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Data Transferability Effectiveness Report

September 2019

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Summary

Data transferability has been a key theme and focus of OES-Environmental (formerly Annex IV) beginning in FY17. The goal of this work is to ensure that datasets from consented/permitted[1] marine renewable energy (MRE) projects are readily available and catalogued for use by regulators to inform future permitting actions. This will reduce the regulatory burden often unnecessarily placed on developers and enable the industry to move forward more rapidly. This report describes the effectiveness of the data transferability process and concept, as well as the actions taken in the past and planned for the future to further refine the process and socialize the concept with MRE stakeholders.

In FY18, regulator surveys were conducted to gauge initial stakeholder interest in the concept of data transferability. A data transferability white paper and further online regulator workshops were developed as a result. The first *Data Transferability and Collection Consistency* workshop was conducted and the *Optimizing Permitting for MRE through Data Transferability* webinar was held. These preliminary actions received positive feedback from the community and the data transferability process continued to be refined moving into FY19.

During FY19, multiple workshops were held to present the data transferability process, including two *Data Transferability Workshops* in April 2019, two *Risk Retirement Workshops* in May 2019, and additional *Risk Retirement Workshop* in September 2019 at the European Wave and Tidal Energy Conference (EWTEC) and the Ocean Renewable Energy Conference (OREC). A *Monitoring Datasets Discoverability Matrix* was developed based on feedback from the MRE community that there is a need to easily access relevant data for transfer while permitting future MRE projects. Further regulator surveys were conducted to gauge familiarity and interest in other OES-Environmental countries. A *Data Transferability Short Science Summary* was also developed to disseminate the work on the data transferability process and to further engage the MRE stakeholder community. Feedback from OES-Environmental Analysts suggest support for data transferability and its promotion through increased engagement, workshops, webinars, and regulator surveys.

In FY20, focus will evolve from data transferability to risk retirement, with focus on retiring the risks from electromagnetic fields (EMF), underwater noise, changes to physical systems, and habitat change. This process will require increased engagement with both regulators and developers in order to work within the existing consenting/permitting processes, both in the U.S. and internationally, to move the industry forward. The *Monitoring Datasets Discoverability Matrix* will be published and available on *Tethys* to facilitate increased accessibility for data transfer as well as to increase familiarity with the data transferability process. For the matrix to be successful, it will also need to be presented through increased engagement, webinars, and teaching tools.

It appears with initial exposure that data transferability process might be an effective and accepted tool by regulators and developers. In order to measure its effectiveness in systematically examining available information collected from monitoring and research studies around permitted projects and making the datasets available to MRE stakeholders, the process needs further integration with the pathway to risk retirement and demonstration using real-world

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[1] "Consent" is the term used throughout Europe, and "permit" is the term used in the U.S.; the two terms can generally be used interchangeably. In this report, "permit" will be used moving forward for consistency.

case studies. As this work continues, we expect a shift in the MRE industry from a precautionary approach to environmental effects to an informed and mitigated risk approach.

Acknowledgments

Acronyms and Abbreviations

BMP   best management practice

BOEM   Bureau of Energy Management

DOE   U.S. Department of Energy

EMF   electromagnetic field

EWTEC   European Wave and Tidal Energy Conference

ICOE   International Conference on Ocean Energy

MRE   marine renewable energy

NOAA   National Oceanic and Atmospheric Administration

OES   Ocean Energy Systems

OREC   Ocean Renewable Energy Conference

PNNL   Pacific Northwest National Laboratory

WPTO   Water Power Technologies Office

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1.0 Introduction

As the marine renewable energy (MRE) industry advances around the world, the increasing demand for data and information about how MRE technologies (wave and tidal devices) may interact with the marine environment continues. Our understanding of the potential environmental effects of MRE development is increasing, informed by monitoring data collected around devices in several nations and a growing body of research studies. However, information derived from monitoring and research is typically published in scientific journals and technical reports, which may not be readily accessible or available to regulators and other stakeholders.

Regulators in all jurisdictions must satisfy legal and regulatory mandates in order to grant permission to deploy and operate MRE devices. Inherent in these laws and regulations is a concept of balancing risk to the environment and human uses of public resources against economic development and human well-being. Research efforts related to the potential effects of MRE development are focused on this concept of risk; the interactions between devices and the environment most likely to cause harm, or those for which the greatest uncertainty exists, are garnering the most attention (Copping et al. 2016). The components of risk—probability of occurrence and consequence of occurrence—are fundamental to the process by which regulators evaluate project compliance with environmental statutes. The concept of risk also provides an excellent context for discussing research outcomes and assisting regulators in learning more about potential effects.

The MRE industry is struggling with the high costs of baseline assessments and post-installation monitoring, as well as long timelines for obtaining permits or licenses, all of which lead to uncertainty and risk related to project financing. Regulators require assessment and monitoring information to allow them to carry out the necessary analyses to describe, permit, and manage the environmental risks associated with new MRE technologies and new uses of ocean space. One way to reduce risks to the industry and the environment and to allow for acceleration of this new form of low carbon energy could be the ability to transfer learning, analyses, and data sets from one country to another, among projects, and across jurisdictional boundaries.

Data transferability is the practice of using existing, relevant data or research to fulfill or reduce the permitting requirements of a new project. The limitations and requirements for data transferability have been described and defined iteratively throughout the data transferability process developed by OES-Environmental[1] (formerly Annex IV). Not all data is transferable, and not all permit requirements can be fulfilled or reduced with transferred data. However, the possibility of transferring data could speed up permitting processes, reduce requirements for developers, and reduce the costs and financial risks for investors due to permitting unknowns. Data transferability can help the MRE industry begin to make a splash and contribute to numerous plans for carbon reduction and energy independence worldwide.

This report describes the data transferability concept and process developed by OES-Environmental to support the MRE industry, along with the feedback that has been received throughout the development process. The aim of the report is to describe the effectiveness of

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[1] Note that the name of the Annex IV task was officially changed to OES-Environmental, effective August 2019. For consistency throughout the report, everything prior to August 2019 is credited as Annex IV while everything following August 2019 is credited to OES-Environmental.

the data transferability implementation strategy and to detail future work in alignment with existing goals.

2.0 Development of the Data Transferability Process

As a means of addressing the concept of transferring data (information, lessons learned, analyses, and data sets) among projects and collecting data consistently, OES-Environmental has developed a data transferability process that has been presented to the MRE community, which includes regulators, industry, developers, consultants, and researchers. The data transferability process consists of the following components (Figure 1):

1. The *Data Transferability Framework* brings together data sets in an organized fashion, compares the applicability of each data set for use on other projects, and guides the process of data transfer.

2. The *Data Collection Consistency Table* ensures that datasets from previously permitted projects provide datasets with sufficient similarity for comparison, or transfer.

3. The *Monitoring Data Sets Discoverability Matrix* catalogues datasets from already permitted projects. Based on feedback from U.S. regulators, the matrix was developed to provide easy discovery and access to monitoring datasets from already permitted projects. The matrix will be available as a tool on the online knowledge management system *Tethys*.

4. *Best Management Practices* (BMPs) include five BMPs that help guide the data transferability process, based on practical steps for implementation.
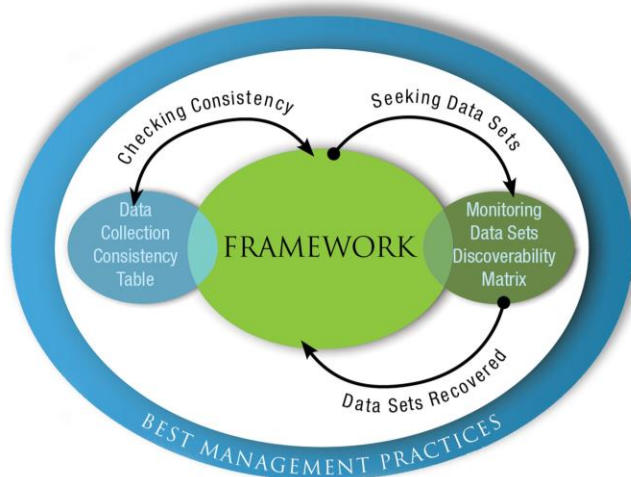
Figure 1. Data Transferability Process

Each of these components is described in more detail in the *Data Transferability and Collection Consistency* report by Copping et al. (2018).

The successful implementation of the data transferability process within the MRE community will accomplish the following:

- Ensure that regulators have access to data sets and processes for transferring data from already permitted projects to future projects.

- Assist regulators in understanding the applicability of these processes through an active outreach and engagement process.

- Provide technical assistance to help regulators implement the data transferability process using OES-Environmental and *Tethys* to facilitate the exchange of relevant data and information.

- Ensure developers and their consultants are active participants in OES-Environmental outreach and engagement efforts to ensure their familiarity with and acceptance of the data transferability process.

- Provide added value to the data transferability process through engagement activities and the consistent collection of data around MRE devices.

3.0 Work Accomplished to Date

3.1 FY18

Through discussions with regulators in the U.S. and abroad and based on the experience of early-stage MRE developers, it was not clear that the state of knowledge of the environmental effects of MRE technologies has been clearly communicated and understood by many regulators. As a first step toward developing a data transferability process to reduce uncertainty and support a common understanding of the risk of MRE devices to the marine environment, the U.S. regulatory community was surveyed to determine the level of understanding of MRE technologies, priorities for permitting risk, and their appetite to engage in a data transferability process.

The survey results helped tailor material and methods to engage regulators on the proposed approach to data transferability, resulting in the development of a data transferability white paper. The white paper included an in-depth literature review of data transferability and collection consistency frameworks and approaches from other industries. U.S. regulators were further engaged through a series of online regulator workshops, at which they were presented with MRE datasets that might be transferred. The project team assessed the regulators' ability to use such datasets from already permitted projects to permit projects in their jurisdictions. The international research and development community was brought together at a workshop sponsored by Annex IV in June 2018, in conjunction with the International Conference on Ocean Energy (ICOE). The workshop allowed the project team to gather additional feedback on the data transferability process, to review and modify proposed best management practices (BMPs), and to discuss ways to implement the data transferability process. The *Optimizing Permitting for MRE through Data Transferability* webinar, held on September 27th 2018, detailed Annex IV's framework, BMPs, and data collection consistency table for data transferability and collection consistency. The webinar attracted 37 attendees and the recording has been viewed on *Tethys* an additional 29 times.

Further detail on the regulator surveys, data transferability white paper, online regulator workshops, and Annex IV workshop can be found in Copping et al. (2018); high-level objectives and outcomes of these activities are summarized in Table 1. A data transferability page was published on *Tethys* in FY18 and is continuously updated which hosts information on outreach and engagements efforts including workshops, webinars, and additional data transferability documents (https://tethys.pnnl.gov/data-transferability).

Table 1. FY18 Activities and Outcomes

Activity	Objective	Outcomes/Feedback Received
Regulator Survey	Gauge regulators' understanding and familiarity with MRE technologies, perceptions of environmental risks for specific interactions of devices and the environment, and thoughts on best approaches to MRE development and data transferability.	Outcomes of the survey were used to design a series of online regulator workshops to understand the challenges of interpreting data and analyses from already permitted MRE projects and the limitations relative to transferring data to future projects in the regulators' jurisdictions. Regulatory concerns highlighted in the survey also

Activity	Objective	Outcomes/Feedback Received
		informed the development of a data transferability white paper
Data Transferability White Paper	Define the challenges associated with data transferability and collection consistency and to propose a preliminary approach to data transferability that could be discussed and socialized with relevant stakeholders	Concepts behind the data transferability white paper were presented to U.S. regulators through a series of online regulator workshops to understand regulator acceptance of and concerns about data transferability, to articulate the real-world challenges regulators face in applying data from already permitted projects to future projects, and to solicit feedback on the proposed data transferability framework.
Online Regulator Workshops	Understand regulator acceptance, concerns, and real-world challenges with data transferability by assessing existing data sets, gain feedback on the usefulness of the proposed data transferability framework, and integrate lessons learned from regionally specific constraints	Regulators are not necessarily looking for raw data, but data that they can interpret and easily understand. Several regulators stressed the importance of using data and outcomes from analogous industries and the difficulty in identifying and accessing relevant data and information. There was strong support from regulators for the data transferability framework; many stated that they needed a method for data set discoverability to find comparable data sets with which to inform their permitting decisions.
Annex IV Workshop	Discuss how data transferability can alleviate challenges to the MRE industry, present feedback and lessons learned from the U.S. online regulator workshops and gather additional feedback on the proposed data transferability framework, review and modify proposed BMPs, and discuss implementation of the data transferability process	Participants thought the data transferability framework would help regulators and developers get MRE developments permitted and that the BMPs were well developed and applicable. The need for existing data to be available and accessible was pervasive throughout the workshop, and participants felt an online tool that could provide such data for regulators and developers to use for permitting processes for future projects would be very useful. It was suggested to use case studies to "test" the data transferability framework and BMPs to understand how they might be applied or implemented, their efficacy, and any gaps that remained. Gathering examples of successful MRE data transfer or lessons learned from data transfer in other industries was also suggested to further inform the BMPs

Activity	Objective	Outcomes/Feedback Received
		and aid implementation. Participants agreed that the BMPs should be implemented with a plan to continue to validate/update them over time, potentially on an annual basis.

3.2 FY19

During FY19, OES-Environmental focused on the refinement of the data transferability process based on the feedback received from outreach and engagement efforts in FY18 and FY19, including the framework, data collection consistency table (in collaboration with the Triton Initiative), and *Monitoring Datasets Discoverability Matrix*.

In refining the data transferability process, and through interactions with U.S. regulators and the international MRE community, OES-Environmental developed a process for risk retirement that incorporates the concepts of data transferability and data collection consistency.

Significant outreach and engagement efforts continued in FY19 with stakeholder engagement taking place through international conferences, workshops, and webinars.

The following sections detail FY19 activities related to the refinement of the data transferability process and development of the pathway for risk retirement.

3.2.1 Data Transferability Online Workshop, April 2019

An online workshop was held in April 2019 to reach out to a wider audience of U.S. regulators and catch up any regulators new to our work. The workshop walked through types of information that represent the major MRE-environment interactions and presented the data transferability process. U.S. regulators were invited to the workshop, with a focus on reaching out to new regulators who had not yet engaged in our work and especially regulators who had permitted U.S. test centers, which was repeated on two separate days (April 9th and April 16th). A total of 18 attendees participated in the online workshops, including representatives from the Federal Energy Regulatory Commission (FERC), National Oceanic and Atmospheric Administration (NOAA), Bureau of Ocean Energy Management (BOEM), and governmental agencies from several states. The recording of the workshop was posted to *Tethys* for further engagement and has been viewed 7 times.

Feedback from the workshop was recorded and summarized by the project team. Participants reacted positively to the quality of data and visualizations available, especially for collision risk, and found the information presented helpful to gain a better understanding of MRE. Overall there was strong support for the concept and application of data transferability for the key MRE-environment interactions. There was a concern about the application of data transferability and that either projects may not be similar enough to enable accurate transfer of data or that projects would still need to collect some site-specific data (especially for habitat change). Some participants recommended that low-frequency sounds and potential masking effects be studied further on considering underwater noise from MRE devices for data transferability. Some participants thought that changes to physical systems were noted to require accurate and detailed models to collect appropriate data. One regulator suggested that further studies be done to refine transferability of mitigation options.

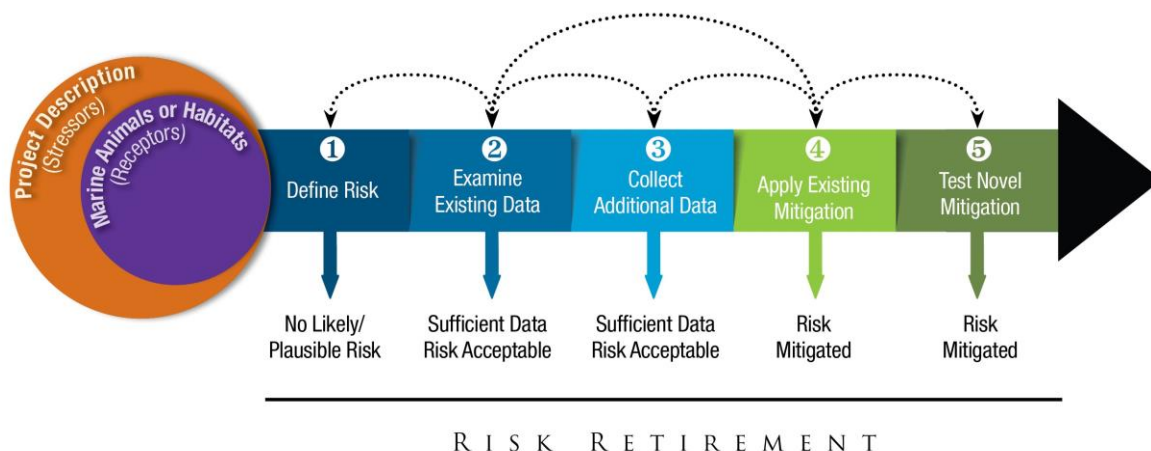### 3.2.2 Risk Retirement Online Workshop, May 2019

Figure 2. Pathway to Risk Retirement

A workshop was held in May 2019 to present the risk retirement pathway (Figure 2) and to introduce the *Monitoring Dataset Discoverability Matrix* and data transferability case studies. U.S. regulators were invited to the workshop, which was presented separately on two days (May 28th and May 30th). A total of 10 attendees participated in the online workshops. The recording of the workshop has been posted to *Tethys* for further engagement and has been viewed 9 times.

Feedback from the workshop was recorded and summarized by the project team. Participants liked the idea of risk retirement and continued to express support for data transferability. While there was limited feedback, some key points included the need to include monitoring as part of applying mitigation strategies to see if mitigation is successful and the continued need for baseline data especially as the industry progresses. One participant expressed that the pathway depends on having a significant project in the water to assess risk and effects. Another participant noted that effects can only be minimized so much, and since mitigation will be used to offset those effects it would be helpful to include data to show if such efforts have been successful. One participant also noted that as risk retirement moves forward it is important for data collected on environmental effects to inform regulatory analyses and to also be defensible in court to prove levels of risk, especially in Endangered Species Act situations. Another participant explained that it is important to define the risk retirement process as a guidance framework, rather than a one-size-fits-all scenario and that risk retirement may take away some leverage of collecting future data by regulators as part of permit requirements.

3.2.3 Regulator Surveys

Surveys have been conducted with regulators in other OES-Environmental countries, analogous to those in the U.S. These surveys were sent to regulators identified by each country's OES-Environmental Analyst. The original U.S. regulator survey was used as a template and was reviewed and revised by each country's OES-Environmental Analyst to be relevant and appropriate for their country, and where necessary, was translated by the Analyst. To date, survey results have been analyzed and a report of the results developed for the following countries:

- *United Kingdom (UK)*: Seven regulators participated. The UK regulators that participated in this survey have experience permitting MRE and are most familiar with tidal devices. The agencies and advisors they represent focus more on the effects of MRE devices on marine mammals, fish, seabirds, and ecology than they focus on economic or social effects. Their main concerns in permitting MRE developments, for both single devices and arrays, are centered around collision with tidal devices. In general, regulators are open to transferring data to permit projects but note that it depends on the applicability of the data to the specific site of the project to be permitted. Most of the regulators prefer an adaptive management approach for both tidal and wave projects as a means to move the MRE industry forward from a permitting perspective. Most regulators have been using *Tethys* for a while to gather information about environmental effects and have found it moderately to very useful. Going forward, the use of *Tethys* as a platform for additional webinars and trainings seems useful and likely to be successful for regulators in the UK.

- *Spain:* Two regulators participated. The Spanish regulators who participated have differing levels of experience permitting MRE and are not familiar with MRE devices. The government agencies they represent focus on the effects on marine mammals, fish, seabirds, and other animals rather than on energy production. Their main concerns in permitting MRE developments, for both single devices and arrays, is energy removal from the environment and changes to flow patterns. In general, regulators are open to transferring data to permit projects but note that it depends on the applicability of the data to the specific site of the project to be permitted. Regarding *Tethys* use, one regulator has been using *Tethys* for a while to gather information about environmental effects and has found it very useful. Going forward, the use of *Tethys* as a platform for additional webinars and trainings seems useful but will require increased promotion for awareness in Spain.

  While the two regulators who participated are the main regulators dealing with permitting of environmental effects of MRE at the Spanish national level, additional feedback from a larger number of regulators at different levels of government, especially the regional level, is recommended to provide a more representative view of Spanish regulator opinions. We are currently working with the Spanish OES-Environmental Analyst to survey regional regulators. If additional regulators respond, the results and associated report will be updated.

- *Sweden:* One regulator participated and had no experience permitting MRE and is not familiar with MRE devices. The federal agency represented focuses on energy production. The lack of responses to questions makes it difficult to identify concerns in permitting MRE developments for single devices or arrays. Since the participant did not respond to any of the questions regarding *Tethys*, no information is available on regulator awareness, uses, or perceived usefulness of *Tethys* as a platform for communicating the environmental effects of MRE. Increased promotion of Tethys as a tool may be helpful in increasing regulator awareness and engagement.

  The low response rate on this survey for Sweden indicates that a more strategic approach is needed to increase participation. It appears that this survey is not the best option at this time to engage regulators. Despite two reminder emails in addition to the initial email invitation, only one incomplete response was received. It should be noted that during this time, the Sweden OES-Environmental Analyst lost funding from the

Swedish government. If a new Sweden OES-Environmental Analyst is appointed, it may be fruitful to repeat the survey with additional engagement approaches such as personal emails to regulators to increase participation. Without sufficient responses from regulators it is difficult to know how to move forward. There has been a drop in interest and funding for MRE in Sweden.

Surveys have been sent out with reminders and are still in progress for France and Ireland.

Other countries that are planning surveys are listed with their current status below:

-   Japan: Some survey responses have been received on paper and the Japanese OES Analysts are working to include these on the online survey forms.

-   China: The Chinese regulator survey is finalized with a list of regulators to contact, but there has been a drop off in participation among the Analysts. When China reengages, there is reason to move forward with the survey.

-   Canada: The survey is drafted, and a list of regulators finalized. Distribution of the survey is waiting for a final review from the Analysts, and it will be completed and sent out soon.

-   Australia and Portugal: Both analysts have expressed interest in distributing the survey but indicated that they do not have time at the moment.

Results from these remaining surveys will be analyzed in FY2020.

3.2.4   Risk Retirement Workshops

A workshop was held in concert with the European Wave and Tidal Energy Conference 2019 (EWTEC) in Napoli, Italy (September 1st – 6th, 2019). The workshop tested the risk retirement pathway using case studies for EMF and underwater noise while focusing on stages 2 and 3 of the pathway (i.e. collecting additional data and assessing existing management measures, respectively). Detailed results and a summary of the workshop findings are forthcoming in early FY20. Preliminary interpretation of results indicates that participants found the risk retirement pathway intuitive and easy to navigate and that the material provided ahead of time was useful and well-synthesized. During the EMF breakout sessions, participants expressed the opinion that EMF is not a likely risk, especially compared to offshore wind farms, but that some basic information (e.g., baseline data on species and habitats, presence of other cables in the area) would be required in order to retire the risk for single device deployments. Participants also expressed concerns regarding the cumulative effects of EMF. During the underwater noise breakout sessions, participants agreed that the risk could be retired for single devices and small arrays after standardized baseline measurements of devices in the water would be provided by developers, as long as they are under the U.S. thresholds. However, they noticed that different countries have different requirements and transfer of knowledge from one project to another may not always be acceptable for regulators.

A similar workshop was also held at the Ocean Renewable Energy Conference 2019 (OREC) in Portland, OR (September 10th -12th, 2019). The risk retirement pathway was tested using case studies for underwater noise. Focusing particularly on stages 2 and 3 of the risk retirement pathway, the workshop experts were asked for input on whether the monitoring datasets and research studies identified meet the threshold for risk retirement. Preliminary results from this

workshop found that underwater noise is close to be retired when there is one device (tidal turbine or wave energy convertor). However, there is still a need to understand how animals use the surrounding area of the device (e.g. feeding, migration) and their behavior around the device (e.g. attraction, avoidance). In the case of an array, the distance between the devices would need to be regulated to avoid the propagation of sound with the distance. Experts agree that test centers allow the developers to deploy their device in the water and better assess the associated noise, contributing to the industry understanding around the potential environmental effects of underwater noise.

3.2.5   Coordination with Triton Initiative

DOE WPTO currently funds the Triton Initiative to test instruments and methodologies for measuring environmental effects around MRE devices. Growing from the OES-Environmental risk retirement research, the Triton project team created T-Fit (Triton Field Trials) to further investigate the application of data collection consistency for monitoring around MRE devices. This data collection consistency is a necessary element of the risk retirement process to reduce monitoring requirements for each MRE permitting application. As T-Fit carries out field tests and identifies a suite of methods and instruments that are preferred for measuring key stressor-receptor interactions, OES-Environmental will assess those outputs for potential inclusion in the pathway to risk retirement.

3.2.6   OES-Environmental Analyst Feedback

One-on-one Analyst meetings were conducted during FY19. Results and feedback from these meetings related to the data transferability process are summarized in the sections below by topic. The countries that participated in one-on-one meetings include all OES-Environmental countries listed below. OES-Environmental Analysts are indicated with an asterisk (*), and alternates are indicated with a double asterisk (**). Several calls included additional participants. The analysts and other representatives expressed appreciation for the one-on-one calls, and voiced interest in face-to-face meetings once a year, if possible.

- Australia: Mark Hermer* (Commonwealth Scientific and Industrial Research Organisation)

- Canada: Anna Redden* (Acadia University), Dan Hasselman** and Melissa Oldreive (Fundy Ocean Research Centre for Energy)

- China: Ou Ling** (National Ocean Technology Center)

- Denmark: Hans Chr Soerensen* (Wave Dragon)

- France: Morgane Le Jart** and Nolwenn Quillien* (France Énergies Marines)

- India: Purnima Jalihal* (National Institute of Ocean Technology)

- Ireland: Anne Marie O'Hagan* and Celia Le Lievre (University College Cork)

- Japan: Daisuke Kiazawa* and Takero Yoshida** (University of Tokyo)

- Portugal: Teresa Simas* and Erica Cruz (WavEC)

- Spain: Juan Bald* (AZTI-Tecnalia)

- Sweden: Jan Sundberg* (Uppsala University)

- UK: Annie Linley* (University of Plymouth) and Reanne Miller* (University of the Highlands and Islands)

- U.S.: Mary Boatman and Brian Hooker (BOEM), Candace Nachman (NOAA)

There are key Analysts missing among the OES-Environmental countries that should be addressed during the preparation for another phase of the initiative.

3.2.6.1 Regulator Survey

This section describes the feedback from analysts about the process of the survey and interest in participating.

Those that were able to distribute a Regulator Survey found it difficult to collect responses and get into contact with the key regulators to complete the survey (France, Ireland, Spain, Japan, Sweden). Many others did not have time to work on the Regulator Survey (Canada, Portugal), or did not think it would be beneficial in their country due to lack of regulator interest (Denmark).

This feedback can be used to inform future surveys in development and outreach. Moving forward, it is likely that surveys will need to be more country-specific, easy to complete, and regulators must be repeatedly engaged. It is critical for the success of the survey that the OES-Environmental Analysts are responsive and willing to partner with the U.S. in sending out emails to engage key regulators and initiating the survey.

3.2.6.2 Data Transferability Workshop Interest

Several OES-Environmental Analysts indicated interest in a data transferability workshop at this time. Portugal and Spain in particular were interested but are not currently able to move forward. Australia, Sweden, and France did not think there would be much interest from regulators. At this time, it seems like engaging with regulators to determine environmental challenges, interests, and limitations would be helpful for a variety of initiatives going forward.

3.2.6.3 Risk Retirement

Analysts like the idea of risk retirement and are supportive of starting with EMF and underwater noise. The U.S. in particular is very supportive as representatives from BOEM mentioned in their one-on-one meeting that they want to retire EMF risk, and NOAA representatives agreed that risk retirement is helpful. The Portugal Analyst likes the idea of focusing on EMF and underwater noise and suggested focusing on case studies to see if there are any additional risks that can be retired.

4.0 Future Work

The development of the data transferability process is complete, though open to revision over time. The focus going forward into FY20 will be on risk retirement and further engagement with regulators. As the risk retirement process developed during FY19, it is clear that data transferability plays a key role in risk retirement and will continue to be an important aspect of OES-Environmental work moving forward. These targets are described more specifically in the OES-Environmental Draft Phase 4 Proposal (Section 4.1) and Next Steps (Section 4.2).

4.1 Draft Phase 4 Proposal

Through the first three phases of Annex IV/OES-Environmental (2009-2012; 2013-2016; 2016-2020), Annex IV/OES-Environmental has been successful in accomplishing the initial goals set out in 2008: to facilitate efficient government oversight of the development of ocean energy systems by compiling and disseminating information on the potential environmental effects of these technologies and identifying methods used to monitor for effects.

Analysts from the 15 nations participating in phase 3 of OES-Environmental believe that there is an important continuing role for OES-Environmental to play in understanding environmental effects, making consenting processes more efficient, and furthering the MRE. Based on this belief, OES-Environmental nations have proposed that the initiative be continued for a fourth phase, lasting four years (2020-2024).

The specific objectives of phase 4 of OES-Environmental are to:

- Continue to curate and expand the knowledge base hosted on *Tethys* to ensure that all relevant publications are represented and accessible;

- Continue to update and collect metadata on all MRE projects for which environmental effects information has been collected;

- Engage members of the MRE community and their organizations around key questions of environmental interactions that are of importance in the siting and consenting of devices and arrays;

- Provide information that is useful and accessible for regulators to reduce uncertainty around environmental effects, and continue to make strides with risk retirement and data transferability;

- Identify and disseminate information on environmental effects uncertainties that continue to slow and complicate the development of the MRE industry through active outreach and engagement to device and project developers, researchers, and regulators;

- Support the acceleration of scientific findings into management and policy products to help reduce uncertainty for sustainable MRE development;

- Ensure that OES member nations are kept apprised of important findings in environmental effects research and monitoring; and

- Ensure that the new name OES-Environmental is recognized and accepted as the same effort as the previous Annex IV.

DOE and their U.S. partners will continue to coordinate tasks among the task participants for all aspects of the work. The activities will be implemented by PNNL, on behalf of DOE, with

significant input and specific work products led and carried out by the analysts from the OES-Environmental participating nations.

4.2 Next Steps

Next steps for data transferability include finalizing the *Monitoring Datasets Discoverability Matrix* and hosting it on *Tethys*. During FY19 the focus of OES-Environmental work shifted from data transferability to risk retirement, of which data transferability is an important part of the risk retirement process. The focus will continue to be on risk retirement for certain interactions of MRE devices and the marine environment. During FY20, the high-level goals for the project include a draft framework for guidance on risk retirement, including the methodology and criteria for developing guidance documents for four major stressor-receptor interactions (EMF, underwater noise, habitat changes, and changes in physical systems). Specific tasks for the FY20 that are relevant to data transferability are described in the subsections below.

4.2.1 *Monitoring Datasets Discoverability Matrix*

During FY20, PNNL will continue to collect and categorize relevant datasets for inclusion in the *Monitoring Datasets Discoverability Matrix*. The datasets could be in the form of raw or quality-controlled data but could also include information in the form of analyzed, synthesized data to reach some conclusion, reports, and other material that has been presented to regulators as part of a permitting process. Each entry in the matrix is tagged for easy retrieval, allowing the user to identify useful datasets by environmental parameters, type of MRE technology, stressors measured, and receptor animal groups and habitats. Each entry will have linkages to the metadata form for the project located on *Tethys*, with details on the datasets available and/or a contact person for the project. Associated papers, reports, and other accessible information will also be attached. The *Monitoring Datasets Discoverability Matrix* will be completed and available on *Tethys* for use during FY20. A webinar announcing and demonstrating use of the matrix will be conducted when the matrix is finalized. The matrix will continue to be updated in the future through the addition of new metadata forms for projects that are relevant for data transferability, curated by the *Tethys* team.

4.2.2 Triton Coordination

T-Fit under the Triton project, was born from the necessity to further investigate the need for data collection consistency for monitoring around MRE devices. Data collection consistency is a necessary element of the data transferability and risk retirement processes in order to reduce requirements necessary for each MRE permitting application. As T-Fit carries out field tests and identifies a suite of methods and instruments that are preferred for measuring key stressor-receptor interactions, OES-Environmental will assess those outputs and integrate them into the matrix, if applicable, and into the draft guidance framework for risk retirement.

5.0 Conclusion

Application and testing of the risk retirement process, including data transferability, requires that regulators and others from the MRE industry accept the premise of the process and begin to apply it. In particular, regulators must embrace the process to make it useable; device/project developers and their consultants must become familiar with the process so they can respond and interact with regulators through permitting and licensing processes; and researchers must be familiar with what is needed in order to design studies that produce compatible and useful information to further increase the base of knowledge in the monitoring dataset discoverability matrix and beyond.

Table 2 summarizes activities related to data transferability and risk retirement, including outcomes to date and next steps. Through the successful development and implementation of the data transferability risk retirement processes, OES-Environmental will continue its efforts of continuous outreach and engagement with relevant stakeholders to further the knowledge and understanding of potential environmental effects of MRE devices, in order to accelerate the siting and permitting process for MRE developments.

Table 2. Data Transferability and Risk Retirement Activities, Outcomes, and Next Steps

Activity	Outcomes to Date	Next Steps
Data Transferability		
Regulatory Survey	Survey complete in U.S. and used to design a series of online regulator workshops to understand the challenges of data transferability and inform development of a data transferability white paper. Survey complete in the UK, Spain and Sweden. France and Ireland regulator surveys have been sent out to regulators. Japan, China, and Canada are currently working on gathering responses. Australia and Portugal have expressed interest. See section 3.2.3 for more details.	Continue to work with OES-Environmental Analysts to deploy the regulator survey in all OES-Environmental countries. Evaluate the need to re-deploy surveys where participation has been low (such as Spain and Sweden).
Online Regulator Workshops and Webinars	5 online workshops and 1 webinar were held in FY18. 23 regulators joined in FY18 throughout the 5 Data Transferability Online Regulator Workshops. See Table 1 for feedback received on the online regulator workshops. 11 regulators joined for the August	Hold a webinar during FY20 once the *Monitoring Dataset Discoverability Matrix* is ready to be viewed to continue to engage regulators on the data transferability process and received their feedback on the matrix.

Activity	Outcomes to Date	Next Steps
	Data Transferability Webinar (9 of which had not joined a previous workshop). 34 members of the MRE community joined for the September Optimizing Permitting for MRE through Data Transferability Webinar. Of those who joined, 8 were regulators (4 of which had not joined a previous workshop or webinar). 4 online workshops were held in FY19. 17 regulators joined the two April Data Transferability Workshops (15 of which had not joined a previous workshop or webinar). Adding the 9 regulators who joined the two May Retiring Risk Workshops (3 of which had not joined a previous workshop or webinar), we have talked to 54 different regulators during FY18 and FY19 (53 U.S. regulators and 1 Canadian regulator).	
Workshops	FY18 Data Transferability and Collection Consistency Workshop around ICOE (June 2018) that brought together 16 members of the MRE community from 6 countries. See Table 1 for feedback received from the workshop.	N/A
Products and Tools	Data Transferability White paper, including a literature review of data transferability to frame development of the Data Transferability process	N/A
	Tethys Data Transferability page: https://tethys.pnnl.gov/data-transferability	Continue to update the Data Transferability page, which hosts information on outreach and engagements efforts including workshops, webinars, and additional data transferability documents. During FY20 the page will be revamped to include more details on the data transferability, rather than just

Activity	Outcomes to Date	Next Steps
		focus on the outreach aspect of the process.
	Data Transferability Framework and Best Management Practices documents to guide data transferability efforts	Update the framework and best practices as needed.
	Data Transferability Short Science Summary (SSS)	Publish the SSS on *Tethys* and include it as outreach material when travelling to conferences or hosting a workshop.
	Design and development of the *Monitoring Dataset Discoverability Matrix*	The matrix will be completed and available on *Tethys* for use during FY20. A webinar announcing and demonstrating use of the matrix will be conducted when the matrix is finalized. The matrix will continue to be updated in the future through the addition of new metadata forms for projects that are relevant for data transferability, curated by the *Tethys* team.
Coordination with Triton	Two meetings were held during FY19 to coordinate OES-Environmental work with Triton, in December 2018 and February 2019	Continue to hold coordination meetings to work together to achieve shared goals/outcomes
Risk Retirement		
Webinar	9 regulators joined the two May Retiring Risk Workshops (3 of which had not joined a previous workshop or webinar)	Continue to engage U.S. regulators and the MRE community through risk retirement webinars, held as needed.
Workshops	FY19 workshops at EWTEC and OREC. 32 participants from 6 countries were at the EWTEC workshop to discuss risk retirement for underwater noise and EMF. 51 participants from 3 countries were at the OREC	Continue to host workshops on risk retirement, specifically to receive feedback on risk retirement for four stressor-receptor interactions: underwater noise, EMF, habitat changes, and changes in physical systems

Activity	Outcomes to Date	Next Steps
	workshop to discuss risk retirement for underwater noise.	
Products and Tools	Development of the Risk Retirement Pathway	Continue to use the Risk Retirement Pathway to explain and guide the risk retirement process and engage the MRE community.

Additional information and reports can be found at https://tethys.pnnl.gov/data-transferability.

6.0 References

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