Executive Summary

Introduction

"Hydrokinetic Energy Projects" refers to technologies that generate electricity from waves, tides, and ocean or river currents. These emerging technologies may become an important energy source, but like any technology they may affect other public resources such as fisheries, wildlife, and recreation. This paper provides guidance on how to study recreation impacts and consider ways to minimize adverse ones. It is designed for staff from utilities/developers and state and federal agencies involved in assessing hydrokinetic impacts, as well as interested stakeholders who want to be "critical consumers" of studies.

Types of hydrokinetic development

Over a hundred conceptual designs of hydrokinetic devices have been developed worldwide, but only a few have been tested at full-scale. The report summarizes broad categories of wave and current technologies and provides examples that give a sense of their size, generating capacity, working principles, place in the water column, or distance from shore. The major distinction between devices is whether they harness 1) wave or 2) current energy (current technologies can be in river, tidal, or ocean current settings). When considering potential impacts on recreation, it is helpful to further divide categories by 1) location relative to shore; 2) location in the water column; and 3) type of technology.

The diversity of hydrokinetic devices makes it challenging to illustrate the range of device characteristics. Additional information needs for recreation impact assessments include: 1) clearance distance for submerged devices; 2) size, shape, appearance, and lighting of visible development; 3) the type and extent of mooring systems; 4) size and shape of anchors and pilings; 5) size, number, and spacing of arrays; 6) specific siting relative to shore; 7) speed and motion of moving parts; 8) initial installation characteristics; 9) routine maintenance activity characteristics; 10) noise levels; 11) transmission facilities; and 12) appearance and location of proposed security features, including a description of potential exclusion zones and activity restrictions.

Types of recreation

The report provides a checklist of recreation activities that occur in river or marine areas with potential hydrokinetic development. Descriptions include setting conditions and attributes that may be affected by hydrokinetic development. Activities include: boat- and shore-based fishing, powerboating, swimming, diving, kayaking, surfing, general recreation on beaches and shorelines, and wildlife viewing.

Concepts for assessing impacts

The report reviews several recreation management and impact assessment concepts, including: 1) providing opportunities for people to have recreation experiences through management of social, biophysical, and managerial setting conditions; 2) distinctions between descriptive and evaluative information; 3) the importance of assessing trade-offs between potential alternative projects; 4) distinctions between direct and indirect effects; and 5) a "progressive approach" of analysis that matches the amount of study, monitoring, and mitigation proportional to a project's likely impact.

Impacts

The paper reviews a range of potential impacts from hydrokinetic projects on recreation, including:

- ***Access restrictions.*** Restrictions could include full "exclusions" or "activity restrictions." The amount of impact depends on the type of restriction; size and shape of the "restriction zone"; importance of the restricted zone to that type of recreation; and availability of substitute recreation opportunities.
- ***Changes in aesthetics.*** Hydrokinetic projects can change the visual quality of an area by introducing structures, cables, power-substations, lights, moorings, or barges. They may also produce sounds during construction, maintenance, or normal operation that some people will find objectionable. The extent of aesthetic or noise impacts from hydrokinetic development depends on the specific project (size, shape, and number of devices; restriction zone buoys; sub-stations; and lighting, etc.), the setting where it will be located, and the types of uses, including recreation, that occur in the area.
- ***Changes in wave or hydraulic characteristics.*** A hydrokinetic project designed to capture energy from waves or currents may affect their characteristics. Surf-related recreation in marine settings may be the most sensitive, but kayakers and others may also seek out areas with dynamic current or wave conditions.
- ***Wreckage and salvage impacts***. Impacts from a wrecked device may damage habitat or create pollution, which may have longer-term implications on plants and animals that in turn affect recreation. Devices that cannot be salvaged may also become navigation hazards, entanglement hazards, or eyesores.
- ***Displacement to other recreation areas.*** Access restrictions may displace recreation users to other areas, which in turn may increase crowding at those areas.
- ***Effects on recreation-relevant fish and wildlife.*** Hydrokinetic facilities may alter fish and wildlife habitat or behavior, with implications for recreation dependent on those species (especially fishing and wildlife viewing). Hydrokinetic development may also increase the abundance of certain fish or wildlife species by creating new habitat or other more favorable conditions.
- ***Cumulative impacts.*** While an individual hydrokinetic project's adverse impacts may be minor, the long-term success of hydrokinetic development relies on many projects over broad areas. The cumulative effect of multiple projects is likely to exceed direct effects on any single project.

Types of studies

The paper reviews several types of studies (organized by three levels of study intensity), describes general study objectives and approaches, and suggests some "keys to success" or other issues, including:

- Overview from existing information
- Hydrology, current, and wave summary
- Interviews with key experienced users
- Expert analyses of potential impacts
- Extensive user interviews & focus groups
- Observations of recreation use
- Limited fieldwork and "expert" assessments
- User surveys
- Economic impact and valuation studies
- Supply and demand assessments
- Computer and physical modeling
- Post-installation monitoring

Many studies focus on indicators/standards-based measures of quality or natural resource health. Choosing recreation indicators for monitoring hydrokinetic development can be challenging, depending on the type of development, type of recreation, site characteristics, and impacts of concern. Indicators are more useful when they are specific, measurable, responsive, sensitive, integrated, relatively few in number, and reflect important conditions.

Protection strategies

There are three general approaches to protect, mitigate, and enhance recreational resources from hydrokinetic projects: 1) identify sensitive and less sensitive areas (a focus on choosing best sites); 2) minimize or reduce impacts through project design modifications; and 3) develop off-site mitigation for impacts that can't be reduced to acceptable levels.

As a new technology, there is limited scientific or historic basis for assessing impacts. This increases the importance of applying adaptive management principles: ensuring there is a structured process for long-term monitoring, evaluation of potential impacts, and adaptation (or removal) of projects to keep impacts to acceptable levels.

Getting involved in licensing processes

A final chapter briefly reviews authorities and processes required to develop hydrokinetic projects, including BOEMRE leases (for projects on the Outer Continental Shelf) and FERC pilot and conventional licenses. It also highlights key information requirements and opportunities for addressing recreation issues. There are many opportunities for stakeholders to participate in the licensing process including: 1) helping identify issues of concern; 2) proposing studies and negotiating study plans; 3) commenting on licensee proposals; 4) recommending operations and protection, mitigation, and enhancement measures; and 5) challenging FERC decisions through administrative and legal appeals.

[This page intentionally left blank].