutritional information label letting people know the lifecycle CO₂ emissions associated with the product's sourcing, manufacturing, distribution, consumption, and disposal. Another member mentioned that the Greenhouse Protocol which measures these emissions, needs to be simplified for consumer understanding.

4.1.3 *Offshore wind energy – Consensus topics*

A majority in each group favoured offshore wind energy development. For Islay in particular, it was thought that a wind farm off the coast would help stabilize their local electricity supply which often fails as they are at the end of the distribution line and storms wreak havoc on the island's fragile infrastructure. Noise was not thought to be an issue since the turbines were miles offshore. Bird mortality was not thought to be a problem either as most thought birds were too smart to fly right into a wind turbine. Some members suggested painting the turbines a colour that would warn birds with one person saying they had read that painting red stripes on the blades kept the birds away. One of the focus groups even had a representative from the Loch Gruinart wildlife preserve which is on the northern Atlantic coast of Islay and there is no record that he mentioned bird mortality issues with wind turbines. This absence of concern for bird deaths follows the results of last year's survey where respondents expressed the same sentiments. Another surprising view among the groups was that they did not think the seascape would be obstructed by offshore wind turbines.

Many people expressed a positive perspective on viewing wind turbines from shore. A person in Group A said they were aesthetically pleasing while another who had lived near a large wind project off the coast of Norfolk said she liked the way the sun glittered off the blades. Another said that the seascape is boring, and it would be nice to have something to look at. A person in Group C said that they would like to see the turbines and not have them too far offshore. He said it would be a visible sign of how forward-thinking his community was. There was one person in Group C who said that they had moved here for the beauty and really would not like to see the turbines anywhere that would detract from the beauty of the landscape or the sea.

4.1.4 *Offshore wind energy – Divergent topics*

There was one person in Group C who was especially concerned with the end-of-life issues with these turbines. He felt that there was not a sufficient guarantee that developers would not just leave the turbines where they were even after they had outlived their usefulness. Though he did not object to seeing the turbines he also did not want them to be just dumped in the sea when the energy company was done with them. Luckily, one of the team was able to share some of his research on the multiple uses for discontinued wind turbines during a coffee break. A member of Group B said that offshore wind energy development would lead to increased heavy cargo traffic on their fragile roadways. He also mentioned that in the development of Shetland's offshore Cambo Oil Field, Shell paid to have the roads fixed.

4.1.5 *Participants' Experience of Living by the Ocean*

In Group A, a sport fisher lamented that there is not the diversity of fish that there used to be, but perhaps the presence of an offshore windfarm off the coast, the banning of dragnet fishing vessels in those waters could increase the diversity of his personal catches.

In Group B, the discussion of sea stories elicited the idea that the ocean was a place of leisure and activity for tourists. Some participants said it was hard for them to envisage living far from the sea.

Islanders pointed out that the ocean connected them to other islands and to a wider community west of Britain stretching from Shetland to Brittany. They were aware that language was a shared aspect of life along

this ocean highway⁸. Many years ago, it was as convenient for people on one edge of Islay to trade with Co Antrim (N. Ireland) by sea, as it was to trade with the far end of Islay as the roads were not good. Today the sea is perceived as a barrier. Currently there is some difficulty getting between the islands, for example the Ballycastle – Campbeltown route is not operated now and there is some difficulty getting space on the car ferry from Islay to the Scottish mainland.

In Group C the facilitator opened with a story of his life growing up on an island. He said that watching a storm roll in from over the ocean left a distinct impression of the power of the ocean and the great respect that engendered in him as a young man for the sea. After rendering his story, the facilitator had to attend to some logistical issues with the BBC reporter and to help Ms. Baxter get ready for her presentation. Upon a participant returning to the table after a comfort break, one person summed-up the discussion that occurred in his absence by stating that others at the table shared the facilitator’s respect for the power of the ocean. He said “we have more respect for the ocean because you’re exposed to it on a regular basis. You see what can happen. Accidents happen. People living in urban environments aren’t going to understand that at all.”

4.1.6 Off Topic Issues Raised by Participants

Participants wanted to express their mild anger they felt as they experienced powerlessness in the face of changes on Islay. They listed the growing influence of new distilleries on the island which were using all the labour resources making it difficult to get any workers for other industries or businesses. They also felt there was a lack of devolved power from the local, national and UK government to Islay. It had become very difficult to find housing on the island, meaning that many people born on the island had to leave to find somewhere to live, even if they had a job on the island. In the face of the new X-Rotor, one participant put it bluntly and said, “What’s in it for us?”. This expressed the frustration felt by islanders who find that their fragile infrastructure is pushed to breaking point by outside influences.

4.1.7 Plenary session on X-ROTOR and participant responses

The research team member from UoS described the working of the X-Rotor wind turbine and its advantages in terms of power output per height, cost of energy, environmental impact, and number of turbines per area of seabed. A video used on the website helped to illustrate the operation of the X-Rotor turbines.

The participants questioned the size of the blades and how high they would be placed above sea level. It was pointed out that such design matters were not finalised yet, and that part of the purpose of this focus group was to help in the process. It was also explained that the research project is in the second of its three years. Participants were curious as to how the project had progressed.

Some participants were curious as to how O&M work would be carried out, as there would seem to be a need to have a platform on the turbine, but one was not visible. They worried that the current design posed some health and safety issues for people who would be working on turbine from the deck of a boat. It was mentioned that the boat deck is not a stable place from which to work on a rotor 20 or 30 metres overhead. It was suggested that maybe a removable catwalk could be designed to hook into the main pillar and the lower aerofoil to provide a stable work platform. It was pointed out that so far modelling had been done in

⁸ “Gaidhlig na hAlban and Gaeilge na hÉireann come from the same family.... originally P-Celtic. Welsh and its derivative, Breton, and Cornish come from Q-Celtic.” (O’Caoimh, 2022)

wind tunnels and on computers, but not yet at sea. A participant asked if the turbines would be white, and whether different colours may make it easier for birds to avoid the blades.

Participants had questions about how heavy the turbine would be and how the moving parts would be protected from seawater. There were several technical questions which illustrated that many people in the focus groups had understood the presentation and were interested in the design. The essential feedback concerned visibility and effect on wildlife.

4.2 Industry stakeholders (Group 2) findings

The wind energy community continued to express that their priorities were the cost of electricity and the durability of the turbine. Issues to do with the environment or impact on other users of the sea were not expressed as high priorities. The content of the informal engagements indicated a reluctance to take on any unproven technology, which indicated a high level of risk aversion. Some considered that it would be risky to invest in any technology which had not been working successfully for 10 years. Energy community members were curious about X-Rotor and were particularly interested in the potentially lower operating and maintenance costs, given the opportunity to use smaller vessels for maintenance visits. The result of these conference engagements was to underline the existing findings, that the wind energy community is mainly concerned with the cost of electricity production and the reliability of equipment. While industry is concerned about the environment and the effect on communities, these are not the most important factors when financial decisions are made.

5 Conclusion

Group one was engaged through a workshop focus group on the island of Islay, Scotland, which found that the local community felt vulnerable to decisions made beyond their reach. They strongly supported renewable energy but were concerned about the infrastructural needs of their small island should a large offshore wind farm be installed nearby. Regarding the X-ROTOR, they were curious & interested in the design. In summary the feedback from the societal stakeholders include:

- Small level of concern regarding visibility from shore, most did not object to seeing turbines.
- High level of concern regarding the frequency of O&M activity and consequent sea and road traffic.
- Some concern regarding the guarantee of removal and disposal of turbines after they are no longer useful for electricity generation.
- Low level of concern regarding noise as the X-Rotor turbines would be off the coast.
- Some concern about sea bird collisions, but most participants did not express this as a concern.

Group two was engaged with a continued use of the non-synchronous dialogue used in year 1 and through direct in-person engagements at wind energy meetings and conferences in Ireland. It had been hoped to further add to this data collection for group 2 during 2022 with have an additional in-person meeting with wind energy professionals but for scheduling reasons this was not possible. It is notable that this group continues to be focused on financial and reliability issues. Insights from engagement with group 2 include:

- LCOE remained the primary concern for the Energy Community.
- Reliability and durability of X-Rotor in the harsh marine environment.
- High levels of risk aversion regarding investing in a new unproven technology, while also a high level of curiosity about the X-ROTOR itself.
- Low concern about consequences for wildlife, the environment or local community.

For Group one, the primary host community workshop focus group will be repeated in 2023 along with engagements of four secondary communities. For Group 2, building on the success of the conference engagements, a series of engagements (both formal and informal) will be held at relevant conference across Europe in 2023. This commences in Jan 2023 with there is a dedicated X-ROTOR session at the EERA Deep Wind conference to be held in Trondheim, Norway. This will be a good outreach engagement in itself – but moreover, will also provide a basis for further in-person meetings during the rest of 2023.

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Appendix 1 – Focus Group Guide



X-shaped Radical Offshore Wind Turbine for Overall
Cost of Energy Reduction

Focus Group Guide



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 101007135

Focus Group Notes

- Participants should be assured of the confidentiality of the project.
- Informed consent should be obtained from all participants.
- The focus group should be recorded, where participants give permission, otherwise detailed notes should be taken.
- Participants should be assured there are no right answers, in all cases we are looking for their experiences and/or their personal opinions.
- Discussion themes are provided as a guide for conversation. An effort should be made to maintain the natural flow of the conversation.

Introduction

This guide has been developed to assist in the planning and delivery of focus groups for the X-ROTOR project. It is based on similar guides produced for other projects within CPPU, and it has been informed by the Focus Group Toolkit developed by CCCSE in The University of Texas at Austin⁹ and the Focus Group Guidelines developed by the SWITCH project¹⁰. A focus group is a small group led through an open discussion by a skilled moderator. The group needs to be large enough to generate rich discussion but not so large that some participants are left out. Focus groups are a method to be used to explore stakeholder perspectives on wind turbine design within the X-ROTOR project.

Key Roles

Moderator

The role of the focus group moderator (or facilitator) is to nurture discussion in an open and spontaneous format. The moderator aims to generate a maximum number of different contributions from as many different people in the available time. The moderator guides the discussion around specific, pre-determined subjects, in an objective, respectful manner. During the focus group, the moderator will

- Follow the discussion outline and activities, as designed, in a consistent manner from group to group; use the same key questions in each session.
- Use a neutral, yet comfortable and inviting tone of voice and facial expressions.
- Ask questions to clarify participants' points and increase understanding of each point made by participants.
- Ensure that each participant contributes throughout the conversation.
- Remind participants of the value of differing points of view.
- Be respectful of all points of view and instruct those in the group to do the same.
- Keep the discussion moving to stay within the specified time frame.

Assistant and Note-taker

The moderator is supported by an assistant and note-taker. The assistant takes notes and oversees the audio-recording. The objective of the note taking is to accurately pull the principal points from the discussion while it is not meant as a transcript nor should it be an interpretation of the participants' contributions. Accordingly, audio recording is preferred because it allows for accurate capture of the original conversation – notes are used to clarify data that is unclear on the recordings.

⁹ Focus Group Tool Kit, Center for Community College Student Engagement, The University of Texas at Austin
<http://www.ccsse.org/focusgrouptoolkit/>

¹⁰ Focus Group Guidelines, SWITCH Intelligent Energy Europe project
https://www.polisnetwork.eu/uploads/Modules/PublicDocuments/switch_focus-group-guidelines.pdf

Recruiting / Selecting participants

Participants will be recruited such that they comprise a diverse profile, in terms of gender, and energy experiences. Focus group participants will be recruited by the research team directly or via partners' networks. All participants should be over 18 years of age. The focus groups should take place locally in the case study locations or as otherwise convenient for the participants. The engagements should be designed and realised in such a manner to promote gender, economic, and physical inclusivity – including *e.g.*, timing, location, format, supports, *etc.*

Overview of Focus Group Session

Preliminary

1. As participants enter, participants will be asked to sign in.
2. The facilitator will introduce themselves and the note taker.
3. The purpose of focus group will be explained and the facilitator will go through the briefing document, answering any queries and ensuring that all participants are clear on its content.
4. The reason for audio-recording will be explained and the anonymity of the participants' contributions will be reiterated.
5. Participants will be invited to give their consent by signing the consent forms – they will again be reminded that they are free to stop participating at any point

Arrangements

6. The facilitator will explain their primary role, which is to ask questions, stimulate a discussion, and to keep the discussion on track.
7. Participants' will be informed that their role is to share their experiences, attitudes, opinions and feelings. The facilitator will emphasise that there are no right or wrong answers, and encourage all participants to contribute fully to the discussion.
8. The logistics of the focus group will be outlined. *i.e.*, 90 minutes discussion, mobile phones on silent, bathroom breaks as required, refreshments provided, *etc.*
9. The focus group ground rules will be outlined and participants will be asked to agree that: one person speaks at a time; no side conversations; no one is allowed to dominate; everyone is given a chance to be heard; there are no right or wrong answers; the discussion is about experiences; they will respect the confidentiality of discussions.

Focus Group Discussion

While the objective is a free-flowing discussion where participants are allowed to say what is important to them, there are of course intended outcomes. The questions below show the questions which will structure the engagement and direct the discussion towards meeting the planned objectives.

Introductions

Participants introduce themselves and outline what they expect from the focus group

Outcome 1: to understand context of participants' contributions

- 1) What does the sea mean to you? Why?
- 2) How do you feel about Climate change?
Do you believe climate change is occurring? What do you think has caused it?

Outcome 2: to capture perspectives on off-shore wind

- 3) Participants will form break-out groups to consider the following statements before reconvening for a plenary discussion
 - Offshore wind farms are good
 - Offshore wind turbines are a serious problem for fishing
 - Offshore wind turbines damage leisure and tourism
 - Wildlife is disturbed by offshore wind turbines
 - Offshore wind can create jobs for people living along the coast
 - Offshore wind turbines are a problem as they kill seabirds
 - Offshore wind can generate electricity cheaply
 - Offshore wind turbines are noisy

Outcome 3: to gather feedback on the turbine design

Participants are provided information and shown details, including mock-ups, of the new turbine design and invited to provide feedback through open ended questions ...

How does this design compare with conventional turbines?

- a. What do you like about the new design compared to older turbines? Why?
- b. Are there elements of the new design do you not like? Why?
- 4) If there was one thing about the new design you would change, what would it be?
- 5) Would this new design change your feelings towards offshore wind? In what way?

Summary and close

- 6) Have you any final thoughts?

Facilitator will ask participants if they have any final questions or comments – following which the facilitator will thank them for their participation once more.