

New York State Energy Research and Development Authority

New York State Hydrokinetic Generation Environmental Policy Workshop Post-Workshop Analysis

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**NEW YORK STATE HYDROKINETIC GENERATION
ENVIRONMENTAL POLICY WORKSHOP
POST-WORKSHOP ANALYSIS**

Final Report

Prepared for the
**NEW YORK STATE
ENERGY RESEARCH AND
DEVELOPMENT AUTHORITY**
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Abstract

The recommendations of the New York State Hydrokinetic Generation Environmental Policy Workshop were made by experts in policy, science, engineering and environment; state and federal regulators; and renewable energy industry professionals. As hydrokinetic energy generation is relatively new to the overall renewable energy landscape, workshop discussions reviewed environmental policy currently in place and reflected the need for policy to reflect this new technology. Workshop participants were highly motivated to examine policy in advance of commercial deployment of this new technology.

The intention of examining existing policies ahead of commercial deployment of hydrokinetic projects was to serve the efficiency of the permitting process, but more importantly, to understand how policy can look ahead and anticipate needs of a new technology such as hydrokinetic energy. By providing a solid foundation of science with the assistance of innovative technology, policy-makers would have facts to inform their decisions to support energy and economic goals, allowing New York State to lead the way in renewable hydrokinetic energy generation. Three key themes emerged.

(1) In examining the current regulatory process for hydrokinetic energy projects, a recurring theme emerged through the course of workshop proceedings. Due to the nature of the new technology, early project review is confronted with both a lack of information and understanding of the environmental interaction as well as difficulties with coordination of procedural framework for permitting. While some streamlining has taken place, the overarching theme during the workshop was: By engaging all agencies early on in the process, working together throughout the entire permitting process along with the developer, the resulting common understanding of a project and its requirements would be beneficial to the hydrokinetic industry and regulators as well.

Workshop panelists from the Federal Energy Regulatory Commission, Environmental Protection Agency and the New York State Department of State offered suggestions that early coordination between the developer and all agencies with regulatory authority over a project would greatly improve the permitting process. This early collaboration would provide a clear understanding of regulatory requirements and allow projects to move forward with efficiency. Representatives from key organizations agreed that signing a Memorandum of Understanding (MOU) would formalize this early collaborative process, and encouraging developers to meet with all appropriate agencies as a group within 90 days of receiving their preliminary permit would streamline the collaborative process.

(2) Hydrokinetic energy generation involves interactions with ecosystems — river and tidal systems — which, because of the lack of installed demonstrations and pilot projects, does not yet have a significant body of information developed. While scientists have some understanding of how these complex and delicate ecosystems function, much remains unknown. The scientists at the workshop agreed that it would be difficult to assess and/or predict how hydrokinetic devices will interact with these systems and their

inhabitants without real-time environmental monitoring data and more complete study. Workshop discussions gave a clear indication that innovative operational environmental monitoring technologies will play a critical role in understanding how hydrokinetic technologies interact with ecosystems, and ultimately provide accurate data to fulfill regulatory requirements. These technologies must evolve to adapt both the hardware and interpretation to study this interaction in a cost-effective and prudent manner that also benefits from, and contributes to, other ecosystem studies.

(3) During the period since 2005, early hydrokinetic developers have been burdened with providing data to satisfy regulatory requirements; for developers to provide the level of data needed for the environmentally-sound development of hydrokinetic generation is an overly onerous task. The workshop group agreed that a collaborative effort is needed here as well, as it is a massive task to collect data to the degree necessary for a comprehensive understanding of ecosystems. As data exists now, it is an inefficient patchwork with gaps and duplications; it is likely there is useful data that has already been collected that no one knows exists. Efforts are underway to connect existing data from around the world in a central data repository, allowing for standardized information to be shared. Workshop participants suggested it could be New York State's role to populate this database with statewide data that would serve an ecosystem-based approach with the most current information to move the hydrokinetic industry forward with efficiency.

New York State is home to a number of businesses and universities with a global reputation for innovation. Workshop discussions were consistent in pointing out the potential to become a global center for innovation and leader in hydrokinetic generation if the State moves quickly to create strong financial incentives to attract developers from around the world. As investors are attracted to countries showing the greatest interest, New York State would be well served to recognize the strengths of its innovators and its wealth of natural resources by creating supportive policies and financial incentives.

It is with these three critical components: early collaboration of agencies and developers to understand what is required; innovative environmental monitoring technologies to provide an understanding of how ecosystems function; and the connection to the best thinking from around the world, that the development of hydrokinetic energy generation can be accelerated. These proactive measures will inform policy that reflects how hydrokinetic devices interact with river and tidal ecosystems, policy based on solid scientific fact. As growing energy needs are of increasing concern both in New York State and around the world, these recommendations were made with the knowledge that it is a critical time for decisions to be made in support of this renewable energy source.

Keywords

Hydrokinetic, Environment, Policy, Energy, NYSERDA

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Summary

On May 17, 2012, a group of 60 respected leaders in the fields of policy, science, engineering and environment; state and federal regulators; and renewable energy industry professionals met for a one-day workshop at the New York State Judicial Institute on the Pace University campus in White Plains, New York. The workshop, made possible by the New York State Energy Research and Development Authority (NYSERDA), called upon participants to define and target specific recommendations and prioritizations for the environmentally-sound development of hydrokinetic energy in New York State. Beacon Institute for Rivers and Estuaries, a subsidiary of Clarkson University, was lead entity for the workshop, working with the Pace Energy and Climate Center, Pace University Law School; Pace Academy for Applied Environmental Studies, Pace University; Verdant Power, Inc., and Ocean Renewable Energy Coalition (OREC) for its development and execution.

Setting the foundation for workshop discussions, two papers were written and distributed to registered participants in advance of the event to prepare them with the most current policies and technologies concerning hydrokinetic power in New York State. The policy paper titled [A Review of Regulatory and Policy Requirements for Hydrokinetic Power Projects in New York State](#), was prepared specifically for the workshop by the Pace Energy and Climate Center of Pace University Law School — the first policy analysis of hydrokinetic power in New York State — which served as the “cornerstone” for the workshop. Compiling the technology primer [Marine and Hydrokinetic Technology – Background and Perspective for New York State](#) were Ocean Renewable Energy Coalition (OREC) and Verdant Power, Inc.; this document provided workshop participants with current issues and the current state of the hydrokinetic industry.

What is Hydrokinetic Generation?

“The Marine and Hydrokinetic (MHK) industry is one of the fastest growing sectors of renewable energy and is set to make a major contribution to carbon-free energy generation.”¹ “Hydrokinetic power generation from river and tidal currents represents substantial potential as a renewable energy generation resource for New York State that in some cases can be co-located with energy consumers.”²

“Hydrokinetic stream energy extraction is derived from the kinetic energy of moving water flows, analogous to the way a wind turbine operates in air. A tidal or river stream energy converter extracts and converts the mechanical energy in the current into a transmittable energy form. A variety of conversion

¹ *Assessment of Energy Production Potential from Tidal Streams in the United States – Final Project Report*; June 29, 2011; Georgia Tech Research Corporation

² Ocean Renewable Energy Coalition (OREC) and Verdant Power, Inc., *Marine and Hydrokinetic Technology – Background and Perspective for New York State*, iii.

devices is currently being proposed or is under active development, but all are premised on the concept of renewable energy production from water currents without the need for dams or impoundments.

Estimates from prior studies of the hydrokinetic potential on main-stem rivers in the U.S. have exceeded 10,000 megawatts (MW) and yielded an overall estimate of 12,500 MW. For purposes of this New York State workshop, we are focused on technologies, environmental effects and policy for the development of the potential of river and tidal resources – omitting wave – the estimated State tidal resource potential was estimated at 280 MW. Independent examinations by Verdant Power and others indicate this tidal potential could be somewhat greater. For river hydrokinetic potential, the estimated resource could be in the range of ~300 MW within New York State.”³

The worldwide theoretical power of tidal power (including tidal currents) has been estimated at around 7,800 terawatt hours per year (TWh/year)¹. This translates to approximately 30-50 gigawatts (GW) of tidal hydrokinetic energy worldwide. As a yardstick; 1 GW = 1000MW and 1 MW is frequently used as roughly equivalent to powering 1000 households²; and so tidal energy could conceivably provide electricity for 30 million homes worldwide.

In Canada – a recent report by the Ocean Renewable Energy Group³ has estimated that the Canadian hydrokinetic extractable mean power potential for In-stream Tidal (~ 6,300 MW¹) and River-Current (estimated to be > 2,000 MW² in the provinces of QC, ON, MB, BC, Arctic).⁴

Workshop Background

New York State environmental policy for hydrokinetic power is as of yet underdeveloped as hydrokinetic is relatively new to the overall landscape of energy production. Regulators and developers have had to rely on a patchwork of policies based on more traditional modes of energy production to inform their decision-making process; transferability of existing policy to hydrokinetic power is not consistent. As witnessed by the controversy in New York State regarding power facilities that use once-through cooling, after 40 years the debate continues, a situation which could have been avoided early on with clearly stipulated policy.

The overarching goal of the New York State Hydrokinetic Generation Environmental Policy Workshop is to learn from the State’s environmental history, and take a critical look at existing environmental policies with regards to the potential for large-scale commercialization of hydrokinetic power generation. The workshop has presented a timely opportunity to plan ahead, address environmental policy in advance, plan

³ Ocean Renewable Energy Coalition (OREC) and Verdant Power, Inc., *Marine and Hydrokinetic Technology—Background and Perspective for New York State*, 1-2.

⁴ Full report available at: http://oreg.ca/web_documents/mre_roadmap_e.pdf

pro-actively – not reactively – preparing now for future large-scale hydrokinetic energy development in New York State.

In the 21st century, we are faced with the necessity for developing alternative non-polluting energy sources. Though each technology has its environmental challenges, establishing efficient, creative and intelligent environmental policy can lessen their impact on ecosystems, allow for the development of renewable hydrokinetic energy, and set the framework for addressing future energy needs of New York State.

Workshop Logistics

On May 17, 2012, the New York State Hydrokinetic Generation Environmental Policy Workshop began with two panel discussions which took place in the morning, each lead by one moderator with four panelists and the primary author of the policy paper participating in each panel. Four simultaneous breakout sessions took place in the afternoon, followed by breakout session reports and a group synthesis. Panelists were prepared with a number of “directional questions” to both keep the discussions focused, and to feed topics for efficient, “granular” discussions in the afternoon breakout sessions, to breed tangible results.

Afternoon breakout sessions on four different topics areas related to hydrokinetic power generation were moderated by an expert on each breakout topic. Each participant had selected a preferred topic area in advance of the workshop, which resulted in an average breakout group size of 15 on workshop day; the goal for each of these focused breakout discussions was to establish three recommendations. All participants re-convened for a group synthesis session where each breakout group reported their recommendations. A “hub” for each breakout topic was established and a rotation by each breakout group took place – each group shifting from topic to topic – allowing for further understanding and input by each workshop participant, and refinement of each recommendation.

The following report sections summarize workshop presentations and discussions that took place throughout the day on May 17, 2012. Specific ideas which emerged out of each panel discussion appear first in a bulleted list; where appropriate, quotes were inserted for edification. Appendices beginning on page A1 list information referenced throughout this document, as well as workshop agenda, panelists, participants and steering committee.

Ideas and suggestions that emerged from these discussions reflect the experiences and insights of those participants who are currently involved in hydrokinetic projects in various stages or aspects of development. The intention for these ideas is to assist in defining policies to explore new parameters for the orderly development of hydrokinetic energy generation, a renewable energy source, while protecting the environment.

1. Panel #1

Policy and Regulation: Challenges and Solutions

Panel 1: Overview

The challenge for permitting agencies to embrace a new technology such as hydrokinetic generation has been the lack of real-world deployment information regarding the environmental effects of these hydrokinetic technologies. In order to fully understand how a hydrokinetic device interacts with a given ecosystem, in this case water systems, agencies need a comprehensive picture formed by intelligent data. To date, policies do not clearly define ways to address these concerns. Agencies and developers have shouldered the burden of laying new foundations to fill this intelligence gap, and have begun to develop strategies which have proven useful in allowing projects to move forward.

The following is a summary of ideas which emerged from Panel 1 presentations and discussions:

Panel 1: Summary

- *Challenges - Agency:*
 - How to permit/license projects allowing for industry growth from pilot to commercial stage.
 - Acquiring sufficient knowledge of environmental impacts of a new technology.

- *Challenges – Developer:*
 - Understanding what is required from all agencies to acquire project permits and licenses.
 - Burden on finances and time in providing sufficient data to fulfill agency requirements.

- *Possible Solutions:*
 - Create a “pre-application task force of agencies” consisting of NOAA, NMFS, DEC, DOS, a formalized committee established by an MOU.
 - Encourage applicant collaboration with regulatory agencies within 90 days of acquiring a preliminary permit.
 - Develop systemic/baseline assessments with State funding.
 - Develop hydrodynamic models to understand the cumulative impacts of hydrokinetic deployment on currents (e.g., energy absorption or navigation issues) for categorization of deployment sites.

Panel 1: Presentations and Discussion

Moderator: Lin Harmon

Panelists: Timothy Konnert, Lingard Knutson, William Little, Jeffrey Zappieri

1.1 FERC Licensing

Initiatives by the Federal Energy Regulatory Commission (FERC) have been established to understand environmental effects of hydrokinetic devices by allowing test projects to be deployed in water bodies as quickly as possible to start gathering information, keeping in mind the potential for larger array deployments in the future.

The first FERC initiative, often referred to as the “Verdant Order” (more accurately the Verdant “exception”), states that a developer does not require a license under the Federal Power Act as long as the developer is testing a new technology during a short-term deployment, and that power generated from the test project will not be transmitted into, or displace power (i.e., receive revenue) from, the national electric energy grid.

Verdant Power’s Roosevelt Island Tidal Energy Project (RITE) was the first project deployed and grid-connected under the Verdant Order having been issued a preliminary permit. Verdant Power Inc., a New York City-based hydrokinetic developer and project integrator, deployed a short-term demonstration project in New York City’s East River. (The RITE Project served as a case study for this workshop.) From 2006 to 2008, Verdant Power conducted environmental monitoring: observing fish presence, abundance, species characterization and fish interaction with operating hydrokinetic turbines. Fish interaction could include: collision, entanglement, strike, recruitment of species due to change in water velocity, magnetic/electrical interference of navigation to local movement or long-distance aquatic species migration, predation (by fish or human fishing activities) on species feeding near fish aggregation/attraction devices (FADs).⁵

As a result of their efforts, Verdant then filed a Hydrokinetic Pilot License Application with FERC for pilot development of the RITE Project and was issued a pilot commercial license from FERC in January of 2012 (P-12611). The RITE Project is the first FERC pilot project license issued for a tidal power array in the U.S., and is licensed to transmit and receive revenue for energy delivered into the grid.

⁵ DOE (U.S. Department of Energy, Wind and Hydropower Technologies Program). 2009. *Report to Congress on the Potential Environmental Effects of Marine and Hydrokinetic Energy Technologies*.

The second FERC initiative was to establish a pilot license, a short term license that waives certain provisions within the FERC licensing process. The emphasis for a pilot license is on post-license monitoring, ensuring any environmental effects to be mitigated. The pilot license stipulates that if mitigation is not possible, the project is to be shut down and removed.

FERC has recently issued the first two pilot licenses, the RITE Project and Cobscook Bay Project in Maine. Prior to the FERC pilot licenses, both the RITE and Cobscook Bay projects were deployed under the Verdant Order, which contributed to improved efficiencies to the FERC regulatory process as a result. Collaboration with the appropriate agencies and information gathered with project test deployments contributed to a clearer understanding of what was achievable during a pilot license.

“On the FERC process and I don’t know if this is possible, but as part of gaining a preliminary permit, I believe an applicant must be required to talk to the agencies that are going to have regulatory authority over them, within 90 days of getting that preliminary permit.”

-Lingard Knutson, Principal Project Reviewer, *U.S. Environmental Protection Agency (EPA), Region 2*

“I could see the need for a pre-application task force of agencies. I think that’s a good idea. NOAA, NMFS, DEC, State spent a lot of time in the room, so maybe some formalization of that would be good, possibly on a case by case basis.”

- Timothy Konnert, Fish Biologist, Division of Hydropower Licensing, *Federal Energy Regulatory Commission (FERC)*

Memorandum of Understanding (MOU)

As the FERC process does entail coordination with all other agencies with federal statutory authority, FERC will often modify their program for an increased level of coordination in an effort to increase efficiency of the permitting process. To date, FERC has signed a MOU with California, Maine, Oregon and Washington to increase efficiencies of hydrokinetic project review in these states. FERC is currently working on an MOU with the U.S. Coast Guard (USCG) and the U.S. Army Corps of Engineers (USACE) for conventional and hydrokinetic projects, formalizing these coordination efforts. This holds significant value for the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS), regarding their responsibilities under the Endangered Species Act, Marine Mammal Protection Act and the Magnuson Stevens Fishery Conservation Management Act. Involving these agencies early on in the permitting process has facilitated a better understanding of what baseline information is required, identifying potential issues, (e.g., formal consultation related to listed species), giving developers a more realistic timeline and the ability to plan sufficient budgets. FERC’s collaborative efforts put into practice thus far have improved the efficiency of the FERC licensing process.

“Our process is really set up to integrate all the other agencies with federal statutory authority...and many times we do modify our program. It does require an increased level of coordination with these other agencies...to try to figure out ways to make that interaction more efficient so it doesn’t hold up these projects. To that end, we signed MOUs with a number of states...

We did have a workshop in 2009...and there was discussion then of the potential of an MOU with the State of New York. I think that is something that we would look favorably on because I think it has been effective with the other states in terms of the efficiencies.”

-Timothy Konner, Fish Biologist, Division of Hydropower Licensing, *Federal Energy Regulatory Commission (FERC)*

The EPA in reviewing the RITE Project had initial concerns regarding the unknown environmental impacts of hydrokinetic technology. A collaborative, coordinated effort between the developer, Verdant Power, FERC, DEC, FWS and USACE ultimately addressed the EPA’s concerns. Monitoring technologies were developed and implemented and once the USACE environmental assessment of the project was completed, the EPA had a clearer understanding of hydrokinetic device interaction at the RITE Project site and the project was able to proceed.

“It’s not until you get to the critical mass in a task force that really works. When you talk about modifying things, it’s really just empowering those individuals within the agencies to be the front line with the developers.”

-Lingard Knutson, Principal Project Reviewer, *U.S. Environmental Protection Agency (EPA), Region 2*

Coastal Zone Management Perspective

As nearly half the U.S. population inhabits the coastal areas of the United States, these areas experience the highest pressure for development. The establishment of the Federal Coastal Zone Management Act (CZMA) in the 1970s was a proactive measure to protect the coastal areas where the highest degree of conflict existed between economic development and resource protection. Several policies outlining ways to balance these factors provided incentive for participation by state governments; if states developed their own coastal policies, they received support on the federal level.

At the same time, the New York Department of State (DOS) had, and has, the ability to veto federal agency activities.

The DOS Coastal Zone Management Program (DOS CZM) currently serves a function of planning, looking at the appropriate use of a project in any given area of New York State within its coastal areas.

“Talk to developers early on. If we [DOS] can give this kind of early direction about where you are, if you are looking at what kinds of things are appropriate in a given area...provide greater clarity...That helps facilitate the expansion of these kinds of activities. I can’t say enough about coordinating early on.”

-Jeffrey Zappieri, Chief, Consistency Review, NY Coastal Management Program, *NYS Department of State*

“Involved agencies understand that, at the outset of a project, business plans may not always anticipate the need to engage all of the involved regulatory agencies at once. But early consultation and collaboration with participating agencies will in the long run be more likely to lead to more predictable development of fundamental data, and greater clarity as to viewpoints on project feasibility and consideration of alternatives.”

-William G. Little, Office of General Counsel, *NYS Department of Environmental Conservation*

1.2 Siting of Hydrokinetic Projects in New York State: Agency Perspective

Defining policy for hydrokinetic energy generation poses new challenges to regulatory agencies due to the nature and diversity of the technology itself. As the industry develops, increased potential exists for adverse environmental impact due to an increasing number of installations in a given water body. To identify deployment sites without a clear understanding of the ecosystem interactions calls for environmental data to enable policymakers to make intelligent decisions.

Policymakers are limited by the relative lack of information at the demonstration and pilot stages. Defining environmental monitoring parameters for the number of allowable installations is difficult until more is known about these ecosystems where projects are deployed.

Identifying resources or values — the carrying capacity of a water body — will likely be learned over time as data accumulates with the progression of hydrokinetic generation. Discreet areas indicated in coastal zone resource, estuary and harbor plans could be explored for where not to allow deployment, pointing to the identification for optimal locations, a process involving the joint cooperation of developers and FERC together. This is an approach the Department of Energy (DOE) has already begun to explore.

The DOS CZMA process could require a great deal of monitoring of any given project, which could pose financial and technical challenges for the developer, stressing project timelines and budgets. Coordinating and collecting data for a baseline assessment to inform the siting process is a massive project; New York State’s involvement in developing baseline assessments would be difficult in the best of fiscal times, and difficult for the State to accomplish.

“More often than not [developers] are looking for information and who’s going to pay for information. So, is there a role for the State in wanting to further this? Maybe.”

-Jeffrey Zappieri, Chief, Consistency Review, NY Coastal Management Program, *NYS Department of State*

The DOS and the Bureau of Ocean Energy Management (BOEM) are nearing the completion of a spatial mapping project of important ocean resources, expected in early 2013. The aim of the ocean planning effort is to serve to identify locations where off-shore wind power deployments would have the least environmental impact for use by industry, NGOs, the ocean use community, and other stakeholders. A similar spatial mapping tool could be applied to understanding tidal and river systems for the hydrokinetic industry, identifying resources where hydrokinetic deployments would have the lowest environmental impact. This could prove to benefit project efficiency of time and cost by providing baseline data which the developer would otherwise be responsible for. Though regulation is not currently driving this mapping tool, it should be considered in order to plan ahead, keeping in mind the potential for cumulative environmental impacts as the numbers of hydrokinetic projects increase.

In the meantime, with little baseline information for reference it is difficult, from the perspective of New York State, to determine cumulative impacts and project boundaries without a more robust knowledge base. With the many open-ended questions regarding the effects of commercial scale hydrokinetic device arrays on the environment, it is difficult to create effective policies to support the growth of the hydrokinetic industry.

Local vs. Broad Ecosystem Impacts

Another dimension to consider regarding the definition of environmental monitoring parameters is the issue of localized environmental impact at a deployment site versus broader impact to the ecosystem at large. Without a greater understanding leading to the ability to characterize the broader ecosystem, defining parameters would seem premature. Take for example fish interactions effecting a migrating population; consider the abundant American eel population of the 1980s now under review for protection under the Endangered Species Act in 2012. Regarding species migratory patterns and environmental effects through time presents a challenge in determining monitoring parameters; effects of climate change will further complicate our ability to understand the ecosystem on a broad scale.

Categorical Inclusion/Exclusion

Building on the concept of an ecosystem-based management system, it would stand to reason that the ability to categorize deployment sites could emerge. Certain sites could conceivably require less monitoring than others, increasing project efficiency of time and budget. There are three components that need consideration for this to be addressed: the system, the siting, and the scale. Realistically, until spatial

planning is further along, the industry is likely a decade away from the ability to categorize potential deployment sites. However, as real-time environmental data is consistently collected over time, then perhaps a data-driven model of ecosystem function could be established.

The RITE Project has and will continue to provide real-world data, indicating potential for fish interactions at the micro, meso and macro scale — at their existing site, and answers will emerge in that way to inform the cumulative picture for that site. The operational monitoring, governed by adaptive management at RITE will continue to inform policy to assist with the development of innovative environmental monitoring technology and data systems, to answer these questions.

“Every site is going to be different, so we need to take a look at our coastal zone resource planning. We need to take a look at our estuary plans, our harbor plans...and chop out those places that it shouldn’t be. Then we can start looking at the best place for it. I think the developers and FERC are going to be working on that; DOE is working on some of that.

I think this goes with some of the talk of baseline studies. I think we need to, as a region, as New York and with FERC, figure out what kind of hydrodynamic modeling we would use for this. We might come up with some models that different agencies have; real world with real monitoring about what’s happening to actual fish at the time.”

-Lingard Knutson, Principal Project Reviewer, *U.S. Environmental Protection Agency (EPA), Region 2*

1.3 Economic viability of hydrokinetic projects

It is becoming increasingly clear that technology innovation needs to be an integral part of both hydrokinetic devices and arrays and for environmental monitoring needs. Whether or not investments that support hydrokinetic and its related technologies should be a function of the marketplace alone or include participation on the State level needs further exploration.

Developers have been successful in supporting innovative technology, yet further collaboration with the State would serve to expedite the industry’s progress. There is activity by DOE, NYSERDA and others in the grant funding of many projects in support of both the development of hydrokinetic devices and the environmental instrumentation since these organizations see technology innovation as critical, recognizing that support for developing effective environmental monitoring technologies must develop concurrently with hydrokinetic devices, viewed as a solution for accelerating the process of providing information to answer regulatory requests.

In addition, the role of adaptive management can serve an important function for the economic development of the hydrokinetic industry, and policies need to reflect this as the industry moves from pilot

to commercial stages. One workshop recommendation suggested that New York State should make data available to a scientific task force and developers, and that data would define and implement appropriate metrics to evaluate, monitor, and predict environmental impacts. Currently, the data and protocols developed during operation are made available for review by participating agencies to evaluate, monitor, and predict environmental impacts and will likely lend significant weight to building the industry.

From a developer's standpoint, government funding by and large requires matching funding from investors and developers, yet if the U.S. is to take a leadership role in innovative technologies we need to create efficient investment incentives and strategies to take the hydrokinetic industry through the demonstration, pilot and into the commercial stage.

2 Panel #2

Monitoring Data and Research: How They Inform Policy and Regulation

Panel 2: Overview

Accurate and cost-effective data collection is a critical factor in the overall feasibility for the emerging hydrokinetic industry. Regulators call for baseline information and ongoing environmental monitoring of hydrokinetic deployment sites to understand the effects of a new device technology on the ecosystem where it is deployed.

The question emerges as to how environmental monitoring data and research can best inform policy and the regulation of hydrokinetic energy. In tandem, consideration might also be given as to how policy and regulation can inform our choices of environmental monitoring and research requirements.

There is great opportunity in New York State for hydrokinetic energy generation, with its abundance of river systems, 127 miles of coastline, and 2,620 miles of shoreline in the marine district from the Tappan Zee Bridge to Montauk. Addressing policy needs in advance of potential commercial deployment is critical at this time.

“We’re seeing major population shifts in marine fisheries and marine resources along the east coast. A lot of things that are going on right now in terms of collapse of fisheries that have nothing to do with over-fishing or pollution, or the traditional things that have been faulted for marine fisheries. It is climate change.”

-James Gilmore, Director, Bureau of Marine Resources, Division of Fish, Wildlife and Marine Resources, *NYS Department of Environmental Conservation (NYSDEC)*

“It’s important that we establish a way of thinking about how developers can attract private investors into this industry to support projects and support developments moving forward because if the United States wants to have a significant role or leadership role, we’ve got to find ways that investment can come in to support our technologies here in the United States.”

-Ronald Smith, Co-Founder and President, *Verdant Power*

The need for innovative monitoring technologies to provide data to inform the permitting process and operation is becoming increasingly clear as the hydrokinetic industry evolves. Uncertainty related to climate change will further complicate our understanding of the environment where hydrokinetic projects are sited, another indicator for the ongoing need for monitoring and technology to provide accurate information about potentially affected ecosystems.

With limited funds in the current fiscal climate, important policy decisions need to be made now for how investment in environmental monitoring technologies might address regulatory monitoring requirements in an economically sound fashion, particularly as the industry moves from pilot to commercial development.

Why is monitoring data and research necessary?

Numerous federal and state agencies must review a hydrokinetic energy generation project, presenting many requirements for information along the way to assure the environmental integrity of an ecosystem where a project is sited. Often, very little data currently exist, making it extremely difficult to provide answers to required questions; collecting data where no data exist adds an extraordinary expense for developers, yet a project cannot move forward without the required information.

The following is a summary of ideas which emerged from Panel 2 presentations and discussions:

Panel 2: Summary

- Adaptive management strategies⁶ will become increasingly important as the hydrokinetic industry transitions from pilot to commercial stages.
- Data on device interactions with the environment is currently limited by limited deployments.
- Concern at commercial deployment stage regarding subtle impacts seen at the pilot stage calls for collaborative assessment of these subtle impacts.
- Collaboration between states, developers and stakeholders for sharing information is a critical factor in developing an ecosystem-based approach to monitoring.
- Connecting data on a global scale by developing a knowledge management system would have great potential for understanding project-based ecosystem interactions worldwide.
- As the hydrokinetic industry evolves, monitoring needs, environmental parameters and monitoring standards can be established and protocols for hydrokinetic deployments should begin to emerge.

⁶ Ocean Renewable Energy Coalition (OREC) and Verdant Power, Inc., *Marine and Hydrokinetic Technology—Background and Perspective for New York State*, C-21.

Panel 2: Presentations and Discussion

Moderator: Paul Jacobson

Panelists: James Gilmore, Andrea Copping, Timothy Konnert, Harry Kolar

2.1 Current policy requirements for hydrokinetic projects

Figure 1 – Hydrokinetic Industry Regulatory Requirements

<u>Hydrokinetic Industry Regulatory Requirements</u>			
	Demonstrations	Pilot	Commercial
Technologies	Many under development	Verdant; ORPC and others in US and worldwide	Few worldwide
Technology readiness level (TRL)	4/5/6 at prototype scale or 7/8 at full scale	7/8/9 pre commercial	9/10 commercial
Timeframe	Testing- limited	5-10 years	> 10 years
No. of machines	1- several	>2 but more in small array	Multiple in large array
Installed capacity	<2 MW	1-20 MW	> 20 MW
FERC	Verdant exemption	Pilot License	License
USACE	NWP 52	404/10j	404/10j
NOAA/NMFS/ESA	Involved in issuing USACE permit	BA	BA
CZMA	Approval	Approval	Approval
State/ NYSDEC	401 Permit	401 Permit	401 Permit

Figure 1: As shown above, the regulatory requirements for the hydrokinetic industry are evolving based on the technology advancement of projects.

Source: OREC; Verdant Power experience (May 2012)

While the FERC process has been streamlined to facilitate installation of pilot projects, it still requires the coordination of the license terms with other state and federal agencies. For example, if a hydrokinetic project has been found to jeopardize any endangered species, FERC requires a formal consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish & Wildlife Service (USFWS).

The following is a checklist of policies which must be adhered to:

- Endangered Species Act (NMFS)
- Marine Mammal Protection Act (NMFS)
- Magnuson-Stevens Conservation Fishery and Management Act (NMFS)
- New York State 401 Water Quality Certification (NYS DEC)
- New York State Coastal Zone Management consistency determination (NYSDOS CZMA)
- Fish and Wildlife recommendations under Section 10-J, Federal Power Act (FERC)

Monitoring plans with FERC-approved licenses have found adaptive management to be of particular importance. By requiring an open communication protocol within a license term, agreement between agencies can be reached more readily and monitoring strategies can be adjusted more efficiently.

“All of our monitoring plans that we’ve approved, and the licenses that we’ve issued, are heavily dependent upon adaptive management strategies because we know these monitoring plans need to be modified during the license term. So, there’s adaptive management strategies in place to try to get an open communication protocol with all of the various agencies so that when those changes do occur, everybody’s on board with them...

I think our biggest challenge moving forward is... once we start moving from these smaller-scale projects to larger commercial build-outs, and also multiple projects within a system... dealing with some of the cumulative effects issues.”

-Timothy Konnert, Fish Biologist, Division of Hydropower Licensing, *Federal Energy Regulatory Commission (FERC)*

2.2 Environmental Impacts

Three categories of environmental impacts have been identified to describe how hydrokinetic devices interact in water bodies, where deployed:

Direct Interaction of Aquatic Species with Turbine Blades

Environmental research documenting the direct interaction of aquatic animals with turbine blades needs to take place with hydrokinetic devices in the water. The RITE Project has greatly contributed to this knowledge base, some information is becoming available from the Gulf of Maine and some European experience, but with limited deployments coupled with the variability of deployment sites and devices, many information gaps remain, that continue to be conditions of the operating pilot projects.

Emissions (electromagnetic, noise, lubricants, paints/coatings)

Research data regarding emissions related to hydrokinetic devices are not as reliant on in-situ deployment. The effects of electromagnetic fields (EMF), noise, the leaking of petroleum-based lubricants (if present), paints, anti-corrosion coatings etc. can be studied to some degree in the laboratory. Emissions data from other industries such as wind power are available to inform the environmental effects as there are similarities in materials used.

Interactions (energy removal, sediment, changes in water quality)

Hydrodynamic and physical interactions have begun to be studied by researchers worldwide as marine hydrokinetic projects at the commercial scale are proposed. These interactions can be simulated using a high-fidelity computer models, allowing scientists to set a starting parameter and adjust from the extreme, to evaluate sensitivities within the resolution and accuracy of the models.

“Most of this work has to be done with devices in the water. Verdant has made a huge contribution with the work they did at the RITE Project, but we need to do this many places, with many different groups of indigenous animals, many different devices. There has been some limited European experience and some great stuff out of the Gulf of Maine, but we’re not there yet. We need to be cautious with marine animals, particularly the listed species, but we’re really not going to learn anything unless we get the devices in the water and have good monitoring programs in place.”

-Andrea Copping, Senior Program Manager, *Pacific Northwest National Laboratory*

Concern for Subtle Impacts at the Commercial Deployment Level

Early reports from small pilot sites indicate there are minimal impacts on benthic habitat from physical interaction regarding fish interactions and direct acoustics. Research suggests however, that though the effect of EMF to individual fish appears to be slight, questions remain regarding population-level impacts of larger hydrokinetic developments.

“There’re a lot of small-scale projects that are looking to deploy over the next few years; hopefully the research supports the fact that small projects, unless they occur in large numbers, are likely to have relatively few impacts. Hopefully those can go forward. But it’s the first few really, really large projects that you have to try in some way to evaluate the more subtle potential impacts that can be difficult or impossible to detect at smaller scales of deployment. I think there has to be a real collaborative effort ... because these are going to be larger initiatives, with more detailed monitoring. It’s going to take a larger solution to address.”

-Hoyt Battey, Environmental Policy Specialist, *U.S. Department of Energy*

At this point there are no protocols for collecting and analyzing consistent information. However, the DOE's Bureau of Ocean Energy Management (BOEM) has funded two projects to help create protocols for collecting and analyzing consistent information, and there have been several conferences which have looked at the environmental effects of tidal energy both in the U.S. and Europe which will help inform hydrokinetic energy moving forward (see Appendix B).

Environmental Data Sharing

A conflicting message emerges as the discussion of data evolves; though data may exist, inconsistencies in quality, quantity (enough to provide a comprehensive picture for understanding an ecosystem), data standards, availability and other impediments, seem to create an overall impression that data is lacking. Contradictions emerge from this patchwork effect, pointing to the need for coordination, cooperation and standardization. To facilitate a cohesive and useful data system, innovative monitoring and assessment technology must be implemented. Simultaneously, we must consider the urgency of energy needs around the world to drive this cooperative effort; this must be an integral part of the process if new technologies are to develop with a data framework to provide a thorough understanding of environment-energy project interactions. A database system named “Tethys,” a project sponsored by the DOE, is a knowledge management system which may serve as a useful tool to meet these needs (see Section 4.2).

“Engage with other states and feds in several ways. We have very poor instrumentation and technologies for monitoring. We really don’t know how to look at a lot of animals and other sensitive habitats around these devices, so let’s move forward on this. And there’re other jurisdictions to partner with: the feds, the states and also internationally; they are all in the same place. We’re all trying to look at the same things, so let’s do it together. Share information and data and be open about it. It’s really important that this isn’t a competitive environment yet. It has to be a collaborative environment to move forward: the states, the developers, the stakeholders.”

-Andrea Copping, Senior Program Manager, *Pacific Northwest National Laboratory*

“Tethys is evolving to a critical mass now where we’re starting to build at least at the metadata level — a repository; However, looking at the international scope and how we could actually relate some of the work in New York State and across the country we can use Tethys as a platform and include some of the analytics, but also link into other organizations, say in Europe, because they’re a bit farther ahead. We can also start to reach into some of the crossover industries such as offshore wind because there is a good deal of data that would be useful. Data sharing is an issue — there are issues with sensitivity given the mix of participants in the ecosystem.”

-Harry Kolar, Distinguished Engineer, Sensor-Based Solutions, *IBM Research*

2.3 Environmental monitoring technologies for hydrokinetic projects

A project is currently underway in Ireland to build a monitoring platform for underwater acoustic monitoring to assess noise and EMF emissions. This monitoring platform will provide particularly valuable data as there are 24 different species of cetaceans around the island.

The IBM “Smart Bay” Project, deployed in Galway Bay and on the west coast of Ireland, hosts a one-quarter scale test site for ocean energy devices. Currently the project is in the process of building a very large-scale grid-connected test site farther up the coast in County Mayo at Belmullet; one “test berth” is in shallow waters (10 meters), another at a depth of 25-50 meters and the third test berth in water over 100 meters in depth. Though this technology is wave energy, it can be applied to all machines including tidal systems.

The first part of the project is to build a monitoring platform to perform underwater acoustic monitoring to assess noise (of particular importance given the 24 different species of cetaceans around the island) and EMF emissions. There is no standard measurement technology in place at this time for this project.

IBM is working with the Sustainable Energy Authority of Ireland and the Marine Institute of Ireland with government funding to build and test this monitoring platform in two stages. A live station will perform background monitoring for one full year of continuous data-streaming from a center array located a short distance away from the test site. It will capture all wide-spectrum noise, with filtering exercises to isolate important data. The Marine Institute of Ireland will be a custodian of these datasets which, as a governmental agency, will hopefully allow for worldwide access to this data.

Science-Based Measurement Standards, Translatable Data & Global Connectivity

The data created from the Galway Bay project, for example, will be used to perfect the technology to determine science-based measurement standards for hydrokinetic projects. The significance of creating these standards is to be able to connect data networks around the world for a greater understanding of how hydrokinetic devices interact with all kinds of ecosystems. As well, scientists and developers will have the ability to learn from what they observe as larger arrays are deployed in other locations around the world, and adjust accordingly.

3 Recommendations and Prioritizations by Breakout Group

3.1 Breakout Group #1

Research and Development of Monitoring Tools

As hydrokinetic generation is relatively new to the field of renewable energy, the challenge for the innovative development of tools to assess its environmental impacts is to keep ahead of the deployment curve. Though some environmental data exist — and focus should be simultaneously placed on collaboration to collect and share this data — generally baseline data is scarce, particularly regarding high-velocity environments. Overall, the science to inform regulators allowing for hydrokinetic projects to move forward has advanced over the past ten years but remains weak.

The scale of pilot projects currently in the water seem small and manageable in terms of environmental impacts, but as the industry moves to commercial deployment, the question emerges as to whether it is reasonable to draw conclusions from small scale assessments for a much larger array. Currently FERC requires a phased approach, requiring an adaptive management plan, increasing the level of monitoring as a project scales up. A condition of the pilot license is any adverse environmental impact would result in withdrawal of the pilot license and removal of the technology.

But for regulatory requirements to be satisfied, and even before that — to provide information to create policy that reflects the true interaction between hydrokinetic devices and the ecosystem — there needs to be an understanding of how the ecosystem functions in the presence of an array of hydrokinetic devices.

For example, overall, it is fairly well understood that the movement of fish tends to be random. Therefore, it would stand to reason that unless scientists can observe fish when they are present in the water and interacting with a device, drawing impact conclusions would be extremely difficult. In this case, a solution would seem to point to the need for some observational monitoring in the presence of an operational device. The right questions have yet to be asked as a great deal is still unknown about how the ecosystem itself functions; asking the right questions for collecting the right data is more than challenging.

Universal Parameters

The DOE National Labs convened a group of scientists from around the world who developed 14 criteria for evaluating and monitoring the environmental effects of tidal energy (see Biophysical Risk Factors: Appendix B). Determining which criteria are applicable to which deployment site or device however, needs continued careful thought. As an example, measuring EMF strength or micropulses/nanopulses might not

be relevant to all sites, nor might setting a universal threshold. Arriving at a consensus in criteria for these 14 parameters might be a way of establishing some monitoring standards.

Ecosystems-Based Approach

Environmental monitoring technologies need to be developed specifically for the hydrokinetic industry to understand ecosystem interaction. Some measurement of baseline and in-situ operating information will facilitate this understanding so we can see how a technology impacts the integrity of an ecosystem.

There is currently a disproportionate burden placed on the industry to develop this data. Budgets for monitoring and assessment programs are limited; a collective collaboration between industry organizations, federal, state and international partners could address ongoing monitoring needs both for the integrity and neutrality of data and to allow for cost-effectiveness of near-term development of the hydrokinetic industry.

Suggestions to expedite hydrokinetic projects and reduce cost:

- Assemble a master checklist of environmental issues relating to hydrokinetic energy and note which issues are unique to tidal/river systems or hydrokinetic devices.
- Develop a synthesis of existing studies from other sources/industries (i.e., biofouling paints, subsea cables) to address hydrokinetic energy development issues which are not unique to the industry.
- Engage in collaboration between states, developers and stakeholders for the sharing of generally applicable data (not site-specific).
- Create a New York State natural resource map (i.e. characterization of a river/ tidal system) — as an informational tool indicating where hydrokinetic deployment might be anticipated to have the least amount of environmental impact on a resource (similar to the pre-development assessment study for offshore wind in the Atlantic Ocean prepared for NYSERDA in 2010⁷). The particular emphasis should be mapping of ecosystem important areas in general, akin to a New York State CZMA database.
- Access detailed criteria for evaluating and monitoring environmental effects (see Appendix B: Biophysical Risk Factors).
- Address sensitivity issues related to sharing data by developing mechanisms to share data at a reasonable cost.

⁷ *Pre-Development Assessment of Geophysical Qualities for the Proposed Long Island – New York City Offshore Wind Project Area*, AWS Truepower, LLC and GEO-Marine, Inc., October 2010

Budgets will not allow for mapping every habitat, therefore a starting point might be to identify sites with high energy potential and anticipated low environmental impacts. Sources of known river estuary and tidal systems, as well as migration patterns, can be identified, although the true baseline monitoring should include areas of increased levels of required detail study. Providing adequate baseline assessments to meet the regulatory standard is a requirement of the developer, and is a difficult challenge. To obtain the level of knowledge needed to move the industry forward efficiently, management by a combined task force of industry and government could accomplish this task.

Phased/pilot approach

Standardizing scale-specific requirements will entail careful analysis. Measurements taken through hydrodynamic characterization with one device deployed, running a computational fluid dynamic analysis for example, may inform baseline data, helping us to understand how the ecosystem functions. As projects scale up in phases as FERC requires, these analyses with monitoring tools will indicate possible changes in impact along the way. Where a figure of 15 percent of the cross-section of flow⁸, tidal velocity etc. is the current theory as to a threshold for adverse environmental impact, this remains an arbitrary number; computational analyses may help to determine a more realistic picture.

Recommendations by Breakout Group 1: Research and Development of Monitoring Tools

Three specific recommendations were made to improve monitoring efficiency, inform hydrokinetic energy regulatory requirements and work toward universal standards:

- 1. Determine which environmental parameters must be monitored at all or most sites and which parameters are site-specific or device-specific.** This will reduce the amount of monitoring needed and improve developer project budgets and timelines. By setting standards, the best minds from around the world can communicate efficiently and share the most current data to inform hydrokinetic projects, protecting ecosystems worldwide. It is in the best interest for New York State to approach the development of the hydrokinetic industry from an international perspective — where data monitoring and evaluation are more advanced — particularly as developers will invest where incentives reflect the greatest interest.
- 2. Need to transform our approach to environmental science and engineering — more ecosystems-based — to collect, use and apply baseline and operational data. This will need to be organized and framed at the regional level using spatial planning.** To accomplish these goals, a coordinated effort on the part of government, developers and stakeholders will be

⁸ This is to say if hydrokinetic devices deployed in a river were to occupy more than 15 percent of the total area (hypothetically consider a lateral ‘slice’ of the river), flow disruption may occur.

necessary for collecting and organizing data which currently exists, identifying any gaps, and overcoming data sharing issues. This ecosystem-based approach will provide a comprehensive understanding of the ecosystems where hydrokinetic deployments are sited, answer regulatory requirements in a more efficient way, and allow for intelligent adaptive management strategies with appropriate learning curves. Overall, an ecosystems-based approach will allow for efficient development of the industry as it transitions from pilot to commercial deployment.

- 3. Develop a monitoring framework that gathers data from the phase/pilot approach — to standardize scale-specific monitoring requirements.** Standards that are appropriate to the potential scale and correlating environmental impacts could be established using information gathered at the pilot stage to inform larger-scale projects. Where regulators currently determine when a threshold has been exceeded, a monitoring framework will allow for increased project predictability with scientific answers; with a better understanding of thresholds for environmental impacts, developers could begin to measure profitability thresholds.

3.2 Breakout Group #2

Facilitating Data Networking, Exchange, and Access

Defining a data framework is the first step before any discussion regarding the networking for, exchange of and access to data can take place. In looking at the lifecycle of hydrokinetic development from a data standpoint, the goal of data networking should be to reduce the overall effort over time, reduce costs, and reduce the time for a project to reach the marketplace.

Where data exists, there is no available central source, there is tremendous variation in quality, and there is likely a wealth of data collected that many are not aware exists at all. The challenge is to move to a technology framework and make evidence-based data available with standards to accelerate the permitting process while protecting the ecosystems where devices are deployed.

“Tying into the overall ecosystem in the communities is very, very important in these projects. There are so many economic impacts across the areas, but from a data standpoint there are many different data sources that need to be pulled together that, in many cases, no one even knows they exist.”

-Harry Kolar, Distinguished Engineer, Sensor-Based Solutions, *IBM Research*

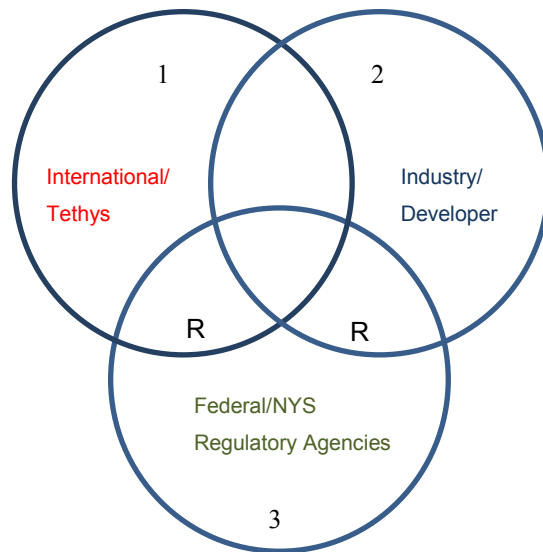
Technology that leverages data with “case-based reasoning” which can look for environmental precedents, issues or cases and how they will be resolved; access to information on permitting for a particular area, a particular machine, a particular benthic mapping; an algorithmic search facilitating the ability to build cases and develop a template to accelerate the permitting process, would have significant positive implications for the development of hydrokinetic energy.

Data sensitivity is a hurdle that needs to be overcome before effective progress to a data framework can be made. The challenge is to allow for progress to data access while protecting intellectual property.

The Environmental Impacts Knowledge Management System, named “Tethys,” is a data system which is currently gathering and organizing information on potential environmental effects of marine and hydrokinetic, and offshore wind energy. Part of Tethys’ goal is to make this information publicly available, though data sensitivity needs addressing.

Tethys could provide the solution to the inherent need for data to inform the development of the hydrokinetic industry in an organized, efficient, intelligent way. While New York State is the home to many of global leaders in innovative technology and environmental research, the combined efforts of the State's intelligence resources in contributing existing data to the Tethys data platform could have significant impacts; by providing analytics, data gathered from industries such as off-shore wind, and information from Europe where hydrokinetic development is further along, New York State could participate in building the Tethys global data platform, accelerate the development of this renewable energy source and contribute to the State’s economy.

Figure 2 — Hydrokinetic data landscape as developed in Workshop Breakout #2 – May 2012



- Key:**
 R = Researcher involvement
 Red = High quality / high quantity data
 Blue = Lower quality / highly focused data
 Green = High quality / less quantity / specific data

As seen in Figure 2, to visualize the hydrokinetic data picture as a whole by drawing three overlapping circles, we can see where data may exist, and where it overlaps. Imagine “Circle one” represents Tethys and international data; this data is considered to be of both high quality and high quantity information. “Circle two” indicates data from industry and device developers collected from instrumentation, marine services, divers, other marine industries, off-shore wind, etc. — slightly lower quality and purpose, yet focused. “Circle three” shows New York State, including many organizations and academia with high quality data, less in quantity, yet very specific. The illustration indicates a great deal of overlap, particularly where R, researchers could be involved. Implied is the need for a coordinated effort to determine what gaps remain.

Coordinating existing data by assigning responsibility to a hydrokinetic environmental task force charged with an MOU could provide the vehicle — a scientific task force — to establish a data baseline to inform the hydrokinetic picture described above. Were New York State to make funding available this task force could inventory, map, assess and list existing data specifically tied to the regulatory process via FERC, CZMA, and on the State level (depending upon the policy), which would have a huge impact on project siting and permitting, while addressing environmental issues. Coordinating with the Tethys knowledge management system could enable New York State to identify geographical gaps, and build in areas for potential hydrokinetic development, similar to what the off-shore wind industry has done in identifying high-wind areas.

As collecting raw data would likely be too cost-intensive, collecting existing data will point to what data sources are, with a goal of sharing the data using standard approaches. FERC and the DOE largely agree that Tethys will serve the purpose of a centralized repository.

New York and region-specific data, federal, and international resource data would form the body of data managed by the science-based task force, looking at world-wide data from scientific and industry sources. Research and student involvement for data quality control, cost-efficient management and analysis of the data platform ongoing should be a key component of the task force; as research grants could also provide a funding source via existing Ph.D. programs.

Recommendations by Breakout Group 2: Facilitating Data Networking, Exchange and Access

- 1. New York State provide funding to inventory, map and summarize existing data on siting and permitting environmental issues that contribute to MHK and offshore wind by populating Tethys with technical links with the next two years.** Initiated and funded by New York State and carried out by a scientific task force (see Recommendation 2), this key component to the hydrokinetic generation “lifecycle” would form a science-based knowledge resource for developers and regulators to consult for required answers to the permitting process. Coordination of data on this level would provide a greater understanding of ecosystems, while accelerating the

permitting process, allowing New York State to benefit from this renewable energy source with a more efficient timeline.

2. **Create a New York State Scientific Task Force to identify gaps and recommend prioritization areas for data collection and dissemination.** Coordinated by New York State, this Scientific Task Force would be a collaboration of organizations and students to manage and analyze data. Researcher involvement is particularly important, those involved in Ph.D. programs, a potential funding source for their work on the Task Force.

3. **Create a New York State Adaptive Management Task Force to work forward with pilot monitoring data to advance the database by contributing to the database while utilizing existing data.** An Adaptive Management Task Force initiated by New York State would participate in data collected at the pilot stage not only to advance the database but optimize learning and allow developers and regulators a true picture of device interaction, particularly as the industry transitions from pilot to commercial stages of deployment.

3.3 Breakout Group #3 Adaptive Management

The primary objective of adaptive management is to foster learning and provide a structure to monitoring projects, recognizing that corrective action might be necessary. Often a timeframe relegated to one set of principles is cut short before true learning can take place, creating a tension between flexibility and uncertainty; reaching a level of balance between the two is necessary to allow for organized development of the industry.

“Adaptive management [is a decision process that] promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet

environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders.”⁹

Adaptive management though embedded in the regulatory process for permits, is the basis of the FERC pilot process and is evolving as the process of choice for the hydrokinetic industry regulation. The process is an improvement to routine decision-making as a learning process, and the emerging MHK industry will provide valuable knowledge; maximizing the rate of learning, and providing potential improvements in technology, if appropriately implemented in the pilot projects.

Decisions do need to be made, but in the realm of determining what knowledge is necessary to increase certainty and predictability. In the case of the RITE Project, through collaboration with the applicable agencies, a reasonable plan for adaptive management was developed, which avoided open-ended monitoring. Implementing this ten-year adaptive management plan with the agencies is expected to achieve the benefits noted above, not only for the Verdant technology and the New York State site and process but also for the MHK industry.

From the standpoint of developers, the more uncertainty that exists within the regulatory landscape, the less likely developers will attempt new technologies. However, New York State has indicated a willingness to collaborate so questions can be asked together early on to establish what is feasible for the industry to progress. This collaboration to think through what fundamental knowledge is necessary — what data exists and what is needed — will provide more certainty moving forward.

Stakeholder Participation & Adaptive Management

Inherent in the adaptive management system is the need to address situations that have not been previously encountered or predicted. Improvements are needed to manage these unexpected situations for adaptive management to be an effective tool.

Variables caused by public interaction can propel or curtail progress, yet it is often the public who foresees the biggest unknowns. The involvement of stakeholders early on — from the first meeting, and information provided through implementation and post-licensing phases — provides a valuable perspective and input source, which can positively affect the course of a project.

⁹ DOE (U.S. Department of Energy, Wind and Hydropower Technologies Program). 2009. *Report to Congress on the Potential Environmental Effects of Marine and Hydrokinetic Energy Technologies*, 50.

FERC’s licensing process currently accounts for stakeholder input, and to FERC’s credit, there are no closed meetings; FERC also offers guidelines for framing questions which help to focus discussions to address difficult issues.

“The FERC Pilot license and DEC Water Quality certification process requires a significant amount of and opportunity for, stakeholder, public outreach and scientific expert review during the course of the regulatory review process. The responsibility for the ongoing enforcement of adaptive management decisions rests with the resource agency technical experts, working with the licensee/permittee who may be asked to call on other experts from areas other than agency representatives to be involved in the decision-making process. Adaptive management implies that monitoring protocols and studies are changed — either modified, expanded or completed based on the technical evaluation of observations effects. While post license monitoring doesn’t involve the same level of notice and comment as pre-issuances, most monitoring protocols require ongoing interaction with resource agencies, and public communication is widely used as a tool for information about the progress of the pilot effort and adaptive management. Moreover, stakeholders can subscribe to the docket and receive copies of every submission electronically, and licensees are mandated to communicate with stakeholder groups regarding safeguard plans and other issues. Public comment, through the FERC or New York State WQC program is available at any time pre or post license for disposition by the regulatory agencies and the licensee or permittee.”¹⁰

The hydrokinetic pilot projects are expected to be well scrutinized, particularly in light of the evolving nature of the renewable technology, and adaptive management will serve as the framework.

Collaborative Learning Organization

Another key function of adaptive management in addition to optimizing learning is to promote the transferability of information. The financial considerations for a developer to repeat the monitoring process for a deployment near an existing machine are overwhelming.

A database to include site-specific work is under development by the DOE, and could include New York State information. Supported scientific development of a predictive model based on technology configurations and general biologic reactions is also ongoing through DOE-supported efforts but could be expanded for New York State species and concerns.

¹⁰ Litz, F. T., Hirschberger, A.M., Casadonte, A., “A Review of Regulatory and Policy Requirements for Hydrokinetic Power Projects in New York State” (prepared as discussion paper for NYS Hydrokinetic Hydrokinetic Generation Environmental Policy Workshop by Pace Energy and Climate Center, Pace Law School), 2012

The creation of a collaborative learning organization to assist in ensuring that adaptive management plans are effective could be a tool for plan effectiveness. This group could be tasked with developing an adaptive management best practices document as well as conceptual models that define project operational monitoring in the context of interactions with the environment.

Within these models could be a mechanism to address open-ended monitoring; an indicator for extended monitoring when an impact is noted and conversely, setting a monitoring end-point if there is no adverse effect to the ecosystem.

As developers do not have the ability to monitor the entire ecosystem, continued research is needed to identify the environmental macro effects, if any, of hydrokinetic deployment, as well as a mechanism to indicate what data is lacking. In the near-term, a focusing tool to close the divide would be to create a prioritized research “gap list.”

With the combined efforts and support of NYSERDA, universities, and larger NGOs interested in looking for private capital to expand their work, this gap list could be created with associated funds to advance this research.

Recommendations by Breakout Group: Adaptive Management

- 1. Structure adaptive management plans to optimize learning and allow for transferrable knowledge/findings.** Increased predictability with the ability to consult a coordinated database with conceptual models (see 2b), developers and regulators could establish a more accurate picture of how a device interacts with an environment. With greater understanding as data is collected, knowledge could be applied to other similar sites; this ability to transfer findings could have significant positive impacts by accelerating project timelines and improving developer budgets.
- 2. Create collaborative learning organized with state, federal agencies and the MHK industry for a project to:**
 - a. Design a best management practices document for adaptive management**
 - b. Develop conceptual models of adaptive management practices**

A collaboration of state and federal agencies as well as other appropriate entities to develop the codification and standardization of the adaptive management process is a potential step to improving the effectiveness and application of collected data. Best management practices could provide the needed insurance for a learning curve to take shape, avoiding premature action.

- 3. Develop a prioritized research/knowledge gap list or agenda to help identify funding sources and partners/collaborators (Academic, public/private authorities, large NGOs, private investors).** For adaptive management to be effective, more knowledge is needed to understand the ecosystems where hydrokinetic devices are deployed. With coordinated efforts in collecting data, gaps of data will emerge, indicating areas where further collection is necessary. By developing a prioritized list of these knowledge gaps, a useful tool would be created for approaching funding sources to support the collection of this data.

3.4 Breakout Group #4

Working at the Nexus of New York State Energy and Environmental Policy

(New York State long-term economic development)

Hydrokinetic energy is currently one of the fastest growing renewable energy technologies. With New York State's abundance of water it holds a competitive advantage over other states, which presents an opportunity for it to become a leader in the development of hydrokinetic power generation in the U.S. Support for hydrokinetic generation with a proactive regulatory framework, could help facilitate New York's leadership role while reaching its renewable energy goals.

New York State, by incorporating hydrokinetic generation into its comprehensive energy plan, could expand in three economically positive dimensions:

- Showcase U.S.-based hydrokinetic technology and demonstrate growth opportunities;
- Develop manufacturing and scientific expertise and jobs for a worldwide export market; and
- Contribute to New York State's renewable energy portfolio.

Popular arguments cloud every form of sustainable energy, delaying the inevitable need for making choices and moving ahead decisively. Environmental risks are inherent with each energy consideration and to move forward in solving environmental problems, the marketplace must enter the equation.

The DOE Jobs and Economic Development Index (JEDI) model exists for the hydrokinetic industry and could be used to predict the potential economic growth in New York State. Taking all external realities into account, (e.g., baseline assessment, mitigation strategies, post-installation monitoring, decommissioning — essentially the whole life system of an installation) will allow the industry to move forward with solid economic footing.

What is Needed?

The interaction of environmental and energy policy in New York State calls for proactive measures to achieve a workable balance for the development of a new technology such as hydrokinetic.

Aligning state, consumer, industry and investor objectives to serve return on investment (ROI) could be a well-served function of policy. Creating incentives, similar to President Obama's recent call for 30 percent of power from offshore wind, could be a way to stimulate financial activity for the development of hydrokinetic energy.

Favorable policy can drive the economic engine, as New Jersey has experienced with its position of second in place behind California, a result of rooftop solar energy credits.

By creating a formal hydrokinetic task force with participating government officials to oversee the development of statewide policies, incentives could be created on a State level for hydrokinetic, addressing energy, environmental and economic needs for New York State. Results could then be integrated into the State energy and economic development plan.

To form actionable policies, a common language is needed in order to address the three perspectives involved in the hydrokinetic equation: policy, environmental and industry. Policy is based in legal and political terms. Environmental concerns are often scientifically and emotionally motivated. Industry's view focuses on the financial market-place drivers of supply and demand. Common tools are needed to secure a common language for understanding the level of risk. As described in this document, tools such as spatial mapping, database populations with New York State specific information, innovative environmental monitoring technologies, and adaptive management participation could reduce or eliminate risk in developing a sound hydrokinetic policy for industry expansion in New York State.

The Role of Innovation in New York State

Innovation needs permeate the lifecycle of hydrokinetic energy generation, from collecting data to understand the ecosystem where projects are deployed, to the development of hydrokinetic devices, and modeling systems to measure their cumulative effects. Regulatory and developer uncertainty, gaps in data, data coordination, innovation of devices to serve multiple environments etc. call for solutions by technological innovation. With the assistance of well-planned policy developed collaboratively with partnerships involving the academic and private sectors, New York State could become a leader in hydrokinetic generation by supporting innovative technology.

Breakout 4: Working at the Nexus of New York State Energy and Environmental Policy (New York State long-term economic development)

- 1. Environmental management (policy, regulations, guidance, risk analysis) must take into account and encourage innovation.** Investment in hydrokinetic energy technologies is needed to develop the devices themselves, as well as finance environmental monitoring and data technologies to answer environmental regulation. Additional investment is needed to monitor and observe the staged installation for the first pilots in New York State, which will inform expansion of the technology in situ to meet the economic targets.
- 2. Economic analysis must be accomplished early in the process and must attempt to identify and consider all externalities.** Hydrokinetic energy development must look to the marketplace to support the transition from pilot to commercial stages and the full life-cycle of a project must be included in the economic model. Data organization, collection, predictive modeling etc. relies on innovative technology from before a device is even deployed; expenses for project decommissioning and device removal must be included in the economic plan as well.
- 3. Find a way to incorporate all current knowledge about risk in a systematic and reliable way, early in the process.** Development of conceptual models and ecosystem-based data could serve to reduce environmental and regulatory risk by looking at science-based data to indicate sites that where hydrokinetic deployment would have the least amount of environmental impact. Similarly, regulatory and financial risk can be mitigated, with clear economic incentives and feed-in tariffs for initial stage developments that support an economic renewable energy job industry for the State.

4 Consensus Action Plan & Actionable Results

Workshop participants at the end of the day's discussions listed the following three components as critical for New York State to become a leader in hydrokinetic energy generation:

4.1 Create a Task Force

A formalized task force integrating state, federal, academic and industry experts should be convened to implement the workings of a new framework for hydrokinetic energy in New York State. This task force should target scientific opportunities, seek out funding resources, and establish collaborations to stimulate economic growth. It should also serve as a resource for developers to consult early on for a clear understanding of New York State requirements for moving a project forward in an efficient manner. An

optimum group size of ten representatives would be a starting point for this committee, as large groups can be unwieldy and less efficient.

4.2 Create a New York State Node on the Global Hydrokinetic Data & Information Network

- Summarize New York State data to populate and collaborate with Tethys knowledge management system.
- Determine data standards, environmental parameters and establish protocols.
- Establish predictive/conceptual models.
- Develop mechanisms to share data at a reasonable cost.

4.3 Create a Center for Research & Development, Innovation & Training

New York State should create a global center for research, development, innovation and training to support the development of hydrokinetic energy. The Center could be charged with the following responsibilities:

- Perform baseline/systemic assessments of New York State water bodies, spatial mapping.
- Inventory, map, assess and list existing data needs specifically tied to the regulatory process via FERC, CZMA and on the State level, which would inform project siting and permitting while addressing environmental issues. Collect New York and region-specific data, federal, state and international resource data.
- Determine what data is still needed to understand environmental impacts on ecosystem.
- Define “whole life system” of an installation: baseline assessment, post-installation monitoring, mitigation strategy, de-commissioning.
- Monitor cumulative effects to determine how many arrays a water body can support, keeping in mind beneficial uses.
- Create a prioritized research gap list, a focusing tool to identify funding and collaborating partners; combined efforts with NYSERDA, universities, larger NGOs interested in looking for private capital to expand their work.
- Train students (doctorate candidates) to collect, manage and analyze data ongoing.

4.4 Breakout Group Top Priority Recommendations

Breakout sessions produced three top recommendations from each of the four topic areas. A voting process which took place during the Group Synthesis session by all participants resulted in the choice four top priority recommendations for accelerating the environmentally sound development of hydrokinetic energy generation in New York State:

1. **Determine which environmental parameters must be monitored at all or most sites and which parameters are site-specific or device-specific.** This will reduce the amount of monitoring needed, improving developer project budgets and timelines. By setting standards, the best minds from around the world can communicate efficiently and share the most current data to inform hydrokinetic projects, protecting ecosystems worldwide. It is in the best interest for New York State to approach the development of the hydrokinetic industry from an international perspective — where data monitoring and evaluation are more advanced — particularly as developers will invest where incentives reflect the greatest interest.
2. **New York State provide funding to inventory, map and summarize existing data on siting and permitting environmental issues that contribute to MHK and offshore wind by populating Tethys with technical links with the next two years.** Initiated and funded by New York State and carried out by a scientific task force (see Recommendation 2), this key component to the hydrokinetic generation “lifecycle” would form a science-based knowledge resource for developers and regulators to consult for required answers to the permitting process. Coordination of data on this level would provide a greater understanding of ecosystems, while accelerating the permitting process, allowing New York State to benefit from this renewable energy source with a more efficient timeline.
3. **Create a New York State Scientific Task Force to identify gaps and recommend prioritization areas for data collection and dissemination.** Coordinated by New York State, this Scientific Task Force would be a collaboration of organizations and students to manage and analyze data. Researcher involvement is particularly important, those involved in Ph.D. programs, a potential funding source for their work on the Task Force.
4. **Create collaborative learning organized with state, federal agencies and the MHK industry for a project to:**
 - a. **Design a best management practices document for adaptive management**
 - b. **Develop conceptual models of adaptive management practices**

A collaboration of state and federal agencies as well as other appropriate entities to develop the codification and standardization of the adaptive management process is a potential step to

improving the effectiveness and application of collected data. Best management practices could provide the needed insurance for a learning curve to take shape, avoiding premature action.

5 Conclusions & Policy Implications

Discussions by workshop participants provided numerous observations, ideas, and tangible next steps to support the development of hydrokinetic energy generation in New York State. The group agreed that New York State would benefit from the development of hydrokinetic power as a significant part of its overall renewable energy landscape.

Critical to efficient development of the hydrokinetic industry will be energy and environmental policies that reflect a new culture of collaboration between agencies, academics and developers together, to understand the environmental and technological needs of this new industry. It was clear through workshop discussions that innovative technology should serve as the foundation to answer these needs through science-based fact.

New York State has the potential to be a leader in technological innovation with the help of financial incentive programs and collaborations between universities and the private sector where innovation receives the strongest support. For the hydrokinetic industry to transition effectively from the pilot to commercial stage, these programs and collaborations must be integrated into a new policy framework combining economic drivers, energy and environmental needs. Decision-makers must understand that only by involving the marketplace can we solve our environmental problems moving forward.

A recommendation to create a task force to implement this new framework created by these policies received overwhelming support by vote at the workshop's conclusion, and was the first of three critical components listed by participants to move New York State into a leadership role for hydrokinetic energy generation. Participants felt that a task force has the greatest potential to increase the efficiency of hydrokinetic development, which would also positively impact investor's limited timelines, ultimately accelerating the availability of renewable energy to New York State.

As reflected in the New York State Energy Plan (see excerpt below), strategies to allow for increased efficiencies for the development of renewable energy would seem to warrant support on a policy level.

Accelerating the strategic development of New York's renewable energy resources will play a key role in achieving the New York State Energy Plan's policy objectives. Production and use of in-State renewable energy resources can increase the reliability and

security of energy systems, reduce energy costs, and contribute to meeting climate change and environmental objectives. To the extent that renewable resources are able to displace the use of higher emitting fossil fuels, relying more heavily on these in-state resources will also reduce public health and environmental risks posed by all sectors that produce and use energy. Additionally, by focusing energy investments on in-State opportunities, New York can reduce the amount of dollars “exported” out of the State to pay for energy resources. By re-directing those dollars back into the State economy, New York can increase its economic competitiveness with other states that are less dependent on energy supply imports to support their local economies.¹¹

Were New York State to incorporate hydrokinetic generation into its comprehensive energy plan, it would allow for expansion in three economically positive dimensions: provide an opportunity for a worldwide renewable industry to grow, provide energy and support to other innovative renewable energy uses within New York State and provide capacity to export technology and services.

In order for New York State to benefit from expansion of this renewable energy industry in these ways, a number of essential frameworks will need to be put into place. With the assistance of policy modifications implied in the conclusions of this workshop, hydrokinetic power could enhance the State's renewable energy mix.

Valuable knowledge currently exists, particularly in Europe where they are further along in hydrokinetic technology development, and international standards are developing under the International Electrical Commission (IEC) technical standards group. However, environmental data exists in an inefficient patchwork, with no centralized source, no standardized “language,” and no mechanism for sharing, which greatly diminishes its value. Huge potential for understanding ecosystems is realizable by connecting data from around the world, and the THETYS system is a start of that effort. Data standards, environmental parameters, predictive models and other critical factors for understanding ecosystems could provide benefits to this global mission of cooperation. The creation of a New York State node on the global data and information network — the second critical component listed in the workshop — is achievable, again, with the support of policy adjustments to include this innovative technology.

Accurate, intelligent process and data is critical to advance the hydrokinetic deployment. As such, if New York State were to first start with the creation of a Hydrokinetic Task Force, and ultimately support the creation of a Center for Research and Development, Innovation and Training, this vision could be achieved. The Center could focus on gaps in data collection, informing a comprehensive understanding of ecosystems of the State's water bodies. The creation of this Center was a third critical component listed by workshop

¹¹ New York State Renewable Energy Policy – A Primer, Extracted from: Renewable Energy Assessment of the 2009 New York State Energy Plan

participants. With the support of New York State, this Center could work to establish baseline assessment data, inventory optimum sites for hydrokinetic deployment, monitor cumulative effects, identify funding resources and train students for the ongoing collection, management and analysis of data. The establishment of this Center would allow policymakers the solid ground of scientific fact to inform their decisions. In addition, increased efficiency to the permitting process with this resource center would assist New York State in reaching its renewable energy goals and support economic growth with the growing success of this new industry.

Appendix A | All Recommendations

Three critical components for New York State to become a leader in hydrokinetic energy generation:

- Create a New York State Hydrokinetic Task Force
- Create a New York State Node on the Global Hydrokinetic Data & Information Network
- Create a Center for Research & Development, Innovation & Training

Research and Development of Monitoring Tools (Breakout Group #1, see full description on page 15)

- Determine which parameters are applicable to all or most sites and which parameters are site-specific or device-specific to facilitate developing universal parameters.
- Need to transform our approach to environmental science and engineering — more ecosystems-based — to collect, use and apply baseline data. This will need to be organized and framed at the regional level using spatial planning.
- Develop a monitoring framework that gathers data from the phase/pilot approach — to standardize scale-specific monitoring requirements.

Facilitating Data Networking, Exchange, and Access (Breakout Group #2, see full description on page 18)

- New York State provide funding to inventory, map and summarize existing data on siting and permitting environmental issues that contribute to MHK and offshore wind by populating Tethys with technical links with the next two years.
- Create a New York State Scientific Task Force to identify gaps and recommend prioritization areas for data collection and dissemination.
- Create a New York State Adaptive Management Task Force to work forward with pilot monitoring data to advance the database by contributing to the database while utilizing existing data.

Adaptive Management (Breakout Group #3, see full description on page 22)

- Structure adaptive management plans to optimize learning and allow for transferrable knowledge/findings.
- Create collaborative learning organized with state, federal agencies and whomever necessary for a project to:
 - a. Design a best management practices document for adaptive management
 - b. Conceptual models of device interaction with the environment
- Develop a prioritized research/knowledge gap list or agenda to help identify funding sources and partners/collaborators (Academic, public/private authorities, large NGOs, private investors).

New York State long-term economic development (Breakout Group #4, see full description on page 25)

- Environmental management (policy, regulations, guidance, and risk analysis) must account for and encourage innovation.
- Economic analysis must be accomplished early in the process and must attempt to identify and consider all externalities.
- Find a way to incorporate all current knowledge about risk in a systematic and reliable way, early in the process.

Appendix B | Biophysical Risk Factors¹²

Biophysical Risk Factor	Description
Risk from small population size	Vulnerability to MHK device presence caused by critically small populations of concern
At-risk life stage	Timing and location of certain life stages vulnerable to MHK device presence that may increase risk to the population
Risk to critical prey	Decrease in available prey due to MHK device presence
Risk to critical habitat	Decrease in available habitat due to MHK device presence
Risk from predation	Changes in behavior due to MHK device presence that may result in increased predation (e.g., attraction)
Risk to ability to compete	Changes in behavior due to MHK device presence that may result in a lower competitive advantage (e.g., avoidance)
Behavior that increases risk of interaction with the device	Behavior of an animal that may increase risk of harm from an MHK device e.g., curiosity from a marine mammal)
Risk to sustaining populations	Population resilience to mitigate MHK-related stress. Vulnerability to MHK device presence due to reproductive strategy or other factors directly affecting success of reproduction (e.g., loss of suitable nesting beaches)
Physical Risk Factors, Nearfield	

¹² A.E. Copping, K.M. Blake, R.M. Anderson, L.C. Zdanski, G.A. Gill, J.A. Ward. 2011. "Screening Analysis for the Environmental Risk Evaluation System: Environmental Effects of Marine and Hydrokinetic Energy." Prepared for the U.S. Department of Energy by the Pacific Northwest National Laboratory, page 2.5.

Risk from size of habitat	Vulnerability to reductions in areal extent and relief of nearfield habitat due to MHK device presence
Risk from reductions in sediment quality	Nearfield changes in sediment depth, grain size, organic content, and contaminants due to MHK device presence
Physical Risk Factors, Farfield	
Circulation that affects water quality	Farfield decreases in water quality due to MHK device presence that include dissolved oxygen, nutrient, and contaminant concentrations
Circulation that affects sediment patterns	Farfield changes in sediment transport and dynamics due to MHK device presence that include rate of sedimentation, sediment quality and quantity
Circulation that affects marine/aquatic food webs	Farfield changes in primary productivity and species at the base of the food web due to MHK device presence
Circulation that affects water level	Farfield changes in height of tidal prism or river stage due to MHK device presence that may affect nearshore habitats

Appendix C | Workshop Agenda

New York State Hydrokinetic Generation

Environmental Policy Workshop

Thursday, May 17, 2012

8:30 **Registration and Continental Breakfast**

9:00 **Welcome and Introduction**

John Cronin

Beacon Institute Fellow, *Clarkson University*

Senior Fellow for Environmental Affairs

Pace Academy for Applied Environmental Studies, *Pace University*

9:15 **Panel 1: Policy and Regulation—Challenges and Solutions**

Moderator: **Lin Harmon**

Assistant Dean, Director of Environmental Law Programs

Pace University Law School

Panelists: **Lingard Knutson** (NEPA/Federal)

Principal Project Reviewer, *U.S. Environmental Protection Agency, Region 2*

Timothy Konner (FERC)

Fish Biologist, Division of Hydropower Licensing

Federal Energy Regulatory Commission

William G. Little, Esq. (Water Quality Certification, SEQR)

Office of General Counsel

New York State Department of Environmental Conservation

Franz Litz (Primary Author of Pre-Workshop Policy Paper)

Executive Director, Pace Energy & Climate Center

Pace University Law School

Jeffrey Zappieri (Coastal Resources)

Chief, Regulatory Review, New York Coastal Management Program

New York State Department of State

10:30 **Break**

10:45 Panel 2: Monitoring Data and Research: How They Inform Policy and Regulation

Paul T. Jacobson, Ph.D. (Moderator)

Waterpower Program Manager, *Electric Power Research Institute*

Andrea E. Copping, Ph.D. (Environmental Research)

Senior Program Manager, *Pacific Northwest National Laboratory*

James Gilmore (NYS Fisheries)

Director, Bureau of Marine Resources, Division of Fish, Wildlife and Marine Resources

New York State Department of Environmental Conservation

Harry R. Kolar, Ph.D. (Monitoring, Data, Technology)

Distinguished Engineer, Sensor-Based Solutions, *IBM Research*

Timothy Konnert (Native & Endangered Species)

Fish Biologist, Division of Hydropower Licensing, *Federal Energy Regulatory Commission*

Franz Litz (Primary Author of Pre-Workshop Policy Paper)

Executive Director, Pace Energy & Climate Center, *Pace University Law School*

12:00 Lunch

1:00 Breakout Sessions — Recommendations & Prioritizations for Advancement of NYS Hydrokinetic Generation

Breakout 1: Research and Development of Monitoring Tools

Moderator:

James S. Bonner, Ph.D., P.E.

Chief Research and Education Officer

Beacon Institute for Rivers and Estuaries, Clarkson University

Shibley Fellow, *Clarkson University*

Breakout 2: Facilitating Data Networking, Exchange, and Access

Moderator:

Harry R. Kolar, Ph.D.

Distinguished Engineer, Sensor-Based Solutions, *IBM Research*

Breakout 3: Adaptive Management and the Evolution of Policies

Moderator:

George E. Schuler

Director of Conservation Science & Practice, Eastern New York Chapter

The Nature Conservancy

**Breakout 4: Working at the Nexus of NYS Energy and Environmental Policy
(NYS long-term economic development)**

Moderator: **Timothy F. Sugrue, Ph.D.**
President and Chief Executive Officer
Beacon Institute for Rivers and Estuaries, Clarkson University
Dean, School of Business
Clarkson University

2:30 Break

2:45 Group Synthesis

Facilitator: **Susan W. Coleman, J.D., M.P.A.**,
C Global Consulting, LLC

4:45 Closing Remarks John Cronin

5:00 Adjourn

Appendix D | Workshop Participants

Mary Ann	Adonizio	Verdant Power, Inc.
Gregory	Allen	Alden Research Laboratory, Inc.
James	Ammerman	New York Sea Grant
Vance A	Barr	NYS Public Service Commission
Roger	Bason	Natural Currents Energy Services, LLC
Hoyt	Batthey	U.S. Department of Energy
Stephen	Bird	Clarkson University
James	Bonner	Clarkson University
Susan	Coleman	C Global Consulting, LLC
Dan	Connors	Rentricity, Inc
Andrea	Copping	Pacific Northwest National Laboratory
Margaret	Crawford	U.S. Army Corps of Engineers, Buffalo District
John	Cronin	Beacon Institute for Rivers and Estuaries Clarkson University Pace Academy for Applied Environmental Studies, Pace University
Andrew	Davis	NYS Dept Public Service
Sean	Dixon	Clean Ocean Action
Carolyn	Elefant	Ocean Renewable Energy Coalition
Anthony	Fiore	New York City Dept of Environmental Protection
Mollie	Gardner	Verdant Power, Inc.
Linda	Geary	New York City Law Dept. Environmental Law Division
Jim	Gilmore	DEC

Lin	Harmon	Pace Law School
Anne Marie	Hirschberger	Pace Energy and Climate Center
Paul	Jacobson	Electric Power Research Institute
Stacey	Jensen	U.S. Army Corps of Engineers
Nathan	Johnson	Ocean Renewable Power Company
Lingard	Knutson	U.S. Environmental Protection Agency
Harry	Kolar	IBM Corporation
Tim	Konnert	Federal Energy Regulatory Commission
Donna	Kowal	Pace University
Gregory	Lampman	NYSERDA
Bill	Little	NYSDEC Office of General Counsel
Franz	Litz	Pace Energy & Climate Center
Edward	Lovelace	Free Flow Power
Sean	Meegan	Ecology and Environment, Inc.
Marc	Moran	Beacon Institute for Rivers and Estuaries Clarkson University
Mick	Peterson	University of Maine
Terry	Platz	Beacon Institute for Rivers and Estuaries Clarkson University
Ann	Powers	Pace Law School
Michael	Razanousky	NYSERDA
Susan	Riha	Cornell University/New York State Water Resources
Diane	Rusanowsky	NOAA/NMFS/Habitat Conservation Division
Dennis	Ryan	ECOspensible, Inc.
George	Schuler	The Nature Conservancy

Karin	Sinclair	National Renewable Energy Laboratory
Steve	Sinkevich	U.S. Fish and Wildlife Service
Ron	Smith	Verdant Power Inc.
Tim	Sugrue	Beacon Institute for Rivers and Estuaries Clarkson University
Chris	Tomichek	Kleinschmidt Associates
Hsui-Lin	Winkler	Pace University
Zywia	Wojnar	Pace Energy and Climate Center
George	Wolff	Ocean Power Technologies
Julia	Wood	Van Ness Feldman Law Firm
Jeffrey	Zappieri	NYS Department of State

Appendix E | Workshop Steering Committee

- **John Cronin**, (Principal Investigator), Beacon Institute Fellow, *Clarkson University*, Senior Fellow for Environmental Affairs, Pace Academy for Applied Environmental Studies, *Pace University*
- **Mary Ann Adonizio**, Director of Resource and Project Development, *Verdant Power, Inc.*
- **Carolyn Elefant**, Legislative & Regulatory Counsel, *Ocean Renewable Energy Coalition (OREC)*
- **Mollie E. Gardner**, Resource Analyst and Regulatory Specialist, *Verdant Power, Inc.*
- **Donna Kowal**, Program Coordinator, Pace Academy for Applied Environmental Studies, *Pace University*
- **Gregory Lampman**, Project Manager, Environmental Research, *NYSERDA*
- **Michelle D. Land**, Director, Pace Academy for Applied Environmental Studies, *Pace University*
- **Franz T. Litz**, Executive Director, Energy and Climate Center, *Pace University Law School*
- **Sean O'Neill**, President, *Ocean Renewable Energy Coalition (OREC)*
- **Anne Marie Hirschberger**, Climate Change Law and Policy Advisor, Pace Energy & Climate Center, *Pace Law School*
- **Terry Platz**, Workshop Coordinator, Communications and Outreach Assistant, Beacon Institute for Rivers and Estuaries | *Clarkson University*
- **Zywia Wojnar**, Research Director, Co-Manager, Northeast Bioenergy and Bioproducts Education Programs, Pace Energy and Climate Center, *Pace University Law School*
- **Julia Wood**, *Van Ness Feldman Law Firm*

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce their reliance on fossil fuels. NYSERDA professionals work to protect our environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York since 1975.

To learn more about NYSERDA programs and funding opportunities visit nyserda.ny.gov

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State of New York
Andrew M. Cuomo, Governor

New York State Hydrokinetic Generation Environmental Policy Workshop Post-Workshop Analysis

Final Report
December 2012

New York State Energy Research and Development Authority
Francis J. Murray, Jr., President and CEO