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Sharing Information on Environmental Effects of Marine Energy: the Annex IV Initiative

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Showing the World – Update on Flagship Projects
International Conference on Ocean Energy
Halifax Nova Scotia
November 5th 2014

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Today….

- Importance of environmental effects for accelerating marine energy development.
- Addressing information needs internationally
  - OES Action
  - Annex IV
- Annex IV goals
- Annex IV progress and products:
  - Metadata
  - Workshops
  - Experts' Forums
  - Webinars
  - Information on Tethys

Environmental Effects of Marine Energy

- Drivers of marine energy development are clear:
  - Need for reliable low carbon energy sources, mitigate climate change
  - Renewable energy standards in many nations, regions
  - Secure energy generated locally

BUT

- Stakeholders have concerns about potential impacts
- Regulatory/consenting processes are not well established

DRIVEN BY:

- New, largely unknown technologies with unknown potential for harm
- New use of ocean space, many other users
- Insufficient knowledge of ocean environment in high energy areas
- Concerns about marine species already under stress

Annex IV – A Concept in Sharing Information and Analyses Internationally

- Phase 1: 2010 – 2012
  - OES ExCo approved Annex IV *Phase 1* in 2009
  - Proposed by US; US Dept of Energy as Operating Agent
  - Other US federal partners: BOEM, FERC, NOAA
  - Seven Annex IV nations: US, New Zealand, Canada, Denmark, Spain, Ireland and South Korea
  - Focus on information gathering, developing data platform, analysis of key interactions

Annex IV – A Concept in Sharing Information and Analyses Internationally

- Phase 2: 2013 – 2016
- Approved by OES Ex Co in 2013
- Twelve member nations so far: US, New Zealand, Canada, Denmark, Spain, Ireland, Portugal, UK, Japan, China, Norway, Sweden.
- Emphasis continues on information gathering, sharing, analysis
- Also creating a commons, gathering place

Developing and Sharing Information: Annex IV case studies, workshops, webinars, expert forums, *Tethys*

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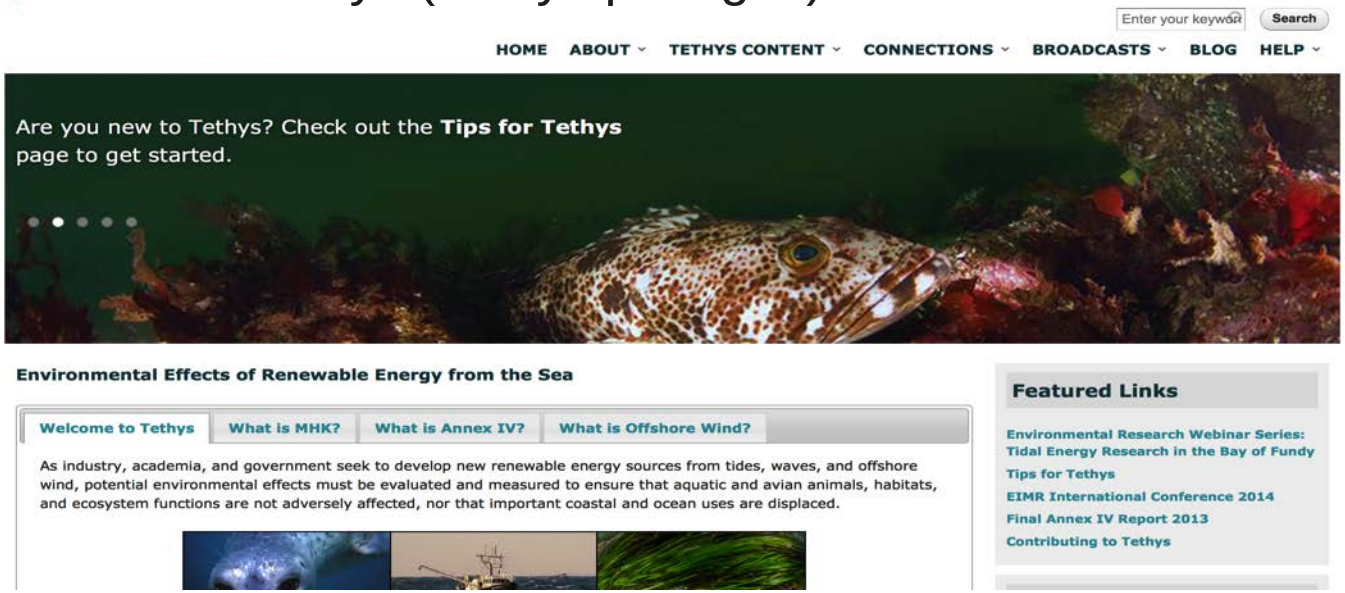
- Metadata collection of environmental information at project sites and pertinent research studies
- Annex IV report: case studies of key interactions
- Series of workshops, building towards scientific understanding
- Webinars on environmental effects
- Experts forums on specific scientific questions
- All hosted on Tethys (Tethys.pnnl.gov)



Annex IV Metadata Forms

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ENVIRONMENTAL EFFECTS METADATA SURVEY FORM

Name of person updating the form

Date submitted

Project name:

Project description:

Project Developer:

Technology type:

Resource (wave, tidal):

Project scale (test site, prototype, array, commercial):

Installed capacity (MW):

Project Website:

Launch Date:

Additional Description:

Location:

Ocean/Water body:

Closest city:

Country:

Coordinates (please use Mercator):

Depth:

Process status:
Current status of the project implementation and future developments
Expected operation date (if project is under way please indicate the start date)

Demonstration Environmental Monitoring Studies: Pelamis Wave Power P2 Demonstration at EMEC

Receptor	Study Description	Design and Methods	Results	Status
Physical Environment	Impact of wave energy farms in the shoreline wave climate.	Prototypes where used to create the effect of wave extraction by wave farms.	Results show that energy extraction does not exceed 9.3%, 23% and 14% of the incident energy in the wave farms, respectively for January, July and October.	Completed
Noise	Underwater Noise Study. A desktop study of underwater noise has been carried out in support of the Scottish Executive's strategic environmental assessment for marine renewables.	A desk based study, which analyses the potential impact of device noises on receptors on the marine environment. The results have been compared to the expected ambient noise levels.	With Limited data, the report concludes there is no significant harm to the surrounding environment.	Completed
Benthos	A study to investigate the evironmental impact of marine renewables.	Desk and field study.	Cable laying and anchoring will cause temporary and minor disturbances to seabed habitats.	Completed
Large Vertebrates	Environmental assessment Orkney.	Desk and field study.	Under water noises from cables will be of no disturbance to cetaceans and pinnipeds. Seals are native to the Orkney site and are likely to be intrigued and habitat the Pelamis device over time.	Completed
Birds	Environmental assessment Orkney.	Desk and field study.	It is considered the shear presences of the device will deterrent avian.	Completed
Marine Uses	Environmental assessment Orkney.	Desk and field study.	Trawling activities regular take place around the Orkney islands in depths of around 58m. It is recognized that during installation of the Pelamis device an increase of traffic was caused. However with a 500m-radius exclusion zone surround the device granted by the Scottish Government, therefore mitigating risk of collision.	Completed
Archaeology	Environmental assessment Orkney.	Desk and field study.	Orkney not considered for its archaeological heritage but is regarded for local culture. The greatest impact would be on unknown archaeology; though known archaeology artifacts are not at risk from works.	Completed
Reports and Papers	Carl Bro. (2002). Marine Energy Test Centre, Orkney Environmental Statement. Marine Energy Test Centre. 1 (36) (available at ftp://website:website@emec.ftpstream.com/Billia%20Croo%20ES%20(CarlBro)%202002.pdf)			
Research	http://www.emec.org.uk/research/			

Annex IV Report, 2013

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Three Case Studies:

- Interaction of animals with tidal blades
- Effects of underwater noise from wave and tidal devices
- Changes to physical systems from energy removal

- An update planned for 2016 “State of the Science” report

- Available for download from OES site and from Tethys

Environmental Effects of Marine Energy Development around the World
Annex IV Final Report

January 2013

Workshops

Date	Workshop	Location
2007	Ecological Effects of Wave Energy Development in the Pacific Northwest	Newport OR, US
2010	Environmental Effects of Tidal Energy Development: Proceedings of a Scientific Workshop	Seattle WA, US
2013	Instrumentation for Monitoring around Marine Renewable Energy Converters: Workshop Final Report	Seattle WA, US
2014	Best Practices for Monitoring Environmental Effects of Marine Energy Devices	Stornoway, UK
2014	Environmental Monitoring, Regulatory Needs & Scientific Capabilities	Nova Scotia, CA
2010	Annex IV program planning	Dublin IE
2013	Annex IV review and planning phase 2	Dublin IE

Webinars, expert forums

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Webinar	Date	Description
Annex IV Environmental Webinar #3: Tidal Energy Research in the Bay of Fundy	October 27, 2014	This webinar highlights the work being done by four scientists who focus their research on better understanding the tidal energy resource and potential in the Bay of Fundy, and how tidal energy developments there may affect the surrounding marine environment.
Annex IV Environmental Webinar #2: Interactions of Marine Mammals and Birds Around Marine Energy Devices	May 19, 2014	Presenters discussed several approaches to understand the interactions between marine mammals and diving seabirds around wave and tidal energy devices.
Annex IV Environmental Webinar #1: Instrumentation Workshop	Jan 23, 2014	An instrumentation workshop was held in June of 2013 to discuss the current state of the science for environmental monitoring around MHK devices.
DOE MHK Webinar #5: The Annex IV Project	Apr 03, 2012	International data sharing efforts for potential environmental effects of marine renewable energy to understand effects, minimize the potential for redundancy of efforts, and increase the efficiency of the permitting and consenting process.
DOE MHK Webinar #4: Acoustic Impacts	Dec 14, 2011	Anthropogenic noise production in the marine environment is a known stressor to many different aquatic species.
DOE MHK Webinar #3: Monitoring Technologies and Strategies	Sep 14, 2011	Focus on developing methodologies for monitoring MHK devices post-deployment, including monitoring framework development and the use of passive and active acoustics to monitor aquatic animal behavior around MHK devices.
DOE MHK Webinar #2: Aquatic Animal Interaction with Marine and Hydrokinetic Devices	Aug 29, 2011	Discussing the probability and extent of damage occurring as a result of interaction between aquatic animals and MHK devices.
DOE MHK Webinar #1: Environmental Data Management, Cumulative Impacts and Risk Assessment	Jul 27, 2011	Showcasing methods for dissemination of valuable environmental data.

Experts' Forum	Date	Description
Experts' Forum #1: Analyzing Acoustic Data around Marine Energy Devices	Jul 24, 2014	The use of active acoustic instruments to measure interactions of marine animals and seabirds around marine energy devices is hampered by inherently high water flows around the energy generating devices. Experts in this field were gathered to discuss techniques and challenges in an

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Current search
Search found 1588 items

Text Search

Tethys Text Search finds items containing the exact words entered, in any order. Phrases can be searched

Title	Author*	Date**	Type of Content	Technology Type	Stressor	Receptor	Collection
Renewable energy developments in an uncertain world: The case of offshore wind and birds in the UK	Masden, E., et. al.	January 2015	Journal Article	Offshore Wind	N/A	Birds	Tethys
Impact of Tidal-Stream Arrays in Relation to the Natural Variability of Sedimentary Processes	Robins, P., Neill, S., Lewis, M.	December 2014	Journal Article	Tidal	Energy Removal	Nearfield Habitat	Tethys
Greenhouse Gas Emissions from Electricity Generated by Offshore Wind Farms	Reimers, B., Özdirik, B., Kaltschmitt, M.	December 2014	Journal Article	Offshore Wind	N/A	Ecosystem	Tethys
Investigating the Co-Existence of Fisheries and Offshore Renewable Energy in the UK: Identification of a Mitigation Agenda for Fishing Effort Displacement	de Groot, J., et. al.	December 2014	Journal Article	MHK, Offshore Wind	Static Device	Fish	Tethys
An Economic and Environmental Assessment of Transporting Bulk Energy from a Grazing Ocean Thermal Energy Conversion Facility	Gilmore, E., Blahm, A., Sinsabaugh, S.	November 2014	Journal Article	OTEC	N/A	Farfield Environment	Tethys
Simulating Blade-Strike on Fish Passing Through Marine Hydrokinetic Turbines	Romero-Gomez, P., Richmond, M.	November 2014	Journal Article	In-Stream, Tidal	Dynamic Device	Fish	Tethys
Is EIA Part of the Wind Power Planning Problem?	Smart, D., Stojanovic, T., Warren, C.	November 2014	Journal Article	Offshore Wind	N/A	N/A	Tethys
Assessing the Influence of Inflow Turbulence on Noise and Performance of a Tidal Turbine using Large Eddy Simulations	Lloyd, T., Turnock, S., Humphrey, V.	November 2014	Journal Article	Tidal	Noise	N/A	Tethys
Using Medaka Embryos as a Model System to Study Biological Effects of the Electromagnetic Fields on Development and Behavior	Lee, W., Yang, K.	October 2014	Journal Article	N/A	EMF	Fish	Tethys
Insights from archaeological analysis and interpretation of marine data sets to inform marine cultural heritage management and planning of wave and tidal energy development for Orkney Waters and the Pentland Firth, NE Scotland	Pollard, E., et. al.	October 2014	Journal Article	MHK	N/A	Socio-economics	Tethys
Records of Trace Metals in Sediments from the Oregon Shelf and Slope: Investigating the Occurrence of Hypoxia Over the Past Several Thousand	Erhardt, A., et. al.	September 2014	Journal Article	N/A	Chemical Leaching	N/A	Tethys

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Map Viewer

The Map Viewer compiles documents, U.S. permitting sites, and international Annex IV project sites and research studies that are associated with a geographic location (but not all Tethys content is geotagged). This view allows panning and zooming, while results can be narrowed by keyword searches and by selecting values in the boxes to the right. Learn more about the filtering here. Clicking on a bubble will open a dialogue box with more information that links to the document page.

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Clear All Filters

Current search
Search found 432 items

Text Search

Tethys Text Search finds items containing the exact words entered, in any order. Phrases can be searched using quotations.

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Legend

- Documents (314)
- Project Site Annex IV (80)
- Research Study Annex IV (31)
- Permitting Site FERC (7)

Closely-packed items are clustered together. Clicking on the cluster allows you to navigate individual items. You may zoom in to make smaller clusters.

Technology Type

- Tidal (149)
- Offshore Wind (135)
- Wave (106)
- MHK (23)
- In-Stream (14)
- OTEC (4)
- Ocean Current (2)

Country

- United Kingdom (128)
- United States of America (111)
- Denmark (52)
- Canada (20)
- Sweden (17)
- The Netherlands (10)
- Germany (9)
- Norway (9)

Annex IV – Moving Forward

- Annex IV continues through 2016
- Major outcomes:
  - Continued updates of material on Tethys
  - State of Science report in 2016
  - Participation in international conference
  - Webinars on specific topics and regional research
  - Expert forums

- And, most importantly:
  - Join our community!
  - Contribute information on your project site or research project to Tethys
  - Join us for webinars, forums, etc.
  - Use Tethys and tell us what you like, and what we can do better!

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Thank you!

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I would like to thank OES for the support and continuous encouragement on this initiative, my very talented research team, the analysts from the Annex IV member nations, as well as Aquatera Limited, The Wave Energy Center (Portugal) and University of Plymouth (UK), DOE's Wind and Water Power Technologies Office, the many marine energy developers and researchers around the world.