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Invisible Work at EMEC

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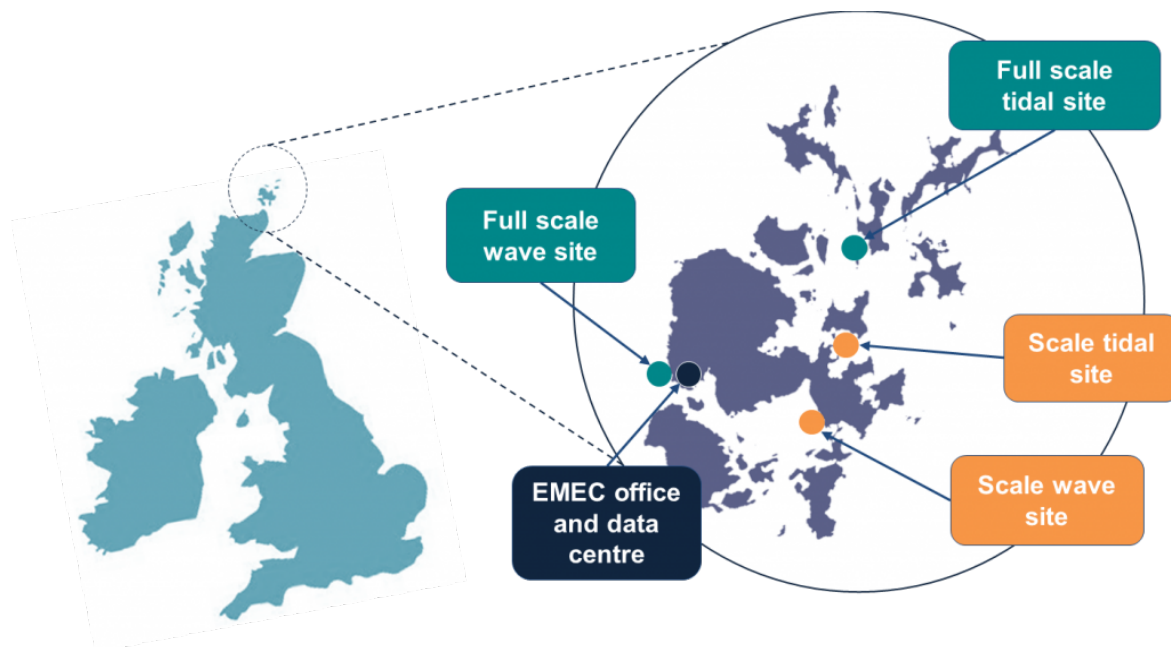
Introduction

Marine Renewable Energy (MRE), also referred to as Ocean Energy, is a developing sector which seeks to harness the power of the sea to generate electricity. The devices being developed at EMEC fall into two types, those that work to convert the kinetic energy of waves, and those that use the force of the tides. According to Scottish Government figures Scotland has the potential to generate up to 25% of Europe's tidal power and 10% of its wave power. The majority of companies working within the sector are Small or Medium Enterprises (SMEs) so employment figures are relatively modest, yet within Orkney, according to figures from Orkney Renewable Energy Forum (OREF) there are around 250 individuals employed within MRE and with EMEC hosting over 400 visitors to Orkney in 2014 the impact on the local supply chain and economy is not insignificant.



This report reflects on a period of fieldwork conducted to look at the 'invisible work' carried out by the European Marine Energy Centre (EMEC), which is based in Stromness, Orkney.

EMEC was set up in 2003 and according to their website 'is a not for profit, private company, limited by guarantee, and owned by The Carbon Trust, Orkney Islands Council and Highland and Islands Enterprise Development Trust'. EMEC employs around 28 members of staff who are mainly based at the main office in Stromness. It is the world's first accredited Marine Energy Test Centre and provides test facilities for both wave and tidal devices, offering 14 full-scale test berths and two scale test sites which allow devices at an earlier stage of development to experience real sea tests but in less challenging conditions. EMEC also offers a range of consultancy and research services and independently-verified performance assessments. It is also involved in the development of industry standards, having co-ordinated the development of a suite of 12 industry guidelines listed below, of which six have gone forward for adoption as the first international standards for marine energy (see Appendix)



Rather than focus on EMEC's technical achievements and its role within the MRE sector, this project sought to identify the additional work which goes on within EMEC which may remain unidentified and unacknowledged but never the less contributes significantly to the organisation's success. In making this 'invisible work' visible, the hope is to acknowledge both its importance, and recognise its value, so that the work of EMEC can be understood more fully within its social context, both locally and globally..

Methods and Theory

1. Data collection

The project ran from 18 August 2014 to 28 November 2014, and involved collecting ethnographic data through interviews and shadowing members of staff, as well as gathering data from industry and media publications (a total of 68 documents were collected), and attending the following public and industry events:

- 7 July, 18 August, 2 October 2014 - Workshops run by University of St Andrews PhD student Sara Friend around issues of renewable energy in Orkney, held at ICIT, Heriot Watt University, Stromness
- 29 August 2014 – Orkney Renewable Energy Forum, Renewable Energy Exhibition, at the Commercial Hotel, Stromness
- 5 September 2014, Orkney International Science Festival talk ‘Wave and Tide: the year ahead’
- 23 & 24 September 2014, Scottish Renewables Marine Energy Conference, Eden Court, Inverness

Data was recorded in the form of handwritten notes, which were transcribed and coded (around 30,000 words of notes in all).

Interviews were conducted with the following EMEC staff:

- Managing Director (Neil)
- Research Director (Jenny)
- Commercial Director (Oliver)
- Client Relationship and Marketing Manager (Eileen)
- Senior Business Development Manager (Matthew)
- Marketing and Communications Officer (Lisa)

I also interviewed Head of Electricity for the Scottish Government (Chris Stark).

In addition, I shadowed the Manager Director, Neil (for around 6 hours), and Client Relationship and Marketing Manager, Eileen (for around 3 hours), following their everyday work at EMEC.

Thanks must go to all my interviewees and the staff of EMEC who were so welcoming and helpful during my research.

2. Context

During the period of the fieldwork a number of major events occurred of significance to the marine renewable energy (MRE) sector and to a contextual understanding of the data.

On September 18th the Scottish Government held a public referendum on the question of whether Scotland should become an independent country, the result was 55% No and 45% Yes. In the run up to the vote both sides made reference to the potential future of MRE to support their case and many companies within the sector, including EMEC, were having to manage public engagement while maintaining political neutrality.

Towards the end of the project Orkney's role in the MRE sector came under media scrutiny with two of the major wave technology developers with devices at EMEC in crisis.

On 21st November the board of Pelamis announced that they had failed to secure funding and were appointing administrators. Founded in 1998 Pelamis first tested their prototype machine at EMEC's Billia Croo test site in August 2004 and the 'sea snake', as it came to be known informally, went on to be the first commercial scale offshore wave power machine to successfully generate electricity to the national grid. Pelamis employed over 50 people, including a small team based at Lyness on Hoy. On 22nd December it was announced that all staff had been made redundant as no offers were received for the business, and Highlands and Islands Enterprise (HIE) through the recently formed Wave Energy Scotland have been announced as the preferred bidder to take over the company's assets. On 3rd December Aquamarine Power, which has the Oyster 800 wave machine undergoing testing at EMEC's Billia Croo wave test site, announced that it was going to significantly downsize its business. Both the Pelamis 'sea snake' and Aquamarine Power's Oyster are iconic devices, which have featured in many images used in MRE publications. This development within the wave energy sector has potential implications for the whole MRE industry.



Pelamis P2 'sea snake' (image: EMEC)



Aquamarine Oyster 800 (image: EMEC)

3. Theoretical Approach

Dialogism and Bakhtin

The nature of the fieldwork and the data collected suggest that such 'invisible work' occurs in the social realm, and is concerned with information, communication, interpersonal relationships, and meaning-making. In analysing my data my approach is informed by dialogism, a 'meta-theoretical framework for the human sciences' (Linell 2009: 28), which approaches human communication and sense making as inherently social and therefore always situated within multiple contexts, and interactional. Dialogism draws on the work of Mikhail Bakhtin who continually stresses the nature of language as a living thing, which emerges from, and reflects, the social interaction of human subjects. Bakhtin talks about the 'heteroglossia' of language (Bakhtin 1981: 271) emphasising the multiple voices which it contains. These voices arise from individual lived experience in the world, and the relationship between individual, language, society, and the active, creative nature of meaning making is captured in the following:

As a living socio-ideological concrete thing, as heteroglot opinion, language, for the individual consciousness, lies on the borderline between oneself and the other. The word in language is half someone else's. (Ibid:293)

The negotiation of this borderline between self and other through language is subject to two opposing forces, characterised by Bakhtin as the centripetal force of 'unitary language' which 'gives expression to forces working toward concrete verbal and ideological unification and centralization' (ibid:271) which 'operate in the midst of heteroglossia', and the centrifugal force of 'decentralization and disunification' which 'widen and deepen as long as language is alive and developing' (ibid:272).

In approaching the data collected during this project we must recognise the influence of these forces on meaning making, both in terms of our own understanding of the data, but more importantly in the way language is used by interviewees, and within texts. Considering the data in context we must look beyond the physical, social and historical context of individual speakers or texts, to also consider how the different voices represented are situated and positioned within a wider socio- cultural and historical context - what Linell calls 'double dialogicality' (Linell, 2009:51). I hope to emphasise the important role of shared meaning making in this process, looking not only at the expression of EMEC's voice, but how the communicative strategies employed within the company and evident in its public discourse, position it in relation to other organisations and discourse communities. This is of

course a two way relationship, and dialogism stresses the complex interrelationship between individual and shared meaning making in the development and transmission of narratives, which emerge within and between private, public, and organisational discourse. The importance and influence of such narratives are discussed by Bakhtin in terms of 'authoritative discourse' and 'internally persuasive discourse':

The tendency to assimilate other's discourse takes on an even deeper and more basic significance in an individual's ideological becoming, in the most fundamental sense. Another's discourse performs here no longer as information, directions, rules, models and so forth - but strives rather to determine the very bases of our ideological interrelations with the world, the very basis of our behaviour; it performs here as *authoritative discourse*, and in *internally persuasive discourse*. (ibid:342)

Bakhtin goes on to explain that 'the authoritative word demands that we acknowledge it, that we make it our own, it binds us, quite independent of any power it might have to persuade us internally; we encounter it with its authority already fused to it' (ibid), while, 'internally persuasive discourse - as opposed to one that is externally authoritative - is affirmed through assimilation, tightly interwoven with "one's own word"' (ibid:345). Of course authoritative discourse may also be internally persuasive, but again this emerges through the negotiation of the two opposing forces in language, on the borderline between self and other, or as Bakhtin puts it - 'The struggle and dialogical interrelationship of these categories of ideological discourse are what usually determine the history of an individual ideological consciousness'. (Ibid:342)

Dialogism, Situated Knowledges, and Care

In the context of this project the focus is on both the creation of shared narratives within EMEC itself, but also on the way these narratives have emerged within a dialogical relationship with external narratives. The invisible work of EMEC involves the negotiation of this borderline between narratives, personal, organisational, and public, and, as this report will discuss, requires a creative engagement with and shaping of, both authoritative and internally persuasive discourses.

In looking at how certain narratives may emerge which are both authoritative and internally persuasive we must examine the borderline between self and other and consider where, and how, shared meaning making and thus shared narratives can occur. In considering how and why certain narratives may become authoritative or persuasive, and the role context, in all its different forms, plays in this process, I have found Donna Haraway's claim for 'Situated

Knowledges' extremely helpful. In thinking about knowledge, and narratives about knowledge, as things that get made within a web of interconnecting, dialogical, human interaction which are always situated, and therefore always partial, I believe that rather than losing (the already impossible) objective view 'from nowhere', we are instead opening our other senses to heteroglossia, and the potential for understanding which can go deeper because it is rooted in the reality of lived experience which always happens 'somewhere'. As Haraway herself says:

We need the power of modern critical theories of how meanings and bodies get made, not in order to deny meanings and bodies, but in order to build meanings and bodies that have a chance for life. (Haraway, 1988:580)

In considering knowledge as situated, and something which emerges through a process of dialogical interactions, suggests that shared narratives, particularly those which carry authority, have the potential not only to reflect, but to shape knowledge and how it is made. Therefore if we can identify these narratives, and look at how they interact dialogically within discourse communities we can begin to gain a better understanding of how knowledge is being situated, by whom, and to what effect.

As I considered the nature of the narratives which emerged within EMEC, particularly in its interactions within Orkney, I discovered that one of the authoritative, and for some individuals internally persuasive, discourses which emerged could be characterised in terms of an attitude of care, which seemed to resonate with Maria Puig de la Bellacasa's (2011) argument for an ethos of care within the study of science and technology. In engaging with Puig de la Bellacasa's characterisation of care, and its importance, I consider how care can be traced within the narratives of EMEC and Orkney, and by bringing in Haraway's understanding of knowledge as situated I consider how being in Orkney has shaped EMEC's discourse and approach to its work, and in what ways it is able to translate this narrative of care in its discourse with others out-with Orkney. Considering issues of meaning making dialogically challenges us to remain continually aware of the influence of context, and the actors involved in any communication, which immediately raises questions about point of view, authority, and intentions, all vitally important factors which influence understanding, but remain largely invisible to the audience. In taking this approach to understanding the work of EMEC my aim was to not only make visible the huge amount of work carried out by EMEC in terms of communicating knowledge and making meaning, but to argue for the importance of this work not only within the company but to the wider MRE sector and beyond.

EMEC in Orkney

1. EMEC in Stromness

EMEC is based in the Old Academy Building in Stromness, with its wave test site at Billia Croo several miles away along the coast to the west. The tide energy test site is further north in Orkney, off the coast of the island of Eday. The physical location of the company within the Old Academy building, which also houses Edinburgh-based Heriot Watt University's ICIT (International Centre for Island Technology) campus, as well as several marine related companies, including Aquatera, places it in an interesting position, both physically and psychologically, as it sits within both an identifiable marine renewables community, the community of Stromness, and the wider Orkney community.



View from Brinkie's Brae over the town of Stromness, Old Academy Building in foreground. (image courtesy of Sigurd Towrie)

While formal interactions between EMEC as a company, and Stromness/Orkney/other organisations are easy to identify, and mediated via 'official' channels and modes of communication, informal contact between EMEC staff members and those from other MRE organisations, or the wider community, arise naturally on a daily basis due to EMEC's physical location. The importance of such unofficial interaction and communication cannot be discounted, and represent one of the many points where internal and external narratives meet - offering the potential for the dialogical negotiation of meaning making. The Old Academy building was originally built as the town's school in the nineteenth century and sits half-way up the steep slope of Brinkie's Brae, which rises up behind the town above the harbour. Stromness itself is huddled between hill and sea, with its one main street, in the words of it's most famous local writer George Mackay Brown, 'uncoiling like a sailor's rope from North to South' (Brown, 1988: 60) along a narrow street which winds between tall

eighteenth century stone houses, which stand gable ends to the harbour separated by narrow closes. Many of the houses stand on their own piers, and though the life of the town is still marked by the daily traffic of the ferries, creel boats, and more recently in the summer the dive boats who take tourists to dive on the war time wrecks of Scapa Flow, the days when you could allegedly walk the length of the town across the decks of the boats crammed into the harbour, have long gone.

Recently a series of major building projects have seen the town undergo many changes, with the refurbishment of historic buildings along the main street, the building of the new Stromness Primary School, new Stromness Library and new Co-operative supermarket. But arguably the most dramatic visual impact on the harbour has been the construction of the Copland's Dock pier which was developed by Orkney Islands Council as part of its Three Ports Strategy to invest in major marine infrastructure projects at key locations in the islands. The aim of this development is to provide upgraded and new-build pier and quayside facilities for all marine users, including the MRE sector. The visual impact of this development on the town can be seen in the images below, which show the site at the start of construction and on completion.



Copland's Dock site at the start of construction (image: OIC)



Aerial view of the completed Copland's Dock pier, Stromness (image: OIC)

2. Marine Renewable Energy (MRE) in Stromness

While the building of Copland's Dock pier serves as a prominent, and not entirely uncontroversial, reminder of the existence of MRE activity in Stromness, it is the daily traffic of individuals, working at EMEC and other MRE organisations up and down from the Old Academy, which weaves the sector's presence in the town into the wider community discourse through daily interactions along the street and in the shops.

One particular example from my fieldwork stands out as illustrating this point, and emphasises the complex relationship between individuals, organisations, and community. While shadowing EMEC Managing Director, Neil, I accompanied him from the EMEC office down the street in Stromness to Argo's bakery to get some lunch. Because of its location and the fact that there are limited options for buying food in Stromness, Argo's is busy at lunchtime and many of those working at the Old Academy end up there at the same time. Standing in the queue we met Gareth Davies, Managing Director of Aquatera (an environmental consultancy), and after a brief explanation of my presence as a shadow, Neil and Gareth arranged to eat lunch together back in Gareth's office and to have a catch up. Here a further piece of context is needed to make sense of the relationship between Neil and Gareth - both are key members of Orkney Renewable Energy Forum (OREF), an island association of organisations and individuals involved in renewable energy in the islands which aims to address strategic issues affecting Orkney's renewables sector through focused collaboration with members and key stakeholders in the local community.

Gareth lives in Stromness and is a well-known figure in the town. Both he and Neil are active in the local community outside of their professional roles. While EMEC and Aquatera are separate companies, who in certain areas of activity could be seen as directly competing for business, they also actively collaborate in a number of areas and have been involved in several projects together involving the wider Marine Renewable Energy supply chain in Orkney, as well as through OREF activities. Ordering our lunch it is clear that Neil is equally well known by the staff, and even feels able to tell Isobel, who is serving us, that he didn't like the cauliflower soup he had last week! This interaction is in a bantering tone rather than as an angry complaint and is received and responded to in the same tone. This could be seen as evidence of Neil's understanding of an identifiable communicative strategy within Orkney where humour is deployed to allow criticism to be made without damaging interpersonal relationships.

3. Orkney Discourse

I have previously written about the role of humour in Orcadian culture (Ford 2013) where I suggest that this communicative strategy has grown out of a shared internally persuasive discourse within Orkney which prohibits 'bigsy-ness' - the dialect term for being conceited, boastful, or thinking yourself better than others. Along with this prohibition on personal bigsy-ness goes the belief in an ideal version of Orkney as an independent, egalitarian, mutually supportive community. As a result there is an authoritative discourse within Orkney which narrates a fictional version of an ideal Orkney. This is transmitted, performed and reinforced through the process of community discourse between individuals. The strategic use of humour to negotiate the possibly conflicting demands of avoiding being bigsy, whilst also maintaining the narrative of an ideal Orkney community, illustrates the complex relationship between individual and group meaning making, and the struggle between authoritative and internally persuasive discourse - where community must be understood as a process which emerges from this dialogical interaction and negotiation between self and other. Individuals within the Orkney community who take on roles of responsibility and public authority often manage to avoid accusations of personal bigsy-ness by a combination of humorous self-deprecation and by emphasising their role in terms of its benefit to Orkney. At the same time responses to authority in public and private discourse are often ambivalent, and humour is often used to deliver quite harsh personal and professional criticism - examples can be heard on the local BBC Radio Orkney post bag, and in found in the comments on various public Facebook pages which relate to Orkney.

To understand EMEC within the context of its location in Orkney is to understand that both official and unofficial communications enter into this dialogical relationship with existing narratives within the community. The example above, while illustrating Neil's understanding and utilisation of humour as a strategy in his interaction in a non-official situation, suggests that this is a competency he can call upon in other situations. While Neil, along with other staff at EMEC, have moved to Orkney from elsewhere, the company also employs a significant number of born and raised Orcadians at all levels of the company. The fact that EMEC offers graduate level job opportunities means that young Orcadians who have been away to University have been able to come back to the islands and find employment - Lisa, Eileen and Matthew are all examples. The importance and influence of local knowledge and understanding within the company was highlighted by many of the interviewees in terms of practical experience of the environmental and marine operating conditions, but an additional aspect of this local input was highlighted by Neil when he explained, 'I felt it was important to have Eileen fronting the media interaction as it gave EMEC a genuinely Orcadian voice'.

4. EMEC's Discourse

Eileen's position within EMEC as Client Relationship and Marketing Manager places her directly on the borderline between discourse communities. She has to manage EMEC's official voice in both public and industry facing communications, as well as interactions with potential and existing clients, internal technical staff and external supply chain members. The complex nature of this role in terms of the different audiences and messages was clearly expressed in interviews with Eileen, who identified the different levels of understanding and interest in EMEC's activities from the 'intellectual debate' within the industry, to the national media who address a general audience of 'electricity bill payers'..

Communicating to an audience within Orkney raises the additional issue that, while EMEC's activities are happening in a public space and therefore the community are aware of their activities, this awareness does not necessarily go along with an understanding of what EMEC actually does. Eileen explained that in approaching one local audience she asked herself 'who are the real communicators in Orkney' and came up with the answer, 'my mother!'. So she decided to speak to the local Scottish Women's Rural Institute (SWRI) groups. (The SWRI was founded in 1917, with the aim of bringing women together through regular group meetings within local communities. Its activities range from baking and craft competitions to raising awareness of current affairs affecting women). There she was able to engage folk on a personal level and illustrate the role of the local community in terms of friends and relations who worked in the industry, or were employed in the supply chain. In

talking to the SWRI groups Eileen's approach was to set the context for EMEC's role, beginning by explaining climate change and the relationship with fossil fuels, and then moving through the energy history of Orkney, which has included North Sea oil and pioneering wind turbine development, through to the potential of marine renewables for the future.

The need to shape narratives depending on the audience was clearly articulated, Eileen explained that when she first came into the role, Neil, the Managing Director, had a chart of different stakeholder groups and what the message was that each of these different audiences needed to hear, and in her role she had to constantly be aware of these different audiences and be able to adapt her communication quickly - which could be a real challenge. In discussing how she approached this task Eileen explained that she always had her ears open for good stories as she felt that stories were more effective in communicating a message than just facts.

If we consider this in relation to Bakhtin's characterisation of the forces at work in language we could suggest that the 'official' language of facts reflects authoritative discourse while the effectiveness of story telling - particularly Eileen's example of making a personal connection with the audience - suggests the opportunity to engage with internally persuasive discourse. The nature of storytelling suggests a personal engagement both on the part of the storyteller and the audience. The emotional energy this requires is suggested by Eileen's comment that in the past 'there had been a disproportionate amount of effort put into telling the story, and it often felt like winning the world over one person at a time.' This level of personal commitment, which went beyond the requirements of their official employment, was evident in all the interviews I conducted within EMEC and is reflected in a range of activity. Neil and Matthew are both actively involved in the Orkney Renewable Energy Forum as volunteers, while Lisa and Eileen carry out public talks and events. This commitment and enthusiasm came across in every interview and could be characterised as a sense of care which went beyond their professional roles and responsibilities. In thinking about the nature of this care I have considered how Maria Puig de la Bellacasa's identification of care 'as an ethically and politically charged *practice*' (Puig de la Bellacasa 2011: 90) might inform a dialogical approach to understanding the nature of EMEC's invisible work, along with the role of authoritative discourse and internally persuasive discourse in this process.

5. Situated Knowledge and Care in Orkney

If we consider that EMEC's work occurs not only within the physical context of the Orkney landscape, but within the dialogical context of local discourses, then we can see that the environment shapes not only the technical but the social aspects of this work. Just as the test sites use the power of the sea to make technical knowledge, the communication work which EMEC must carry out, not only with data but in the form of the storytelling identified by Eileen, also makes use of the social environment to inform its approach. Donna Haraway's call for 'situated knowledges' (Haraway 1988: 581) could be utilised here to suggest the process by which the technical, and social aspects of EMEC's work are dialogically connected. When Haraway says 'Feminist objectivity is about limited location and situated knowledge, not about transcendence and splitting of subject and object. It allows us to become answerable for what we learn how to see' (ibid, 583) I am reminded of Neil's assessment of why Marine Renewables have been so successful in Orkney, in terms of local community support and local supply chain engagement. He felt that this was due to the fact that in Orkney, as in other island communities 'people can see the edges', so there is a common sense of boundary. 'You can see who you are in this with' and this in turn fosters a shared outlook and shared effort. There is resonance here with Haraway, 'Situated knowledges are about communities, not about isolated individuals. The only way to find a larger vision is to be somewhere in particular.' (ibid, 590). I'd like to draw attention to Haraway's use of the word answerable because it captures a key aspect of the dialogical view of community as an active and ongoing process through discourse. Per Linell points out 'the active work and sense-making that is involved in the other's (and self's) understanding of an utterance or thought' (Linell, 2009, 13) which highlights the interdependency between 'self' and 'other' in shared meaning making, and is captured in the following passage from Bakhtin:

Every word is directed towards an *answer* and cannot escape the profound influence of the answering word that it anticipates.[...]Responsive understanding is a fundamental force, one that participates in the formulation of discourse, and it is moreover an *active* understanding, one that discourse senses as resistance or support enriching the discourse. (Bakhtin, 1981, 280-281)

This emphasis on answerability suggests also shared responsibility, both in terms of an ability to respond but also an obligation to do so. In the context of Orkney discourse the nature of this shared responsibility is shaped by the shared narratives within the community's discourse - including the authoritative/internally persuasive discourse around

avoiding bigsy-ness and promoting an ideal version of Orkney as egalitarian and mutually supportive. The nature of this discourse about Orkney could be said to represent an attitude of care towards the islands' community, which is enacted through 'material and affective tasks related to communication, the production of sociability, and capacity of affect' (Puig de la Bellacasa, 2011, 93). Interdependence and answerability are therefore not only features of the content of discourse in Orkney but also characterise communicative strategies, which make use of (self) deprecating humour, storytelling, biographical, and genealogical knowledge. It must be emphasised that this is care, not as a romantic ideal, but as a pragmatic process, which is participatory, ongoing and continually evolving. This is community as a process which is enacted through the interactions of individuals and their discourse, through which shared narratives emerge. Care could perhaps be expressed in terms of a commitment to this process, which because of the authoritative/internally persuasive discourse about the importance of the Orkney community, means individual differences must be negotiated while maintaining, at least the appearance of, community cohesion and solidarity. On a practical level this allows individuals to negotiate personal hostility, conflict, or differences of opinion, and find ways to work together on community projects which require collaboration.

6. EMEC and Care in Orkney

In relation to the work of EMEC the effect of this discourse and the dialogical relationship with the Orkney community is reflected in an attitude of care within the company, which is evident in all areas of its operation. In fact I would argue that while there are many expressions of the invisible work done by EMEC, as characterised in 'The Invisible Work of EMEC' cards produced as part of this project (download from www.alienenergy.dk), the nature of the work is in every case informed by an attitude of, and commitment to, care.

Before going on to examine the way care extends beyond the local context into EMEC's work in the wider world, it would be helpful to look at examples of EMEC's caring role within Orkney. During my fieldwork the most obvious examples were the relationship between EMEC and OREF and the relationship between EMEC and the local supply chain. In both of these relationships the care that was observable included individual companies and organisations, and was expressed in a sense of care for what Oliver described as 'Team Orkney'. In describing the nature of this relationship Oliver, the Commercial Director, referred to the European Union Open Energy Day, which had been organised by EMEC along with OREF, the local supply chain, and the wider community. Oliver felt that this had been an enormous success and that the EU Commissioners, who had visited EMEC, had

seen the best of both the MRE sector, and Orkney. From Oliver's characterisation of the relationship between EMEC and the Orkney community, it is clear that the relationship of care is a reciprocal one which works for both parties. He talked about how 'if we [EMEC] bring something to Orkney then it's good for the wider community too', but at the same time when it comes to making a good impression on potential clients or visiting officials then 'Orkney puts on a particularly good "game face"'. Oliver summed up the nature of the relationship - 'Everyone has to work together to make things happen. What's good for me is good for you too'. When I asked Oliver about the two words that I had heard coming up again and again at the Scottish Marine Renewables Conference in Inverness, 'collaboration' and 'competition' he felt that the strength of 'Team Orkney' was its ability to negotiate these two 'c' words, and that this was due to the fact that enough local companies have respect for each other to play by the rules. I would go further to suggest that 'Team Orkney' has a commitment to care because it is based on relationships which recognise 'what's good for me is good for you too', and are engaged with the discourse of a mutually cohesive, and supportive Orkney community.

An interesting factor in this relationship is the role of OREF (Orkney Renewable Energy Forum) as an organisation, which requires, and allows, the negotiation of relationships between individual concerns and organisational interests around renewable energy in Orkney. This may in part be based on the fact that, as a voluntary organisation, members are motivated by personal concerns and enthusiasm, though one negative effect of this is that it is harder for OREF to tackle big projects and to attract certain types of funding. To make anything happen it has to rely on the commitment and efforts of individuals, who are already employed within the renewables sector and therefore have to manage their work for OREF alongside their professional commitments. While both Neil and Matthew reported doing additional work on behalf of OREF, the relationship between how this work benefitted EMEC, marine renewable energy in Orkney, or Orkney more generally, was something that was raised as an issue of balancing work, which they felt was vitally important, with the recognition that the motivation to do this was personal. The complicated inter-relationship of EMEC/OREF/Orkney was clearly articulated by Neil when he told me that while his work as an advocate for Orkney could conflict with his role as Managing Director of EMEC, if he let it. But he felt the advocacy role was vitally important as he did not want EMEC to be a boring footnote in the history of marine energy but the exciting centre of an expanding story - at the moment he saw Orkney as the kernel of the marine energy sector as it expanded and that EMEC was at the centre of this expansion. Matthew saw that while EMEC did lots of greater good work for the marine energy sector this often had no direct monetary benefit for EMEC, however the nature of OREF as a voluntary organisation representing the renewables sector

meant that it could be used to tackle potentially sensitive issues, such as the grid connection to Orkney.

7. The Value of Care

The tension between the long-term strategic value of this invisible work, be it Eileen and Lisa's storytelling, or Neil and Matthew's work for OREF, and the need to demonstrate economic benefit, or tangible measurable results, is at the heart of what Puig de la Bellacasa identifies as 'knowledge politics', which it is important to acknowledge because 'our ways of studying and representing matters of fact and sociotechnical assemblages have world-making effects' (Puig de la Bellacasa, 2011, 99). While the facts and figures of EMEC's achievements in terms of the number of devices tested, the amount of electricity generated, and even the fact that EMEC has achieved its goal of being financially self-sustaining, can all be measured and quantified, the achievement of all of this relies on the collaborative efforts of multiple individuals and organisations which in turn relies on the ability to communicate and create shared understanding - and as Eileen pointed out 'rather than just facts stories can be more effective in communicating'. EMEC's care 'is both a doing and ethico-political commitment that affects the way [they] produce knowledge about things' (ibid, 100), and the importance of this approach is revealed when we consider how the caring work which goes into building relationships within 'Team Orkney' can lead to opportunities which benefit all those involved - including EMEC.

A good example of this is the Orkney Vessel Trials Project which involved 20 organisations in Orkney, over 120 people, 60 vessels and 30 days at sea. It aimed to demonstrate the ability of local support vessels and the Orkney supply chain to offer developers access to local knowledge and expertise, and to reduce costs by using smaller, locally based vessels. EMEC was one of the lead organisations in this project, although when I spoke to Neil he identified Gareth Davies, Managing Director at Aquatera, as the driving force behind the original idea. The level of cooperation involved in organising and running this project clearly demonstrates the effectiveness of collaboration within the Orkney supply chain. An example of EMEC's ability to coordinate collaboration beyond the marine energy sector in Orkney can be seen in the recent award of £30,000 of funding from the Community and Renewable Energy Scheme, Local Energy Challenge Fund (a Scottish Government funded scheme to support the development of projects linking local energy production to local energy use) to the 'Orkney Surf and Turf' project Initiative. This project combines wind and tidal energy to produce hydrogen as fuel, and involves collaboration between EMEC and its tide energy test site, the Orkney Islands Council (local government), and the community wind turbine owned

by Eday Renewable Energy Ltd. (the community development trust on the island of Eday). This was the project that Neil had been working on when I was shadowing him, and his explanation of it highlighted the level of care that he takes in considering the relationship between EMEC and the local community. Neil told me that while Chris Stark (Head of Electricity for the Scottish Government) was keen to see energy storage as it 'fit with his world view' in terms of finding alternative solutions to the lack of electrical grid capacity, Chris had wanted the electricity to be stored in batteries and discharged when the tide wasn't running, whereas Neil had understood that this would kill the Eday community wind turbine, as demand for its power would then be less. Both wind and tide energy is converted from electricity to hydrogen, which is then used as fuel on the local island ferries. This way everyone involved benefits - from the community wind turbine, that generates more income for the community, to the island ferries gaining cheaper fuel, decarbonising their operations, and operating more fuel efficiently. In addition, EMEC frees up more grid capacity for developers and also demonstrate that the grid is not the only way to export energy.

As a background to this, it is important to understand that in 2014 Orkney produced 104% of its electricity needs. However, the electricity grid infrastructure was not designed to deal with this level of energy export and the existing subsea cable interconnector between Orkney and the Scottish Mainland is in danger of overheating. In 2012 the grid network operator, Scottish and Southern Electricity (SSE), issued a moratorium on any new connections of renewable devices over 3kW. Solutions to the grid capacity issue have seen the introduction of a Smart Grid approach, using Active Network Management (ANM) technology to monitor real time production. While this allows the grid infrastructure to operate at optimum capacity, this often means renewable devices must be curtailed during periods of high production. Until the long discussed additional interconnector grid cable becomes a reality, the immediate concern for EMEC, and all renewable producers in Orkney, is on how to maximise demand for electricity within the islands.

EMEC in the World

1. Care in Different Contexts

The difference of approach between Neil (Managing Director at EMEC) and Chris Stark (Head of Electricity for the Scottish Government) suggests that the level of care with which EMEC operates may not be understood or shared in other contexts. In my interview with Chris Stark it was interesting that, when he spoke about the bottleneck in the National Electricity Grid to/from Orkney, he felt that this had been 'unhelpfully painted as an Orkney issue' and that 'Orkney's vocality has made it the focus'. The impression I got was that he saw the problem in terms of the need to get electricity off the islands and into the grid, based on the level of production (the islands are more than 100% self-sufficient, and generate more electricity than they use); whereas my impression from interviews with the staff at EMEC and from reading local media reports, was that the issue was that lack of capacity was discouraging marine energy device developers from coming to Orkney in the first place, or leading them to move on elsewhere because there was not the capacity to test larger devices or arrays of several devices. Apart from the obvious loss of business, the concern is that EMEC, and therefore also Orkney, Scotland and the UK, could lose their position as world leaders in the global marine energy sector. It is this understanding of EMEC's importance within a global context that further demonstrates the way care is an integral part of the company's work. Just as, in Orkney, individuals come to gain authority and respect through demonstrating their capabilities, so EMEC has achieved its position as a leader in the marine energy sector through proving its ability to provide the technical infrastructure and support services developers need.

Along with the ability to provide the necessary physical environment and technical infrastructure, EMEC has been attentive to the needs of the industry and demonstrated a commitment to identifying and supporting research needs within the sector, through its work on the development of internationally recognised standards. This is Jenny's area of expertise and she felt that, because of their position, it was easy for EMEC to have an overview of the sector and see where there were gaps in research. The effect of this work is to reinforce EMEC's position within the marine energy sector, both as a leading provider of grid-connected test centre services, and as an authoritative voice informing the standards within the sector. In taking on this role EMEC must engage with the heteroglossia of competing narratives within the marine energy sector, from funding bodies, to SMEs, to public agencies, to academia, and often this meant EMEC taking a lead in initiatives, and

committing staff time and resources to non-income generating activities. An example of this was the workshop for global Marine Renewable Energy test centres that EMEC ran during the 5th International Conference on Ocean Energy in Halifax, Nova Scotia, in November 2014. During a meeting prior to the event, when I was shadowing Neil, a discussion of the plans for the workshop highlighted the way care for the marine energy sector could also directly benefit EMEC in terms of reinforcing its lead within the global marine energy community. During the meeting Neil's comment was '[we're] dominating the space' [for marine energy test sites] while Eileen was clear on the business benefit of taking the lead in running this workshop: 'We've been driving this so far, consolidating our global brand'. Neil made clear the need to make visible the direct benefits of carrying out this work of establishing and maintaining the lead within the sector. - 'We are investing a lot of company time and money in this event'. The long term strategic importance of this work and the potential benefits for EMEC in the future are recognised in Neil's use of 'investing' to describe the resources being put into this event.

2. Collaboration, Care and Competition

The challenge of building collaboration within the marine energy sector, which operates in a climate of competition, was a central narrative which emerged throughout my fieldwork. Jenny was particularly clear that while 'collaboration' is spoken about everywhere, in reality true and open collaboration tends to be hindered by everyone's need to make commercial benefits, often in the form of intellectual property, for their company or organisation. This applies not only to business but also to academia, with academic technology research increasingly required to undertake commercial activity. With many schemes in place to introduce academic expertise into business (e.g. the Knowledge Transfer Partnership scheme), there is a risk of commercial conflicts arising between companies and university research, unless collaborations between these are carefully managed.

One negative effect of competition is over-funding for research. Jenny felt this had led to research institutions becoming protective of funding to the point that the research funding doesn't necessarily match up with the departments doing the most relevant research. Jenny suggested that the problem within marine energy research reflected the wider UK culture of ultra-competitiveness, but also a nanny state approach, which wanted to make the competitive process 'all inclusive'. It was interesting that Jenny also reported the way EMEC had enacted Oliver's observation of 'respect within Orkney for competitors' by choosing not to carry out their own EIAs (Environmental Impact Assessments) for installing devices at the test site, but by requiring companies to employ an environmental consultancy to undertake

this massive piece of work. This was done, so as 'not to step on existing consultancies locally'. It would suggest that in acting with care EMEC develops collaboration by both acting from a position of authority, and being responsive to the authority of others, and that collaboration is a dialogical process which needs to operate through mutually responsive relationships. Neil was very clear that he deliberately 'sets the tone' within EMEC to encourage collaboration, and as a result EMEC is more willing to collaborate. However, some developers did not immediately understand this collaborative atmosphere, in Neil's words some arrived 'full of alpha males and alpha females' who 'struggled to understand this is not a race'. For Neil, one of the benefits of collaboration was in providing motivation to participate in a development process that could be long and difficult. As he put it 'wins are so infrequent we may as well celebrate everyone's victories'.

The role of EMEC in providing a collaborative environment for developers is supported by a great deal of invisible interpersonal work, as I discovered from shadowing Eileen. She received an email from a developer requesting to move their device by 50m at the test site, but, as Eileen explained, this might encroach on other developers. She explained that 'a big part of my job is mediating' since she is the mid-point between the operations team (who manage operations in the water at the test sites) and the developers. Both have related, but potentially competing, concerns - the Operations team's main concern is keeping the site functioning efficiently and safely, while the developers want to get their money's worth out of their time at the test site. Eileen's role is to keep the developers happy, as the 'customer is always right, they are paying', but it is clear that she is also helping to teach them about the benefits of collaboration and that this is part of the invisible work of EMEC. It is interesting to note that while the interpersonal relationship work of teaching collaboration through the process of operating the test sites might be largely invisible, the importance of care as a guiding approach within EMEC is written into the company's procedures. Eileen told me that there is a cooperation clause in the developers' contracts. I was also interested to see that the recently updated EMEC vision statement was on display above many desks. In the 'core values' section of the vision statement, which had been drawn up by Oliver after consultation with all the EMEC staff, I was interested to note that 'integrity', 'respect' and 'responsive and helpful' all resonate with both an attitude of care and the narrative about the ideal Orkney community. It is also interesting to note that the final 'vivid description' of the 'envisioned future' in the vision statement is 'we will have been good corporate citizens and assisted sustainable economic development both locally and globally' - which reads as a direct statement of outward looking concern and care.

Conclusion

Making the invisible work of EMEC visible reveals the central role it plays in the success of EMEC as a company, its relationship to the Orkney community, and its role in the national and global marine energy sector. By identifying the nature of this work as caring, suggests that this work, which is both hard to define and therefore easy to overlook, is at same time complex, skilled and extremely valuable. While this report demonstrates the central role of this work in EMEC's commercial success, the dominant cultural narratives around the role of care tend to present this as work which is not only invisible, but strangely manages to be both taken for granted and at the same time deemed worthless within a twenty-first century capitalist paradigm.

If the future of marine energy, in Scotland, the UK, and internationally, rests on balancing the two 'c's' of collaboration and competition to overcome the technical challenges, then EMEC is well placed to take a leading role in helping the individual companies and organisations 'see who they are in this with', and helping to foster care for the industry. This is based on a recognition that 'what's good for me is good for you too'. In doing this I would suggest that EMEC is working to translate Orkney care to the wider marine energy community. Having gained a position of authority within the industry through demonstrable expertise, EMEC has a strong voice within the narrative of marine energy as a sector and so has the potential to help to shape an authoritative discourse of care for, and within, the industry through its continuing work.

Yet, if marine energy is to develop a sense of a shared narrative through shared discourse how can this engage with existing global narratives about energy and environment, where care can mean many different things, and knowledges are often very differently situated? As Neil pointed out 'you can only get at the people you can get at' and EMEC's reach relies on it retaining its leadership within a sector which is suffering the pressures of competition in a time of financial austerity, and where energy is a highly politicised area. The success of EMEC suggests that if it can continue to translate Orkney care to a wider marine energy community around the globe then there is a chance to build real collaboration to benefit the entire sector. In a world facing the challenges of energy security, depleted resources, environmental damage, and climate change, the potential role of marine energy as part of the solution is clearly a factor driving many involved in the sector, beyond an interest in the technical challenge and the potential for commercial gain. Making the caring work of EMEC visible is potentially significant, not only to understand its importance to EMEC as a

company, but also to suggest a solution to the current dilemma within the marine energy sector about how to address the apparently conflicting demands of collaboration and competition. In making care visible and recognising its role, and value, in the work of EMEC I would agree with Puig de la Bellacasa that, 'as a transformative ethos, caring is a living technology with vital material implications for human and non-human worlds' (2011, 100).

I would go further to suggest that this 'living technology' of care is relevant to the wider challenge of climate change and the need for sustainable energy for the future. While EMEC has developed its version of care through its interaction within Orkney, it has managed to translate this into its interactions in the wider marine energy sector. But can Orkney care travel further afield, beyond marine energy? Perhaps the answer lies in understanding the relationship between care and situated knowledge. Orkney care works because it engages in the process of community enacted through community discourse, it is meaningful because it is situated, both physically and culturally, within that community. EMEC's translation of Orkney care works because it has the authority within the marine energy sector discourse to shape the narrative within that discourse community. As a living technology, care, like language, offers an active, responsive and answerable engagement with the world. Just as viewing knowledge as situated allows us to 'become answerable for what we learn how to see' (Haraway 1988, 583) viewing care as a situated process allows us to understand our moral answerability, not as an abstract concept or theoretical ethical position, but as a situated interactional relationship - it allows us to 'see who we are in this with'. I would argue that dialogism offers us an approach to communication which can help us to understand the value of situated knowledges and care, by helping us to see them not as fixed positions to be adopted, or ideal states to be achieved, but as processes which can be understood and enacted within our own context and through our own discourses. If we can engage with knowledge and learn to care, not from a position of external monological authority, but from the basis of active internally persuasive relationships, then perhaps we really can learn to live so that 'what's good for me is good for you too'.

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Appendix

EMEC is involved in the development of industry standards, having co-ordinated the development of a suite of 12 industry guidelines listed below, of which the six marked (*) have gone forward for adoption as the first international standards for marine energy:

1. Assessment of Performance of Wave Energy Conversion Systems*
2. Assessment of Performance of Tidal Energy Conversion Systems*
3. Assessment of Wave Energy Resource*
4. Assessment of Tidal Energy Resource*
5. Guidelines for Health & Safety in the Marine Energy Industry
6. Guidelines for Marine Energy Certification Schemes*
7. Guidelines for Design Basis of Marine Energy Conversion Systems*
8. Guidelines for Reliability, Maintainability and Survivability of Marine Energy Conversion Systems
9. Guidelines for Grid Connection of Marine Energy Conversion Systems
10. Tank Testing of Wave Energy Conversion Systems
11. Guidelines for Project Development in the Marine Energy Industry
12. Guidelines for Manufacturing, Assembly and Testing of Marine Energy Conversion Systems