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Tethys and Annex IV Progress Report for FY2012

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September 2012



Pacific Northwest
NATIONAL LABORATORY

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Summary

As the offshore renewable energy industry progresses in U.S. and international waters, the demand for data and information on how marine and hydrokinetic (MHK) technologies may interact with the marine environment has begun to increase. Data and information on the environmental effects of offshore renewable energy developments are limited, and many of the publicly accessible resources are scattered across various scientific journals and technical reports from many different countries. To help organize and disseminate this information and data to researchers, project developers, regulators, and the MHK community, the U.S. Department of Energy's (DOE) Wind and Water Power Technologies Office (WWPTO) has directed Pacific Northwest National Laboratory's web developers and marine scientists to create the *Tethys* and Annex IV knowledge bases.

Tethys is a web-based knowledge management system with semantic properties to enable enhanced searching and tagging capabilities and provides researchers, project developers, and regulators with access to information and data pertaining to the environmental effects of offshore renewable energy. *Tethys* also facilitates connectivity and collaboration amongst the offshore renewable energy community by providing a means for communicating and disseminating important information and data on stressor/receptor interactions between MHK devices and the marine environment. As this site continues to grow in content, additional efforts and resources will be focused on creating a commons for *Tethys* to facilitate more communication and awareness from the MHK community and further enhance the sites functionalities in order to continue fostering a clear dissemination channel for information and research among MHK researcher, project developers and regulators.

Annex IV, led by the U.S. and DOE, is an international collaborative project amongst member nations of the Ocean Energy Systems (OES). The Annex IV knowledge base is housed within *Tethys*, and primarily consists of metadata collected from a wide range of international ocean energy developments and research projects focused on the environmental effects of ocean energy.

As the *Tethys* and Annex IV knowledge bases continue to grow and more information and data are disseminated across the MHK community, the uncertainty about the environmental effects of MHK development will begin to be reduced and the efficiency and predictability of the overall permitting process for MHK projects will be increased. Additionally, as the MHK community begins to grow and utilize *Tethys* as a tool to facilitate communication and collaboration, it will begin to simplify the permitting and siting process for MHK developments, thus becoming an invaluable tool for project developers, researchers, regulators and the MHK community as a whole.

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1.0 Introduction and Purpose

The marine and hydrokinetic (MHK) environmental Impacts Knowledge Management System, dubbed “Tethys” after the mythical Greek titaness of the seas, is being developed by the Pacific Northwest National Laboratory (PNNL) to support the U.S. Department of Energy’s Wind and Water Power Program (WWPP). Functioning as a smart database, *Tethys* enables its users to identify key words or terms to help gather, organize and make available information and data pertaining to the environmental effects of MHK and offshore wind (OSW) energy development. By providing and categorizing relevant publications within a simple and searchable database, *Tethys* acts as a dissemination channel for information and data which can be utilized by regulators, project developers and researchers to minimize the environmental risks associated with offshore renewable energy developments and attempt to streamline the permitting process.

Tethys also houses a separate content-related Annex IV data base with identical functionality to the *Tethys* knowledge base. Annex IV is a collaborative project among member nations of the International Energy Agency (IEA) Ocean Energy Systems – Implementing Agreement (OES-IA) that examines the environmental effects of ocean energy devices and projects. The U.S. Department of Energy leads the Annex IV working with federal partners such as the Federal Energy Regulatory Commission (FERC), the Bureau of Ocean Energy Management (BOEM), and the National Oceanic Atmospheric Administration (NOAA). While the Annex IV database contains technical reports and journal articles, it is primarily focused on the collection of project site and research study metadata forms (completed by MHK researchers and developers around the world, and collected by PNNL) which provide information on environmental studies and the current progress of the various international MHK developments in the Annex IV member nations.

The purpose of this report is to provide a summary of the content, accessibility and functionality enhancements made to the Annex IV and *Tethys* knowledge bases in FY12.

2. Highlights for FY12

The primary objective for FY12 was to enhance the reliability and accessibility of the *Tethys* knowledge base, and to continue expanding the knowledge base through the curated addition of documents, datasets, modeling scenarios, and other information types pertaining to the environmental effects of offshore renewable energy. Metrics and associated goals were also created as a part of an overall measurement plan for *Tethys*, enabling PNNL researchers and *Tethys* users to evaluate the site's effectiveness and its overall usability.

2.1 Site Development

Site development focuses on creating and extending the *Tethys* technical infrastructure to ensure that the required functionality is working effectively and that new features are added in a timely and cost-effective manner. Site development was a major focus of the *Tethys* task in FY12. Highlights include:

- The MHK and OSW databases were combined into one comprehensive knowledge base. The MHK and OSW databases had been separate knowledge bases containing their own information. Merger of the data is expected to promote sharing of information between stakeholders for these two renewable energy types and to enhance the searchability of *Tethys*.
- Several improvements were made to enhance the user experience and increase the scalability of *Tethys* as data collection grows. Improved handling of search results and a new indexing program were implemented with the net result of significantly decreasing the page-loading times for the *Tethys* and Annex IV knowledge bases.
- The *Tethys* map viewer was changed in order to allow association of any type of document or report with a specific location or project site. Originally, site associations were limited primarily to the MHK projects extracted from the FERC docket.
- The knowledge base was reorganized to streamline data entries and maintain uniformity amongst all media types. This enabled properties such as the Technology Type to be a label across many different media types, thus enhancing the search capabilities of the site.
- “Support” pages such as a *Tethys* blog, FAQs, contacts, recent news, and definition pages for stressors, receptors, and technology types were created and an explanation of *Tethys* and Annex IV were added to educate and direct users to the appropriate information.

2.2 Data Curation and Partnerships

Data curation, which includes properly vetting, classifying, abstracting and indexing documents, is a critical aspect of maintaining the *Tethys* knowledge base. Information housed in *Tethys* must be current and new research and information must be incorporated when available. Partnerships with external agencies and other stakeholders can be invaluable resources to review and attain content. Throughout FY 12, *Tethys* focused on the following data curation and partnership activities:

- The PNNL *Tethys* team, led by Luke Hanna and assisted by Pacific Energy Ventures (PEV) added approximately 400 new knowledge base entries between October 1, 2011 and September 1, 2012, greatly exceeding the goal of adding an average of 40 documents each quarter. As of September 1, 2012, *Tethys* contained approximately 600 entries in the *Tethys* knowledge base. Approximately 26 of those entries are associated with a specific geographic location and hence viewable via the *Tethys* map viewer.
- The *Tethys* team also generated original data via the Annex IV surveying effort, which allowed us to add 61 project site summaries and/or documents associated with sites, and 84 research study summaries. Scheduled for broader deployment in early CY2013, these documents are currently available to a small group of Annex IV participants, and represent a significant source of original information about MHK development activities throughout the world.

2.3 Site Maintenance and Management

To ensure the operational success of *Tethys*, and to address user's feedback regarding site functionality, website maintenance and management efforts must be an ongoing effort. In addition to improving the functionality of *Tethys* where opportunities present themselves, insuring that the site is kept current with security and software code updates requires continual monitoring by the *Tethys* team. The *Tethys* team has implemented an issue tracking system that allows client and user community requests, as well as system upgrade tasks, to be tracked and assigned to individuals within the team.

Key FY12 maintenance and management activities included:

- To assess the functionality, content, and practicality of *Tethys* to other professionals in offshore renewable energy community, several researchers in the offshore renewable energy community were asked to peer review the *Tethys* knowledge base. Comments and suggestions from the review were taken into consideration and *Tethys* was amended to better suit their issues and concerns.
- *Tethys* Web Metrics and Goals (Table 1) were prepared and approved by WWPP and delineates the key performance metrics and a reporting process for using them to monitor and improve the performance of *Tethys*. By identifying these website performance metrics, several quarterly and annual goals are also described to ensure that *Tethys* continues to grow in an efficient and sustainable manner. Unfortunately, our ability to collect web metrics was compromised during the final quarter of FY12 due to technical issues stemming from PNNL's web security system. While these issues have been resolved moving forward into FY13, our FY12 data primarily

reveals our overall traffic, and top rated documents/features. The data should be considered provisional, and will be updated in Q1 FY13 following our first quarter of fully responsive data.

- Highlights of the FY12 web site data include:
 - From June 20 – Sept 19, 2012 *Tethys* averaged 19,485 hits per day. This figure includes internal (PNNL/DOE) users and search engine hits so should be taken as an optimistic estimate of site activity.
 - A more reasonable estimate can be derived from looking at download activity on technical documents indexed in *Tethys*. These documents are rarely accessed by PNNL users for maintenance purposes, and accessed relatively infrequently by users who are not seeking the data they contain. From this data we find:
 - The most downloaded document is the Fundy Ocean Research Center of Energy's Environmental Effects Monitoring report; downloaded more than 6,800 times (an average of more than 68 downloads per day over the observation period).
 - 12 reports were downloaded 1,000 or more times during the observation period.
 - More than 100 documents indexed in *Tethys*' knowledge base were downloaded 200 or more times during the 100 day observation period.
 - Modifications were implemented to the generation of the use logs that allow much greater resolution of user patterns, including an analysis of average number of pages downloaded per user, distribution of countries from which downloads originate, and search terms that are being used to find *Tethys* documents. These data will be reflected in quarterly reporting from *Tethys* starting at the conclusion of Q1 FY13.

Table 1. *Tethys* Metrics and Goals

Metric	Goal	Explanation
Total user sessions	10% increase on annual basis, based on first year of operation, to be tracked on revolving quarterly basis.	Activity measure that needs to be tracked as a measure of success.
Total page impressions	10% increase on annual basis, based on first year of operation, to be tracked on revolving quarterly basis.	Activity measure that needs to be tracked as a measure of success.
Average page impressions per user session	Based on previously measured metrics.	Activity measure that needs to be tracked as a measure of success.
Number of documents indexed	Increase by 40 documents per quarter, through FY12-FY13	
Number of websites linked from <i>Tethys</i>	Increase by 10 links to external websites per quarter, through FY12-FY13	
Number of external websites linked to <i>Tethys</i>		Can be increased through active outreach, but beyond our control; no numerical goal
Percentage of valid links in the <i>Tethys</i> knowledge base	90% of all links working at any time	
Increased functionality and usefulness of site	Continued improvements annually.	Based on annual peer review by 4 to 6 peer reviewers, using structured questions.
Availability of information useful to users	Majority of site users are satisfied with the information they retrieved from <i>Tethys</i>	Dialogue box to ask for feedback or survey

2.4 Related Projects – Annex IV

During FY12, an Annex IV database and map view were added to *Tethys* to permit sharing of data collected under the aegis of the Annex IV collaborative project. This task, involving member nations of the International Energy Agency (IEA) Ocean Energy Systems (OES), examines the environmental effects of ocean energy devices and projects.

While the Annex IV database contains technical reports and journal articles, it is primarily focused on the collection of project site and research study metadata forms (completed by MHK researchers and developers around the world, and collected by PNNL, with assistance from the Wave Energy Center and the University of Plymouth) which provide information on environmental studies and the current progress of the various international MHK developments in the Annex IV member nations.

Annex IV data collections within *Tethys* are currently available to a small set of registered users representing each of the nations involved in the Annex. Current plans are to open the collection of data to the broader MHK community in early 2013. During FY12, much of the work completed in support of the

Annex IV collection builds upon features that are already part of the *Tethys* knowledge base and is described in the preceding sections. Unique Annex IV activities in FY12 included:

- The Annex IV project site and research study metadata forms were finalized and are now available on the *Tethys* home page in a PDF format.
- The Annex IV map viewer was enhanced to display the associated location of each project site and research study metadata forms (assuming location information is available).
- Per the request of the Annex IV member nations, security provisions were enabled to restrict access to the Annex IV database to designated users such developers and researchers from member nations. The Annex IV knowledge base will be publicly available starting in early CY2013.

3 Outreach

The outreach component of a website such as *Tethys* is crucial in order to build the user community and educate the public on its purpose and functionality as a useful research tool. Outreach activities during FY 12 included:

- Global Marine Renewable Energy Conference (GMREC). The 2012 GMREC was held in Washington D.C. from April 24th -26th. PNNL distributed *Tethys* bookmarks with the website's URL and a brief description of the site's purpose to attendees of GMREC. The WWPP also displayed a large monitor at their information booth to demonstrate the functionality and accessibility of the *Tethys* and Annex IV knowledge bases.
- Semantic Media Wiki Con 2012. This conference, aimed at developers using Semantic Media Wiki (the software platform on which *Tethys* is built) was held in Carlsbad, CA from April 25-27, 2012 and was attended by two *Tethys* development staff. Primary benefits from attending included networking with other users and developers of the technology; learning about and in some cases influencing the direction of future improvements to the software platform; and workshop sessions on how to conduct search engine optimization for wiki-based content, an important topic for improving the use statistics for *Tethys*.



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