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# *Tethys and Annex IV Annual Report for FY 2014*

**September 2014**

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Prepared for the U.S. Department of Energy  
under Contract DE-AC05-76RL01830



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## Summary

The purpose of this report is to provide an overview of the Annex IV activities carried out and to summarize the overall usage and enhancements made to the *Tethys* knowledge base during FY2014. The first section of this report highlights Annex IV progress and describes the record of events organized and supported by Annex IV, and how these accomplishments are facilitating the advancement of this project and creating a commons around Annex IV and the *Tethys* knowledge base. The second section of this report summarizes the analytical data for *Tethys* over FY2014 and Q4 of FY2014 with respect to the knowledge bases metrics and goals, and the various enhancements implemented during FY 2014.



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## 1.0 Introduction

To help organize and disseminate information and data to the offshore renewable energy community, the U.S Department of Energy's (DOE) Wind and Water Power Technologies Office (WWPTO) has directed the Pacific Northwest National Laboratory (PNNL) to create *Tethys*. *Tethys* is a public, online knowledge management system that gathers, organizes, and provides access to information on the environmental effects of marine and hydrokinetic (MHK) and offshore wind (OSW) energy development. *Tethys* also facilitates connectivity and collaboration among the offshore renewable energy community by providing a means for communicating and disseminating important information and data on stressor/receptor interactions between devices and the marine environment.

Annex IV, led by the US DOE, is an international collaborative project amongst member nations of the Ocean Energy Systems (OES). Information collected through Annex IV 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. Annex IV is currently in its second phase, which will last for three years (2014-2016).

The purpose of this report is to address Q4 milestones for the *Tethys* and Annex IV projects under DOE's WWPTO. The milestones are as follows:

### Annex IV:

End of year inventory completed of Annex IV metadata forms from new marine energy projects, updates on existing projects, record of events organized and supported by Annex IV, analysis of progress towards creating a commons for practitioners, and plans for the following year to be reported to member nations.

### Tethys:

Annual assessment completed of Tethys metrics and goals, record of progress in Tethys/Annex IV forum activities and progress towards creating a commons

## 2.0 Annex IV

### 2.1 Metadata Collection

As part of the Annex IV effort, PNNL is routinely seeking new metadata forms for wave and tidal projects and research studies. Updates for existing metadata forms are solicited every 12-18 months as outlined in the *Tethys* Management Plan. These metadata are collected through direct communication with Annex IV country analysts, international wave and tidal project developers, and the marine energy research community. The following is a summary of the Annex IV metadata collection status and efforts in FY2014:

- *Tethys* currently houses 80 project site metadata forms and 51 research study metadata forms;
- 8 new project sites and 6 new research studies were added in FY 2014;
- A total of 42 project sites were updated within the last 18 months;

- A total of 11 research studies were updated within the last 18 months;
- 2 project sites were removed, 23 research studies were replaced with reports

PNNL will continue to seek new and updated metadata forms from the Annex IV member nations and greater research community as Annex IV progresses into FY2015.

## 2.2 FY2014 Activities

As an international collaborative project focused on sharing and disseminating information related to the a new and emerging industry, Annex IV seeks opportunities to sponsor or hold events and activities that are targeted towards the international community of wave and tidal energy researchers, developers, and regulators. During FY2014, activities also focused on improving the overall organization of the Annex IV effort and the project's effectiveness in disseminating information and metadata and creating a commons which facilitates communication and collaboration amongst the international marine energy community. Annex IV activities in FY2014 consisted of the following:

- Annex IV workshop at the Environmental Impacts of Marine Renewables (EIMR) 2014 conference  
Annex IV sponsored a one day workshop in conjunction with the EIMR conference in Stornoway Scotland from April 30 to May 1, 2014. The Annex IV workshop was held on April 29, and was focused on identifying the best practices of environmental monitoring for specific key environmental interaction between marine animals and wave and tidal devices. The workshop was attended by 43 participants and 61 observers. Two sets of break out groups occurred in the morning and afternoon, each consisting of four sessions. A final workshop report has been written and is currently being reviewed by break out group session chairs and recorders, and will be available in Q1 of FY2015. For more information on the EIMR conference, and to reference the conference abstracts, presentation, and posters, visit the *Tethys* site at: <http://Tethys.pnnl.gov/eimr-international-conference-2014>
- Annex IV Environmental Webinars  
As part of the second phase of Annex IV, environmental webinars are being organized and held to disseminate new information and research efforts to a large international audience of stakeholders. These webinars are mostly focused on key environmental concerns that burden wave and tidal projects worldwide, but also include more regional topics and discussions. To date, two webinars have been held:
  - Summary of Instrumentation Workshop, January 23, 2014  
This webinar summarized a workshop that was held in Seattle in June of 2013 that was focused on evaluating the gaps in available instrumentation for environmental monitoring and identifying possible solutions to address these gaps. Speakers for this webinar included: Jocelyn Brown-Saracino, Wind and Water Power Technologies Office at US Department of Energy; Brian Polagye at the Northwest National Marine Renewable Energy Center, University of Washington; and Andrea Copping, Pacific Northwest National Laboratory. For a recording of this webinar, visit *Tethys* at <http://Tethys.pnnl.gov/environmental-research-webinar-series-instrumentation-workshop>.
  - Interactions of Marine Mammals and Birds around Marine Energy Devices, May 19, 2014  
The second Annex IV webinar was focused on discussing the current understanding and new research efforts dealing with the interactions between marine mammals and

birds and marine energy devices. Speakers for this webinar included: Ben Wilson, Scottish Association for Marine Sciences; Benjamin Williamson, University of Aberdeen; and Beth Scott, University of Aberdeen. For a recording of this webinar, visit *Tethys* at <http://Tethys.pnnl.gov/environmental-research-webinar-series-interactions-marine-mammals-and-birds-around-marine-energy>.

The next Annex IV environmental webinar will be held in late October and will discuss research activities focused on understanding the environmental effects of marine renewable energy development in the Bay of Fundy.

- Annex IV Expert Forums

In addition to environmental webinars, Annex IV also holds several expert forums online through *Tethys*. These forums are intended to target specific issues and interactions with high levels of uncertainty that continue to hinder the advancement of research efforts and the industry as a whole. To date, one expert forum has been held:

- Analyzing Acoustic Data around Marine Energy Devices, July 24, 2014.

This expert forum discussed the use of active acoustic instruments to measure interactions of marine animals and seabirds around marine energy devices and how to best deal with and potentially remove turbulence and other background sounds from acoustic data. Gayle Zydlewski from the University of Maine led this discussion, with participation from several other researchers and scientists. For a recording of this discussion, visit *Tethys* at <http://Tethys.pnnl.gov/experts-forums/analyzing-acoustic-data-around-marine-energy-devices>.

- Analysts peer review

In Q3 of FY2014, peer reviews were sent to all Annex IV country analysts. Six countries (Ireland, Japan, Portugal, Spain, United Kingdom, and the United States) completed this peer review, consisting of 70 comments; and the feedback was organized in a matrix and summarized in the Q3 FY2014 *Tethys* and Annex IV report and can be accessed on *Tethys* at <http://Tethys.pnnl.gov/sites/default/files/attachments/Tethys%20FY14Q3%20Progress%20Report.pdf>.

- Annex IV plan

In FY2014, PNNL wrote the *Tethys* Management Plan to provide an overview of how the *Tethys* and Annex IV projects are managed and tracked. This report include specific details on how PNNL manages the collection efforts for metadata collection, utilizes both Annex IV and *Tethys* to facilitate the creation of a commons for the international marine energy community, and monitor the overall performance of the *Tethys* and Annex IV projects. The final report will be uploaded on *Tethys* once it is available.

## 2.3 Creating a Commons

As Annex IV progresses into its second phase, one of the primary objectives is to ensure that PNNL, with support from the US Department of Energy, facilitates the creation of a commons around the Annex IV project and the *Tethys* knowledge base. The purpose of this effort is to attract a larger and more diverse set of users and participants to utilize *Tethys* and Annex IV as tools to access and share information and

facilitate communication and collaboration amongst the international marine renewable energy community. During FY2014, several Annex IV activities have been targeted towards this objective. Annex IV environmental webinars and expert forums were recorded and posted on *Tethys* to drive more visitors to the knowledge base in an attempt to generate comment threads on current issues and concerns related to the potential environmental effects of marine renewable energy. Annex IV was also a co-sponsor for the EIMR 2014 conference, which allowed PNNL to post all presentations, recordings of presentations, abstracts, and posters on *Tethys*.

Other PNNL activities in FY2014 have focused on providing more content and functionality to *Tethys* in order to begin facilitating more of a commons. These additions have included providing users with the ability to comment and rate on individual pages and *Tethys* content and creating additional avenues for users to connect with each other and other stakeholders through the *Tethys* community, Experts, and Databases pages. The *Tethys* community has also been apprised of current news, research, and additions to *Tethys* through the blog and the bi-weekly *Tethys* blasts, distributed to subscribed users. A *Tethys* and Annex IV social media campaign also began this year with the creation of *Tethys* pages on Facebook, LinkedIn, and Twitter. The *Tethys* Facebook page currently has 76 followers and is updated on a weekly basis.

It is often difficult to look at the analytics and attribute specific activities with an increase in *Tethys* usage. Often times there are random spikes in *Tethys* usage; conversely, traffic may appear normal following large outreach events that are expected to draw traffic. However, the analytics show a significant annual increase of 105.7% more pageviews and 27.3% more visits (see Performance Metrics below), which indicates that people are using *Tethys* and that these efforts directed at creating a commons are playing a significant role in facilitating more site visits and usage. Anecdotal evidence also suggests that these efforts are well received. For example, *Tethys* and Annex IV have received positive feedback from attendees at international conferences and workshops.

## 2.4 Future Activities

The next Annex IV sponsored event will be an environmental webinar held at the end of October to highlight some of the current research efforts underway in the Bay of Fundy. This webinar will also be a precursor to the International Conference of Ocean Energy (ICOE) 2014 being held in Halifax.

PNNL will continue to plan and organize the Annex IV international state of the science conference, which will be held in FY2015. The location of this conference is still undetermined, but will most likely be an independent track at a larger conference such as EWTEC 2015. PNNL is also currently holding discussions with Annex IV country analysts and US DOE to begin scoping the Annex IV state of the science report. Similar to the first Annex IV report, this report will take a case study approach to focus on several key interactions or areas of interest regarding the environmental effects of offshore renewable energy. PNNL, Annex IV country analysts, and other contributors will begin writing the State of the Science report in FY2015. The final report will be published at the end of the second phase of Annex IV in 2016.

As Annex IV progresses into its second phase, PNNL will continue to focus efforts on creating a commons around Annex IV and *Tethys*. This will include the continuation of the Annex IV environmental webinars and expert forums, the use of social media to reach new users, and the regular addition of new content, metadata, blog posts, and *Tethys* blasts to continue engaging with the *Tethys* community. Regular

communication and update calls will be held with Annex IV member nations to keep this group apprised of Annex IV progress and upcoming activities such as webinars and expert forums, solicit new and updated metadata forms, and continue to discuss and plan the state of the science report.

## 3.0 Tethys Performance Metrics

### 3.1 Performance Metrics for Q4 of FY2014

Table 1 lists the metrics and goals identified in the *Tethys* Management Plan, as well as the data collected during Q4 (July 1 2014 – September 20 2014). The last 10 days of September have been omitted from results in order to summarize and report findings by the Q4 deadline. As such, all values after this date were artificially *increased by 11%* to account for the missing days. Performance metrics representing the entire span of Q4 will be available on *Tethys* after September 30<sup>th</sup>, along with additional information providing past metrics, reports, and a list of recently added documents at:

<http://tethys.pnnl.gov/deliverables>.

Table 1. Performance Metrics for Q4 of FY2014

Metric	Goal	Q4 Results	Compare to Q3 Data
Total Visits	10% increase on annual basis, to be tracked on revolving quarterly basis.	<b>5,925 users; 8,561 visits</b>	Q3: 6,475 users; 8,860 visits <b>8.5% decrease in users;</b> <b>3.4% decrease in visits</b>
Total Pageviews	10% increase on annual basis, to be tracked on revolving quarterly basis.	<b>38,203 pageviews</b>	Q3: 25,670 pageviews <b>48.8% increase</b>
Average Pages per Visit	No goal, but activity should be tracked on revolving quarterly basis.	<b>4.46 pages/visit</b>	Q3: 2.90 pages/visit <b>53.8% increase</b>
Number of Documents Indexed	Increase by 25 documents per quarter.	<b>1458 documents</b>	Q3: 1244 documents <b>+214 documents; 155 OSW, 79 MHK</b>
Number of External Websites Linked to <i>Tethys</i>	No goal, as this is outside of our control, but active outreach may increase.	<b>34 domains</b>	Q3: 26 domains <b>+8 domains</b>
Number of Websites Linked from <i>Tethys</i>	Increase by 10 links per quarter.	<b>1598 links</b>	Q3: 975 external links <b>+623 links</b>
Percentage of Valid Links in <i>Tethys</i>	90% working links at any time.	<b>99.2% links</b>	Q3: 98.7% links <b>0.5% increase</b>

## 3.2 Q4 Highlights and Key Findings

- A 48.8% increase was seen in the number of pageviews. This is a great indicator of the site's overall usability and relevance of its content, as it shows that users are more engaged with the material rather than accidentally visiting *Tethys*. The average visit lasted for over 5 minutes, which when compared against the 45% of bounced visits (those who leave without visiting a second page) means that engaged users were spending around 10 minutes each visit.
- The significant increase of 623 links was due to new organization landing pages on *Tethys*. Each document now lists author affiliations, each hyperlinked to a page that has basic information and lists all other documents in *Tethys* by that organization.
- The focus on increasing offshore wind documents in *Tethys* yielded 155 new offshore wind documents. Many of the additional 59 documents added this quarter also had some relevance to offshore wind, but were not explicitly related (i.e. general noise exposure to whales)
- Every two weeks during Q4 of 2014, a new blog and *Tethys* Blast was released on Friday afternoon. Weekend traffic (Friday-Sunday) increased by 16% compared to the slight decrease in general traffic, showing that the *Tethys* Blasts are generating increased traffic. Each blast was sent to 541-585 people, a changing number as new people subscribe or unsubscribe.
- The small reduction in users and visits can be attributed to the annual trend coincident to summer months. Viewing numbers tend to decrease during the summer presumably due to vacations and the summer break for our academic audience.

### 3.3 Annual Performance Metrics for FY2014

Table 2 lists the metrics and goals identified in the *Tethys* Management Plan, as well as the data collected during FY2014 and FY2013. These annual comparisons give us a better view of the general health of the website because they exclude any seasonal variance that might be seen in a quarter-to-quarter comparison. FY2013 values are adjusted to include the missing Q1 data that occurred prior to our use of analytics, and FY2014 values are adjusted to include the last 10 days of Q4. Additional information providing past metrics, reports, and a list of recently added documents is available at: <http://tethys.pnnl.gov/deliverables>.

Table 2. Annual Performance Metrics for FY2014

<b>Metric</b>	<b>Goal</b>	<b>FY2014 Results</b>	<b>Compare to FY2013 Data</b>
Total Visits	10% increase on annual basis, to be tracked on revolving quarterly basis.	<b>36,653 visits</b>	FY2013: 21,587 visits <b>27.3% increase</b>
Total Pageviews	10% increase on annual basis, to be tracked on revolving quarterly basis.	<b>111,177 pageviews</b>	FY2013: 40,545 pageviews <b>105.7% increase</b>
Average Pages per Visit	No goal, but activity should be tracked on revolving quarterly basis.	<b>3.03 pages/visit</b>	FY2013: 1.88 pages/visit <b>61.5% increase</b>
Number of Documents Indexed	Increase by 25 documents per quarter.	<b>1458 documents</b>	FY2013: 946 documents <b>+474 documents; 293 OSW, 196 MHK</b>
Number of External Websites Linked to <i>Tethys</i>	No goal, as this is outside of our control, but active outreach may increase.	<b>34 domains</b>	FY2013: 22 links <b>+12 domains</b>
Number of Websites Linked from <i>Tethys</i>	Increase by 10 links per quarter.	<b>1598 links</b>	FY2013: 527 external links <b>+1071 links</b>
Percentage of Valid Links in <i>Tethys</i>	90% working links at any time.	This number varies by quarter based on the number of broken links. Any broken links are fixed during this quarterly check.	

### 3.4 FY2014 Highlights and Key Findings

- Earlier this year, *Tethys* was transitioned from Semantic MediaWiki to Drupal. This came with new features such as user profiles, commenting and rating, clustering on the Map Viewer, rotating announcements on the home page, and a modern look and feel. Press releases announcing the new *Tethys* brought in a huge increase in visits (33.9% quarterly), which has been slowly decreasing into the summer months. Meanwhile, sharp increases in pageviews (105.7% annual) has contrasted this slow decline in visits, indicating that the initial burst of visitors have been replaced by dedicated users who are utilizing *Tethys*.
- Additional *Tethys* features developed over the last year include:
  - Roughly 700 organizations now have a page on *Tethys* that includes a description, logo, link, and a table listing all documents in *Tethys* related to the organization through author affiliations, sponsoring the study, or conducting the research.
  - A Tips for *Tethys* page was created that visually explains how to use *Tethys*.
  - Broadcast material is now separated into several categories, including: MHK Webinars, OSW Webinars, Conferences and Workshops, *Tethys* Blasts, and Expert Forums.
  - *Tethys* Community page that automatically shows professional contact information for *Tethys* users who opt to be included.
  - The website was transitioned to a new, faster server that is capable of sending out emails.
- Social media outreach has been tested with Facebook, Twitter, and LinkedIn. Facebook currently has 76 followers, and has posted 30 times in the last six months. Twitter currently has 71 followers, and has tweeted 100 times in the last six months. LinkedIn had only 19 followers after 18 posts. While the goal of most active users on LinkedIn is to find jobs, LinkedIn has been unsuccessful at driving traffic to *Tethys* and will therefore be discontinued. PNNL will continue to use Twitter and Facebook to drive traffic to *Tethys*, altering tactics based on discussions with other outreach programs at PNNL. We will initiate a one month trial period aimed at relatively frequent posts on our social media sites. The purpose of this targeted effort will be to increase our understanding of the benefit of using Facebook and Twitter to increase visibility and drive traffic to *Tethys*.
- Efforts were made to add *Tethys* links to Wikipedia and to create a dedicated *Tethys* Wikipedia page ([https://en.wikipedia.org/wiki/Tethys\\_%28database%29](https://en.wikipedia.org/wiki/Tethys_%28database%29)). Wikipedia has the top referral to *Tethys* (excluding searches and bookmarks), resulting in 573 visits this year, mostly in the last two quarters.
- Eight blog posts have been released since mid-April after the Drupal release. Analytics show that 509 people have explored the blogs, spending an average of 1 minute on the page. New effort is being made into having more blogs written by experts outside of PNNL, providing an informal location for announcements and updates to members of the *Tethys* community.

The following several pages are a direct output of quarterly statistics from Google Analytics, showing information that may prove helpful in identifying the health of *Tethys* and top referral sources:

# Print Client Dashboard

Jul 1, 2014 - Sep 20, 2014

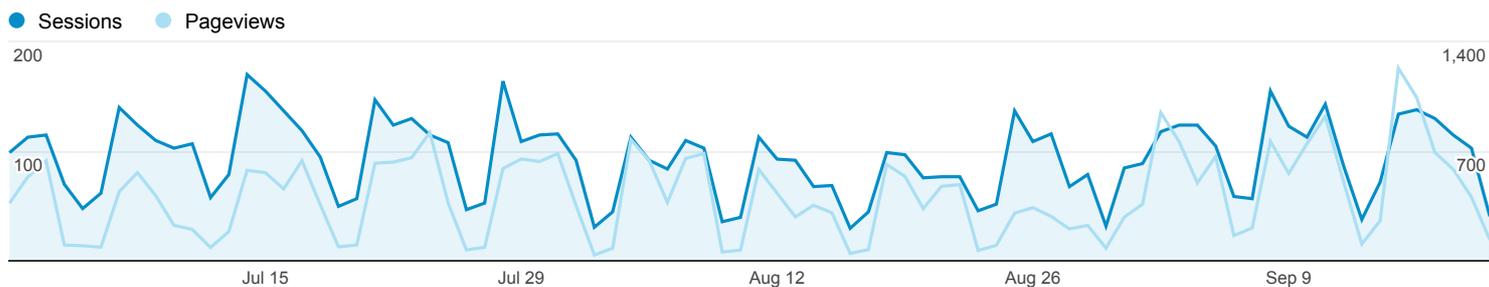
All Sessions  
100.00%

+ Add Segment

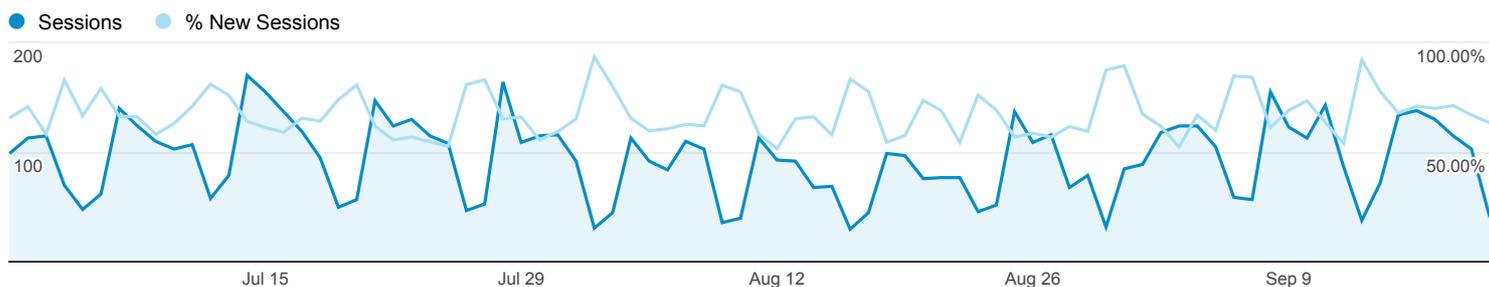
## Visits and Unique Visitors



## Visits and Pageviews



## Visits and % New Visits

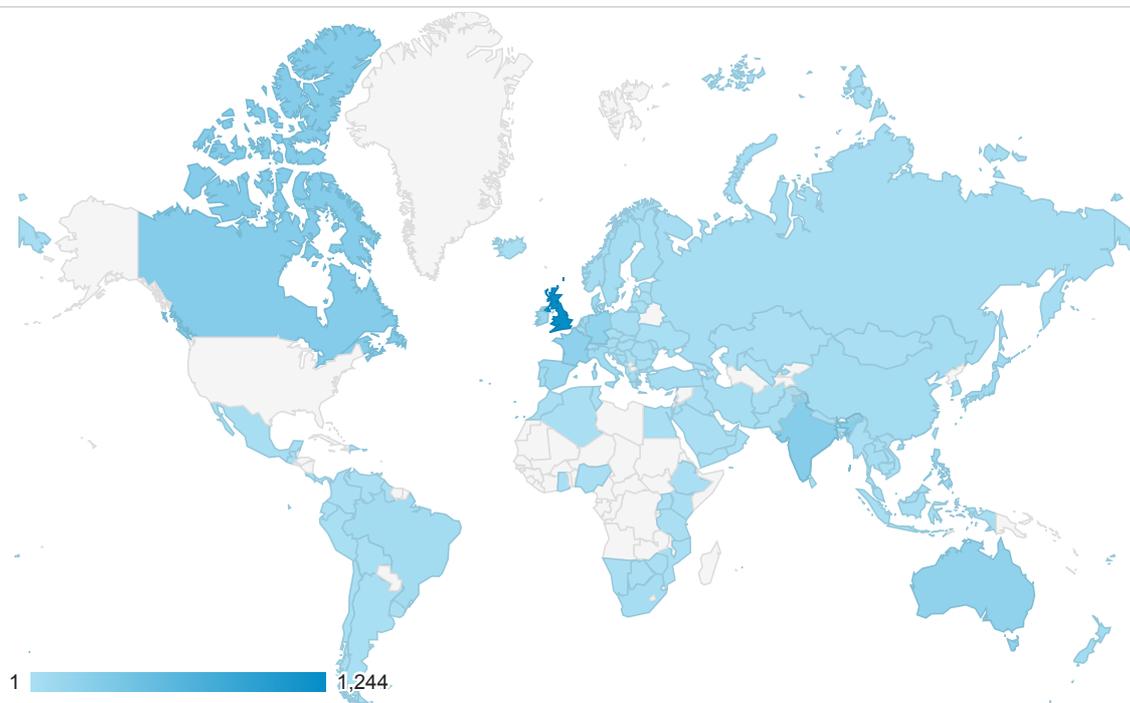


## Pages / Visit and Avg. Visit Duration



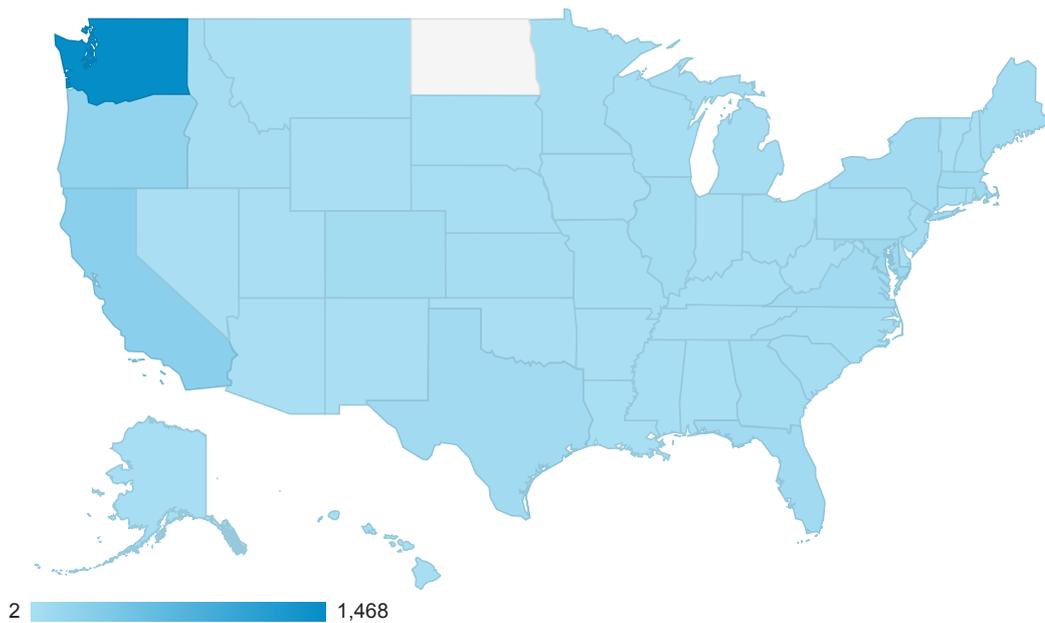
## Visits Per Country (excluding the U.S.)

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## Visits Per State

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## Visits and Bounce Rate by Source / Medium

Source / Medium	Sessions	Bounce Rate
google / organic	4,861	48.18%
(direct) / (none)	1,608	40.86%
en.wikipedia.org / referral	250	37.20%
bing / organic	87	52.87%
websearch.pnl.gov / referral	74	48.65%
listserve.pnnl.gov / referral	49	10.20%
mhk.pnl.gov / referral	43	9.30%
en.openei.org / referral	42	38.10%
yahoo / organic	41	58.54%
energy.gov / referral	35	20.00%

## Visits and Bounce Rate by Page

Page	Sessions	Bounce Rate
/	1,330	27.97%
/publications/san-juan-islands-tidal-currents	527	66.03%
/technology-type/wave	152	50.00%
/eimr-international-conference-2014	133	54.14%
/annex-iv-sites/la-rance-tidal-barrage	123	53.66%
/annex-iv-sites/sihwa-tidal-power-plant	106	53.77%
/annex-iv-sites/admiralty-inlet-pilot-tidal-project	98	48.98%
/map-viewer	76	43.42%
/regulatory-frameworks	76	64.47%
/knowledge-base	70	42.86%



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