



Pacific Northwest
NATIONAL LABORATORY

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Annex IV Meeting of Country Analysts online meetings

September 20th 2018



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



ANNEXIV

Today...

- ▶ New Annex IV nations
- ▶ Updated Annex IV pages
- ▶ Data transferability process
 - Regulator surveys
 - Process for data transfer
 - Data collection consistency
 - ICOE workshop
- ▶ Social and economic data in consenting
- ▶ Plans for next year:
 - Engagement for data transferability
 - Workshops
 - Planning for 2020 SoS
- ▶ Annex IV Ambassador Activities
- ▶ Roundtable



New Annex IV nations

Annex Member Nations	Analysts
Australia	Mark Hemer, CSIRO
Canada	Anna Redden, Acadia University
China	Wei Xu, National Ocean Technology Center
Denmark	Hans Chr Soerensen, Wave Dragon
France	Nolwenn Quillien, France Énergies Marines
India	Purnima Jalihal, NOIT
Ireland	Anne Marie O'Hagan, Univ College Cork
Japan	Daisuke Kitazawa, University of Tokyo
Norway	Lars Golmen, NIVA
Portugal	Teresa Simas, WavEC
South Africa	Wikus van Niekerk, Stellenbosch University
Spain	Juan Bald, AZTI-Technali
Sweden	Jan Sundberg, Uppsala University & Olivia Langhamer, Chambers University
United Kingdom	Annie Linley, University of Plymouth
United States	Andrea Copping, PNNL

The WREN white paper on Adaptive Management in the Wind Energy Industry is available [here](#).



Marine Energy

Generating electricity from the sea



Wind Energy

Generating electricity from wind on land and at sea



Annex IV

Addressing environmental effects of marine energy internationally



WREN

Resolving conflicts between wind and wildlife internationally



NEW USER

If you are new to Tethys, start here to learn more

KNOWLEDGE BASE

Access thousands of publications and more, all in a searchable database

← **SEPTEMBER 2018** →

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Tethys Story

A radar study to relate the number of birds crossing an area to the number of fatal bird collisions at wind turbines

The number of fatal bird collisions at wind turbines is rarely studied in relation to the number of birds observed crossing an area. The reason might be that the acquisition of such data is time consuming, costly, and not trivial. The analysis and interpretation of radar data is especially... [Read More](#)

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About Annex IV

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ANNEX IV

[Access Tethys Knowledge Base](#)

Annex IV was established by the [International Energy Agency \(IEA\) Ocean Energy Systems \(OES\)](#) in January 2010 to examine environmental effects of marine renewable energy (MRE) development. The United States leads the Annex IV effort, with the [US Department of Energy \(DOE\)](#) as the Operating Agent, partnered with the [US Bureau of Ocean Energy Management \(BOEM\)](#) and the [US National Oceanic and Atmospheric Administration \(NOAA\)](#). Annex IV is implemented by [Pacific Northwest National Laboratory \(PNNL\)](#), utilizing *Tethys* as the platform on which Annex IV activities are coordinated and recorded.

The MRE industry is relatively new and has faced regulatory challenges associated with potential environmental impacts that are not well understood. Annex IV is mobilizing information and practitioners from OES nations to coordinate research that can progress the industry in an environmentally responsible manner. A key component of this effort involves making existing information available and accessible.

To access the member-only collaborative space, visit the [Annex IV Members Page](#).

Countries Currently Involved in Annex IV (14)

- [Canada](#)
- [China](#)
- [Denmark](#)
- [France](#)
- [India](#)
- [Ireland](#)
- [Japan](#)
- [Norway](#)
- [Portugal](#)
- [South Africa](#)
- [Spain](#)
- [Sweden](#)
- [United Kingdom](#)
- [United States](#)

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Notable Annex IV Products

Annex IV provides a unique perspective of MRE and the environment on the global scale, which is compiled into a collaborative report after every 3-4 years. Additionally, Annex IV partners with conferences and hosts workshops to bring researchers together around environmental issues. Whenever possible, products from these activities are made publically available via Tethys. Below is a list of notable products:

- [2018 Annex IV The State of Knowledge for Environmental Effects: Driving Consenting/Permitting for the Marine Renewable Energy Industry](#)
- [2018 Annex IV/ORJIP Workshop: Data Transferability and Collection Consistency Workshop \(ICOE\)](#), Cherbourg, France
- [2018 Annex IV/ORJIP Workshop: Case Studies on Social and Economic Effects around MRE Development](#), Kirkwall, UK
- [2017 Annex IV/ORJIP Workshop: Exploring the State of Understanding and Practice used to Assess Social and Economic Risks and Benefits of Marine Renewable Energy Development](#), Cork, Ireland
- [2017 Annex IV/ORJIP Workshop: Management Measures Workshop](#), Glasgow, UK
- [2016 Annex IV Workshop: Pacific Region Marine Renewables Environmental Regulations](#), Portland, USA
- [2016 Annex IV State of the Science Report](#)
- [2016 Annex IV Workshop: Collision Risk for Marine Mammals and Tidal Turbines](#), Edinburgh, UK
- [2015 Annex IV Workshop: State of the Science](#), Nantes, France
- [2014 Annex IV Workshop: Environmental Monitoring, Regulatory Needs & Scientific Capabilities](#), Wolfville, Canada
- [2014 Annex IV Workshop: Best Practices for Monitoring Environmental Effects of Marine Energy Devices](#), Stornoway, UK

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Welcome to the Annex IV members page! While most Annex IV information and content is publicly accessible, **this space is reserved for Annex IV member nations for collaborative work, please contact us** **if someone needs access.**

We recommend you add this page to your bookmarks for quick access. To avoid information overload, the members page primarily lists resources available only to members. You can find general information about Annex IV on the public [About Annex IV](#) page.

Annex IV Meetings

Access documents, presentations, and additional materials from Annex IV meetings.

- [May 2018 Analysts' Meetings](#) ([Presentation](#) , [Recording](#), [Meeting Notes](#))
- [January 2018 Analysts' Meetings](#) ([Presentation](#) , [Meeting Notes](#) , [Data Transferability Paper](#))
- [October 2017 Analysts' Meetings](#) ([Presentation](#) , [Meeting Notes](#))
- [May 2017 Analysts' Meetings](#) ([Presentation](#) , [Meeting Notes](#) , [Environmental Management Measures](#))
- [March 2017 Analysts' Meetings](#) ([Presentation](#) , [Meeting Notes](#))
- [January 2017 Analysts' Meetings](#) ([Presentation](#) , [Meeting Notes](#) , [Annex IV Phase 3 DOE Work Plan](#) , [Management Measures Workshop](#))

Google Drive

Access files that Annex IV is actively working on via [Google Drive](#), which includes working papers, [ambassador activities](#), outreach materials, and more. Documents may be shared and multiple people can edit the same paper simultaneously. You may need to create a free Gmail account if you do not currently have one.

Annex IV Contacts

You can view a list of [contact information](#) for all individuals involved in the Annex IV project. Your account settings determine what information is shown here, and this page is only available to other Annex IV members.

Annex IV Metadata

Annex IV metadata forms (questionnaires) are used to solicit information from project developers and researchers that are performing environmental work. Current projects can be found on the [Knowledge Base](#) and [Map Viewer](#). We need your help sending metadata forms to developers and researchers from your country. We are specifically interested in projects where environmental monitoring was conducted and larger research initiatives with multiple publications. Please contact [Mikaela Freeman](#) if you have any questions. Templates for the forms are available here:

- [Annex IV Research Study Metadata Form](#)
- [Annex IV Project Site Metadata Form](#)

Notable Annex IV Products

Annex IV provides a unique perspective of MRE and the environment on the global scale, which is compiled into a collaborative report after every 3-4 years. Additionally,

Recap:

- ▶ Survey of US regulators to determine needs (<https://tethys.pnnl.gov/annex-iv-members-page>)
- ▶ Data transferability white paper complete
- ▶ US regulator workshops:
 - Showed the regulators data, rolled out data transferability framework, archetypes
- ▶ Drafted Best Management Practices (BMPs)
- ▶ Convened experts at workshop around ICOE (Annex IV/ORJIP)



- ▶ Regulators not looking for raw data
- ▶ Valued videos, audio clips and other data/information
 - Help increase understanding of potential impacts
- ▶ Overall, positive feedback
 - Would help to find data/information easier
 - Reacted positively to ability to have data available that are compatible with proposed projects



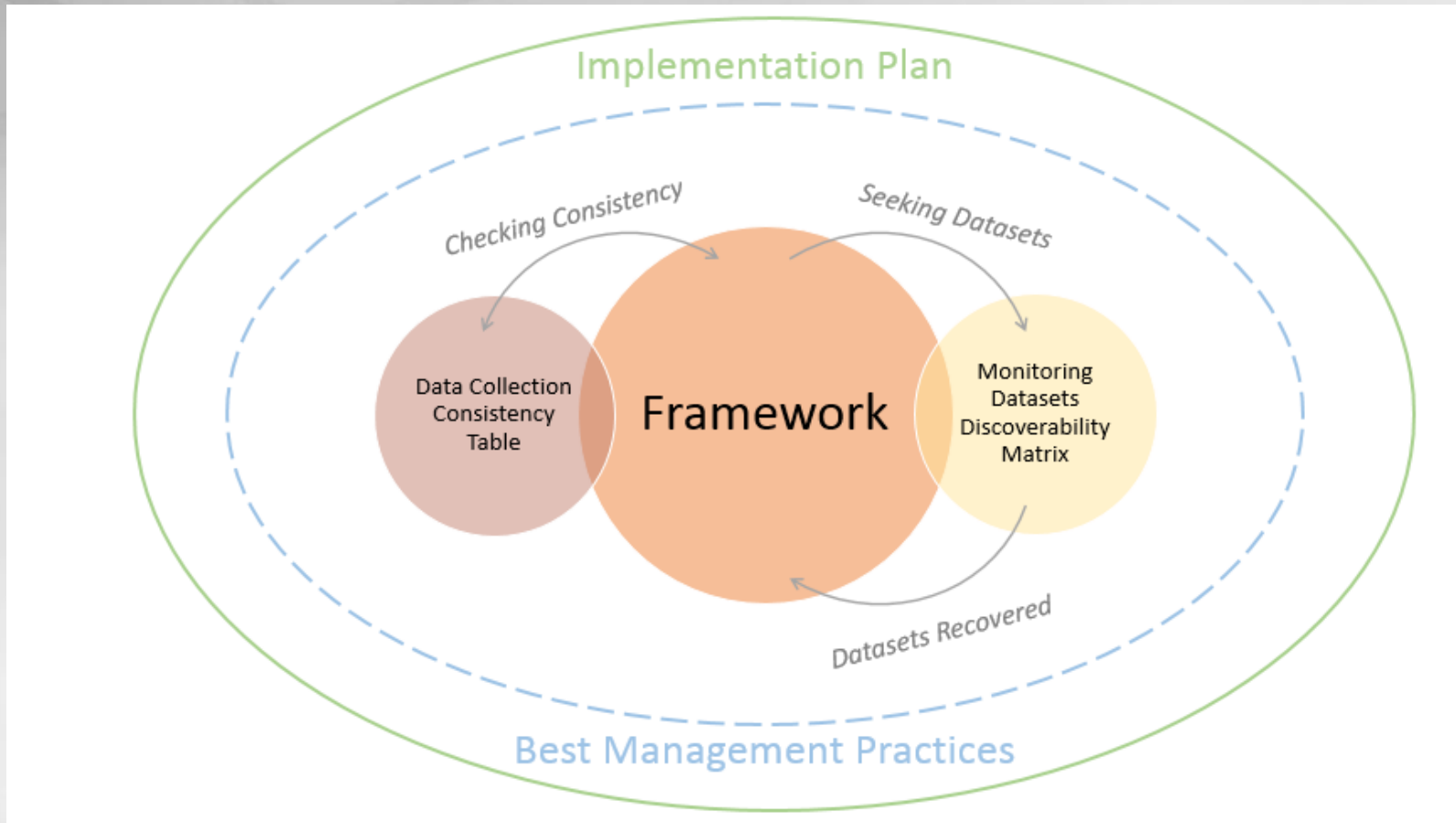
Expert Workshop at ICOE

- ▶ 21 attendees from 7 countries
- ▶ Information provided ahead of time
- ▶ Smaller group discussions, sharing of information on:
 - Minimum requirements for data transferability
 - Data collection consistency table
 - Best Management Practices



- ▶ Need regulators most of all to buy-in (no excuses!)
 - Also need industry to become familiar, buy in
- ▶ Need datasets from approved projects available and accessible
- ▶ Framework and BMPs look good and should be implemented
 - Look at validating/updating BMPs on an annual basis
- ▶ Learn from analogous industries as well as successful/unsuccessful MRE “data transfer”
- ▶ Importance of data collection consistency, needs more refinement
- ▶ Use case studies to test framework and BMPs
 - Assess applicability and efficacy
 - Identify gaps
- ▶ Bring together:
 - International forum to validate and update BMPs
 - Groups of regulators to talk to one another

Data Transferability Process



Data Transferability Guidelines

Necessary

- 1: Same MREPA and data collected consistently

- 2: Same project size (single or array)

Important

- 3: Same receptor species (or closely related)

- 4: Similar technology

Desirable

- 5: Similar wave/tidal resource

Data Collection Consistency

- ▶ Consistent processes/units for data collection can increase confidence in transfer of data
- ▶ Quality assurance checks on existing data
- ▶ Trustworthiness of data: credible, transferrable, dependable, confirmable, and reflexive

Stressor	Process or Measurement Tool	Reporting Unit	Analysis or Interpretation
Collision Risk	Sensors include: acoustic only, acoustic + video, Other	Number of visible targets in field of view, number of collisions	Number of collisions and/or close interactions of animals with turbines used to validate collision risk models
Underwater Noise	Fixed or floating hydrophones	<ul style="list-style-type: none"> • Amplitude dB re 1 μPa at 1 m • Frequency: broadband or specific frequencies 	Sound outputs from MRE devices compared against regulatory action levels. Generally reported as broadband noise unless guidance exists for specific frequency ranges.
EMF	Source: Cable, other, shielded or unshielded	AC or DC, voltage , amplitude	Measured EMF levels used to validate existing EMF models around cables and other energized sources.
Habitat Change	<ul style="list-style-type: none"> • Underwater mapping with: sonar, video • Habitat characterization from: mapping , existing maps 	Area of habitat altered, specific for each habitat type	Compare potential changes in habitat to maps of rare and important habitats to determine if they are likely to be harmed.
Displacement/ Barrier Effect	Population estimates by: human observers , passive or active acoustic monitoring , video	Population estimates for species under special protection	Validation of population models, estimates of jeopardy, loss of species for vulnerable populations
Changes in Physical Systems	Numerical modeling, with or without field data validation	No units. Indication of data sets used for validation, if any.	Data collected around arrays should be used to validate models.

- ▶ Under development
- ▶ Classify datasets from consented projects by MREPA:
 - Project size (single/array)
 - Stressor and receptor
 - Technology
 - Site conditions
- ▶ Discover datasets, based on MREPA, and evaluate consistency of information
- ▶ Help transfer data from an already permitted/consented project to future projects (applications to regulators)
- ▶ Will be web-based tool on *Tethys*

- ▶ **BMP 1: Meet the necessary requirements in the Guidelines for Transferability to be considered for data transfer from an already permitted/consented project to a future project.**
 - Purpose: Ensure minimum thresholds, necessary to have the same MREPA and data collected consistently, are met for transferring data.

- ▶ **BMP 2: Determine likely datasets that meet data consistency needs and quality assurance requirements.**
 - Purpose: Ensure methods used to collect/analyze data are compatible and will help to determine the validity of their comparison.

- ▶ **BMP 3: Use of models in conjunction with and/or in place of datasets.**
 - Purpose: Encourages the use of numerical models to simulate interactions.

- ▶ **BMP 4: Provide context and perspective for datasets to be transferred.**
 - Purpose: Encourages the use of available and pertinent datasets to enhance the interpretation of data and information.

- ▶ Please review Data Transferability Report, including Framework, BMPs, and Implementation Plan, and provide feedback



Call for Annex IV country input

- ▶ Data Transferability information on *Tethys*:
 - <https://tethys.pnnl.gov/data-transferability>
- ▶ Data Transferability Webinar for MRE community, Sept 25th 8:00am PT (UTC-7)
 - <https://tethys.pnnl.gov/events/optimizing-permitting-mre-through-data-transferability>

Social and Economic Impacts of MRE



- ▶ Two expert workshops held around EWTEC (Aug 2017, Cork IE) and EIMR (April 2018, Orkney UK)
- ▶ Review reports on *Tethys*:
 - <https://tethys.pnnl.gov/conferences-and-workshops>
- ▶ Developing Short Science Summary on Social and Economic data collection and use in Consenting



Call for Annex IV country input

Social and Economic Impacts of MRE

- ▶ Examining data needs for consenting/permitting
- ▶ At strategic level (for nation, region) and at project scale:
- ▶ Listing and description of data such as:
 - Employment
 - Supply chain companies and revenues
 - Housing and effects on schools
 - Effects on indigenous populations, etc.
- ▶ Important outcomes:
 - Need reliable baseline data, at appropriate scale (not national...)
 - After data need to use same scale, methods
 - Strategic level data ought to be purview of gov't
 - Project level data from developers
 - Data collected need to be directed at important questions
 - Need means to track outcomes after consenting
- ▶ Best Management Practices for data collection and use under development

Plans for next year

- ▶ Data transferability process
- ▶ Convene a virtual group of international representatives from across MRE community
- ▶ Annex IV workshop opportunities, conferences
- ▶ Planning for 2020 State of Science report

- ▶ Data transferability:
 - Regulator surveys in other Annex IV countries
 - Workshops or other meetings on data transferability and consistency
 - Will continue outreach in US

- ▶ Convene a virtual group of international representatives from across MRE community
 - To share progress in understanding and permitting/consenting MRE projects
 - To provide technical assistance in using the framework and BMPs
 - To gauge the success of the venture

EWTEC – September 2019, Naples IT

- ▶ Annex IV will contribute to environmental track (Jan and Andrea TDs)
- ▶ Opportunity for workshop:
 - Ideas
 - Collision risk still top tidal and river turbine issue
 - Other ideas...?
- ▶ OMAE in Glasgow in June 2019...?
- ▶ Other conferences in 2019...?
- ▶ PAMEC in Costa Rica January 2020
- ▶ ICOE in Washington DC in April/May 2020



Call for Annex IV country input

▶ Timing

- Must be released (draft or final) by May 2020
- Begin planning now, settle on annotated outline by January 2019
- Encourage authors, contracts where needed
- Full draft by September 2019 for Annex IV review
- October-November 2019 review by OES, peers
- Finalize in early 2020.

▶ Topics:

- Update on the topics in 2016 SoS
- Data transferability
- (my idea!) chapter that works through ~2 risks towards retirement (underwater noise, EMF...??)
- Other....??



Call for Annex IV country input

Annex IV Ambassadors

- ▶ Formally track activities for all Annex IV nations
- ▶ Asking analysts to act as “ambassadors” for Annex IV

Purpose:

- ▶ To increase awareness of work of Annex IV
 - Understanding status of environmental effects of MRE development
 - Explaining how risk of effects/uncertainty affects consenting, monitoring
 - Describing pathway forward to ‘retiring’ risks
- ▶ Also, to increase awareness of Annex IV/*Tethys* and conduct outreach activities in all Annex IV countries
- ▶ Please fill out Google Drive [Ambassador spread sheet](#)



Call for Annex IV country input



Roundtable



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Future Meetings

- ▶ December 4th 2018
- ▶ March 2018

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ANNEX IV