

Managing Data for Environmental Effects of Marine and Hydrokinetic Energy Development – a Knowledge Management System

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Data: Managing Information to Support Decision Making

*Renewable Ocean Energy and the Marine Environment:
Responsible Stewardship for a Sustainable Future*

Palm Beach Gardens FL
November 4th 2010

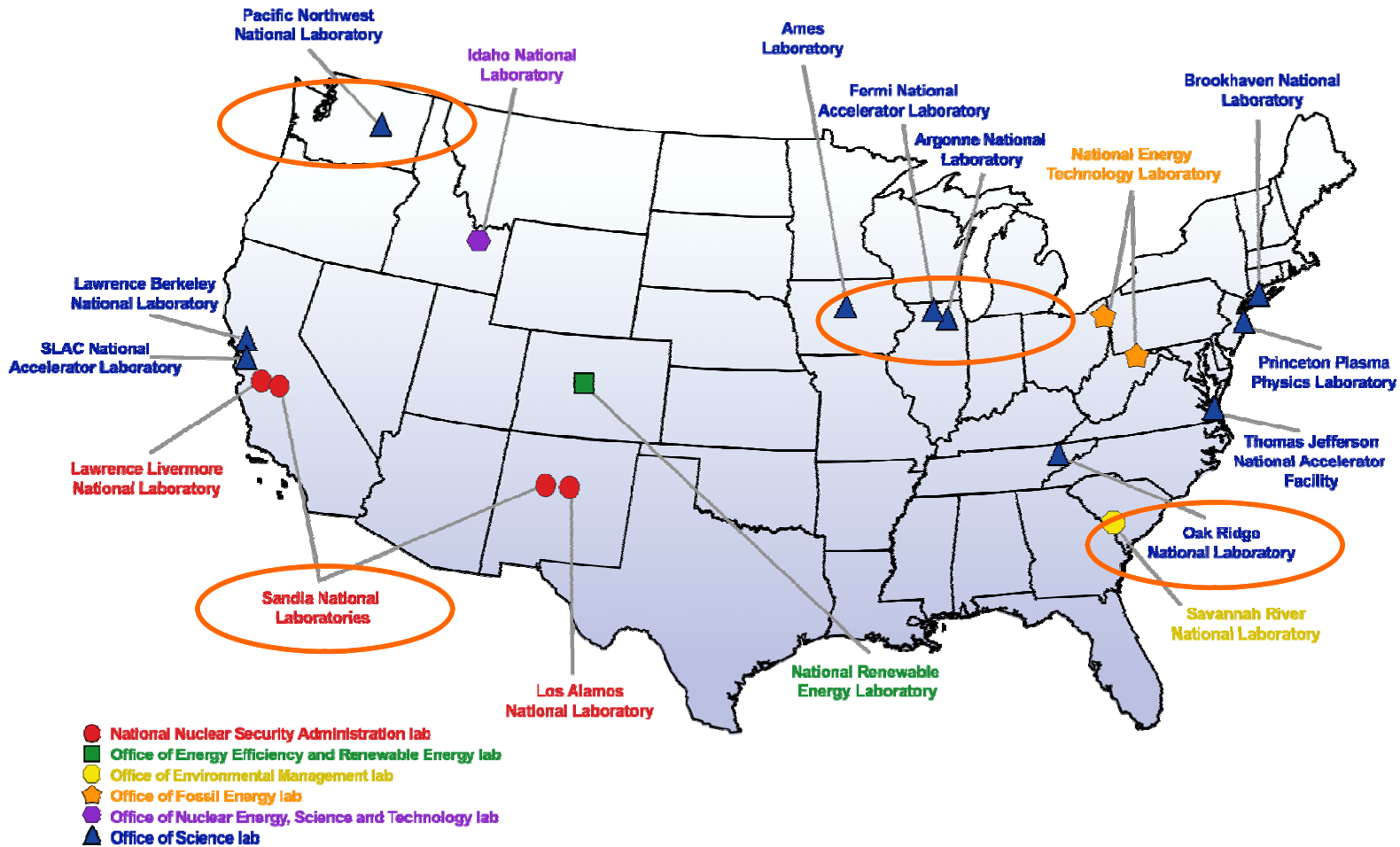


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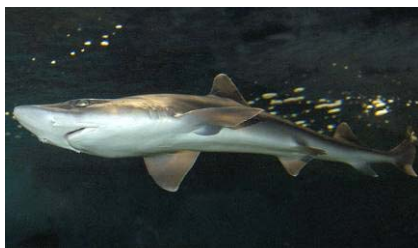


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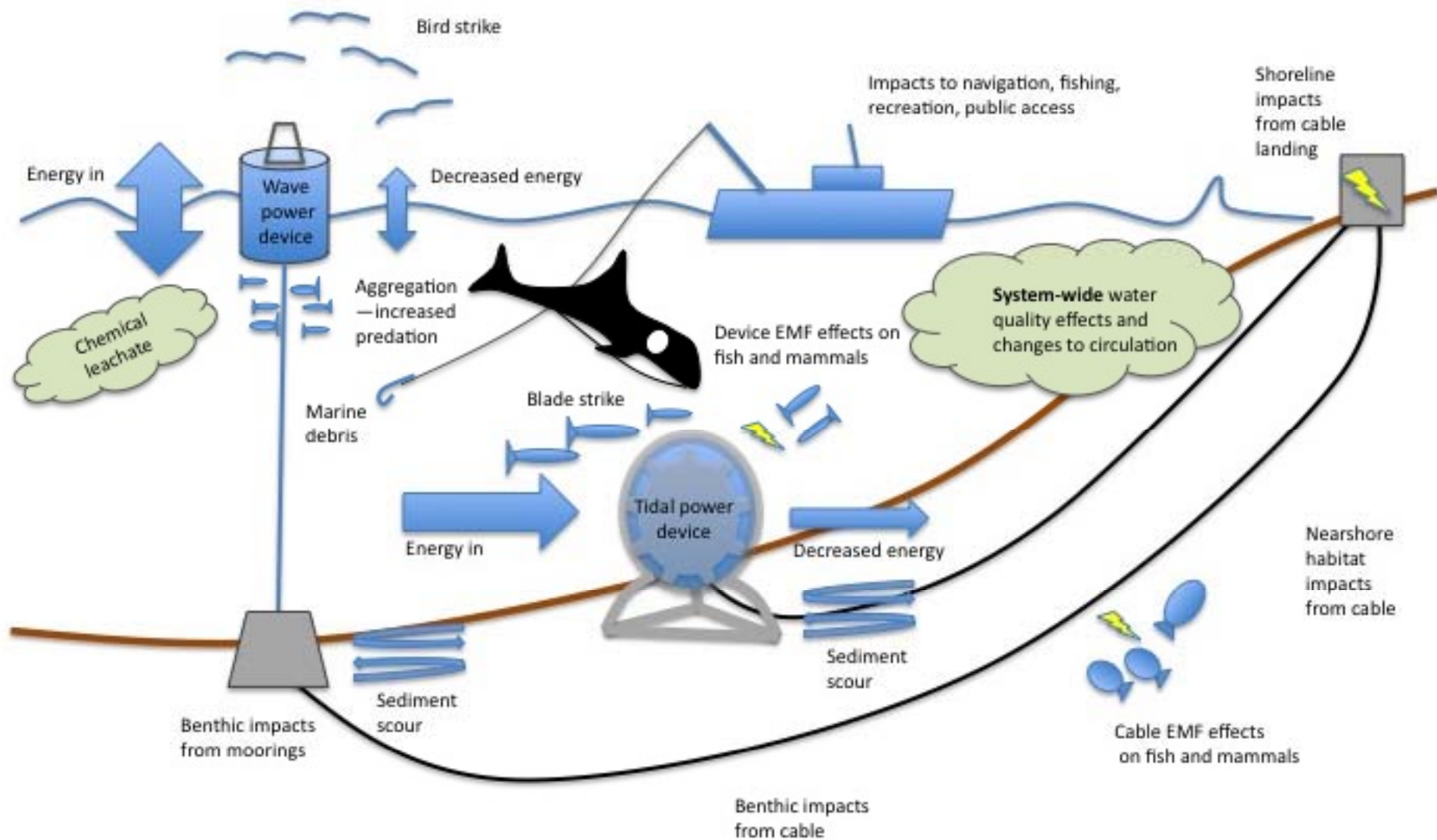
Today....

- ▶ Complexity of environmental effects data
- ▶ Challenges for data management for multiple uses
- ▶ Our solution for ocean energy data management
 - National Laboratory program in environmental effects of ocean energy
 - International data management needs
- ▶ Tethys – Knowledge Management System



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Potential Environmental Impacts of Marine and Hydrokinetic Energy Devices



Environmental Effects of MHK Energy Development

Project purpose: To address environmental issues needed to get MHK devices in the water through four tasks:

1. Classifying & evaluating environmental effects

- Organize data into a “smart”, searchable database
- Use risk assessment tools to determine the really important risks
- *This task integrates the other tasks in the project*

2. Effects of energy removal from waterbodies

3. Effects on animals

- Electromagnetic fields
- Acoustic output
- Physical interaction
 - Strike, entrainment, impingement
 - Attraction, avoidance

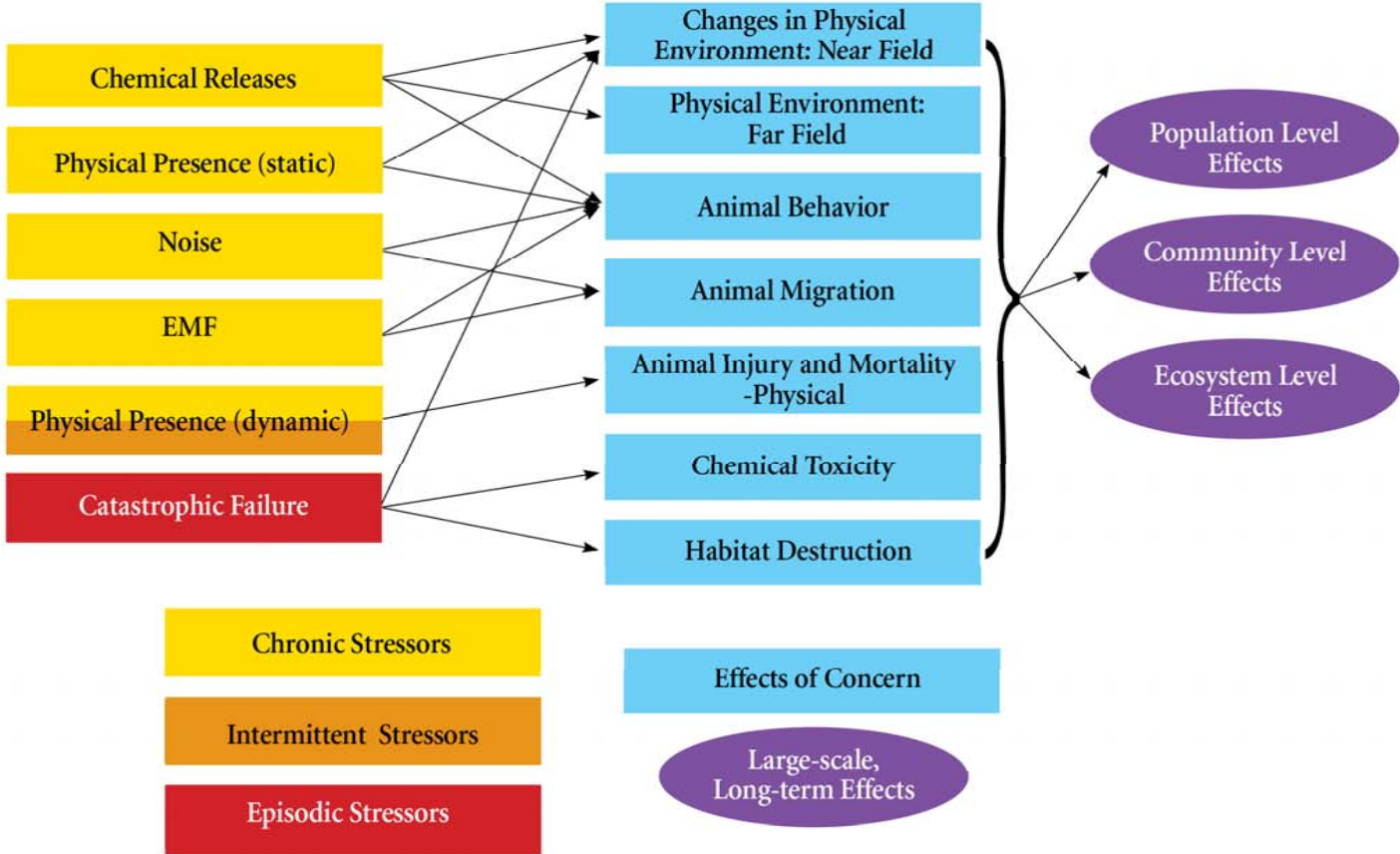
4. Siting constraints and opportunities

- Stakeholder engagement and spatial planning



Environmental Interactions of MHK Devices

Operational Phase



Annex IV



- ▶ International Energy Agency – Ocean Energy Systems
 - “Annex” is an agreement to carry out collaborative tasks

- ▶ IEA Annex IV
 - Eight member nations, U.S. is lead, DOE/BOEM/FERC
 - Gather environmental effects data from member nations, evaluate effects, monitoring methods, mitigation strategies


- ▶ PNNL implement on behalf of DOE for U.S.
 - Create portion of *Tethys* for Annex IV data
 - Wave Energy Center/Univ Plymouth assisting with data collection, analysis
 - Held experts’ workshop in Dublin in September

Complexity of data management needs for MHK

THE DATA

- Many sources, origins of data: laboratory results, modeling runs, field data, scientific papers
- Many data types: tabular, geospatial, pdfs, maps, photos, video
- Many marine receptors of concern: marine mammals, birds, fish, turtles, also hydrodynamics, sediment transport, water quality, other ocean uses

THE AUDIENCE

- MHK project developers, regulators, researchers, stakeholders
- 
- Lots of challenges to house, organize, and make these data accessible

WHAT IS NEEDED IN AN MHK DATABASE?

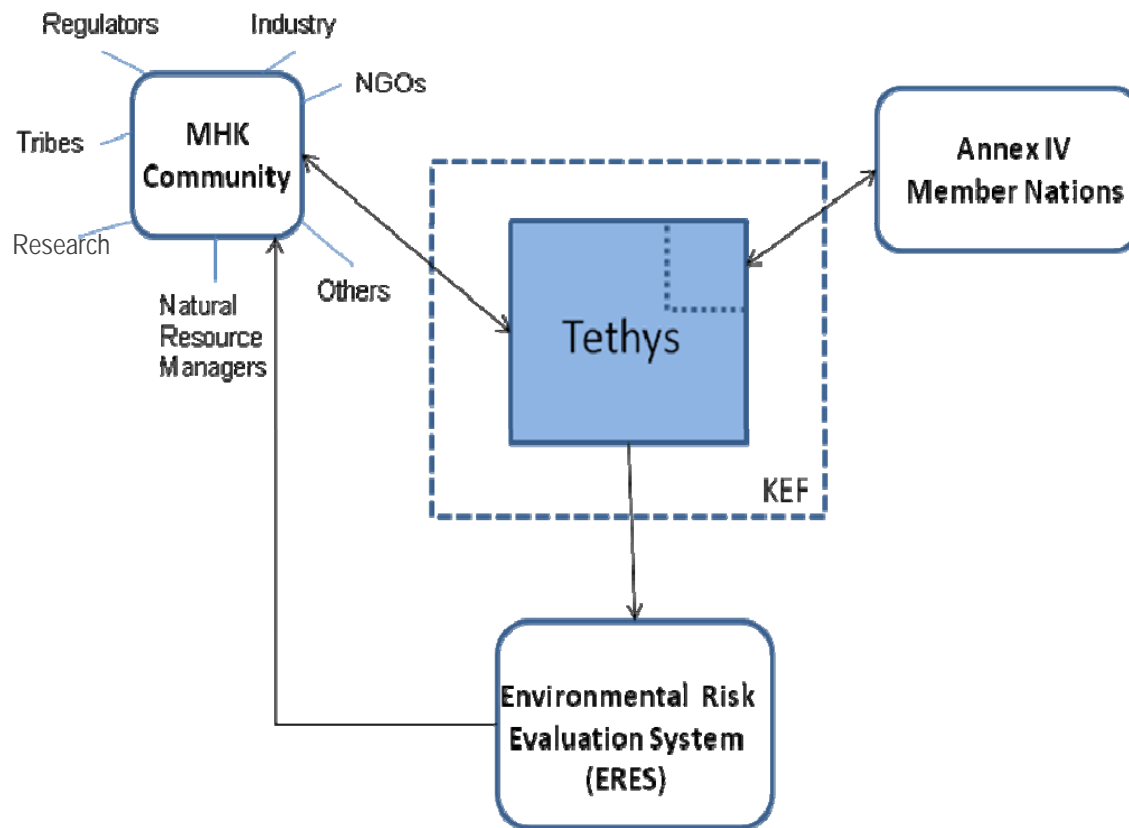
- Flexibility for data intake of many types
- Good user interface for input and query/display of data
- Ability to tag data for QC, other information
- Easy linkage to other databases
- Automated data intake
- Extensible for related uses

MHK Knowledge Management System, aka *Tethys*

- ▶ Named for Greek Titan goddess
- ▶ Primary function of the system is as a knowledge base to support the risk framework (ERES)
 - Evidence collection and marshalling
 - Data navigation and management of risk model results
- ▶ Other functions expected to be important
 - Knowledge portal for various stakeholders
 - Portal to other knowledge sources (e.g., Annex IV database under construction)
 - Collaborative environment for MHK research community
- ▶ Functionality created through interviews with users



Tethys serves as knowledge management framework for MHK environmental studies



Tethys image courtesy of Wikipedia and used under Creative Commons license



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Tethys platform features:

- ▶ Automated ingest of documents into a wiki-like environment
 - PDF files, Word documents, web pages, etc
 - Automatic semantic encoding of many meta-data fields
- ▶ Semantic “pipeline” processing to aid in recognizing and tagging key types of entities
 - People
 - Places
 - Specific vocabulary terms
- ▶ Rich annotation features
- ▶ Semantic search




Tethys Video Here

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MHK

Page Discussion Annotate Evidence Edit History


Navigation

- Main Page
- Announcements
- Community Portal
- Current Events
- Recent Changes
- Random Page
- Help

Toolbox

- What Links Here
- Related Changes
- Special Pages
- Printable Version
- Permanent Link
- Browse Properties

Main Page



Map Satellite Hybrid Terrain

Overlays

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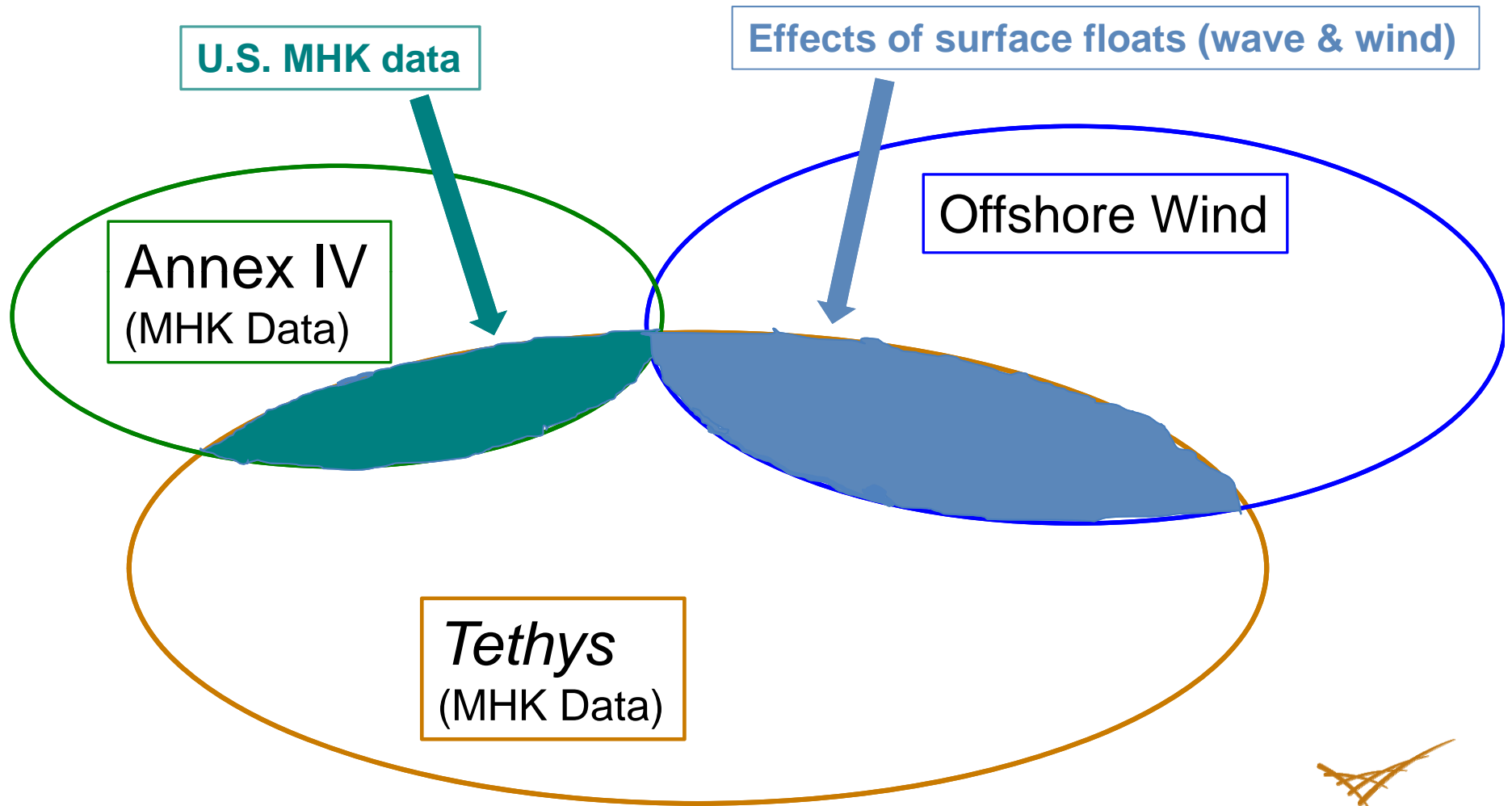
Next Steps in *Tethys* Development

- ◆ Just finished requirements document
- ◆ Beginning to populate *Tethys*
- ◆ Building Annex IV portion of KMS, collecting metadata
- ◆ Also building linked KMS for offshore wind development



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Knowledge Management System(s)



Next Steps in MKS Development


- ◆ Talk with us on contributing data, additional functionality that would be useful to you
- ◆ Expect to have *Tethys* operational outside PNNL firewall end of February 2011



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Thank you for your attention!

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A photograph of a sunset over a body of water. The sun is low on the horizon, creating a bright orange glow and a reflection on the water. The sky is a mix of orange, yellow, and grey. In the foreground, there is a dark silhouette of a shoreline. A blue-bordered text box is overlaid on the image, containing the following text:

We would like to acknowledge generous support by the US Department of Energy Wind & Waterpower Technologies Office (WHTP) and KEF development supported by the PNNL Technosocial Predictive Analytics Initiative (TPAI)