Workshop on Data Transferability and Collection Consistency

Andrea Copping and Mikaela Freeman
(Pacific Northwest National Laboratory)

Ian Hutchinson and Jennifer Fox
(Aquatera Limited)

Carrie Schmaus
(US Department of Energy)

June 12, 2018
900 – 1230
Cherbourg, France
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 – 920</td>
<td>Introductions</td>
</tr>
<tr>
<td>920 – 930</td>
<td>Challenges and introduction to data transferability, and collection consistency</td>
</tr>
<tr>
<td>930 – 1000</td>
<td>Brainstorm data transferability/best practices needs</td>
</tr>
<tr>
<td>1000 – 1030</td>
<td>Data Transferability Framework and Best Management Practices</td>
</tr>
<tr>
<td>1030 – 1045</td>
<td>Break</td>
</tr>
<tr>
<td>1145 – 1200</td>
<td>Report out from breakout sessions</td>
</tr>
<tr>
<td>1200 – 1220</td>
<td>Brainstorm implementation of BMPs</td>
</tr>
<tr>
<td>1220 – 1230</td>
<td>Next steps and closing remarks</td>
</tr>
</tbody>
</table>
Challenges to the MRE industry and the need for Data Transferability and Collection Consistency
Barriers to Consenting

- MRE industry perceptions
- Our perceptions of the regulatory community
- Annex IV working to bridge these gaps
  - 2018 theme: Data Transferability and Collection Consistency
- Learning as we go…
Engaging Regulators

2017

- Held two regulator webinars (largely US):
  - Environmental Effects of Permitting MRE Development
  - Environmental Effects of MRE Development: Regulator Survey Results and Next Steps

- Regulator Survey

2018

- Data Transferability Workshops in US
  - In-person: Portland, OR, US
  - Online: East and West Coast of US

- ICOE workshop

What do we mean by “data”?

- We really mean data and information:

  Could be raw or quality controlled data but more likely analyzed data, synthesized data to reach some conclusion, reports, etc.
Participants indicated:
- Difference in impacts between single device and array
- Risk increases with scale, but more data needed

Data transferability should be further explored
- No one answered “never”
- 25% state regulators and 36% federal answered “absolutely”
Data Transferability and Collection Consistency

Challenges:
- Lack of access to data from early stage projects
- Lack of consistent methods for data collection
- No mechanisms to apply data/information between projects

Goal: to transfer learning from early projects to inform future projects

To consider transfer from, necessary that data are collected with similar methodologies, measurements, etc.
Working with US Regulators

- Data can be transferred from:
  - Research studies and established projects (monitoring)
  - Other industries with similarities

- Site specific data collection could be reduced

- Data for “transferring” need to be collected consistently for comparison

- 5 Data Transferability Workshops (~2 hours)

- Share MRE data, understand regulators’ needs and willingness to transfer data

- Gather feedback on our data transferability framework
Sample data from regulator workshops

Tidal turbines at EMEC
Sample data from regulator workshops

WECs at WETS (Hawaii)
Data Transferability Framework and Best Management Practices
Annex IV proposes: Framework for Data Transferability

- Develop common understanding of data types and parameters to address potential effects of MRE development.
- Create best practices for consistent collection of data.
- Engage regulators to test framework, solicit input on acceptance for data transfer.
- Guide implementation of best practices for siting, permitting, post-installation monitoring, and mitigation.

Framework:
1. Method for describing environment, evaluating the comparability of data sets (MRE project archetypes);
2. Description for applying framework; and
3. Method for implementing framework, to support regulatory processes
Key Interactions (Stressors) for Data Transferability

<table>
<thead>
<tr>
<th>Stressors</th>
<th>MRE Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision Risk</td>
<td>Tidal</td>
</tr>
<tr>
<td>Underwater Noise</td>
<td>Wave and tidal</td>
</tr>
<tr>
<td>EMF</td>
<td>Wave and tidal</td>
</tr>
<tr>
<td>Changes in Benthic Habitat</td>
<td>Wave and tidal</td>
</tr>
<tr>
<td>Physical Systems</td>
<td>Wave and tidal</td>
</tr>
</tbody>
</table>
Marine Renewable Energy Project Archetypes

Archetypes =
- A very typical example
- Imitation of an original
- Learned from other industries – economics, transportation, ecology, and land system science

Marine Renewable Energy Project Archetypes = MREPAs

“Like” MREPAs have highest potential for data transferability

MREPA defined by 4 variables:
- Stressor
- Site Conditions
- MRE technology types
- Receptor groups
<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Technology</th>
<th>Receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow and Narrow Channels</td>
<td>Tidal Device, Bottom-Mounted</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
<tr>
<td></td>
<td>Tidal Device in the Water Column</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
<tr>
<td>Shallow and Wide Channels</td>
<td>Tidal Device, Bottom-Mounted</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
<tr>
<td></td>
<td>Tidal Device in the Water Column</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
<tr>
<td>Deep and Wide Channels</td>
<td>Tidal Device, Bottom-Mounted</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
<tr>
<td>Deep and Narrow Channels</td>
<td>Tidal Device, Bottom-Mounted</td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine Mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diving Birds</td>
</tr>
</tbody>
</table>
Applying the Data Transferability Framework

1. Characterize the MREPA of the future project

Stressor
• Collision Risk

Site Conditions
• Shallow & Narrow Channels

Technology
• Tidal, Bottom-Mounted

Receptor
• Marine Mammals

MRE Project Archetype
2. Compare MREPA of the future project with those of existing projects, to determine similarity.
Applying the Data Transferability Framework

3. Evaluate transferability potential

**Evaluation Hierarchy**

- **Necessary**
  - Same MREPA

- **Preferred**
  - Same receptor species (or closely related)
  - Similar technology and project size
  - Similar wave/tidal resource

- **Optional**
  - Close geographical proximity
Monitoring Dataset Matrix

- Under development
- Used to classify all existing monitoring datasets by an MREPA
  - List key metadata features of each dataset

- Allows for:
  - Datasets to be easily found, based on MREPA
  - Evaluation of data consistency
  - Evaluation of transferability between existing project datasets for future projects
Best Management Practices (BMPs)

“practices or procedure, that are qualitative and flexible” (EPA 1993)

3 phases:
1. Planning
2. Development and Implementation
3. Evaluation and reevaluation

Planning – regulator workshops and Data Transferability Framework

Development
- Draft BMPs
- Examination/improvement of BMPs
- Develop implementation plan

Creating BMPs for data transferability and collection consistency

Focus today
Minimum Requirements for Data Transferability

1. Projects share the same MREPA (preferable to share several steps in the Evaluation Hierarchy)

2. Data collected in a consistent manner

Based on the Data Transferability Framework
Collecting Data in a Consistent Manner

- To transfer data, need to understand similarities of data
- Encourage use of consistent data collection processes and units
  - Increase confidence in transfer of data/information/learning
- For qualitative data – evaluate based on trustworthiness of data

<table>
<thead>
<tr>
<th>Quality Criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credibility</strong></td>
<td>Establishes whether the research findings represent plausible information drawn from the participants’ original data and are a correct interpretation of the participants’ original views.</td>
</tr>
<tr>
<td><strong>Transferability</strong></td>
<td>The degree to which the results of qualitative research can be transferred to other contexts or settings with other respondents.</td>
</tr>
<tr>
<td><strong>Dependability</strong></td>
<td>The stability of findings over time. Includes participants’ evaluation of the findings, interpretation and recommendations of the study such that all are supported by the data as received from participants of the study.</td>
</tr>
<tr>
<td><strong>Confirmability</strong></td>
<td>The degree to which the findings of the research study could be confirmed by other researchers and the findings are clearly derived from the data.</td>
</tr>
<tr>
<td><strong>Reflexivity</strong></td>
<td>The process of critical self-reflection about oneself as researcher (biases, preferences, preconceptions), and the research relationship (how the relationship affects participant’s answers to questions).</td>
</tr>
</tbody>
</table>
## Data Collection Consistency

<table>
<thead>
<tr>
<th>Stressor/Interaction</th>
<th>Process or Measurement Tool</th>
<th>Reporting Unit</th>
<th>Analysis or Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision Risk</td>
<td>Sensors include:</td>
<td>Number of visible targets in field of view, number of collisions.</td>
<td>Number of collisions and/or close interactions of animals with turbines used to validate collision risk models.</td>
</tr>
<tr>
<td></td>
<td>- acoustic only,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- acoustic + video,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underwater Noise</td>
<td>Fixed or floating hydrophones</td>
<td>Amplitude dB re 1μPa at 1 m Frequency: broadband or specific frequencies</td>
<td>Sound outputs from MRE devices compared against regulatory action levels. Generally broadband noise unless guidance exists for specific frequency ranges.</td>
</tr>
<tr>
<td>EMF</td>
<td>Source:</td>
<td>AC or DC; voltage; amplitude</td>
<td>Measured EMF levels used to validate existing EMF models around cables and other energized sources.</td>
</tr>
<tr>
<td></td>
<td>- cable;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- other;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- shielded or unshielded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat Change</td>
<td>Underwater mapping with sonar; video; other</td>
<td>Area of habitat altered, specific for each habitat type.</td>
<td>Compare potential changes in habitat to maps of rare and important habitats, to determine if these are likely to be harmed.</td>
</tr>
<tr>
<td></td>
<td>Habitat characterization from mapping; existing maps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in Physical Systems</td>
<td>Modeling, with or without validation</td>
<td>No units. Indication of datasets used for validation, if any.</td>
<td>Data collected around arrays should be used to validate models.</td>
</tr>
</tbody>
</table>
1. Meet the minimum requirements to be considered for data transfer.
   • *Determine MREPA(s) for future project, search for similar MREPA(s), and choose datasets that match.*

2. Determine likely data sets that meet data consistency needs.
   • *Determine if collection methods are sufficiently similar.*

3. Use models in conjunction with and/or in place of datasets.
   • *Once sufficient data exists, models should be created to describe interactions, which can take place of larger field data collection. In some cases, models may be used prior to collection of field data.*

4. Provide context and perspective for datasets to be transferred.
   • *Collect ancillary datasets when available to provide context (i.e., behavioral studies of animals, habitat maps, etc.)*
Breakout sessions

Discuss:

- Minimum requirements for Data Transferability
- Data Collection Consistency Table
- Best Management Practices
Report out
Implementation

► Desirable to have support from all parties involved in permitting/consenting MRE devices

- Regulators
- Device and Project Developers
- Researchers and Consultancies

► Brainstorm steps to implement:

1. Data Transferability Framework
2. Collection Consistency
3. Best Management Practices
Next Steps

- Continue to seek input from regulators in US and other Annex IV country
- Finalize BMPs for data transferability and collection consistency
- Develop steps for implementation
- Present findings via web-based tool on Tethys
Thank you for joining us today!

Andrea Copping
Pacific Northwest National Laboratory
andrea.copping@pnnl.gov
+1.206.528.3049

Mikaela Freeman
Pacific Northwest National Laboratory
mikaela.freeman@pnnl.gov
+1.206.528.3071