

R&D Needs for Waterpower Development: *Resource Agency Perspective*

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- NOAA currently has an important energy role
 - regulatory - hydropower, LNG, oil and gas project review
 - informational - critical data and forecasts to industry
- envision increased role as marine renewables evolve
- working with industry, licensing agencies and stakeholders to avoid or minimize potential impacts
- environmental, social and regulatory uncertainties associated with renewable energy development

Key Statutory Responsibilities

- Federal Power Act
- Endangered Species Act
- Magnuson-Stevens Fishery Conservation & Management Act
- Marine Mammal Protection Act
- Coastal Zone Management Act
- National Marine Sanctuaries Act
- Ocean Thermal Energy Conversion Act

Conventional Hydropower

- over 1,000 FERC-licensed hydropower projects provide ~10% of the nation's electricity
- licenses range 30-50 years; critical opportunity to issue mandatory fishway prescriptions and provide conservation recommendations during licensing process
- potential NOAA concerns
 - blocked migration to spawning grounds
 - alteration of river flows
 - lack of adequate up/downstream passage



Hydropower R&D

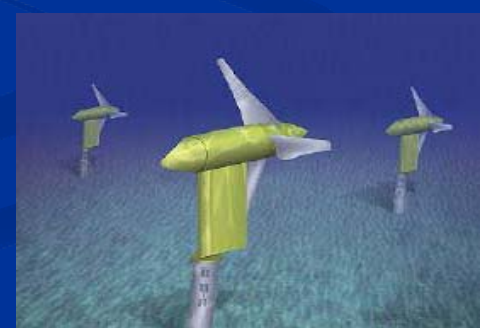
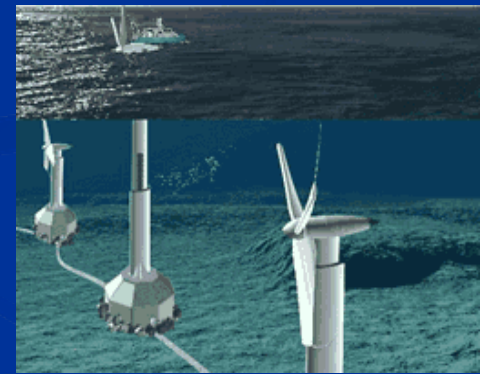
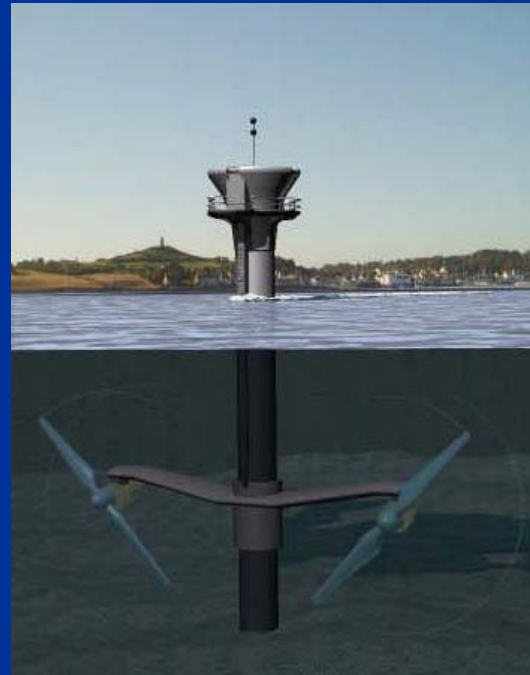
- adults: *evaluate and improve passage at ladders*
 - entrance conditions, attraction flows
 - optimum velocities, acceleration gradients
 - entrance and ladder configurations
- juveniles: *improve turbine survival*
 - understand effects of spill, flow, turbine passage
 - develop turbine screening systems
 - transportation

Hydropower R&D

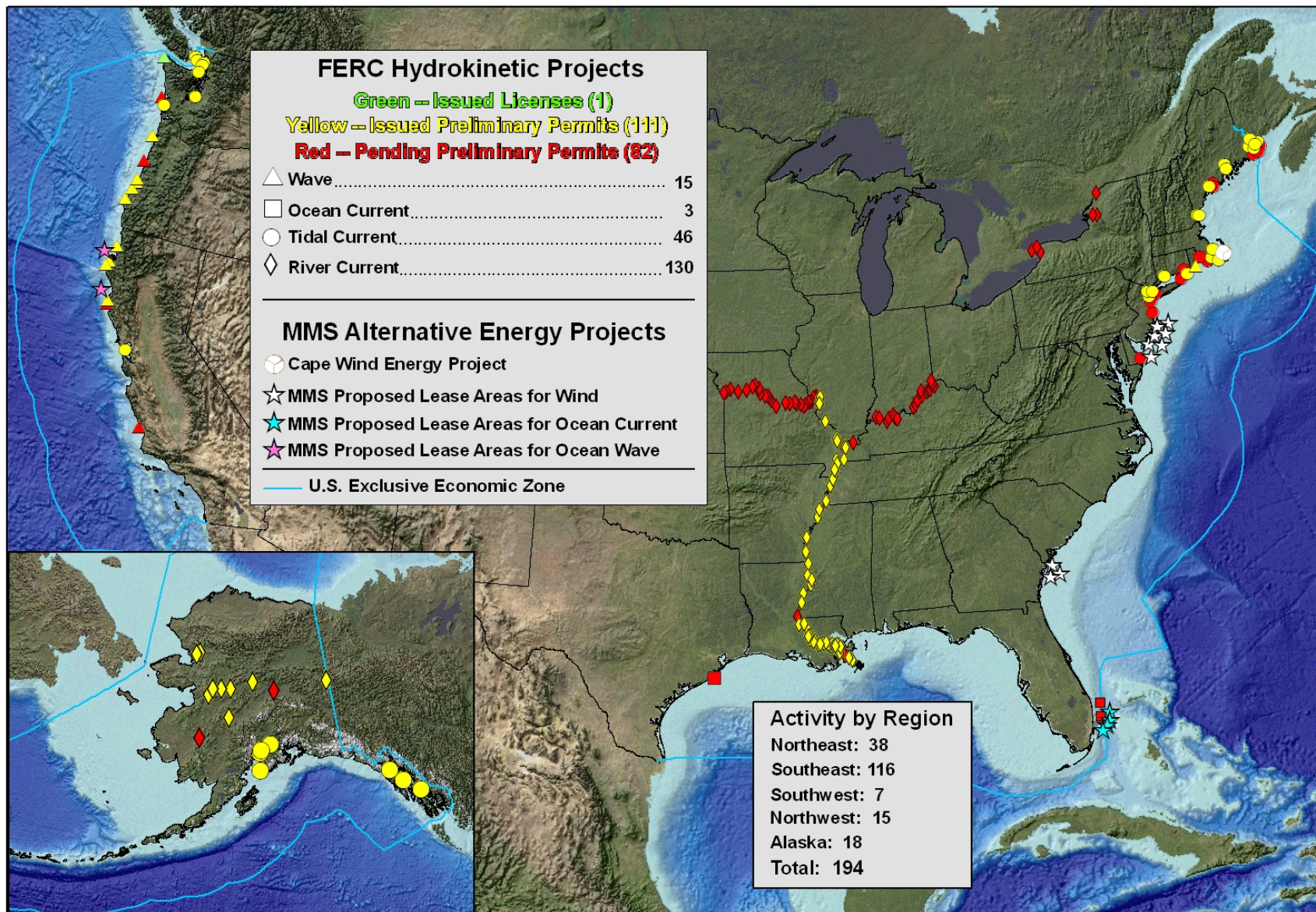
- bio-engineering
- non-salmonid species
- possible effects of climate change
- site-specific
- evaluations critical

Hydrokinetic Energy

Electricity from “waves, tides, and currents in oceans, estuaries, and tidal areas; free flowing water in rivers, lakes and streams; free flowing water in man-made channels...”

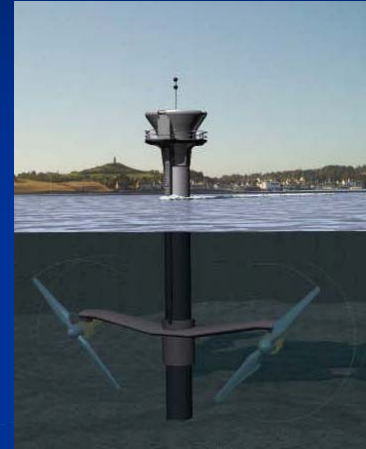


FERC Hydrokinetic Projects and MMS Alternative Energy Projects in the U.S



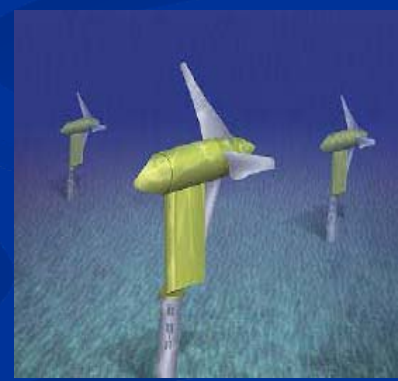
Technology Characteristics

- multitude of individual generating units
- expansive spatial footprint
- significant engineering challenges
- uncertainties regarding impacts
 - siting criteria and operating parameters
 - environmental data collection/in-water testing
- shallow capitalization; slow maturation
- balancing promotion and precaution



Hydrokinetic Energy

- potential NOAA concerns
 - lethal and non-lethal impacts to living marine resources and habitats
 - construction and operational noise and vibration; altered migration patterns
 - secondary effects from chronic exposure
 - conflicts with navigation, maritime commerce and other coastal/ocean users
 - cumulative and ecosystem-level effects



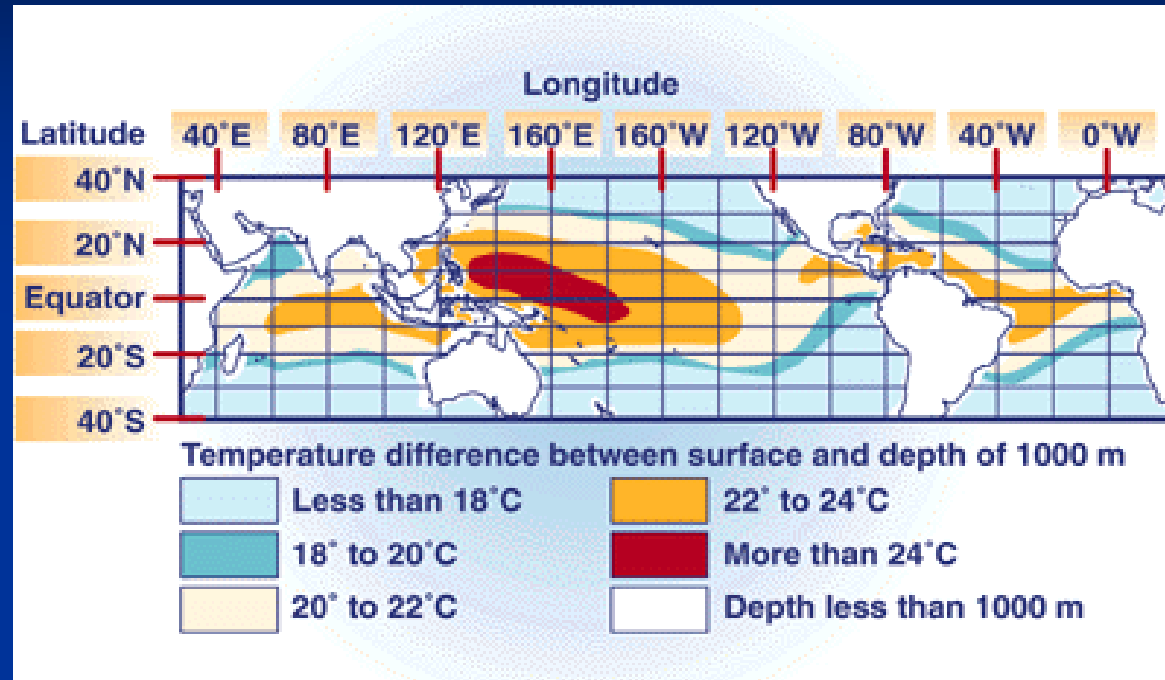
Pilot Hydrokinetic R&D

- baseline information: ecological, socio-economic, historic-cultural, aesthetic
- pilot project monitoring: installation, operation and maintenance, decommissioning and removal
- bioengineering: designing prototypes to prevent or reduce adverse ecological effects
- model development: extrapolation of individual impacts to commercial levels; assessing cumulative impacts
- “fish” “passage”

'Commercial' Hydrokinetic R&D

- expanded project monitoring: refining siting criteria, sensitive area closures
- continued bioengineering: adjusting technology capabilities and operating parameters to individual species characteristics
- multiple-array and ecosystem-level impact modeling
- information exchange (repository/clearinghouse)
- independent research capacity

Ocean Thermal Energy Conversion



- “...and differentials in ocean temperature”
- Uses ocean temperature differences between warm surface waters and cold deep waters to generate power
- NOAA has licensing authority under the OTEC Act

Evolving Regulatory Framework

FERC

- **Notice of Inquiry and Interim Statement of Policy for Preliminary Permits for Wave, Current, and Instream New Technology** (*April 2007*)
- **Hydrokinetic Energy Pilot Project Licensing Process** (*November 2007*)
- **Hydrokinetic Conditioned License Policy** (*December 2007*)

MMS

- **Draft PEIS for Alternative Energy Development and Alternative Use of Facilities on the OCS** (*May 2007*)
- **Request for Information and Nominations of Areas for Leases Authorizing Alternative Energy Resource Assessment and Technology Testing Activities** (*January 2008*)

Challenges

- scientific uncertainty and lack of information associated with direct and cumulative impacts
- new forms of collaboration with outside partners needed
- energy issues represent a substantial workload for NOAA staff, as traditional sectors expand and new sectors evolve



Opportunities

- industry inviting NOAA participation to work on new energy sectors
- NOAA data and data collection expertise can assist the design of new technologies
- input into the design and application of new scientific inquiries
- rare opportunity to identify, avoid and mitigate impacts at early stages

