

The Roosevelt Island Tidal Energy (RITE) Project Environmental Assessment

Environmental Monitoring, Evaluation And Protection In New York: Linking Science And Policy

New York State Energy Research and Development Authority
NYSERDA
November 15-16, 2007



Agenda

- Kinetic Hydropower Systems (KHPS)
- Verdant Power Inc.
- RITE Project
- Regulatory Challenges and Achievements
- Rethinking Environmental Law
- Project Challenges
- Project Opportunities
- RITE 11 Study Plans
- Fixed and Mobile Fish Monitoring
- RITE Project Next Steps
- Recommendations





Kinetic Hydropower Systems (KHPS)

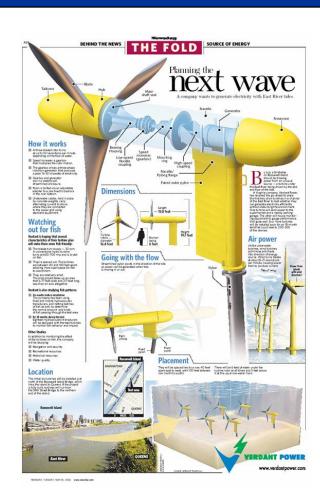
- Capture kinetic energy in natural flowing water currents – tides, rivers, manmade channels
- No dams, impoundments, or major civil works
- Minimal environmental impacts
- Water currents greater than 7 feet/second





Verdant Power Inc.

- Start-up in 2000 to commercialize KHPS
- Systems integrator, project developer
- 26 employees and consultants
- Partners & Contractors:
 - NYSERDA; NYC Econ Dev Corp; KeySpan Energy; Cooper Union; Devine, Tarbell & Associates (DTA); Biosonics; Oceaneering Int'l; others.
- Current funding Institutional financing, State energy R&D funds





The Roosevelt Island Tidal Energy (RITE) Project

- 5-meter, axial-flow KHPS, 37kW
- Tidal flows > 7 ft/sec.
- Phase I: On-site test (Jan 2003)
- Phase II: Six Turbines Field Array in East River (July 2003 – June 2008)
- Phase III: Field Build-Out to 5-10MW, 100 to 300 Turbines (2008-2010)
- NYSERDA Partnership





RITE Phase II: 6-Turbine System for Environmental Impact

- Phase IIA: 2 Turbines Installed (Dec 2006)
 - T#1 Dynamometer Unit
 - T #2: Generator Unit (to January 21 2007)
 - 100% Availability 155 tides
 - Generated Power 77% of Time
 - Average Power Output 14.5 kW
 - Energy Production 10 MWh / 40 Days
- Phase IIB: Turbines #3 6 (April 2007)
 - 175 kW Installed
 - 40+ MWh June 2007
 - 7,000+ Operational Hours
 - Powering Supermarket & Garage (but no revenue)
- Phase III: 32-100 turbine Field Build-out (TBD 2008-09)







RITE Tidal Demonstration Project

• Longstanding partnership with NYSERDA: *Thank-you!*

• Support for funding environmental monitoring; evaluation; and protection...

• But often stifled by link between necessary science and the policy mandates.



US Regulatory History

- Received FERC preliminary permits (Sept. 2002, May 2006)
- Phase I: On-site test (Jan 2003)
- FERC order: April/July 2005 allows six turbines (<200kW) to be tested without Federal License
- Sept. 2005 NYSDEC and May 2006 USACE issue permits to deploy study units USACE good until May 2009 (requires pre- and post-deploy studies)
- Phase II: 6 Turbines Field Array deployed and operating in East River (Dec 2006- July 2007)
- Studies underway and license application for NEPA process in Fall 2007 for licensing action? Fall 2008
- Phase III: Field Build-Out ? 1 − 10 MW? (2009)



Regulatory Challenges and Achievements

- Unprecedented Generation Technologies & Deployments
- Overlapping Federal, State & Local Agencies and Interests
- FERC Openness:
 - "Verdant Ruling" for Electricity Delivery to Partners
 - Hydroelectric Infrastructure Technical Conference (12/06)
 - Executive Policy Board (1/07)
 - Proposed Pilot Project Commercial License (7/07)
- NYSDEC, ACOE, NYSDOS OGS Permits
- Unprecedented Comprehensive 24/7 Fish Monitoring Approach
- 11 Study Plans



Rethinking Environmental Law

"... we must be able to balance the need for new renewable energy technology against the laudable policies and values embedded in our environmental laws."

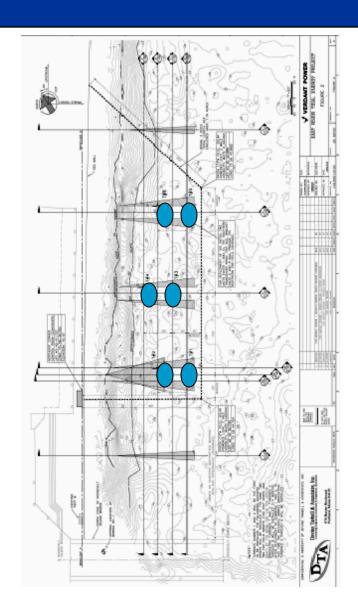
"We must rethink all of our environmental laws from a globalwarming perspective so that environmental law does not stifle our response to a larger environmental problem. There is no challenge that more urgently faces us as environmental, energy and resource lawyers."

"Environmental Law in a Climate Change Age", David R. Hodas; "Natural Resources and Environment", Summer, 2007.



Project Challenges

- First tidal in US -- embarking on a cooperative path to approach kinetic hydropower development
- Little precedent for studying the environmental effects of fields of kinetic hydro turbines
- Valid mandates and questions of resource agencies – but can a study be conclusive?
- Overwhelming workload of resource agencies
- Data interpretation applying new methods
- How much data is enough to make a decision?





Environmental Accomplishments

- VP has completed most studies (~\$750,000 to date)
- Data being collected since December 2006 and ongoing
- Provisional data provided July 2007
- Initial interpretation pending --no "outstanding" observations

GREAT NEWS...

The technology delivers clean renewable electricity in an urban setting with no fuel or no emissions!

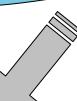
How do we satisfy the state and federal regulatory mandates?



Mandates...

Clean air, Climate change, Renewable Portfolio Standards

Regulatory policy, process and mandates...

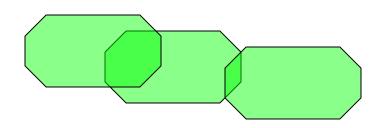


State agencies

Renewable technologies...



Tidal





"Catch - 22" agencies, June 20,2007

- Joseph Heller... 1963
- Webster's
 - "a problematic situation for which the only solution is denied by a circumstance inherent in the rule or problem"
 - "the circumstance or rule that denies a solution"
 - "An illogical, unreasonable or senseless situation"
 - "A measure or policy whose effect is the opposite of what was intended"
 - "A situation presenting two equally undesirable alternatives"



Realization – June 2007

- Regulatory mandate requires understanding of effects to allow commercial project;
- Science and study alone can't project all the effects;
- Demonstration can answer some but not all questions;
- Demonstration/Commercial operation could cause effects;
- Effects can only be understood after longer-term commercial demonstration;



Project Opportunities

- Working together to develop a real 'outside the box' first time renewable energy system work -- the good news is the turbines generate electricity remarkably well and reliably
- Keen interest and desire for water renewables
- Expanding new "fish science" a rewarding?
 experience
- Establishing policy that makes sense for this technology



RITE - 11 Study Plans

Regional Site Specific

- Benthic Habitat Characterization

 Italics = field work
- Water Quality Assessment
- Mobile Hydroacoustic Fish Survey
- Bird Observation Survey
- Rare, Threatened and Endangered Species Assessment
- Recreational Resources Assessment
- Navigational and Security Assessment
- Historical and Cultural Resources Assessment

KHP Specific

- Fixed Hydroacoustic Fish Survey
- Underwater Noise Survey
- Hydrodynamic Survey



RITE Project Fixed Hydroacoustics

Installed State-of-the-Art Monitoring System

- \$2 Million in transducers and interpretation
- 24 Biosonics Hydroacoustic Transducers (and software)
- 1 DIDSON System (Dual-Frequency Identification Sonar)experimental but poor performance in situ.

Operating Successes and Challenges

- Transducer aiming and exposure due to water level changes
- Acoustic 'noise"
- Multiplexing rates—Fast vs. Slow
- 24/7 Reporting Daily Event and Biological density reports
- Data Reduction, Analysis, storage and Interpretation



Custom Acoustic Fish Monitoring System for Six Turbines

• Fixed 24 Transducer Monitoring System

-Design, Fabricate, & Deploy *Transducer Frames, Housings and Gimbal Mounts*

-Acoustic Array - Cross-section & water-column zones

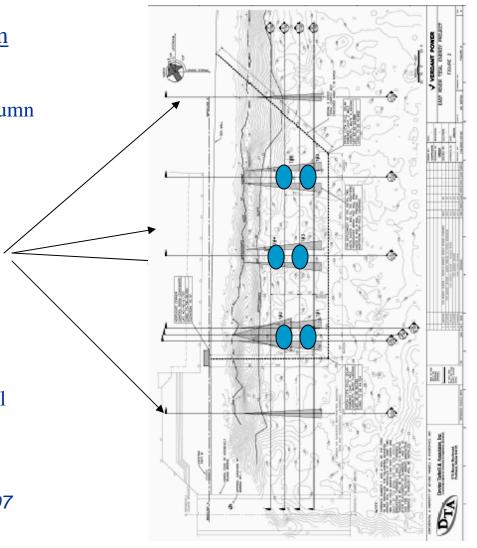
-Acoustic Autoanalysis Software

-Event Processing – Events, Alerts, Alarms

24/7 Monitoring System Challenges

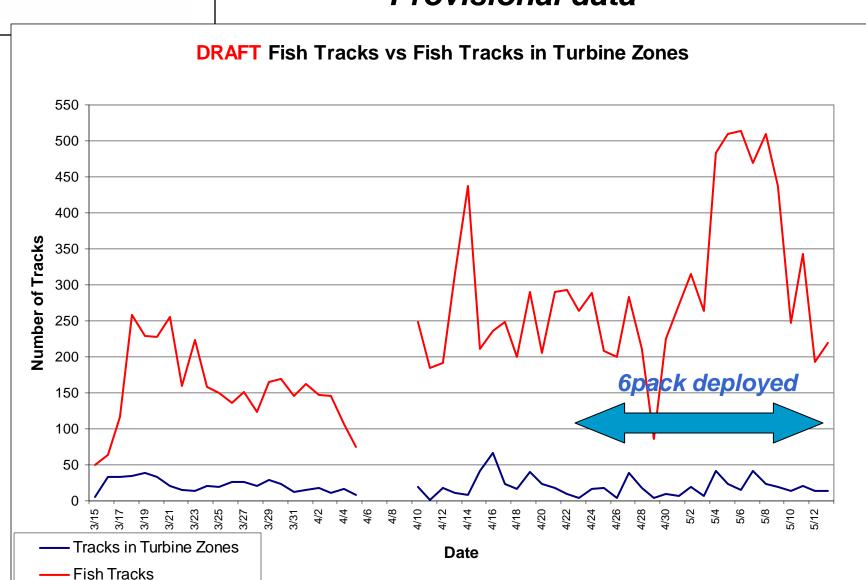
- -Transducer Aiming
- -Transducer Exposure
- -Acoustic Noise
- -Changing Tidal Conditions
- -Multiplexing Fast vs. Slow
- -Reporting Daily Event Reports, Biological Report
- -Data Reduction & Analysis

Preliminary data and interpretation – Fall 2007





RITE 6-Pack Provisional data





Summary of RITE Project

Scientific understanding of the resource dynamics and key issues

Many basic ?s answered

Existing data sources and interpretation – then supplement with studies

Data interpretation available late 2007

Proportional monitoring in commercial project
 To be proposed in 2008



Next Steps for RITE

- Revised study provisions to USACE/NYSDEC permits under negotiation
- Next deploy of two retrofitted turbines Spring 2008
- File for FERC "commercial demonstration license"
 - New regulation since July in an attempt to simplify process
 - Still requires NYstate 401 water quality certification



Verdant Power Recommendations

- Communicate that Renewable Tidal/River technology is acknowledged as a technology that supports NYState mandates for renewables: make it work!
- Resolve dilemma on water policy issues; find the solution to allow commercial demonstration and monitoring – within realistic cost limits
- Support a "Climate change task force" both science and law – beyond existing regulatory duties:
 - -- Alleviates work load
 - -- Specially deals with making these "new" renewable technologies happen in NY state



Thank You!

Ron Smith CEO

rsmith@verdantpower.com

888 Main St., New York, NY 10044

Phone: 212-888-8887 x601

Cell: 703-328-6842

