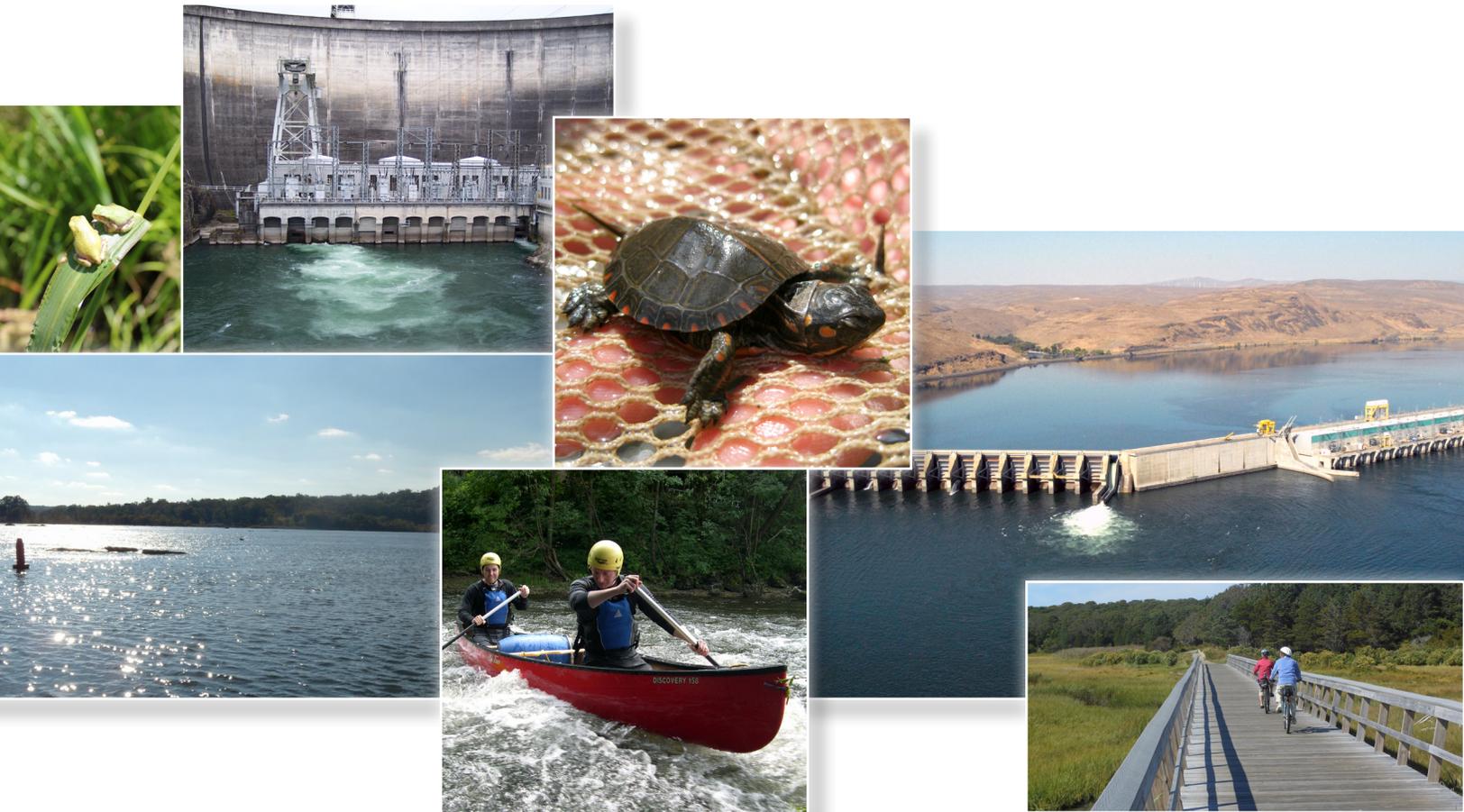


HYDROPOWER PRIMER

A Handbook of Hydropower Basics



A staff report of the Office of Energy Projects/
Federal Energy Regulatory Commission



HYDROPOWER PRIMER

PURPOSE OF THIS PRIMER

This hydropower primer provides an overview of the Federal Energy Regulatory Commission’s role in regulating and overseeing non-federal hydropower generation in the United States. It provides a history of hydropower and describes the role hydropower plays in the nation’s energy mix. The primer explains the different types of hydropower projects and the resources they affect. Further, it discusses the regulations and statutes applicable to the hydropower program. The primer describes the role of the Office of Energy Projects and its three divisions that work together to review hydropower project applications through the various licensing processes, oversee compliance and administration, and ensure dam safety. Finally, it provides an overview of how the public and agencies can interact with the Commission and the outreach opportunities provided by Commission staff.

It is written to be used either as a traditional text—read front to back—or as a reference guide. Consequently, some material is repeated in different sections, and references are provided to other parts of the primer where a concept is addressed in greater detail. Additional information about various aspects of hydropower and FERC regulation can be found at <http://www.ferc.gov/industries/hydropower.asp>.



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February 2017

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The Hydropower Primer is a staff product and does not necessarily reflect the views of the Commission or any Commissioner.

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Pictures on cover from left to right: York Haven reservoir, PA; Merwin Dam, WA; Wanapum Dam, WA.

1. HYDROPOWER IN THE UNITED STATES

1.1 Overview

Introduction

Hydroelectric projects are currently in almost every state and on most of the major river systems in the United States, with a combined 101,000 megawatts (MW) of electric generating capacity.

Hydroelectric generation accounts for about 8 percent of the total generating capacity in the United States and about 48 percent of all renewable generation. States that have significant water resources, such as those in the Pacific Northwest, obtain a large percentage of their power from hydroelectric projects.

Hydroelectric projects are owned and operated by private, non-utility companies; private utility companies; municipalities; electric cooperatives; private citizens; and state and federal government agencies. Federal agencies that own hydroelectric projects include: the U.S. Army Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), Tennessee Valley Authority (TVA), Bureau of Indian Affairs, and the International Boundary and Water Commission.

The Corps and Reclamation own 78 percent of federally owned projects and account for 91 percent of federally owned capacity, and TVA owns most of the remaining federal capacity. Federally owned projects, which are authorized by Congress, provide a little less than half of the total hydropower capacity in the United States,¹ and the Federal Energy Regulatory Commission (Commission or FERC) regulates these non-federal projects. FERC has jurisdiction over more than 2,500 dams that generate approximately 55,500 MW of hydropower capacity.

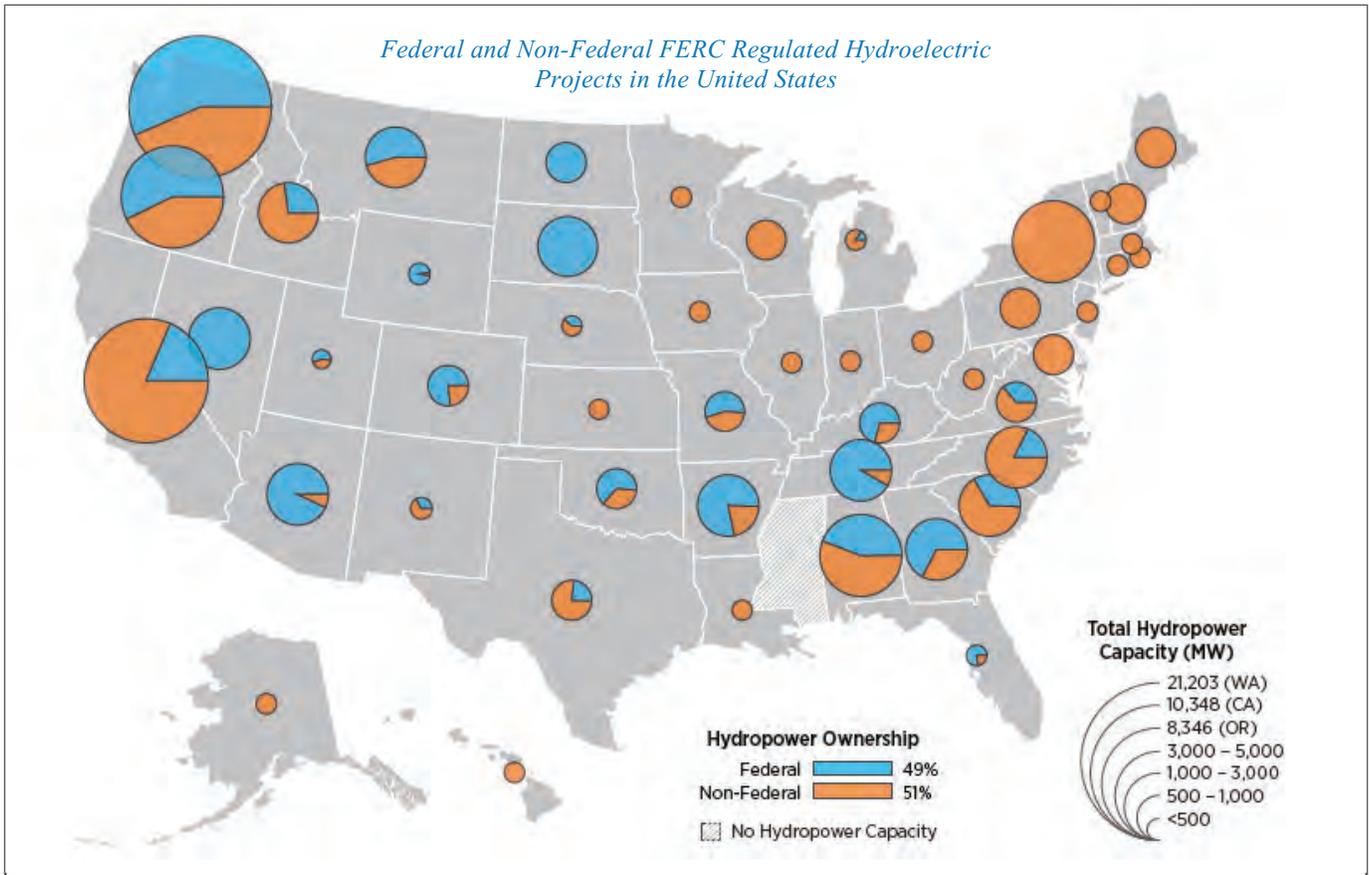
Hydropower regulation, the oldest area of the Commission's jurisdiction, began with the Federal Power Commission's regulation of non-federal hydroelectric generation in 1920. Under Part I of the Federal Power Act (FPA), the Commission's responsibilities include authorizing the construction of projects and overseeing their operation and safety.

This document discusses the general history and principles of hydropower and FERC's role in the regulation of non-federal hydropower projects.



Toledo Bend Project, TX

¹ U.S. Department of Energy. 2016. Hydropower Vision – A New Chapter for America's 1st Renewable Electricity Source.



Source: U.S. Department of Energy, 2016

Hydro History Highlights

<p>1881 Jacob F. Schoellkopf diverted part of the output from his waterwheel-powered flour mills onto a power canal above the Niagara Gorge near American Falls. This effort provided the first use of electricity at Niagara Falls – nighttime illumination for tourists.</p>	<p>1889 200 electric plants in the United States used waterpower for some or all generation.</p>	<p>1920s 25% of electric generating capacity in United States provided by hydropower. Federal government begins regulating hydropower projects.</p>	<p>1950s to 1970s Construction of several hydropower projects on large rivers throughout the United States, such as the Columbia and Snake Rivers, along with construction of several large pumped storage projects in the eastern United States.</p>
1880	1900	1930	1960
<p>1880 World's first hydroelectric powerhouse began operation in Grand Rapids, Michigan, when a water turbine at the Wolverine Chair and Furniture Company's factory was used to illuminate 16 street arc lights.</p>	<p>1882 World's first hydroelectric power plant began operation in Appleton, Wisconsin.</p>	<p>1907 15% of electric generating capacity in United States provided by hydropower.</p>	<p>1930 First use of pumped storage hydropower in the United States.</p>
<p>1940s New Deal increases construction of projects; 40% of electric generating capacity in United States is provided by hydropower.</p>			

History of Hydropower in the United States

People have been harnessing the power of water for thousands of years. As one of the planet's oldest power sources, hydropower was used by farmers as far back as ancient Greece for mechanical tasks like grinding grain. In the United States, hydropower originated more than 200 years ago with the construction of dams to produce mechanical power for gristmills and other industries. On September 30, 1882, the world's first hydroelectric power plant began operation on the Fox River in Appleton, Wisconsin, when a paper manufacturer used generators provided by Thomas Edison to power a single home and paper mill. Since then, many dams originally constructed for mechanical power have been converted to include the production of electricity, with a large number of conversions occurring in the early-1900s as the nation's electric power grids were being established. Construction of new hydropower projects in the United States greatly expanded in the middle of the twentieth century. Although construction has waned since the 1990s, hydropower continues to provide reliable generation and grid support services that help meet the nation's requirements for the electrical bulk power system. For over a century, hydropower has provided the United States with clean, affordable, reliable, and renewable electricity and supported development of the nation's power grid and industrial growth.²

Role of Hydropower in Nation's Energy Mix

Hydropower has many advantages as an energy source. It is a scalable, highly reliable generation technology that offers significant operational flexibility to maintain grid reliability and integration of variable generation resources, such as wind and solar. Hydropower projects also can provide associated environmental benefits such as recreational opportunities, water quality protection and enhancement, fisheries enhancement, and low-flow augmentation. In addition:

- Hydropower is fueled by the kinetic energy of water, which is a clean fuel source, meaning it does not emit air pollutants.
- Hydropower is a domestic source of energy.

- The energy generated through hydropower relies on the water cycle, which is driven by the sun, making it a renewable and reliable source of power.
- Reservoirs created by many hydropower projects offer a variety of recreational opportunities, notably fishing, swimming, and boating. Most water power installations are required to provide some public access to the reservoir to allow the public to take advantage of these opportunities.
- Some hydropower facilities can quickly go from zero power generation to maximum output. Because hydropower plants can generate power to the grid immediately, they can help integrate variable energy resources, and provide essential back-up power during major electricity outages or disruptions.
- In addition to a sustainable fuel source, hydropower projects provide flood control, irrigation, and water supply.

Hydropower also provides economic benefits to the country. In 2013 in the United States, the operation, construction, and upgrades of conventional hydropower projects supported approximately 143,000 jobs.³

The Future of Hydropower

In addition to the nation's existing hydropower generating capacity, there is also potential to increase hydropower development. Many dams that were originally constructed for other purposes, such as commercial navigation (locks and dams), irrigation, or flood control, do not have power generating facilities. In the United States, there are approximately 87,000 existing dams⁴ and only 3 percent generate electricity. The U.S. Department of Energy estimates that significant additional hydropower potential (12,000 MW) is available at some of these existing non-powered dams. Modeling of reasonable assumptions for advancements in technology, low-cost financing for hydropower projects, and environmental considerations for additional development, reduces the resource potential for non-powered dams to 4,800 MW.⁵ Most of the current and future hydropower potential in the United States is concentrated in mountainous areas along the Atlantic and Pacific coasts, including the Appalachian and Rocky Mountains, as well as within the Great Lakes drainage and Mississippi River Basin. Alaska also has significant hydropower potential, but only a small percentage has been developed to date.

² U.S. Department of Energy. 2016. *Hydropower Vision – A New Chapter for America's 1st Renewable Electricity Source*.

³ U.S. Department of Energy. 2016. *Hydropower Vision – A New Chapter for America's 1st Renewable Electricity Source*.

⁴ U.S. Army Corps of Engineers. 2013. *National Inventory of Dams*. May 26, 2015. Accessed July 5, 2016. <http://nid.usace.army.mil>.

⁵ U.S. Department of Energy. 2016. *Hydropower Vision – A New Chapter for America's 1st Renewable Electricity Source*.

1.2 Project Types and Configurations

Hydroelectric projects convert the potential or kinetic energy of water into electricity. This flow of water turns a turbine that is connected to a generator that produces electricity. Electricity flows from the generator to a substation, where the voltage is increased. From there, the electricity is transmitted via a transmission line to an end user or to the interstate power grid.

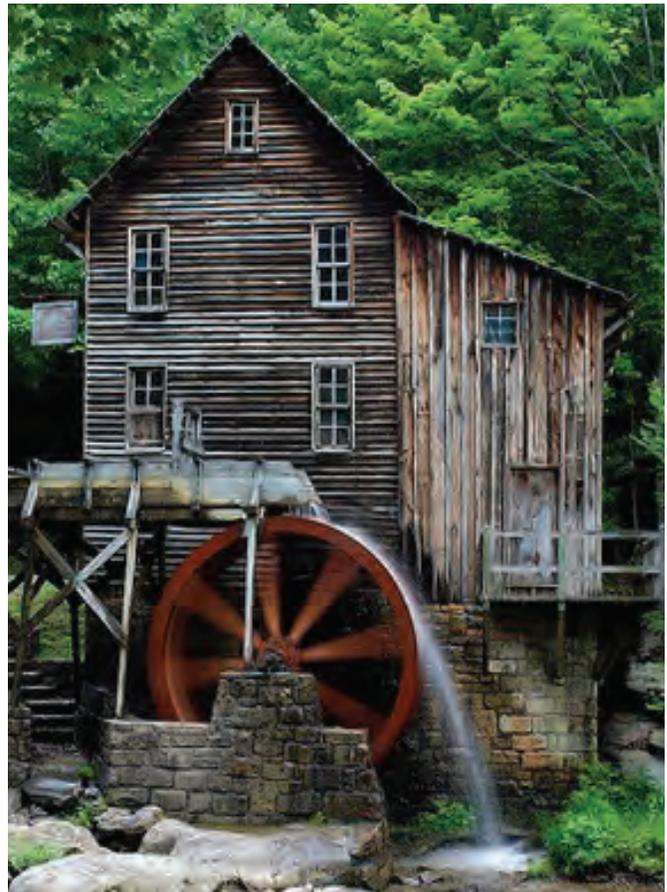
Power from Water

Water wheels are a familiar sight at the many scenic grist mills that dot the country. Although the approach has become significantly more sophisticated, hydropower projects employ the same concept. In the 1820s, Benoît Fourneyron developed the first commercial horizontal water wheel he called a turbine which is derived from the Latin word turbo, meaning “whirlwind or whirl.” James Francis improved on earlier designs, creating the Francis reaction turbine, which is the most common type of turbine in use today.

The type of hydropower turbine selected for a project is based on the available hydraulic head and the flow of water at the site. Hydraulic head is defined as vertical change in elevation expressed in feet or meters between the head (reservoir) water level and the tailwater (downstream) water level. Flow is the volume of water, expressed in cubic feet or cubic meters per second, passing a point in a given amount of time. The greater the hydraulic head and rate of water flow, the greater the potential energy that can be converted to electricity. Hydropower plants with smaller rates of flow must have higher hydraulic head in order to generate electricity from the potential energy of the falling water. Plants with lower hydraulic head must have more water passing through the turbine to generate the same amount of electricity.

Development of the Turbine

- 1827** — **Benoît Fourneyron** developed first commercial horizontal water wheel.
- 1848** — **James Francis** improved on earlier designs, creating the Francis reaction turbine.
- 1878** — **Lester Pelton** developed an impulse water wheel, known as the Pelton wheel, which is very efficient with high heads and low flows.
- 1912** — **Viktor Kaplan** developed the reaction turbine that used adjustable propeller-type blades to improve efficiency, allowing it to match a range of flow and head site conditions.



Glade Creek Mill, WV

Types of Turbines

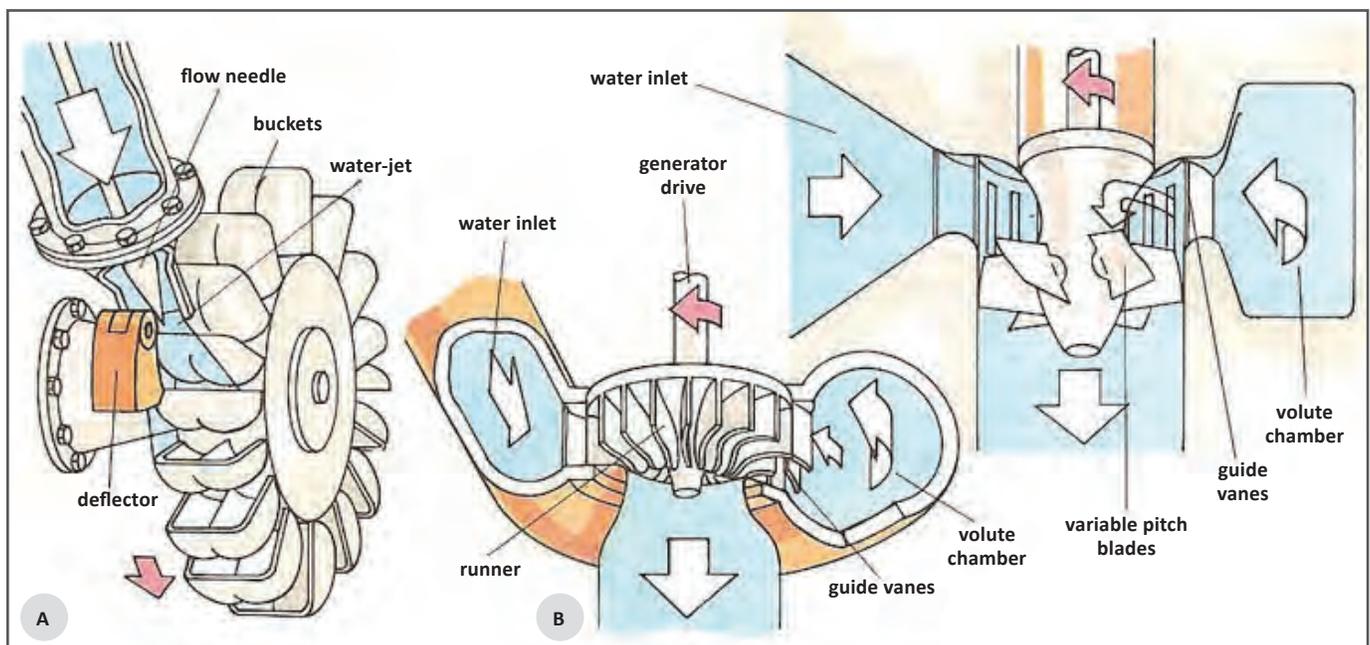
There are several types of turbines that can be used in hydropower projects. The three main types currently in use at FERC-regulated projects are Pelton, Francis, and Kaplan turbines.⁶

The Pelton turbine is an impulse turbine, which means that it generally uses the velocity of the water to move the runner.⁷ The water stream hits each bucket on the runner. There is no suction on the down side of the turbine, and the water flows out the bottom of the turbine housing after hitting the runner. An impulse turbine is generally suitable for high head, low flow applications.

The Francis turbine is a reaction turbine, which means it develops power from the combined action of pressure and moving water. The runner is placed directly in the water stream so the water is flowing over the blades rather than

striking each individually. Reaction turbines are generally used for sites with lower head and higher flows than sites where impulse turbines are used. The Francis turbine has a runner with fixed buckets (vanes), usually nine or more. Water is introduced just above the runner and all around it and then falls through, causing it to spin. Besides the runner, the other major components are the scroll case, wicket gates, and draft tube.⁸

The Kaplan turbine is also a reaction turbine with a propeller design. The propeller turbine generally has a runner with three to six blades in which the water contacts all of the blades constantly. The major components besides the runner are a scroll case, wicket gates, and a draft tube. In the Kaplan turbine, both the blades and the wicket gates are adjustable, allowing for operation over a wider range of flows. It is best adapted for sites with lower head and higher flows.



The three main types of water turbine: (A) the Pelton turbine (or wheel); (B) the Francis turbine; (C) the Kaplan turbine
Source: http://www.daviddarling.info/encyclopedia/W/AE_water_turbine.html

⁶ <https://energy.gov/eere/water/types-hydropower-turbines>.

⁷ A runner is the rotating part of the turbine that converts the energy of falling water into mechanical energy. (All definitions are from <https://energy.gov/eere/water/glossary-hydropower-terms>.)

⁸ A scroll case is a spiral-shaped steel intake guiding the flow into the wicket gates located just prior to the turbine. The wicket gates are adjustable elements that control the flow of water to the turbine. A draft tube is a water conduit that conveys a flow of water from the turbine outlet to the downstream water level (tailrace).

Types of Dams

The Commission regulates various types of dams and appurtenant structures associated with hydroelectric generation and water storage projects. Each project is unique, and many dams have been in place for decades. Types of dams regulated include:

- **Gravity**—constructed from concrete or stone masonry and designed to hold back water by primarily using the weight of the dam itself to resist the horizontal pressure of water pushing against it;
- **Arch**—similar to a gravity dam but thinner and curves upstream in a narrowing curve that directs the water pressure against the shoreline (typically canyon rock walls), providing the force to compress and maintain the strength of the dam;
- **Roller compacted concrete (RCC)**—a gravity dam constructed using a mix of cement/fly ash, water, sand, aggregate and common additives, but containing less water, compacted by vibratory rollers;
- **Slab and buttress**—reinforced concrete buttresses proportioned to transfer the water load to the foundation rock through individual buttress footings, using the weight of the impounding water and the weight of the structure to provide resistance against sliding and overturning;
- **Embankment**—massive dam created by the placement and compaction of a complex semi-plastic mound of various compositions of soil, sand, clay and/or rock, with a typically dense impervious core; and
- **Rockfill**—a type of embankment dam constructed of compacted free-draining granular earth typically with an impervious zone, using a high percentage of large particles (rock).

Types of Dams



Gravity



Arch



Slab & Buttress



Roller Compacted Concrete



Embankment



Rockfill

Other Structures



Powerhouse



Canal



Gates



Flume



Penstocks



Transmission Yard

Types of Structures

In addition to dams, the Commission regulates other key components of hydroelectric projects. These structures include:

- **Powerhouse**—the building that houses the project’s turbines/generating units;
- **Turbine**—a machine that produces continuous power in which a wheel or runner revolves, pushed by a fast-moving flow of water;
- **Generator**—a device that converts the rotational energy from a turbine to electrical energy;
- **Canal**—a man-made open channel for conveying water typically from a reservoir to a powerhouse;
- **Flume**—a man-made structure for conveying water in the form of an open, declined gravity chute with walls that are raised above the surrounding terrain;
- **Penstock**—an enclosed pipe-like structure that typically conveys water directly from a reservoir to a powerhouse;
- **Gate**—a structure, typically on a dam or canal, that allows passage of water when open;
- **Transmission lines**— those lines that convey electricity to the interconnected grid (referred to as “primary lines”); and
- **Transmission yards**—electrical substations that receive power generated by a project and increase the voltage for transmission to the power grid.

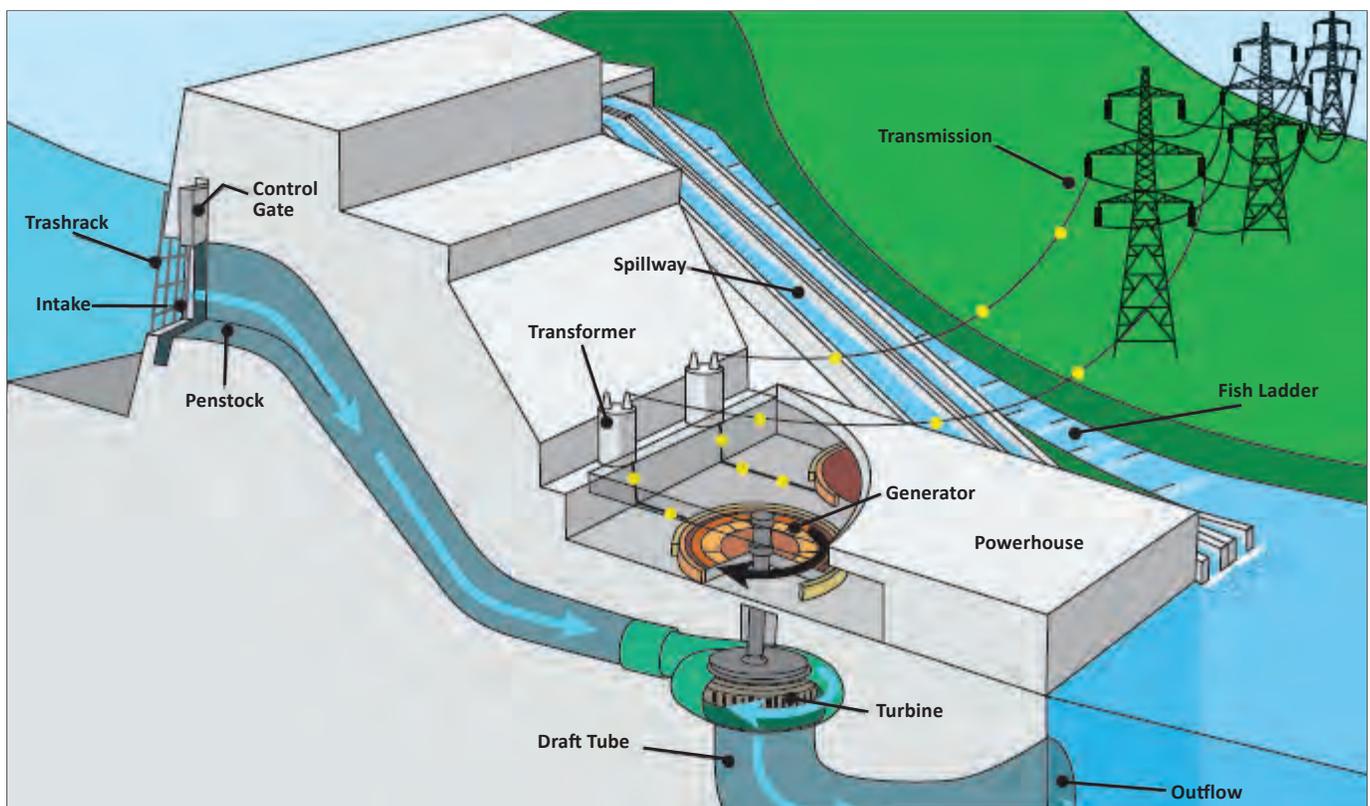
Types of Projects

Hydroelectric projects can be generally categorized into conventional, pumped storage, and marine and hydrokinetic designs. These types of projects are described below.

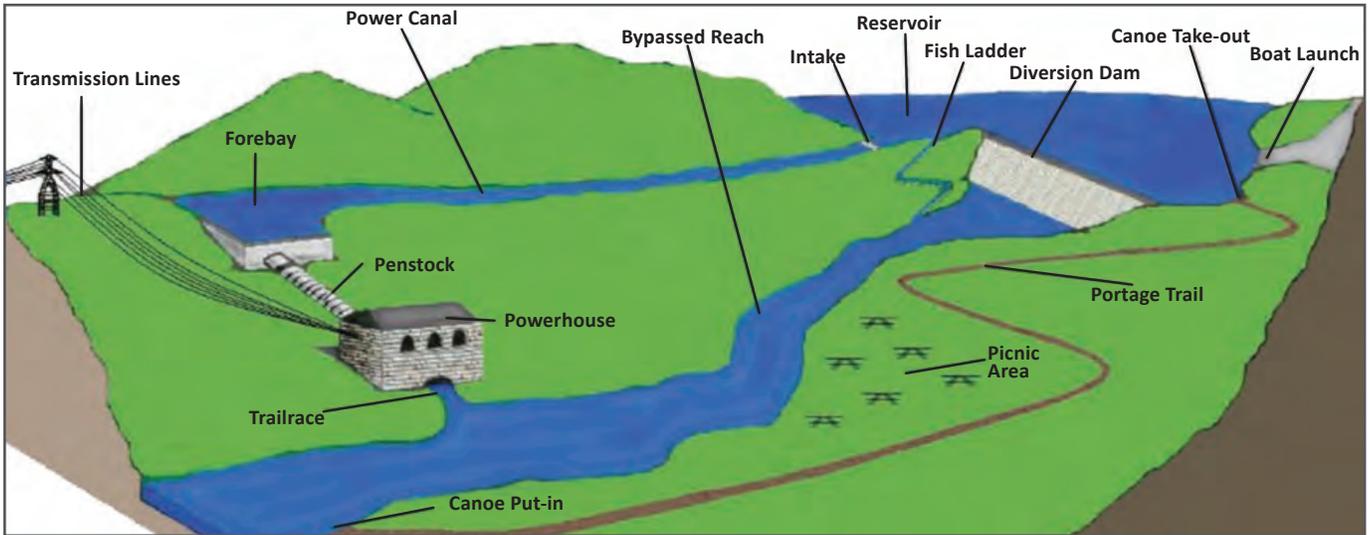
Conventional Hydroelectric Projects

Most hydroelectric projects in the United States are conventional and convert the potential energy of water impounded by a dam (the reservoir or impoundment) to electricity. The reservoir created by the structure of the dam creates the hydraulic head. Water flows from the reservoir through the penstock to the powerhouse. The powerhouse contains the turbine, which converts the power of the water into electricity. When a turbine gate is open, the weight of the water above the powerhouse causes the water to flow into the penstock and spin the turbine and generator, producing electricity.

The electricity is transmitted from the generator to on-site transformers and then to the transmission lines, tying into the grid. Some dams and powerhouses are integral (are constructed as part of the same structure) and are typically called impoundment projects (see conventional impoundment schematic), while other conventional projects have the dam and powerhouse separated to gain additional head (i.e., vertical elevation) and are typically called diversion projects (see conventional diversion schematic). Diversion projects channel water from the impoundment through a canal or penstock to a powerhouse that is from a few feet to miles downstream. The waterway between the dam and powerhouse is called a bypassed reach.



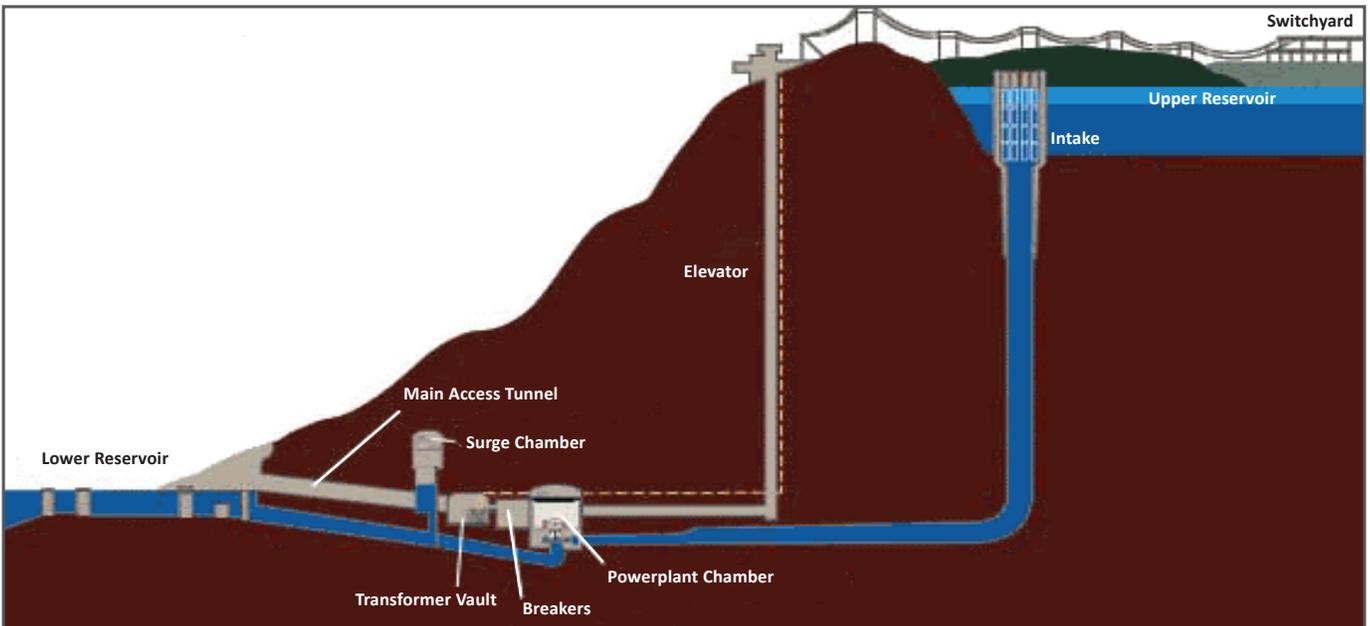
Conventional Impoundment Project



Conventional Diversion Project

Pumped Storage Hydroelectric Projects

Pumped storage projects are fewer in number than conventional projects. Most were constructed from the 1960s to the 1980s to complement operation of large, baseload coal and nuclear power plants by balancing electricity load and demand on the transmission grid. A pumped storage project is similar in concept to a battery. Construction involves the creation of an upper reservoir and a lower reservoir, which may be man-made or a natural lake or river. During off-peak hours (typically on nights or weekends), when electricity demand is low, water is pumped to the upper reservoir and stored for later use. During peak hours (typically weekdays/evenings), when electricity demand increases, stored water is released from the upper reservoir and passes through the powerhouse, generating power as it is released into the lower reservoir. Pumped storage projects work well in conjunction with baseload power sources, like nuclear and steam-generating power plants, that provide pumping power. These hydropower projects can also help to integrate variable generation from other renewable energy sources, such as wind and solar, and can serve an important role in providing the power needed to restart other generating facilities after a regional blackout.



Schematic of a Pumped Storage Hydroelectric Project



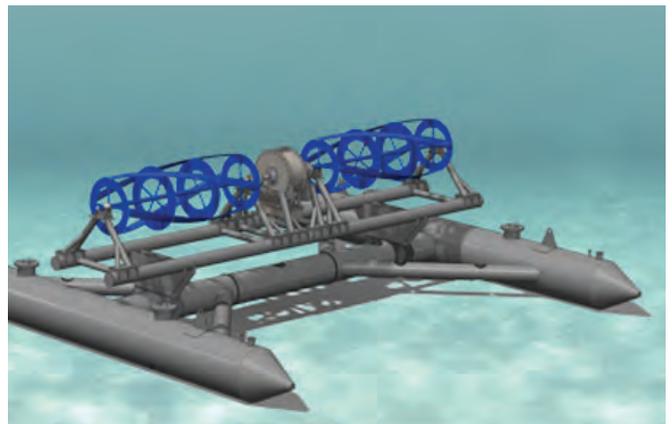
Experimental Point Absorber Wave Energy Device

Marine and Hydrokinetic Projects

Marine and hydrokinetic (MHK) projects generate electricity from waves or directly from the flow of water in ocean currents, tides, or inland waterways. No dam or powerhouse is required, and the generating device is placed directly within the waterway. Wave energy projects extract energy from the undulating action of ocean waves or from pressure fluctuations below the ocean surface. A variety of technologies has been proposed to capture energy from waves, and all are still in the early stages of development and testing. To date, most testing of MHK projects in the United States has involved marine tidal and inland river currents. These projects typically involve placement of propeller-type or helical turbine/generators into the current.



Schematic of Inland River Hydrokinetic Project



Schematic of Tidal Current Hydrokinetic Project

Safe Harbor Dam, PA



1.3 Environmental Concerns

Constructing new projects, as well as relicensing existing projects, may have environmental effects that are of concern to stakeholders (e.g., state and federal agencies, Indian tribes, local landowners, and nongovernmental organizations [NGOs]). The specific environmental and developmental issues commonly associated with hydropower projects are discussed below. The number of issues and the amount of information required to address them are project specific and depend on the project location and design and the site-specific resources that are affected.

For hydropower projects under FERC jurisdiction, requirements for addressing environmental issues are spelled out in the Exhibit E (Environmental Report) sections of the Commission's regulations, set forth in 18 Code of Federal Regulations (CFR) §4.34(i), §4.38(f), §4.41(f), §4.51(f), §4.61(d), §5.18(b), and §16.8(f). Generally, applicants are required to describe the existing resources in the project area, impacts that would occur during the construction and/or operation of the project, and proposed measures for mitigating the project's effects or enhancing resources in the project area.

Geology and Soils

Typical issues of greatest concern related to geology and soils are shoreline erosion for existing projects, and erosion resulting from ground disturbance for proposed or existing projects involving new construction. Information about the geology and soils of a project area, along with how a project would affect these resources, must be considered. Types of information required for assessment include descriptions of: geologic features, including bedrock lithology, stratigraphy, structural features, glacial features, unconsolidated deposits, and mineral resources at the project site; soils in the project area, including soil types, occurrence, erodibility, and potential for soil mass movement; and the geology of the project area, including bedrock type. Geology and soils information is used in the analysis of the proposed project design or design changes and effects on water quality. Project proponents also need to consider measures that would be implemented to reduce erosion during both construction and operation of a project.



Shoreline Erosion

Water Use and Quality

Primary issues related to water resources are typically instream flow needs; effects downstream of the project; and effects of the project on specific water quality parameters such as water temperature, dissolved oxygen, and nutrient levels in the reservoir and in waters downstream of the project. Water usage and quality of waters in the project area must be assessed. All waters affected by the project must be described, including, but not limited to, project reservoir(s), tributaries thereto, the riverine bypassed reach, the tailrace, and the river downstream of the project. For projects that propose new construction, effects of that construction, including issues such as erosion and sedimentation and the need for an erosion and sedimentation control plan, must be considered. The operational effects of projects also must be assessed, including any proposed flow diversions or modifications to streamflow, shoreline erosion, and changes in water quality parameters in the project reservoir or in discharges from the project. Project proponents must be able to describe how the project would be operated (the flow release regime, e.g., peaking⁹ or run-of-river¹⁰) and what measures would be implemented to ensure that releases from the project would be consistent with state water quality standards. Project proponents must also obtain water quality certification pursuant to section 401 of the Clean Water Act (see chapter 2).¹¹

Aquatic Resources

Project-related effects on fisheries and other aquatic resources, such as macroinvertebrates and mussels, are the primary issues associated with most hydroelectric projects. Primary fishery concerns are related to fish passage and protection of fish from turbine passage mortality, fish passage for maintenance of diadromous¹² fish migrations and populations in the river affected, and effects of inundation (mainly for proposed projects) and changes in streamflow on aquatic habitat and fish populations. Effects on mussel species, particularly federally listed threatened or endangered species, must also be considered. Applicants should propose measures for protection of fish passing through the powerhouse and for upstream and downstream passage over the project, if appropriate; instream flows for protection of downstream aquatic habitat; and mitigation or enhancement of fish or mussel populations affected by inundation. These measures may or may not be needed on all projects, and will depend on the species that will be affected and the extent of impacts on those species. For instance, if fish survival is high during turbine passage, or diadromous species are not present, fish protection and passage measures may not be needed.



9 A peaking project is one in which water can be stored in a reservoir until needed, and then released through turbines to generate power to help supply the peakload demand (<https://www.usbr.gov/power/edu/pamphlet.pdf>).

10 A run-of-river project is a type of hydropower project in which limited storage capacity is available and water is released at roughly the same rate as the natural flow of the river (<https://energy.gov/eere/water/glossary-hydropower-terms>).

11 Water quality certifications are issued by the state(s) in which the project is located.

12 Diadromous species include both anadromous species (such as Atlantic and Pacific salmon, American shad) and catadromous species (American eel). Some of these species may also be federally listed as threatened or endangered, including distinct populations of salmon on the Pacific coast, and Atlantic salmon and Atlantic sturgeon on the Atlantic coast.



©Joe Riis USACE Kansas City Missouri River Restoration



Atlantic salmon

Wildlife and Botanical Resources (including Wetlands, Riparian, and Littoral Habitat¹³)

The operation of hydropower projects, including reservoir water level fluctuations and changes in downstream flows can affect the distribution, species composition, and health of wetland and riparian habitat. In addition, project construction and maintenance activities, such as vegetation clearing, can have a direct effect on wildlife and botanical (vegetation, including forests and wetland/riparian communities) resources. The effects on botanical resources and associated wildlife species must be evaluated. For proposed projects, the extent of vegetative clearing and loss of wildlife habitat through inundation must be estimated. For existing projects, changes in the vegetative and wildlife communities resulting from changes in flow releases/streamflow or changes in reservoir operations and water levels must be assessed. Project proponents must describe how the vegetative and wildlife communities will change and propose measures to protect these communities, such as limits to reservoir fluctuations or habitat enhancement to mitigate for lost habitat.

Threatened or Endangered Species

The presence of federally listed threatened or endangered species must be documented in the vicinity of all proposed or existing projects, and the effects of construction and operation must be assessed, including a determination of the effects on individuals and populations of those species and any critical habitat. If a project under Commission jurisdiction has the potential to affect listed species, Commission staff and staff of the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) must consult to determine appropriate mitigation to protect listed species. For those projects, the applicant may serve as the Commission's non-federal representative for consultations with these agencies, and if a listed species may be affected, Commission staff must prepare a biological assessment (BA) addressing potential effects on listed species. This may be followed by formal consultation with FWS or NMFS under section 7 of the Endangered Species Act (see chapter 2).

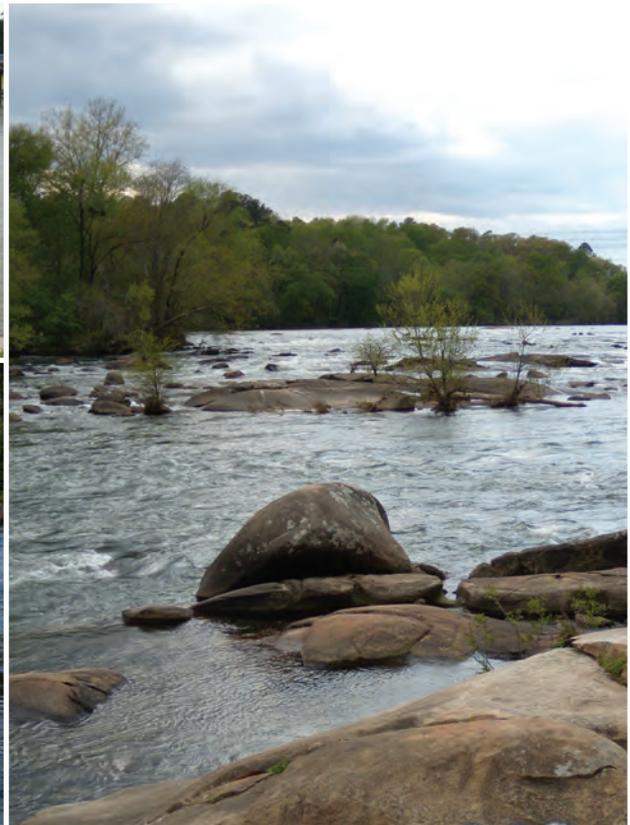
¹³ Riparian habitat is terrestrial habitat found along the banks of a river or stream. Littoral habitat is wetted habitat that is close to the shoreline of a water body.

Recreation

Hydroelectric projects can provide significant recreational opportunities, such as boating and fishing on project reservoirs, campgrounds, visitor centers, and access points for recreational use of a reservoir or river reach. Creation of new projects can affect existing recreational opportunities at a project site by limiting access to or inundating existing facilities, altering flow conditions and water levels, or creating new opportunities and facilities. For existing projects, changes in project operation can affect recreation by affecting access to the project's shoreline and boating flows downstream. An assessment of those effects must be conducted along with an evaluation of whether any proposed recreational facilities will adequately serve recreation needs. For existing projects, the adequacy of existing recreational facilities is also assessed, as are changes to existing recreational opportunities resulting from proposed project modifications. Projects with numerous recreation opportunities and facilities are typically required to provide recreation plans that guide the operation and maintenance of project facilities and opportunities.

Aesthetics

The aesthetics of a hydroelectric facility are considered in the context of the surrounding landscape. This is typically a more important issue for proposed projects, especially if the existing landscape will be significantly affected by the construction of project facilities. For existing projects that have been part of the landscape for many years, the aesthetic evaluation often focuses on how to make existing project structures blend better with the local landscape, or whether flow releases could be provided to enhance aesthetics (such as flows over a falls). As with other resources, project proponents must consider measures that will be implemented to protect aesthetics during the construction of proposed projects, or protect or enhance aesthetics during the operation of existing projects.



Cultural Resources

Cultural resources include pre-historic (archaeological) and historic-era sites and structures in the project area, regardless of their eligibility for listing in the National Register of Historic Places (National Register). As defined in section 106 of the National Historic Preservation Act (see chapter 2), historic properties are those resources that are either listed in the National Register or have been determined by the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) to be eligible for listing. Historic properties would include eligible sites to which Indian tribes attach religious and cultural significance, whether on or off any federally recognized Indian reservation. All historic properties within a project's Area of Potential Effect (APE)¹⁴ must be identified, the impacts of the proposed project described, and measures to resolve effects that are found to be adverse developed in consultation with the SHPO or THPO. Applicants must provide the Commission sufficient information to allow Commission staff to evaluate potential effects on properties listed or eligible for listing in the National Register prior to an undertaking,¹⁵ pursuant to section 106. Section 106 also requires that the Commission seek concurrence with the SHPO on any finding involving effects on historic properties, and allow the Advisory Council on Historic Preservation an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Tribal Resources

In addition to the issues described above, proposed project construction and operation may affect tribal interests not necessarily associated with the above resources, e.g., tribal fishing practices or agreements between the tribe and entities other than the potential applicant. These tribal interests must be addressed for both proposed and existing projects and may be closely tied to the analysis conducted under cultural resources.

Land Use

Typical issues related to land use involve shoreline management and the extent of shoreline development (homes, cabins, marinas, and boat docks), shoreline public access, and protection of important shoreline resources. Applications for both proposed and existing projects must depict land uses and resources adjacent to the project using maps, aerial photographs, or drawings that clearly delineate the project boundary and boundaries of public lands; describe any associated shoreline and reservoir management plans; and identify land management plans, including a discussion of the project's consistency or lack of consistency with each plan, and the plan's relationship to adjacent uses of land and resources. The Commission also encourages project proponents to develop shoreline management plans in cooperation with resource agencies, adjoining property owners, local governments, and other interested entities. A shoreline management plan helps the applicant and the Commission reach a reasonable balance between developmental and recreational interests and wildlife and fisheries resource values around the project reservoir.

Socioeconomics

Socioeconomics can be an important issue, particularly for large proposed projects. The existence of a hydropower project can affect the local economy through employment opportunities, tax revenues, and tourism. Typical information requested for new, unconstructed projects includes a description of general land use, employment, population, and personal income trends in the impact area; an evaluation of workforce impacts; a discussion of residences and businesses displaced, property acquisition procedures, and relocation assistance; and an analysis of impacts on local governmental budgets and taxes. For projects without major construction, or existing projects, the socioeconomic information can be limited to a discussion of the project's ongoing effects on the local economy and local government budgets and taxes, along with estimates of any changes in employment or income associated with any anticipated modifications or improvements to recreational facilities that result in increased recreational use and employment in the project area.

14 According to the Advisory Council on Historic Preservation's regulations, the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR, Part 800.16[3]).

15 An undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including: (1) those carried out by or on behalf of the federal agency; (2) those carried out with federal financial assistance; (3) those requiring a federal permit, license, or approval; and (4) those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency (<http://www.achp.gov/nhpa.pdf>).

Comprehensive Plans

Applicants must identify all relevant federal or state comprehensive plans pursuant to section 10(a)(2)(A) of the FPA.¹⁶ Those plans are then reviewed by Commission staff to consider the extent to which a project is consistent with those plans for improving, developing, or conserving a waterway or waterways affected by the project. If a project is found to be inconsistent with portions of a comprehensive plan, Commission staff assesses whether it would be reasonable to include conditions in the project license that would make the project consistent. Projects not fully consistent with a comprehensive plan may still proceed if the Commission concludes that the project would be in the public interest despite these inconsistencies.

1.4 Developmental Issues

Economics

All projects, whether proposed or existing, must include an economic analysis of the estimated costs of any proposed facilities and for implementing each proposed resource protection, mitigation, or enhancement measure, including any specific measures filed with the Commission by stakeholders (e.g., state and federal agencies, Indian tribes, NGOs, or members of the public). The economic analysis is not a cost/benefit analysis, but instead considers the estimated costs of constructing, operating, and maintaining a proposed project. For licenses, the estimated costs should include operating and maintaining the project under its existing license, including any changes that may be required by relicensing. Commission staff estimates the cost of any proposed facilities and resource protection, mitigation, or enhancement measures using data supplied by the applicant or other entities, or staff's independent analysis of likely costs. The economic analysis also considers the benefit of developmental resources associated with the project. As applicable, these developmental resources may include power generation, water supply, irrigation, navigation, and flood control. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,¹⁷ the Commission

compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using the likely alternative source of least-cost power for the region (cost of alternative power). The economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits. Likely alternative source of power may include fossil fuels, solar, or wind.

Flood Control, Water Supply, and Irrigation

Dams can play a role in preventing the loss of life or property due to flooding.

Dams and reservoirs can be effectively used to regulate river levels and flooding downstream of the dam by temporarily storing the flood volume and releasing it later. Each dam can be operated by a specific water control plan for routing floods through the basin without damage. This means lowering the reservoir level to create more storage before the rainy season.¹⁸ In a flood situation, federal and non-federal dam operators work together to manage water levels along rivers and other waterways, coordination that saves property and lives.¹⁹ In addition, dams add to domestic water supplies, control water quality and can provide water for irrigation for agriculture.²⁰ Commission analyses will consider these issues, as appropriate.

Navigation

Natural river conditions, such as changes in the flow rate and river level, ice and changing river channels due to erosion and sedimentation, create major problems and obstacles for inland navigation. Enhanced inland navigation is a result of comprehensive basin planning and development. Where appropriate, Commission-regulated dams, locks, and reservoirs may be operated to enhance navigation, thus providing a role in realizing regional and national economic benefits.²¹



¹⁶ The Commission considers comprehensive plans to be those federal or state plans for improving, developing, or conserving a waterway or waterways affected by the project. Commission Order No. 481-A establishes that the Commission will accord FPA section 10(a)(2)(A) comprehensive plan status to any federal or state plan that: (1) is a comprehensive study of one or more of the beneficial uses of a waterway or waterways; (2) specifies the standards, the data, and the methodology used; and (3) is filed with the Secretary of the Commission.

¹⁷ See *Mead Corporation*, Publishing Paper Division, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which the fuel cost is the largest component of the cost of electricity production.

¹⁸ http://www.icold-cigb.net/GB/dams/role_of_dams.asp.

¹⁹ <http://www.hydro.org/why-hydro/other-benefits/>.

²⁰ <https://www.usbr.gov/power/edu/pamphlet.pdf>.

²¹ http://www.icold-cigb.net/GB/dams/role_of_dams.asp.

2. PERTINENT LAWS AND REGULATIONS RELATED TO NON-FEDERAL HYDROPOWER PROJECTS

The Commission is an independent agency that regulates non-federal hydroelectric projects by authorizing their construction and operation. The Commission was created through the Department of Energy Organization Act on October 1, 1977. At that time, the FPC, which was established in 1920, was abolished and the Commission inherited most of the FPC's regulatory mission.

FERC also regulates the interstate transmission of natural gas, oil, and electricity and reviews proposals to build interstate natural gas pipelines, natural gas storage projects, and liquefied natural gas (LNG) terminals. Congress assigned these responsibilities to FERC (or its predecessor, FPC) in various laws enacted over nearly 100 years, including the Federal Water Power Act of 1920, which became Part I of the FPA of 1935; the Natural Gas Act of 1938; the Public Utility Regulatory Policies Act of 1978; and the Interstate Commerce Act of 1887, as amended.

The FPA is the primary statute governing the regulation of non-federal hydropower projects, but it is not the only statute. Other federal laws come into play and are described herein. To promote efficiency when authorizing non-federal hydropower projects, the Commission's goal is to conduct consultations and processes required by the FPA simultaneously with consultations required by other federal laws.

2.1 Federal Power Act

The FPA, codified in 16 U.S.C. §§ 791 to 823d, was enacted in 1935 and grants the Commission jurisdiction over non-federal hydropower projects throughout the United States,²² as well as the power to regulate the transmission and wholesale sale of electricity in interstate commerce. The FPA comprises three Parts: Part I addresses hydropower licensing, administration, and safety, and Parts II and III address electric transmission and wholesale sales rates and services.

The FPA established the FPC, which was renamed FERC when the U.S. Department of Energy was established by the Department of Energy Organization Act of 1977. FERC was established as an independent regulatory agency within the U.S. Department of Energy. In 1986, the Electric Consumers Protection Act amended the FPA to require the Commission to assess hydropower projects' impacts on all environmental

and social issues and consider both power and non-power resources values during the licensing process.

Under Part I of the FPA, Commission authorization of a non-federal hydroelectric project is required, unless a project has a valid pre-1920 federal permit, if the project:

- is located on navigable waters of the United States;
- is located on federal lands or reservations;
- uses surplus waters from a federal dam; or
- is located on a non-navigable stream over which Congress has Commerce Clause jurisdiction, is constructed or enlarged after 1935, and affects interstate commerce, usually by connecting to the interstate grid.

Section 4(e)

This section of the FPA specifies the Commission's jurisdiction and allows the Commission to issue licenses to citizens of the United States, any association of such citizens, any corporation organized under the laws of the United States, or to any state or municipality for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from, or in any of the streams or other bodies of water over which the Commission's jurisdiction has been granted. It states that the Commission, in deciding whether to authorize a hydropower project, must consider the power and developmental purposes of the project and will give equal consideration to the purposes of energy conservation; the protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

This section also allows the Commission to issue licenses for projects located on public lands and reservations of the United States, only after a finding that the license will not interfere or be inconsistent with the purposes for which the reservation was established. Any license issued within a federal reservation is also subject to mandatory terms and conditions issued by the federal land management agency.

²² Federally owned hydroelectric projects do not fall under FERC jurisdiction and instead are authorized by Congress.

The licensee, however, may appeal these conditions to Secretaries of the department under whose supervision such reservation falls.²³

Section 10(a)(1)

Section 10(a)(1), often referred to as the comprehensive development requirement of the FPA, states that any project licensed must be, in the judgment of the Commission, best adapted to a comprehensive plan for improving or developing a waterway or waterways for the benefit of multiple public uses. In conjunction with section 4(e), it sets forth the matters the Commission must consider in reviewing a license application. Equal consideration must be given to power development, energy conservation, fish and wildlife, recreation, other aspects of environmental quality, and other beneficial uses (irrigation, flood control, water supply).

Section 10(a)(2)(A)

Section 10(a)(2)(A) requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Qualifying comprehensive plans that are filed with the Commission and are applicable to the waterway where a proposed project is located must be reviewed by Commission staff to determine whether the project would be consistent with the plans.

Section 10(c)

Section 10(c) forms the basis of the Commission's mission related to dam safety and inspections and states:

the licensee shall maintain the project works in a condition of repair adequate for the purposes of navigation and for the efficient operation of said works in the development and transmission of power, shall make all necessary renewals and replacements, shall establish and maintain adequate depreciation reserves for such purposes, shall so maintain, and operate said works as not to impair navigation, and shall conform to such rules and regulations as the Commission may from time to time prescribe for the protection of life, health, and property. Each licensee hereunder shall be liable for all damages occasioned to the property of others by the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto, constructed under the license and in no event shall the United States be liable therefore.

Section 10(j)

This section requires that any license issued must include conditions to protect, mitigate damages to, and enhance, fish and wildlife related habitat. Conditions are to be based on recommendations from federal and state fish and wildlife agencies. The Commission may reject a recommended condition if it decides that a condition is inconsistent with Part I of the FPA or other law, but it must first attempt to resolve the matter with the recommending agency, giving due weight to expertise and statutory responsibilities of that agency. Agency recommendations under section 10(j) are made in comments filed in response to the Commission's notice that a project is ready for environmental analysis (see section 4.3). Commission staff reviews those recommendations and if it concludes that any recommendations are inconsistent with Part I of the FPA or other applicable law, meets with the recommending agency to try to resolve the inconsistency. If resolution does not occur, the license order must make a finding that: (1) the recommended condition is inconsistent with Part I of the FPA or other applicable law; and (2) the other fish and wildlife conditions selected by the Commission will adequately and equitably protect, mitigate damage to, and enhance fish and wildlife affected by the project.

Section 18

Section 18 states that the Commission must require the construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Interior or Commerce. These prescriptions are mandatory and must be included in the license. As mentioned above, as with the 4(e) conditions, the licensee, however, may appeal these prescriptions with the Secretaries. Section 18 also provides that the Commission must require any lights and signals as directed by the Coast Guard for navigation facilities.



Turners Falls Fishway, MA

²³ The U.S. Department of the Interior (Interior) and the U.S. Department of Agriculture, Forest Service, share mandatory conditioning authority under section 4(e) of the FPA for hydropower licenses within reservations of the United States; Interior and the U.S. Department of Commerce (Commerce) share mandatory conditioning authority under section 18 for fishways (see description below on section 18).

2.2 Rivers and Harbors Act

Section 14 of the Rivers and Harbors Act of 1899, codified in 33 U.S.C. 408, authorizes the Secretary of the Army to grant the alteration, occupation or use of Corps properties, if the Secretary determines the activity “will not be injurious to the public interest and will not impair the usefulness of the project.” This applies to non-federal hydroelectric projects constructed at Corps projects. The Corps’ section 408 procedures are grouped into nine steps, including: pre-coordination, written request, required documentation, district-led agency technical review, summary of findings, division review, Corps headquarters review, notification, and post-permission oversight. The Corps applies this process to conventional hydroelectric projects being developed in combination with unpowered Corps dams, and non-conventional projects, such as marine and hydrokinetic facilities, that would use civil works structures like jetties, levees, and navigation channels.

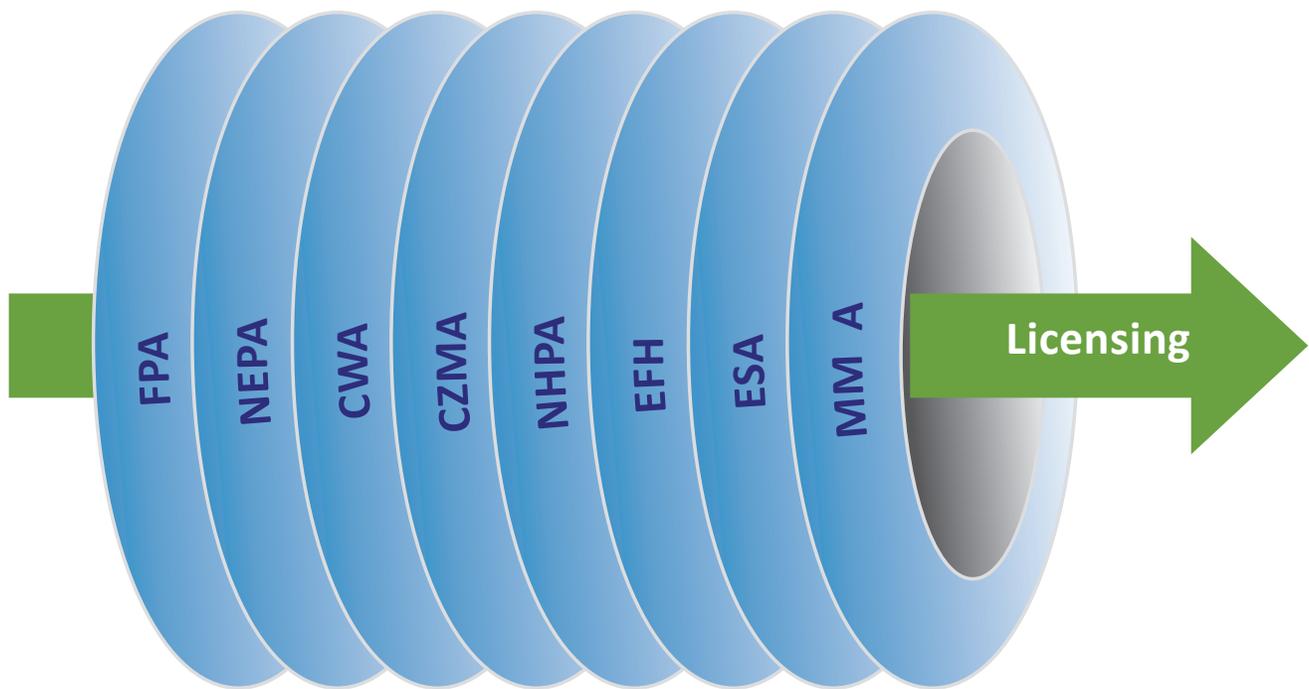
Further, on July 21, 2016, the Commission and the Corps signed a Memorandum of Understanding (MOU) to facilitate the development of hydropower at the Corps’ federal facilities by synchronizing each agency’s permitting process, including the Corps’ requirements for authorizing any discharge of dredged or fill material into all waters of the United States, including wetlands, pursuant to section 404 of the Clean Water Act (CWA) (33 U.S.C. § 1344). The MOU offers project developers an approach designed to improve efficiency with the Commission and Corps processes, reduce permitting times, provide a single environmental document and ensure more certainty and less risk. The synchronized approach includes two phases – an environmental review phase (Phase 1), followed by a detailed technical, engineering, and safety review phase (Phase 2). Phase 1 concludes with the Commission’s licensing decision, and if the Corps deems the section 404 permit application complete and satisfactory, with status letters from the Corps on its sections 404 permit application review and 408 environmental review. During Phase 2, the licensee prepares its detailed project designs in coordination with Commission and Corps staff, and submits the designs to the Commission and the Corps. The licensee also submits a section 408 application to the Corps for its review. If the Corps approves the application, it issues a section 408 approval decision and then issues the final section 404 permit. Once all preconstruction requirements have been completed and the Commission receives the Corps’ written construction approval, the Commission authorizes construction of the project.

2.3 U.S. Bureau of Reclamation Statutes

If Congress reserves to Reclamation the development of the entire hydropower potential of a site, Reclamation has sole authority to approve hydropower projects there, whether they are government projects or non-federal projects as to which Reclamation grants a non-federal entity a lease of power privilege. If, however, Congress has not reserved the entire power potential of a site, a developer may need to obtain a license from the Commission. On November 6, 1992, the Commission and Reclamation signed an MOU that establishes a process for early resolution of issues related to the development of non-federal hydropower at Reclamation facilities. This process provides for coordinated review of the appropriate jurisdiction of a hydropower proposal at Reclamation facilities to determine whether it would be under the Commission’s or Reclamation’s jurisdiction, and a coordinated review of any license application, if a project is found to fall under the Commission’s jurisdiction. If a project is found not to fall under the Commission’s jurisdiction, it will require a Reclamation Lease of Power Privilege. Under the “Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act” (2013), Reclamation may authorize small conduit hydropower facilities at Reclamation projects, independent of the Commission’s regulatory requirements, but any such Reclamation authorization may not alter or affect any existing preliminary permit, license, or exemption issued by the Commission under Part I of the FPA.



Rogue River Dam, OR



2.4 National Environmental Policy Act

The National Environmental Policy Act (NEPA) was passed by Congress in 1969 with the stated purpose: “To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.” NEPA directs all federal agencies to develop methods and procedures so that environmental amenities and values are given appropriate consideration in decision making, along with economic and technical considerations, and requires that every recommendation or proposal for a major federal action significantly affecting the quality of the human environment must be accompanied by a detailed statement on the environmental impacts of the proposed action. This detailed statement is the environmental impact statement (EIS). For proposals that would not be a major federal action significantly affecting the quality of the human environment, an environmental assessment (EA) is prepared.

Thus, hydropower licensing or exemption actions taken by the Commission require preparation of a NEPA document (EA or EIS) that analyzes the environmental effects of a proposed action and reasonable alternatives to the proposed action, recommends whether or not a project should be licensed or exempted, and recommends appropriate terms and conditions if a license or exemption is recommended (18 CFR §380).²⁴ The NEPA document serves as part of the record for the Commission’s consideration.

NEPA National Environmental Policy Act

- Scoping
- Preparation of environmental documents (EA/EIS)
- Public comments on EA/EIS
- Responding to Comments in final EA/EIS
- Final agency action

²⁴ Under the Commission’s regulations, conduit exemptions (see chapter 4) are considered categorical exclusions, and these do not require preparation of a NEPA document (18 CFR § 380.4).

Scoping

Scoping is the process whereby Commission staff identify the issues that will be analyzed in the NEPA document and determine whether an EA or EIS will be prepared, based on the overall scope of the project and its issues. Scoping begins with Commission staff issuing an initial Scoping Document that describes the proposed project and outlines the expected environmental issues for the project. This document is issued for public comment and may be followed by public scoping meetings in the vicinity of the project. Following receipt of agency and public comments on the scoping document, staff may issue a revised Scoping Document, if public comments identify additional issues not initially contemplated by staff and included in an initial Scoping Document, or if commenters disagree with staff's recommendation for the type of NEPA document. The revised Scoping Document outlines all the environmental issues to be addressed in the NEPA document and addresses the comments received on the initial Scoping Document.

Draft National Environmental Policy Act Document

Selection of either an EA or EIS usually occurs during the scoping process. Whether an EA or EIS is prepared depends on the size of the proposed project, whether it is an existing or unconstructed project, the expected environmental impacts of the project, and the extent of public concern or controversy associated with the proposed project. Both documents include a conclusion on whether or not the project will have a significant effect on the quality of the human environment. NEPA requires that an EIS be prepared if it appears that the project will have a significant effect on the quality of the human environment, or when an EA makes that finding. The EIS will often include a more in-depth analysis of the proposed project and its environmental effects, and provides stakeholders an additional avenue for commenting via public meetings held after issuance of a draft EIS. Environmental and developmental issues typically analyzed for the proposed action and reasonable alternatives to the proposed action include those described above and are specific to each project analyzed.²⁵ The environmental document, whether a single EA, a draft EA, or a draft EIS, will usually be issued for a public comment period of 30 to 60 days.²⁶ Interested stakeholders are invited to file comments on the draft NEPA document or other aspects of the proposed project with the Commission.

²⁵ For example, fisheries issues are usually unique to each project, depending on the species that occur, project effects on that species, and agency management objectives for the river or water body.

²⁶ For some small projects with minimal environmental effects, only a single EA may be issued. Any comments received can be addressed in the Commission's decision on the application.

Final National Environmental Policy Act Document

Comments received from stakeholders are reviewed and, if appropriate, revisions will be made to the NEPA document, resulting in the preparation of the final EA or EIS. The analysis and recommendations may be changed in the final document if new or not previously considered information is brought to light by the comments filed. The final EA or EIS addresses all comments filed and generally recommends a preferred alternative, which may include whether or not a license should be issued by the Commission and what conditions developed by staff or recommended by other stakeholders should be required for any license that may be issued.

2.5 Clean Water Act

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating water quality standards for surface waters. Under the CWA, EPA has implemented pollution control programs, such as setting wastewater standards for industry and setting water quality standards for all contaminants in surface waters. Pursuant to section 401 of the CWA, an applicant for a Commission license must obtain certification (or a waiver of certification) from the appropriate state pollution control agency verifying compliance with the CWA before the Commission can issue a license for a project. The conditions of a water quality certification become mandatory conditions of any license issued.

2.6 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of those species. If any proposed licensing action may affect listed species, the Commission must prepare a BA. Sometimes this BA is a stand-alone document; however, it is more typically incorporated as part of the analysis in the Commission's environmental document. Commission staff may consult with FWS or NMFS when gathering information about listed species, prior to preparing a BA or the environmental document. Commission staff's BA or environmental document will conclude whether or not the proposed action will affect listed species or their critical habitat. These conclusions may include: "no effect," "not likely to adversely affect," or "likely to adversely affect." If a "likely to adversely affect" conclusion is reached for a listed species in the BA or environmental document, Commission

staff must enter into formal consultation with the federal agency responsible for management of that species (either FWS or NMFS) and obtain that agency’s Biological Opinion on measures to avoid jeopardy or adverse modification, and measures that are required to avoid or minimize the “take” of that species.

2.7 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires federal agencies granting a license or permit for the control, impoundment, or modification of streams and water bodies to first consult with FWS, NMFS, and the appropriate state fish and wildlife agencies regarding conservation of fish and wildlife resources. A federal agency licensing a water-resource development project is required under the FWCA to give full consideration to the recommendations of FWS, NMFS, and the state fish and wildlife agency on the fish and wildlife effects of such projects. The Commission is also to include in any license issued, conditions for the protection, mitigation, and enhancement of fish and wildlife. Those conditions should be based on recommendations received pursuant to the FWCA from the above-named agencies during the agency consultation process for each licensing proceeding.

2.8 National Historic Preservation Act

The National Historic Preservation Act (NHPA) was enacted and amended to require the federal government to accelerate its historic preservation programs and to encourage such efforts on state, local, and private levels. Compliance with the NHPA may be coupled with the Commission’s NEPA process where the federal action (licensing) affects cultural resources. In licensing, the Commission is bound by the provisions of the NHPA, which requires it to take into account the effect of the action on any historic properties, which include any district, site, building, structure, object, or Traditional Cultural Property

that is included in or eligible for inclusion in the National Register of Historic Places, and to give the Advisory Council on Historic Preservation a reasonable opportunity to comment on a proposed action. Section 106 of the NHPA and its implementing regulations, found at 36 CFR Part 800, contain several important steps, and require licensees or license applicants to identify all historic properties within a proposed action’s APE and assess the action’s effects on these resources. If effects are determined to be adverse, resolution of effects usually involves the development of a Historic Properties Management Plan (HPMP) that specifies measures to avoid, reduce, or mitigate these effects.²⁷ State Historic Preservation Officers, appropriate agencies, Native American tribes with interests in a project area, and others as needed are consulted throughout each phase of the section 106 and HPMP development processes. The HPMP is typically implemented through the execution of a Programmatic Agreement between the Commission, State Historic Preservation Officer, and Advisory Council on Historic Preservation (if it chooses to participate), with others included as concurring parties. Execution and implementation of the Programmatic Agreement satisfies FERC’s section 106 responsibilities toward cultural resources.

2.9 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) states that the Commission cannot issue a license for a project within or affecting a state’s coastal zone unless the state CZMA agency concurs with the license applicant’s certification of consistency with the state’s CZMA program, or the agency’s concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant’s certification. Commission staff determines a project’s consistency with the CZMA during the preparation of the environmental document for a proposed licensing, amendment, or exemption action.



²⁷ See Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects, Federal Energy Regulatory Commission and Advisory Council on Historic Preservation, Washington, DC (2002).

2.10 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with NMFS on all actions that may adversely affect essential fish habitat (EFH). If EFH for species managed by NMFS occurs in the project area, Commission staff must analyze the effects of the project on EFH, and if adverse effects are predicted, must consult with NMFS to determine appropriate measures to reduce those effects. Commission staff completes the EFH analysis and consultations during the preparation of the environmental document for a proposed licensing, amendment, or exemption action.

2.11 Marine Mammal Protection Act

The 1972 Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the “take” (defined under statute to include harassment) of marine mammals in U.S. waters and the high seas. In 1986, Congress amended both the MMPA, under the incidental take program, and the ESA, to authorize incidental takings of depleted, endangered, or threatened marine mammals, provided the “taking” (defined under the statute as actions that are or may be lethal, injurious, or harassing) was small in number and had a negligible impact on marine mammals. With this relationship between the MMPA and the ESA, NMFS cannot complete section 7 consultation under the ESA and issue an Incidental Take Permit for listed marine mammals until an Incidental Harassment Authorization²⁸ has been issued. This requires that Commission staff analyze effects of a project on marine mammals, if there is a likelihood of their occurrence in the project area. This analysis occurs during the preparation of the environmental document for a proposed licensing, amendment, or exemption action.

2.12 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act provides for the protection and preservation of certain rivers and their immediate environments by instituting a national wild and scenic rivers system. Rivers may be included in this system either by an act of Congress or by the Secretary of the Interior, upon application by a governor. Section 7(a) of the Wild and Scenic Rivers Act provides that the Commission may not license the construction of project works on or directly affecting any river that is designated as a component of the Wild and Scenic River system. Commission staff assesses the effects of a proposed action on the Wild and Scenic River System during the preparation of the environmental document for a proposed licensing, amendment, or exemption action.

²⁸ In 1994, MMPA section 101(a)(5) was amended to establish an expedited process by which citizens of the United States can apply for an authorization, referred to as an Incidental Harassment Authorization, to incidentally take small numbers of marine mammals by harassment.

2.13 Pacific Northwest Power Planning and Conservation Act

Under section 4(h) of the Pacific Northwest Power Planning and Conservation Act, the Pacific Northwest Planning Council (Northwest Council) developed the Columbia River Basin Fish and Wildlife Program (Program) to protect, mitigate, and enhance the fish and wildlife resources associated with development and operation of hydroelectric projects in the Columbia River Basin. Section 4(h) of the Act states that responsible federal and state agencies should provide equitable treatment for fish and wildlife resources, in addition to other purposes for which hydropower is developed, and that these agencies shall take into account, to the fullest extent practicable, the Program adopted under the Act. The Program directs agencies to consult with federal and state fish and wildlife agencies, appropriate Indian tribes, and the Northwest Council during the study, design, construction, and operation of any hydroelectric development in the basin. Section 12.1A of the Program outlines conditions that should be provided for in any original or new license. The Program also designates certain river reaches as protected from development, although this provision does not preclude the Commission from licensing a project in such designated reaches. The Northwest Council will recommend that the Commission not issue a license in a protected reach, and will instruct the Bonneville Power Administration not to acquire the power from such a project if one were to be licensed by the Commission, nor to allow access to the power grid in a way that would undermine the protected areas policy. However, if hydroelectric development proceeds, the Program directs that agencies responsible for that development (including the Commission) consult with federal and state fish and wildlife agencies, appropriate Indian tribes, and the Northwest Council during the study, design, construction, and operation of any hydroelectric development, to mitigate harm to fish and wildlife resources. Commission staff assesses the consistency of a proposed action with the Program during the preparation of the environmental document for a proposed licensing, amendment, or exemption action.



3. FEDERAL ENERGY REGULATORY COMMISSION

3.1 Overview of Agency

As stated above, FERC is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build LNG terminals and interstate natural gas pipelines, as well as to license hydropower projects.

The Commission is composed of up to five commissioners who are appointed by the President of the United States with the advice and consent of the Senate. Commissioners serve staggered 5-year terms and have an equal vote on decisions, in the form of orders through which FERC takes action. The President appoints one of the commissioners to be the chairman of FERC—the administrative head of the agency. FERC is a bipartisan body: no more than three commissioners may be of the same political party. Commission staff, which numbers almost 1,500 employees, comprises engineers, scientists, planners, regulatory specialists, attorneys, and support staff who carry out the Commission’s normal operations, providing the information and analysis required for the Commission to make decisions on matters that come before them. Commission staff is organized into the following 12 offices:

- Office of Administrative Law Judges and Dispute Resolution
- Office of Administrative Litigation
- Office of Electric Reliability
- Office of Energy Infrastructure Security
- Office of Energy Market Regulation
- Office of Energy Policy and Innovation
- Office of Energy Projects
- Office of Enforcement
- Office of External Affairs
- Office of the Executive Director
- Office of the General Counsel
- Office of the Secretary

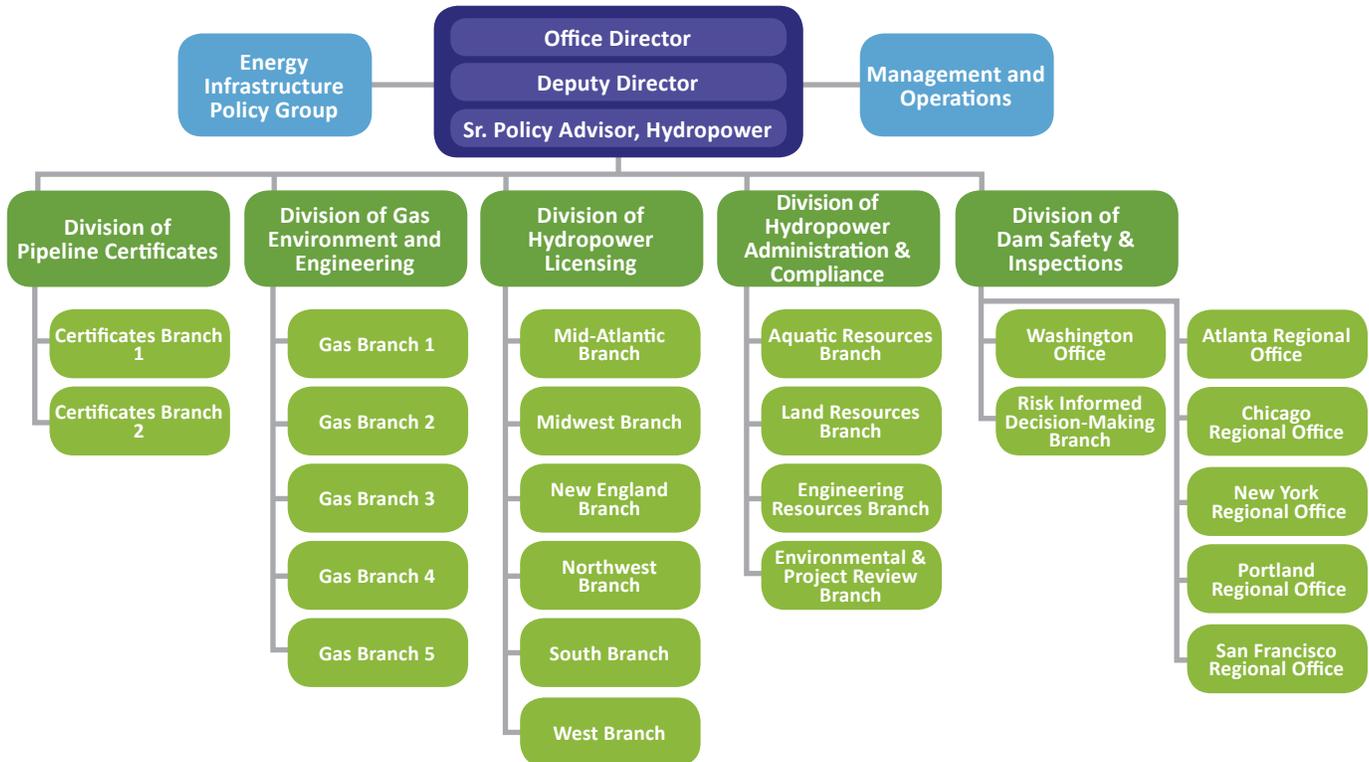
3.2 Office of Energy Projects

The Office of Energy Projects (OEP) is one of the offices within FERC that has oversight responsibility for both hydropower and natural gas projects. OEP fosters economic and environmental benefits for the nation through the approval and oversight of hydroelectric, natural gas pipeline, natural gas storage, and LNG projects that are in the public interest. Within OEP, five divisions carry out the core functions of the office:

- Division of Hydropower Licensing (Hydropower Licensing)
- Division of Hydropower Administration and Compliance (Hydropower Administration and Compliance)
- Division of Dam Safety and Inspections (Dam Safety and Inspections)
- Division of Pipeline Certificates
- Division of Gas Environment and Engineering

The three hydropower divisions (Licensing, Compliance, and Dam Safety) are responsible for coordinating and managing the processing of hydropower project license and exemption applications, as well as applications for preliminary permits (under which permittees study proposed projects). This includes determining the effects of constructing, operating, and maintaining hydropower projects on environmental resources, and the need for the project’s power. In doing so, OEP prepares environmental documents that describe the effects of the proposal and alternatives, evaluates mitigation and enhancement measures, balances developmental and non-developmental resources, and recommends an action to the Commission. Issues considered during the application review process often include power production; fish, wildlife, recreation, and other environmental issues; flood control; irrigation; and other water uses. The office is also responsible for ensuring compliance with the terms and conditions of licenses and exemptions, and compliance with Commission regulations and the FPA and for ensuring that the water-retaining features of hydropower projects are designed, constructed, operated, and maintained using current engineering standards and meeting the federal guidelines for dam safety.

Office of Energy Projects (OEP)



3.3 Hydropower Program

The Commission’s mission is to provide reliable, efficient, and sustainable energy for consumers. For the Commission’s Hydropower Program, fulfilling this mission involves OEP pursuing a primary goal to promote the development of safe, reliable, secure, and efficient infrastructure that serves the public interest. Key components of the Commission’s approach to achieving this goal include fostering economic and environmental benefits for the nation through approval of hydropower projects and minimizing risks to the public associated with Commission jurisdictional energy infrastructure.

For hydropower projects, the fundamental responsibilities of OEP are to review applications; prepare environmental documents; make recommendations to the Commission for action on the applications; and oversee the administration of licensed projects, including dam and public safety, during the license term.²⁹ Orders approving hydropower projects are issued by the Commission, or by the Director of OEP under delegated authority from the Commission.

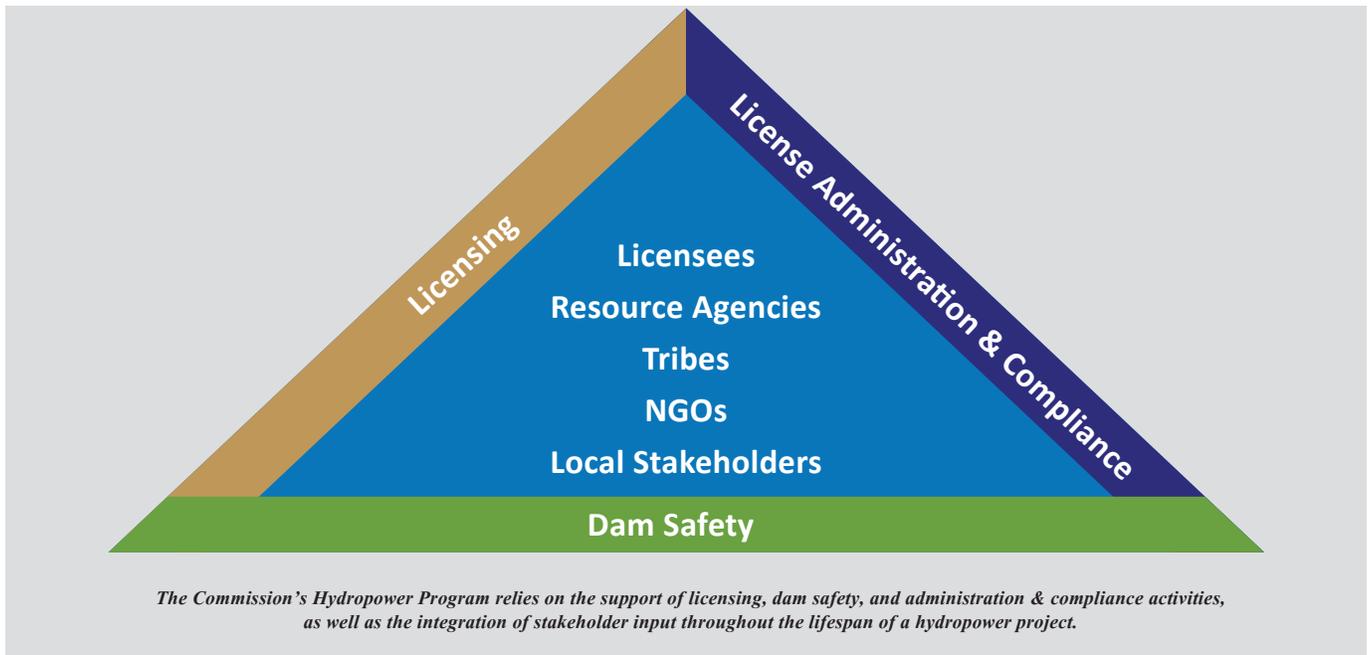
These orders may include the following types of issuances: action on uncontested applications for licenses, exemptions, or preliminary permits; action on uncontested applications for amendments or surrenders of licenses, exemptions, or preliminary permits; and action on license transfers, jurisdictional determinations, motions for extensions of time, and new or revised exhibits, studies, plans, and similar filings.

Currently, OEP administers more than 1,000 active licenses and more than 600 projects that are exempted from licensing.³⁰ Together, these include over 2,500 dams. The following chapters highlight how the divisions within OEP administer the Hydropower Program and in turn support the Commission’s Strategic Plan.

The Commission’s Hydropower Program relies on the support of licensing, dam safety, and administration & compliance activities, as well as the integration of stakeholder input throughout the lifespan of a hydropower project.

²⁹ A license authorizes the construction and operation of a hydroelectric project and is issued for a period of 30 to 50 years.

³⁰ Projects receiving an exemption are exempt from the requirements of Part I of the FPA, and have no expiration date.



Division of Hydropower Licensing

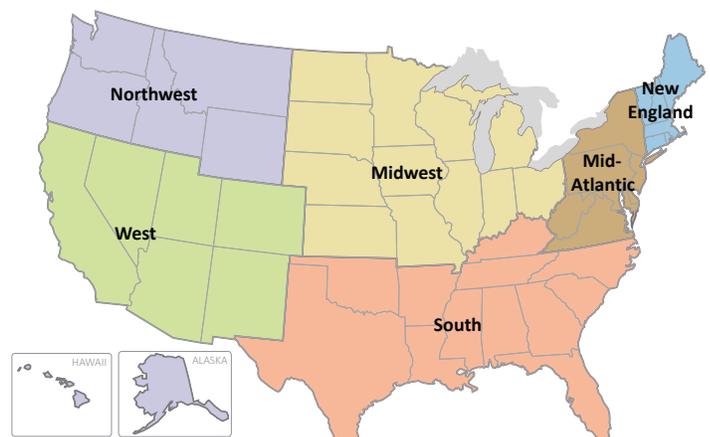
Hydropower Licensing staff review applications filed with the Commission for hydropower authorizations (see chapter 4). Hydropower Licensing advises applicants in selecting the appropriate licensing process to be used for applications; determines whether applications are adequate for processing once filed; and then processes those applications, including preparation of the environmental document (EA or EIS). Hydropower Licensing also makes recommendations to the Commission regarding action on applications for hydropower authorizations (approval, approval with modifications, or denial), and recommends final measures (e.g., specific administrative, engineering, and environmental requirements) for each authorization.

Hydropower Licensing is organized into six branches that are defined by geographic area. The six branches and the geographic coverage of each branch are as follows:

New England—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island

Mid-Atlantic—New York, New Jersey, Pennsylvania, Virginia, West Virginia, Maryland, and Delaware

South—North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas



Division of Hydropower Licensing Branches

Midwest—Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas

Northwest—Alaska, Hawaii, Washington, Oregon, Idaho, Montana, and Wyoming

West—California, Nevada, Utah, Colorado, Arizona, and New Mexico

Division of Hydropower Administration and Compliance

Hydropower Administration and Compliance staff ensures compliance with Commission rules and regulations and with the conditions included in hydropower authorizations (see chapter 5). In addition, once an authorization has been issued, Hydropower Administration and Compliance staff resolves complaints from stakeholders alleging noncompliance with license conditions and authorizes amendments to licenses and exemptions.

Hydropower Administration and Compliance consists of four branches that are organized by resource-related activities. The four branches and their major program responsibilities are as follows.

Land Resources

This branch administers filings³¹ and compliance issues primarily related to project lands and waters. Typical areas of responsibilities include: non-project use of project lands and waters, recreation including FERC Form 80 filings, shoreline management, encroachments, property rights, historic and cultural resources, wildlife resources, and aesthetic resources.

Engineering Resources

Typical areas of responsibility for this branch include: capacity-related license amendments, engineering exhibits (A, F, and G) for licenses, conduit exemptions, qualifying conduits, erosion and flooding issues, project operations, annual charges, mining claims, and federal lands.

Environmental and Project Review

This branch's main areas of responsibility include: jurisdictional determinations, navigation studies, preparation of EAs and EISs for compliance actions, Part 12³² support to Dam Safety and Inspections (see below), issues related to invasive species and noxious weeds, production tax credits, license surrenders, and non-operating projects.

Aquatic Resources

This branch mainly handles issues associated with water quality and fisheries, including actions related to: aquatic habitat, dredging/sedimentation, upstream and downstream fish passage, water withdrawals, wetlands, dissolved oxygen, and water temperature.

Division of Dam Safety and Inspections

Dam Safety and Inspections staff implements the Commission's dam safety, public safety, and hydropower security programs by developing and implementing policies, programs, and standards for dam safety, public safety, and hydropower security at and around jurisdictional projects (see chapter 6). Commission staff is responsible for ensuring that jurisdictional projects are inspected and evaluated using good engineering practices during the design, construction, and operation and maintenance phases to protect life, health, property, and the environment. Dam Safety and Inspections is headquartered in Washington, DC, and includes regional offices in New York, New York; Atlanta, Georgia; Chicago, Illinois; Portland, Oregon; and San Francisco, California.



Dam Safety and Inspections Regional Offices

As of December 2016, Dam Safety and Inspections regulates 2,518 dams within the United States. Of these, the Atlanta Regional Office (ARO) oversees 311; the Chicago Regional Office (CRO) 418; the New York Regional Office (NYRO) 827; the Portland Regional Office (PRO) 394; and the San Francisco Regional Office (SFRO) 568.

³¹ The Form 80 is used to gather information pursuant to the Commission's regulations at 18 CFR §8.11, to identify recreational facilities located at licensed projects, whether public recreational needs are being accommodated by the facilities, and whether additional efforts could be made to meet future needs.

³² Part 12 of the Commission's regulations (18 CFR Part 12) concerns the safety of water power projects and project works under FERC jurisdiction, based on Order 122, issued in 1981.

4. HYDROPOWER PERMITS AND AUTHORIZATIONS

4.1 Overview

Mission

As discussed in chapter 3, when applicants are seeking authorization to construct and operate a non-federal hydropower project, they must file an application with the Commission. Commission staff is then responsible for analyzing the proposal and making recommendations to the Commission on whether to authorize the proposal, and if so, what measures to include in the authorization. The overall principles and objectives of the Commission's hydropower licensing program are to:

- give equal consideration to environmental, recreational, cultural, and developmental resources when evaluating hydropower projects;
- provide assistance to and foster coordination among applicants and stakeholders to process applications efficiently;
- employ the best possible technical expertise in evaluating development applications, environmental measures, and alternatives to provide sound recommendations to the Commission;
- facilitate the development of hydropower and marine and hydrokinetic technologies through a flexible regulatory framework; and
- increase domestic renewable energy capacity and infrastructure to serve the public interest.

The Commission issues three types of authorizations for non-federal hydroelectric projects in the United States, pursuant to the FPA: preliminary permits, licenses, and exemptions. As discussed previously, authorizations may also be needed from the Corps, Reclamation, and the Forest Service, if located on federal lands or at federal facilities.

Jurisdictional Determinations

Some non-federal hydroelectric projects in the United States have been constructed without first obtaining a license from the Commission, and some potential project owners may contemplate constructing a project and may need to know if a license is required. Commission staff is charged with determining when a hydroelectric project requires licensing, and may order entities owning or proposing an unlicensed project to apply for a license with the Commission. Section 23(b)(1) of the FPA requires any

person who intends to construct a hydroelectric project to file with the Commission either a license application for a proposed project or a Declaration of Intention to allow the Commission to determine if a proposed project requires a license. If a project is currently operating, the owner must file for a Petition for Declaratory Order to allow the Commission to determine if the project requires licensing.

Part 24 of the Commission's regulations (18 CFR Part 24) outlines the information needed for Commission staff to determine whether a project is required to be licensed. Project owners/developers should use these regulations as a reference guide to file a Declaration of Intention or Petition for Declaratory Order. The filing must include:

- The location of the project (state, town, street, county, stream, river basin name: township, range, and meridian);
- The exact name, business address, telephone number, FAX number, and E-Mail address of the applicant, authorized agent, existing dam owner, existing powerhouse owner; or local electric utility company;
- A project description (proposed or existing), proposed mode of operation (peaking or run-of-river) and initial and ultimate installed capacity of the project;
- Project history, if applicable;
- Jurisdictional analysis of navigability of the stream, including current and historical uses, land status (private, state owned, federally owned), a statement of whether the project will use surplus water or waterpower from a government dam or affect interstate commerce, and state which power company will be used; and
- A profile of the river and general maps of the area.

Commission staff then reviews these filings and issues a determination of whether a project must be licensed.



Three Rivers Project, MI

4.2 Preliminary Permits (18 CFR §4.80)

A preliminary permit grants a permittee priority over other potential applicants for that hydroelectric project site and authorizes a permittee to study a project site for a 3 year period. During the permit period, a permittee typically conducts feasibility and environmental studies and conducts pre-filing consultations with other stakeholders. Permits require 6-month progress reports related to these activities. Permits do not authorize construction or operation of a project, nor do they authorize any groundbreaking activities. A permittee has the option to extend the permit for an additional 2 years if it files an extension application and the Commission finds that the permittee has carried out activities under the permit in good faith and with reasonable diligence, such that Commission staff is able to discern from the permittee's progress reports a pattern of progress toward the preparation of a development application.³³

During or at the end of the permit period, the permittee may file a license application, depending on the results of feasibility and other studies. A preliminary permit, however, is not a prerequisite to filing a license application. A permittee may also voluntarily surrender a preliminary permit. A preliminary permit cannot be transferred to another entity. The Commission may cancel a preliminary permit after notice and opportunity for hearing, if the permittee fails to comply with the specific terms and conditions of the permit or for other good cause shown. Cancellation of a permit will result in the loss of the permittee's priority of application for development of the proposed project, which will free the site to be developed by another entity.

Preliminary Permit Process

Any citizen, association of citizens, domestic corporation, municipality, or state may file an initial application or a competing application for a preliminary permit for a water power project under Part I of the FPA. The required contents of a preliminary permit application are found in 18 CFR §4.81. The application must contain three exhibits: Exhibit 1 contains an engineering description of all the components of the proposed project, the total estimated average annual energy production and installed capacity, and a description of any lands of the United States that are enclosed within the proposed project boundary; Exhibit 2 describes studies conducted or to be conducted with respect to the proposed project, a work plan for new dam construction, if applicable, and a statement of costs and financing;

and Exhibit 3 includes a map or series of maps, to be prepared on USGS topographic quadrangle sheets or similar topographic maps of a state agency, showing the location of the project and its components in relation to water bodies and towns/municipalities, and a project boundary enclosing the principal project features, any public lands and reservations of the United States, and any areas protected under the National Wild and Scenic Rivers System and the Wilderness Act.

Once an application is filed with the Commission, staff determines whether the application is adequate (contains all the components required by 18 CFR §4.81), and if the application is adequate, issues a public notice of the application, allowing all interested stakeholders to comment on the application, or potential competitors to file a competing application. Commission staff considers all comments filed in response to the notice, and if there is no major opposition or legal reasons for denying the permit, issues the permit for a period of 3 years. The Commission, however, will not accept or approve an application for a preliminary permit for project works that: (1) would use in whole or in part, the same water resources that would be used by a project for which there is an unexpired preliminary permit; (2) would interfere with a licensed project in a manner that, absent the licensee's consent, would be precluded by Section 6 of the FPA; and (3) would use in whole or in part, the same water resources that would be used by a project for which an initial development application has already been filed, unless the preliminary permit application is filed not later than the time allowed under §4.36(a) for the filing of competing applications for a preliminary permit that would use in whole or in part, the same water resources.



Upper Middle Dam, ME

³³ FFP Project 132, LLC, 156 FERC ¶ 62,010 (2016); S. Martinez Livestock, Inc., 155 FERC ¶ 62,064 (2016).

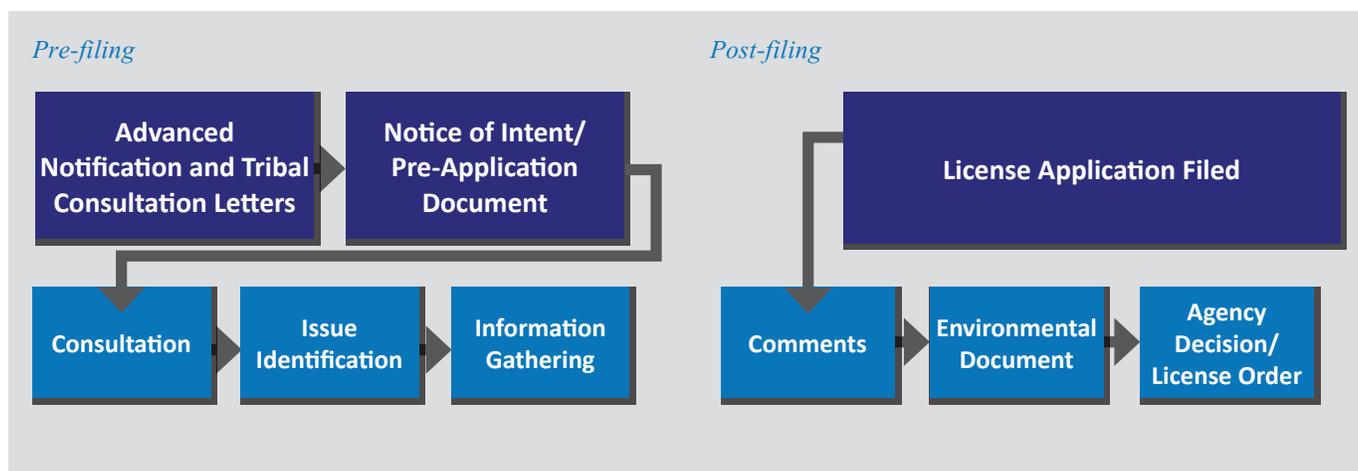
4.3 Licenses (18 CFR Parts 4, 5, and 16)

A hydropower license authorizes a licensee to construct and operate a hydroelectric project (referred to as an original license) or to continue to operate an existing project (relicense).³⁴ An original license is granted for a period of up to 50 years, while a relicense is issued for a period of 30 to 50 years. License terms are based on the amount of redevelopment, new construction, new capacity, or environmental mitigation, and other factors such as coordination of license terms for multiple projects in the a river basin. Hydropower licenses contain terms and conditions (articles) that require environmental measures to protect, mitigate effects on, or enhance environmental resources; engineering measures to ensure safe construction and operation of the project; and certain administrative requirements (such as filing exhibit drawings, paying annual charges to FERC,³⁵ establishing a project amortization reserve,³⁶ and filing a Public Safety Plan). Mandatory terms and conditions may also be prescribed by certain state and federal agencies and become part of the license. A license gives the licensee the ability to use eminent domain to acquire the property required for project development. At the end of the license period, a licensee may apply for a new license or surrender the license.

Licensing Process Overview

Pre-filing

Before filing a license application with the Commission, applicants are required to conduct a pre-filing process that consists of: (1) presenting the proposed project to appropriate stakeholders (e.g., state and federal agencies, Indian tribes, local landowners, and NGOs); (2) consulting with those stakeholders; (3) identifying issues; and (4) gathering information. The purpose of this pre-filing process is to fully inform stakeholders about the project proposal, engage those stakeholders in consultations to identify issues and study needs, and conduct those studies to provide the information needed to develop mitigation and enhancement measures and prepare the license application. The first steps in the process, to be conducted by the applicant, are advanced notification to stakeholders and Indian tribes that the applicant will be applying for a license, and a formal notice of intent (NOI) to the Commission and stakeholders that a license application will be filed with the Commission. The NOI is accompanied by a pre-application document (PAD) that describes the proposed project and environmental resources likely to be affected. For a relicense, the NOI and PAD must be filed with the Commission between 5 and 5.5 years before the expiration date of the current license. The pre-filing process concludes once an applicant has completed consultations with stakeholders, gathered all the necessary information for licensing the project, and prepared the license application for filing with the Commission.



³⁴ The FPA refers to this as either a new or subsequent license, but for clarity we will refer to this as a “relicense” throughout.

³⁵ The Commission receives an annual appropriation from Congress to defray its operating costs and recovers 100 percent of this appropriation through the collection of filing fees and annual charges. Filing fees are fees that the Commission assesses for specific services and benefits provided to identifiable beneficiaries (see 18 CFR Part 381). Annual charges are assessed to recover costs incurred by the Commission in the performance of its regulatory responsibilities and are based on a project’s annual generation.

³⁶ Pursuant to section 10(d) of the FPA, a specified reasonable rate of return upon the net investment in the project must be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves.

Components of an Application

The end product of pre-filing is a complete license application that provides Commission staff with sufficient information to process the application. The components of a license application and the corresponding sections of the regulations for each type of project are described in the following table. If Commission staff determines that insufficient information is provided in the application, it will issue either a deficiency letter or an additional information request (AIR)³⁷. An applicant must correct the deficiencies in the application within a specific time frame (usually 90 days), or the application may be dismissed. Applicant responses to AIRs may be required on different time frames, depending on the nature of the information requested.

Post-filing

The post-filing process begins once the applicant files the license application with the Commission. Then, Commission staff: (1) determines whether the application contains all the necessary components (see description of the components of an application above) and is adequate for processing; (2) if the application is adequate, solicits formal comments from stakeholders; and (3) prepares an environmental document. Once Commission staff determines that the application is adequate and ready for environmental analysis, formal comments from the stakeholders are requested through issuance of a public notice, which also requests motions to

intervene on the project.³⁸ Agencies and stakeholders then comment on the proposed project and submit recommendations, prescriptions, terms, and conditions for any license that may be issued. In the environmental document, Commission staff analyzes effects of the project proposal and alternatives, analyzes comments and any agency terms and conditions, and makes recommendations to the Commission regarding whether the project should or should not be licensed. A final Commission decision follows the issuance of the environmental document, and that decision considers all information in the public record for the project. If the Commission decides to authorize the project, the measures it determines necessary for operating the project and protecting the environment, as well as any mandatory terms and conditions filed by the agencies, are included in the license. More information on the final Commission decision is included below.

A typical relicensing action takes about 5 years to complete, including the pre-filing and post-filing processes using the Integrated Licensing Process (explained below). The processing time for applications depends on the number and complexity of issues at the project and the completeness of the application. It will be very project-specific. The Hydropower Regulatory Efficiency Act of 2013, however, directed the Commission to investigate the feasibility of a 2-year licensing process for hydropower development at non-powered dams and closed-loop pumped storage projects. That investigation is ongoing.

Required Application Components	Major Unconstructed or Major Modified Project (>5 MW) ^a	Major Project-Existing Dam (>5 MW) ^b	Minor Project (≤1.5 MW) or Major Project Existing Dam (>1.5 MW but ≤5 MW) ^c	Major Unconstructed or Major Modified Project (>1.5 MW but ≤5 MW) ^d
Pertinent Regulations	18 CFR §4.41	18 CFR §4.51	18 CFR §4.61	18 CFR §4.61
Initial Statement	✓	✓	✓	✓
Exhibit A – Project Description	✓	✓	✓	✓
Exhibit B – Project Operation	✓	✓	NR ^f	NR
Exhibit C – Construction Schedule	✓	✓	NR	NR
Exhibit D – Costs and Financing	✓	✓	NR	NR
Exhibit E – Environmental Report	✓	✓	✓	✓

a This is a major hydroelectric project (with a generating capacity greater than 5 MW) that is proposed but not yet constructed, or is an existing major project (capacity greater than 5 MW) that will require major construction for improvements or modifications to the project.
 b This is a major hydroelectric project (with a generating capacity greater than 5 MW) located at an existing dam, typically proposed for relicensing.
 c This is a minor hydroelectric project (with a generating capacity of 1.5 MW or less), or a major project (with a generating capacity greater than 1.5 MW and not more than 5 MW) located at an existing dam, typically proposed for relicensing.

d This is a major hydroelectric project (with a generating capacity greater than 1.5 MW and not more than 5 MW) that is proposed but not yet constructed, or is an existing major project (capacity greater than 1.5 MW and not more than 5 MW) that will require major construction for improvements or modifications to the project.
 e Additional information on the requirements for license applications can be found on the Commission’s website at: <http://www.ferc.gov/industries/hydropower/gen-info/guidelines.asp>.
 f NR = not required.

37 A deficiency letter is a document issued by Commission staff notifying the applicant that its application is incomplete or fails to provide information adequate for Commission filing requirements. The applicant is notified that the official filing date is withheld, pending receipt of the requested information. An AIR is a document issued by staff notifying the applicant that staff has determined that additional information beyond the content of the original application is necessary or desirable to complete the Commission’s review, analyses and action on the application. The AIR may include a *Schedule A* or *Schedule B* specifying the types of information to be submitted, with due dates for scheduled compliance.

38 Any stakeholder may request intervenor status, which means that the stakeholder becomes an official party to the licensing proceeding, and the applicant must serve all project filings made with the Commission on all the intervenors. An intervenor may or may not oppose the project.

Specific Licensing Processes

The default licensing process is the Integrated Licensing Process, or ILP. However, an applicant may request to use two other processes: the Alternative Licensing Process, or ALP, and the Traditional Licensing Process, or TLP. When considering the ALP or TLP in place of the default ILP, the applicant should seek input from the stakeholders for the specific project. If the applicant decides to use the ALP or TLP, it must make a written request to the Commission with its NOI and PAD filing. The applicant must also publish notice of its request to use the ALP or TLP in a daily or weekly newspaper and solicit comments. In deciding whether or not to approve an applicant’s request to use the ALP or TLP, the Commission considers, among other things, the complexity of the resource issues, level of anticipated controversy, and the amount of available information and potential for significant disputes over studies. If approved by the Commission, the applicant then follows the steps for the ALP or TLP. Each process is described in more detail below.

Integrated Licensing Process (ILP)	Alternative Licensing Process (ALP)	Traditional Licensing Process (TLP)
Default process	Available upon request and FERC approval	Available upon request and FERC approval
Projects with complex issues and study needs; FERC oversight in pre-filing	Projects that effectively promote a self-driven collaborative pre-filing process; some FERC involvement	Projects with less complex issues and study needs; no FERC oversight in pre-filing
Predictable scheduling in both pre-filing and post-filing stages	Collaboratively determined schedule in pre-filing stage	Paper-driven process; no set timeframes
Post filing elements of each process are similar		

Integrated Licensing Process (18 CFR §5.1)

The ILP is the default process (since 2005). This process is most appropriate for projects with complex issues and study needs that require close coordination and cooperation with stakeholders during the pre-filing stage. Commission staff is also an active participant during the pre-filing stage, providing oversight and advice to the applicant and all stakeholders. NEPA scoping is conducted during the pre-filing phase of the ILP, allowing identification of issues and acting to focus the studies that may be required. Commission staff makes the final determination on studies that are required during the pre-filing period, and a dispute resolution process is available for parties not in agreement

with the studies that would be required. The ILP has specific timelines and filing requirements that all participants must adhere to during both the pre-filing and post-filing stages. The basic steps of the ILP pre-filing process are as follows:

- Applicant files NOI and PAD (18 CFR §5.5 and 5.6);
- Commission staff holds tribal consultation meetings, if requested by affected tribes (18 CFR §5.7);
- Commission staff notices NOI/PAD and conducts scoping (18 CFR §5.8);
- Participants, including Commission staff, file study requests and comments on the PAD and SD1 (18 CFR §5.9);
- Commission staff issues a second scoping document, if necessary (18 CFR §5.10);
- Applicant and participants, including Commission staff, collaborate in study plan development (18 CFR §§5.11, 5.12, 5.13);
- Director of the Office of Energy Projects issues a study plan determination (18 CFR §5.13);
- If there are disputes on the study plans, mandatory conditioning agencies may request to go through a formal study dispute resolution process, which may amend the approved study plan (18 CFR §5.14);
- If there are no disputes on the studies required by the study plan determination, or after dispute resolution is completed on any disputed studies, the applicant conducts the studies, providing annual updates that include opportunities for participants and Commission staff to review study progress and request modifications (18 CFR §5.15);
- Not later than 150 days before the license application is due, the applicant files its Preliminary Licensing Proposal (PLP) for review and comment by participants and Commission staff (18 CFR §5.16); and
- Applicant files its license application in accordance with the ILP schedule.

The post-filing process follows the steps outlined above in the section entitled “Post-filing.”

Alternative Licensing Process (18 CFR §4.34(i))

The ALP is an alternative process that an applicant may use if approved by the Commission. Under 18 CFR §5.3, a request for authorization to use the ALP must include justification for the request and any existing written comments on the potential applicant’s proposal and a response thereto. For the ALP, a potential applicant must demonstrate that a reasonable effort has been made to contact all stakeholders and that a consensus exists that

the use of the ALP is appropriate; submit a communications protocol, supported by interested entities, governing how the applicant and other participants in the pre-filing consultation process, including the Commission staff, may communicate with each other; and provide a copy of the request to all interested stakeholders. Similar to the ILP, the ALP encourages coordination among the applicant, Commission staff, and stakeholders during the pre-filing process, and it also coordinates the NEPA process (scoping) and administrative processes associated with the CWA for water quality certification. Timelines are not specified but, instead, are developed collaboratively among the applicant and stakeholders early in the pre-filing process, tailored to the issues associated with the project. Commission staff may be involved in pre-filing consultations to facilitate the process but does not make the final determination on studies. In lieu of an Exhibit E for the license application (see description of the components of an application above), the applicant is given the option to prepare a draft EA or file a draft EIS that is prepared by a contractor chosen and directed by Commission staff and paid for by the applicant. The ALP encourages the applicant and stakeholders to come to agreement on proposed protection, mitigation, and enhancement measures, ultimately leading to a settlement agreement. The basic steps of the ALP pre-filing process are as follows:

- Applicant forms agency/NGO work group, establishes communication protocol, and obtains consensus on process;
- Applicant files NOI and PAD and request to use the ALP with FERC (18 CFR §5.3, 5.5, 5.6);
- Commission staff notices NOI/PAD and request to use the ALP (18 CFR §5.3);
- Commission approves use of ALP;
- Applicant holds initial information meeting, scoping of environmental issues (18 CFR §4.34(i)(4));
- Applicant conducts studies, prepares draft application; and
- Applicant files final license application and preliminary draft EA or EIS prepared by third party contractor.

The post-filing process follows the steps outlined above in the section entitled “*Post-filing.*”

Traditional Licensing Process

The TLP is a licensing process initially developed in the 1980s that is still available for applicants’ use with Commission approval. Under 18 CFR §5.3, a request to use the TLP must also include justification for the request and any existing written comments on the potential applicant’s proposal and a response thereto. An applicant must also address: the likelihood of timely license issuance; the complexity of the resource issues; the level of anticipated controversy; the relative cost of the traditional process compared to the integrated process; the amount of available information and potential for significant disputes over studies; and other factors believed by the applicant to be pertinent. The TLP is most appropriate for less controversial or less complex projects requiring fewer studies, although it still requires a three-stage pre-filing consultation process with stakeholders, including coordination with stakeholders in the pre-filing studies. Commission staff is typically not involved in the pre-filing process, although they may be requested to attend meetings and provide advice regarding the pre-filing process. The TLP has no set timelines for the pre-filing process, except that the final license application for relicenses must be filed no later than 2 years prior to the expiration date of the existing license. The basic steps of the TLP pre-filing process are as follows:

- Applicant files NOI and PAD and request to use the TLP with FERC (18 CFR §5.3, 5.5, 5.6);
- Commission staff notices NOI/PAD and request to use the TLP (18 CFR §5.3);
- Commission approves use of TLP;³⁹
- Stage 1- Applicant holds initial information meeting, scoping of environmental issues, prepares study plans (18 CFR §4.38(b));
- Stage 2- Applicant conducts studies, prepares draft application (18 CFR §4.38(c));
- Stakeholders provide comments on draft application (18 CFR §4.38(c)); and
- Stage 3- Applicant files final license application (18 CFR §4.38(d)).

The post-filing process follows the steps outlined above in the section entitled “*Post-filing.*”

³⁹ Typically, the Commission approves use of the TLP for smaller, less controversial projects where the stakeholders have also agreed to its use.

Marine and Hydrokinetic Pilot Project Licensing Process⁴⁰

The Commission specifically developed this licensing process for marine and hydrokinetic projects. It is not a stand-alone process; rather, it involves a waiver of some provisions of the ILP regulations. Because marine and hydrokinetic technology is experimental to date, this process allows developers to test new marine and hydrokinetic technologies to determine

appropriate siting of these technologies and to confirm their environmental effects, while continuing to maintain FERC oversight and agency input. Pilot projects are small (typically less than 5 MW), short-term (generally no more than 5 to 10 years), removable with site restoration, and carefully monitored to avoid placement in sensitive locations. The pilot project procedures (1) could lead to

Verdant Policy

The Commission has also determined that applicants wanting to test MHK technologies are not required to obtain a license if the following conditions are met:

1. the technology is experimental;
2. the proposed facilities are to be utilized for a short period for the purpose of conducting studies necessary to prepare a license application; and
3. power generated from the test project will not be transmitted into, or displace power from, the national energy grid.

See Declaratory Order (Docket No. P 12178 001), 111 FERC ¶ 61,024 (2005).

a license under the FPA; (2) are reviewed and overseen by the Commission; (3) allow the transmission of electricity into the national power grid if licensed; and (4) are available to those who wish to test technology, whether or not they intend to pursue a standard license application to follow the pilot project license.

The process completes licensing in as few as 6 months to allow for project installation, operation, and environmental testing as soon as possible. The duration of a pilot license is generally between 5 and 10 years. As of September 2016, two pilot licenses have been issued for two tidal projects.⁴¹ Six additional projects with active preliminary permits are currently under study, and three projects are in post-filing, having completed the pre-filing licensing process. The basic steps of the marine and hydrokinetic pilot project pre-filing process are as follows:

- Applicant files NOI, draft license application with proposed monitoring plan, request for waiver/process plan, and request for designation as non-federal representative for ESA and section 106 of the NHPA consultation;
- Commission notices pre-filing process and document availability, and designates applicant as non-federal representative for ESA and section 106 consultation;
- Agencies and others file comments on draft license application and process plan;
- Commission solicits tribal consultation;
- If needed, Commission holds public meeting/technical conference;
- Commission notices conclusion of pre-filing process and makes determination on request for waiver/process plan; and
- Applicant files final license application with revised monitoring plan, draft Biological Assessment, CZMA application, and section 401 of the CWA application, if needed.



Hydrokinetic Turbine by Smart Hydro Power <http://www.smart-hydro.de/>

⁴⁰ See FERC White Paper on Licensing Hydrokinetic Pilot Projects, April 14, 2008.

⁴¹ These are the 1,050-kW Roosevelt Island Project No. 12611, New York, and the 300-kW Cobscook Bay Project No. 12711, Maine. Both are tidal hydrokinetic projects.

License Order

Following issuance of the final NEPA document, the Commission issues an order acting on the license application. It may either issue an order, typically with conditions, approving the license application, or an order denying the application. The final order may, depending on the circumstances, be issued by the Commissioners or may be delegated to the Director of OEP for issuance. Most orders are not contested (that is, no party argues that the license should not be issued) and thus can be delegated to the Director of OEP pursuant to the delegation authority. However, contested applications are decided by the Commission. Also, large, controversial, or policy setting projects may be handled by the Commission even if they are not contested. A typical license order includes background information on the project; a description of the proposed project and its operation; project economics; proposed environmental measures; a summary of the license requirements; a summary of other federal law requirements, including mandatory conditions; administrative provisions of the license; and license articles that state the specific terms and conditions⁴² of the license. The order also addresses any issues raised by intervenors and other commenting entities, particularly any intervenors who are opposed to the project. A license order constitutes final Commission action, unless an intervenor files a request for rehearing within 30 days of the date of the order.⁴³

4.4 Exemptions (18 CFR §4.90 and §4.101)

Small hydroelectric projects having limited environmental impacts and meeting certain criteria may be exempt from the licensing requirements of Part I of the FPA. As with a license, a license exemption authorizes a licensee to construct and operate a project; however, exemptions are issued in perpetuity. The exempted project is subject to mandatory terms and conditions set by federal and state fish and wildlife agencies and by the Commission, and exemptions do not convey the right of eminent domain. Applicants for exemption must have all real property rights necessary to develop and operate the project, or an option to obtain such interests, at the time of filing of the application. Obtaining an exemption can be a more simplified process than applying for a license.

The two categories of exempted projects are conduit exemptions and case-specific (10-MW) exemptions. Conduit exemptions are projects that would be located on a conduit used for agricultural, municipal, or industrial consumption; would not be an integral part of a dam; and would have an installed generating capacity of 40 MW or less. Case-specific exemptions are projects that would be located at an existing non-federal dam (built prior to 1977) or located at a natural water feature (such as a waterfall) that would not require construction of a dam and would have an installed generating capacity of 10 MW or less.

Finally, certain hydropower facilities located on non-federally owned conduits are not required to be licensed or exempted by the Commission at all. These facilities are referred to as “qualifying conduit hydropower facilities” and must be located at conduits that meet the same criteria as conduit exemptions, have a maximum installed capacity of 5 MW, and cannot have been previously licensed or exempted on or before August 9, 2013. These facilities are discussed in more detail below.

Exemption Process

The application process for exemptions is similar to that for licenses, with both pre-filing and post-filing processes, and preparation of exemption applications. The pre-filing consultation process for exemptions follows 18 CFR §4.38, which is the same pre-filing consultation process required under the TLP. The basic steps of the exemption pre-filing process are as follows:

- Applicant files NOI and PAD and request to use the TLP with FERC (18 CFR §5.3, 5.5, 5.6);
- Commission staff notices NOI/PAD and request to use the TLP (18 CFR §5.3);
- Commission approves use of TLP;
- Stage 1- Applicant holds initial information meeting, scoping of environmental issues, prepares study plans (18 CFR §4.38(b));
- Stage 2- Applicant conducts studies, prepares draft application (18 CFR §4.38(c));
- Stakeholders provide comments on draft application (18 CFR §4.38(c)); and
- Stage 3- Applicant files final license application (18 CFR §4.38(d)).

⁴² Some conditions or prescriptions filed by other agencies are mandatory and must be included in a license. These include conditions provided by federal land management agencies for projects located on federal lands (pursuant to section 4(e) of the FPA), and fishway prescriptions made by the Secretaries of the Departments of Interior or Commerce (pursuant to section 18 of the FPA). The conditions of the CWA water quality certification issued for the project are also mandatory. Conditions to avoid or minimize incidental take are also required to comply with the ESA prohibition against taking threatened or endangered species. See chapter 3.5 for more information on mandatory conditions.

⁴³ An intervenor who is aggrieved by a Commission or delegated license order may file a request for rehearing, asking the Commission to reconsider its decision. If a rehearing is not granted, an intervenor that sought rehearing may appeal the Commission decision to the U.S. Court of Appeals for the D.C. Circuit or the Circuit Court where the licensee is located or has its principal place of business, and ultimately may seek review from the U.S. Supreme Court.

The required contents for exemption applications are described in the following table.

Required Application Components	Conduit Exemptions (<40 MW)	Case-specific Exemptions (<10 MW)
Pertinent Regulations	18 CFR §4.92	18 CFR §4.107
Introductory Statement		
Exhibit A Project Description		
Exhibit E Environmental Report		
Exhibit F Design Drawings		
Exhibit G Project Boundary Map		

The post-filing process generally follows the steps outlined above for licenses in the section entitled “*Post-filing.*” One difference is that terms and conditions filed by state and federal resource agencies to protect fish and wildlife resources are mandatory, pursuant to section 30(c) of the FPA. In addition, while a NEPA document is prepared for a case-specific exemption, conduit exemptions are categorically exempt from preparing an environmental document under 18 CFR §380.4(a)(14), unless determined necessary.

Exemption Order

An exemption order follows the issuance of the final NEPA document and is formatted similarly to a license order; however, exemption orders typically include fewer license articles than standard licenses, but do include any mandatory terms and conditions filed by state and federal resource agencies pursuant to section 30(c). While a conduit exemption typically does not require preparation of a NEPA document, the order does include any mandatory terms and conditions filed by state and federal resource agencies. As with a license order, an exemption order constitutes final Commission action, unless an intervenor files a request for rehearing within 30 days of the date of the order.

Qualifying Conduit

Under the Hydropower Regulatory Efficiency Act of 2013, the Commission is required to determine whether proposed projects meet the criteria to be considered “qualifying conduit hydropower facilities.” Qualifying conduit hydropower facilities are not required to be licensed or exempted by the Commission; however, any

person, state, or municipality proposing to construct a facility that meets the criteria must file a Notice of Intent to Construct a Qualifying Conduit Hydropower Facility with the Commission. A “qualifying conduit hydropower facility” must meet the following provisions:

1. A conduit is any tunnel, canal, pipeline, aqueduct, flume, ditch, or similar manmade water conveyance that is operated for the distribution of water for agricultural, municipal, or industrial consumption, and is not primarily for the generation of electricity.
2. The facility generates electric power using only the hydroelectric potential of a non-federally owned conduit.
3. The facility has an installed capacity that does not exceed 5 megawatts (MW).
4. The facility was not licensed or exempted from the licensing requirements of Part I of the FPA on or before August 9, 2013.

After an applicant files the Notice of Intent, Commission staff reviews the information and makes an initial determination about whether the project meets the qualifications for a qualifying conduit within 15 days. Commission staff then issues notice of its initial determination and provides a 45-day period for the public to comment. If no comments are received, Commission staff issues a letter with a final determination. On average, this process takes about two months.

4.5 Amendments

License Amendment Process (18 CFR §4.200-4.202)

A licensee may file an application for a license amendment if it proposes to: (1) make a change in the physical features of the project or its boundary, or make an addition, betterment, abandonment, or conversion of the project that would constitute an alteration of the license; (2) make a change in the plans for the project under license; or (3) extend the time fixed in the license for commencement or completion of project works. Most project changes that require an amendment can be classified into six categories: capacity changes, design changes, operational changes, land status changes, compliance filings, and time extensions. Capacity-related amendments (18 CFR §4.201[b]) are requested when the proposed changes would: (1) increase the project’s actual or proposed total installed capacity; (2) result in an increase in the project’s maximum hydraulic capacity by 15 percent or more; and (3) result in an increase in the installed nameplate capacity of 2 MW or more. Any amendment that does not meet the criteria for a capacity-related amendment will be considered to be a non-capacity-related amendment (18 CFR §4.38[a][4]) (i.e., project changes fit into one of the other five categories

of amendment listed above- design changes, operational changes, land status changes, compliance filings, and time extensions). Capacity-related and non-capacity amendment processes are described below. The Commission staff reviews the application, and as appropriate, the Commission or staff acting under delegated authority issues an order approving or denying the amendment of license.⁴⁴

Capacity-related Amendments (18 CFR 4.201(b))

As noted above, a capacity-related amendment is one that involves additional generating capacity not previously authorized, and would increase a project's hydraulic capacity by 15 percent or more and its installed generating capacity by 2 MW or more. The licensee completes the following steps as part of the capacity-related amendment process:

- Participates in the First Stage Consultation Process (18 CFR §4.38(b));
- Conducts studies and prepare a draft application (18 CFR §4.38(c));
- Completes Second Stage Consultation (18 CFR §4.38(c));
- Requests and receives a water quality certification, if required; and
- Files an amendment application with the Commission (18 CFR §4.201).

In turn, Commission staff processes the application, as follows:

- Completes the NEPA process, similar to an application for license; preparing an EA or EIS, depending on the scope of the amendment; and
- Completes the section 10(j) process for fish and wildlife recommendations, if required (18 CFR §4.34).

The process concludes with the Commission or Commission staff approving or denying the license amendment. The rules governing these activities are the same as those that govern applications for license using any of the available licensing processes.

Non-capacity Amendments (18 CFR 4.201(c))

The format and process for an application for a non-capacity-related amendment may vary from a one-page letter to a comprehensive, multi-volume amendment application, depending on the type of amendment and the level of detail required. The application must provide reasons for the amendment and include relevant resource agency letters of comment, exhibits, and applicable drawings as specified

in 18 CFR §4.201(c). The application must contain an initial statement; certain specified exhibits; pre-filing consultation; and, in some cases, evidence of a request for water quality certification. The three-stage agency consultation process (18 CFR §4.38) does not apply to non-capacity-related amendments, except for those changes identified in 18 CFR §4.38(a)(6)(v), which include: (1) the construction of a new dam or diversion in a location where there is no existing dam or diversion; (2) any repair, modification, or reconstruction of an existing dam that would result in a significant change in the maximum surface area or elevation of an existing impoundment; or (3) the addition of new water power turbines other than to replace existing turbines. The nature of the proposed change, the type of project, and the construction status of the project determine which exhibits to include in the amendment application.

Commission staff processes the application, which may or may not include the preparation of a NEPA document, and the Commission or Commission staff issues an order either approving or denying the amendment.

Exemption Amendment Process [18 CFR §4.96 for Small Conduit Exemption and 18 CFR §4.104 for Small (Case-Specific) Hydroelectric Exemption]

The holder of an exemption for either a small conduit hydroelectric facility or a small hydroelectric project must construct and operate its project as described in the exemption application approved by the Commission. If an exemption holder wishes to change the design, location, or method of construction or operation of the project works, it must first notify the appropriate federal and state fish and wildlife agencies and inform them in writing of the changes it intends to implement. If these agencies determine that the changes would not cause the project to violate the terms and conditions imposed by the agencies, and if the changes would not materially alter the design, location, or method of construction or operation of the project works, the exemption holder may implement the changes. If any of these agencies determines that the changes would cause the project to violate the terms and conditions imposed by the agencies, or if the changes would materially alter the design, location, or method of construction or operation of the project works, the exemption holder may not implement the changes without first acquiring authorization from the Commission to amend its exemption, or applying for a license that authorizes the project, as changed. Commission staff reviews the application and the Commission or Commission staff issues an order approving or denying the request for amendment. As appropriate, Commission staff may prepare a NEPA document prior to issuance of a final order on the application.

⁴⁴ Depending on the nature of the amendment, Commission staff may need to prepare a NEPA document (EA or EIS).

An application to amend an exemption may be filed only by the holder of the exemption and is governed by the Commission's regulations for applications for an exemption. This means that the amendment application process must follow the process described in Section 4.4 for an application for an exemption.

4.6 Surrenders, Transfers, and Terminations

Surrenders

A license may be surrendered by the licensee for a variety of reasons, such as that the project is no longer economical, or natural catastrophes have damaged or destroyed project facilities. To protect the environment and public, a license may only be surrendered upon agreement between the licensee and the Commission. The surrender process often can be complex because there are many environmental implications associated with ending Commission jurisdiction over a project. Commission staff would review the surrender application, typically prepare a NEPA document (particularly if the surrender would involve removal of project facilities), and then, after reviewing the record, the Commission or Commission staff would act by issuing an order either approving or denying the surrender.

License Surrender Process (18 CFR §6.1 and §6.2)

Licenses may be surrendered only after the licensee fulfills the obligations that the Commission may prescribe. If the project works have been constructed on lands of the United States, the licensee is required to restore the lands to a condition satisfactory to the federal agency with supervision over them, and must continue to pay annual charges until the restoration has been completed. A licensee must prepare an application for a license surrender as specified in 18 CFR §6.1, which includes the reason for surrendering the license and a copy of the license and all amendments associated with the project. Once the application is filed, Commission staff reviews the application and the Commission or Commission staff issues an order approving or denying the request for surrender. If appropriate, a NEPA document is prepared before an order is issued.

Licenses may only be surrendered after fulfilling the obligations under the license order that the Commission may prescribe and, if construction has begun, after fulfilling any conditions for disposing of project works and restoring project lands that may be required by the Commission and the federal and state fish and wildlife agencies.

Exemption Surrender Process [18 CFR §4.95 for Small Conduit Facilities and 18 CFR §4.102 for Small (Case-Specific) Hydroelectric Projects]

The surrender process for a license exemption is the same regardless of whether the exemption is for a small hydroelectric project or for a small conduit hydroelectric project. The holder of the exemption must file an application with the Commission to surrender the exemption. If project construction has begun before the surrender application is filed with the Commission, the exemption holder must consult with fish and wildlife agencies in accordance with 18 CFR §4.38, substituting for the information required under 4.38(b)(1), information describing the exemptee's plans for disposing of project works and restoring project lands. The Commission issues a public notice of the application, and, at least 30 days later, the Commission or Commission staff issues an order approving or denying the application. If appropriate, an EA is prepared before an order is issued.

If construction has not yet begun, unless the Commission issues an order to the contrary, the exemption remains in effect through the 30th day after the Commission issues a public notice of receipt of the application. Any new application for an exemption by another party for the site of the surrendered exemption may be filed on the next business day.

Exemptions may only be surrendered after fulfilling the obligations under the exemption order that the Commission may prescribe and, if construction has begun, after fulfilling any conditions for disposing of project works and restoring project lands that may be required by the Commission and the federal and state fish and wildlife agencies.

If a federal agency has authorized the use of federal lands or reservations under its supervision, the exemption holder must concurrently notify that agency of the application to surrender the exemption and the steps it will take to restore the affected federal lands or reservations.

Implied Surrender

Where the entity responsible for a project has, by action or inaction (for example, allowing a project to be in a state of disrepair for a long period, with no plan to put it back in operation in the foreseeable future) clearly indicated its intent to abandon the project, but has not filed a surrender application, the Commission may, on its own initiative, issue an order terminating a license or exemption by implied surrender. Before final Commission action, notice of proposed implied surrender will be given to the licensee or exemptee.

Transfers

A license can also be transferred to a different entity by a licensee, subject to Commission approval (18 CFR §9.1-9.3). This transfer typically does not require a NEPA document because it is an administrative action not involving any environmental impacts.

License Transfer Process (18 CFR §9.1-9.3)

A licensee desiring to transfer a license must file a transfer application jointly with the person, association, corporation, state, or municipality that would gain the license and acquire the project after approval of the transfer and acquisition. The application must conform to 18 CFR §131.20, and must be filed in accordance with 18 CFR §4.32. The application must state in appropriate detail the qualifications of the transferee to hold the license and to operate the project under the license. Commission staff reviews the application, determines whether or not the transfer should be granted, and issues an order approving or denying the transfer. Approval of the transfer is contingent on the transfer of title to the properties under the license, delivery of all license instruments, and a showing that the transfer is in the public interest. The transferee is subject to all of the conditions of the license and to all the provisions and conditions of the FPA, as if the transferee was the original licensee, and is responsible for the payment of annual charges that accrue before the date of transfer. When the Commission issues a transfer order, the order is forwarded to the transferee for acknowledgment of acceptance. Unless a request for rehearing is filed, or the Commission issues a stay, the order becomes final 30 days after the date of issuance. The acknowledgment of acceptance is filed in triplicate with the Commission within 60 days after the date of issuance, accompanied by a certified copy of the deed of conveyance or other instrument evidencing transfer of the property under the license, together with evidence of the recording of the transfer. Because a license transfer is an administrative process, a NEPA document is typically not required.

Exemption Transfer Process [18 CFR §4.94(g), Article 7 for Small Conduit Exemptions, and 18 CFR §4.106(i), Article 9 for Small (Case-Specific) Hydroelectric Exemptions]

An exemptee may transfer any property interests in an exemption for either a small conduit exemption or a small hydroelectric exemption, but must first inform the transferee of the terms and conditions of the exemption as provided in 18 CFR §4.106(i). Within 30 days of transferring the property interests, the exemption holder must inform the Commission in writing of the identity and address of the transferee. As long as the transferee has the necessary property rights, it is authorized to operate the project. Commission staff then issues a public notice of the exemption transfer. The notice contains all of the information concerning the exemption holder and transferee. The notice does not have a public comment period because exemption transfers do not require prior Commission approval. The purpose of the notice is to advise interested parties that there is a new project owner/exemptee. An Acknowledgment of Transfer of Exemption letter is mailed out to the new owner/exemptee that includes filing instructions and mailing address, explanation of article and terms and conditions of compliance, extension of time requirements, guidance on exemption amendments, and where to obtain additional assistance. Because an exemption transfer is an administrative process, a NEPA document is typically not required.



Holyoke Dam, MA

Terminations

License Termination (18 CFR §6.1-6.5)

The Commission can terminate a license for two reasons: (1) the licensee fails to begin construction of the project within the prescribed time (18 CFR §6.3); or (2) the licensee fails to make a good faith effort to maintain and operate the project (18 CFR §6.4). In both cases, the Commission provides notice before it acts, as follows: (1) 90 day prior notice to the licensee where there is a failure to commence construction; and (2) 90-day prior notice in the case of project abandonment. Commission staff would review the project record and the Commission or Commission staff, would issue an order either approving or denying the termination. This may or may not require a NEPA document, depending on the extent of measures required to restore the project site.

With respect to the failure to commence construction, Section 13 of the FPA requires the Commission to establish a deadline for the commencement of construction of a new (original) project, which can be no more than 2 years from the date the project license is issued, and allows the Commission to extend the deadline once, for no more than two additional years. If a licensee does not begin construction by the deadline, section 13 requires the Commission to terminate the license. It is important to note that a licensee cannot begin construction until it has met all of the pre-construction requirements in its license.

Exemption Termination [18 CFR §4.94, Articles 3, 4, and 6 for Small Conduit Exemptions, and 18 CFR §4.106, Articles 3, 5 and 7 for Small (Case-Specific) Hydroelectric Exemptions]

Because license exemptions are issued in perpetuity, there are no regulations pertaining to termination of an exemption by the Commission; however, the Commission may revoke an exemption if, during the application process, material discrepancies, inaccuracies, or falsehoods were found to be made by or on behalf of the applicant. The Commission may also revoke an exemption if construction of any proposed generating facilities has not begun within 2 years or has not been completed within 4 years from the effective date of the exemption. Further, the Commission may revoke an exemption if any necessary rights to use or occupy federal lands for the proposed project purposes have not been obtained within 1 year from the date the exemption was granted. If an exemption is revoked, the Commission will not accept a subsequent application for an exemption from licensing for the same project from the prior exemption holder within 2 years of the revocation.



Stevenson Dam, CT

5. HYDROPOWER ADMINISTRATION AND COMPLIANCE

5.1 Overview

Mission

The overall mission of the Commission's administration and compliance program is to:

- ensure compliance with license conditions;
- protect and enhance beneficial uses of hydropower projects;
- serve the public interest; and
- provide leadership and vision in promoting economic and environmental benefits for the nation.

Responsibilities

As with the licensing process, the administration and compliance process must follow the relevant parts of the FPA and other federal laws in carrying out its responsibilities, particularly related to license amendments, license/exemption surrenders, and license/exemption transfers. The Commission (or Commission staff, by delegation) takes final action on any applications for amendment, surrender, or transfer by issuing an order approving or denying the application.

Once a hydropower authorization is issued, Commission staff is responsible for overseeing compliance with the terms and conditions of licenses for the length of the license period (up to 50 years), and of exemptions in perpetuity (exemptions do not expire). Specific administration and compliance responsibilities include:

- administering licenses and tracking license requirements (see section 5.3 of this chapter);
- reviewing and approving amendments, license/exemption surrenders, and license/exemption transfers (see sections 4.5 and 4.6 of chapter 4);
- inspecting and recording site conditions (environmental inspections) (see section 5.2 of this chapter);
- acting on compliance filings, mandated or voluntary (see section 5.3 of this chapter);
- monitoring license effectiveness (see section 5.3 of this chapter);
- investigating compliance issues (see section 5.3 of this chapter);
- working with the Office of Enforcement to issue penalties as necessary (see section 5.7 of this chapter);
- determining whether operating unlicensed projects should be licensed (see section 4.1 of chapter 4);
- determining and assessing headwater benefit charges (see section 5.8 of this chapter); and
- conducting outreach and technical workshops (see section 7.2 of chapter 7).



Sturgis Dam, MI

5.2 Environmental Inspections

Commission staff conducts environmental inspections of licensed and exempted projects to evaluate and assess compliance with the environmental and public use requirements of the license or exemption. Environmental inspectors look specifically at a licensee's or exemptee's compliance with license or exemption requirements for the protection and enhancement of environmental resources at the project. Environmental inspections also allow Commission staff to identify problem areas and to share information with licensees and exemptees, to assist them with their responsibilities for maintaining compliance with license or exemption requirements. The nature and frequency of environmental inspections at projects depends on the type of project, the environmental and public use impacts, and whether any non-compliance issues have occurred. Typical inspections review the physical and operational features of a project's facilities and compliance with license terms and conditions related to fish and wildlife, recreation, cultural resources, and public safety.

5.3 Compliance Tracking and Monitoring

Licensing in the twenty-first century has resulted in an increase in the number and complexity of license requirements. Tracking large projects with complex settlement agreements and many requirements creates a need for additional measures to ensure compliance. One way to assist licensees is through improved compliance tracking.

Important strategies include transition meetings with new licensees, and technical workshops on issues of interest to licensees and stakeholders. Commission staff has conducted or participated in workshops on subjects such as: fish passage, invasive species management, shoreline management, and recreation. Commission staff also uses data from inspections, monitoring, and filings to assist licensees in understanding how to comply, which helps licensees to achieve compliance in practical and effective ways. Monitoring of project requirements and outcomes can identify problems common to licensed or exempted projects and can lead to proactive strategies that help licensees and exemptees identify and correct common problems.

Monitoring plans and reports are typical license requirements, and their filing (with copies to consulted agencies) allows Commission staff and other stakeholders to review data and identify potential issues to see if project requirements are being met and whether changes are needed. Examples include water quality monitoring, river flow monitoring, fish passage reports, and reports on recreational facility usage.

Licensee self-reporting and stakeholder reporting can be an important means to track compliance. While licensee self-reporting is required with the filing of monitoring reports, licensees also routinely report unusual occurrences to the Commission (such as boat accidents, drownings, and minimum flow deviations). Stakeholder reporting (via hotlines,⁴⁵ phone calls, and letters) allows the reporting of events that the licensee or Commission staff may not have observed or known about, and that may require the licensee to take some corrective action. Commission staff uses the information from licensee and stakeholder reports to open investigations into compliance with the license and to assist licensees with getting into compliance with license conditions or, when necessary, working with licensees to amend the license in consultation with the appropriate state and federal agencies.

5.4 License Transition Meetings

License transition meetings with new licensees and Commission staff allow staff to review with the licensee the requirements of the license and what is expected of the licensee during the license term. While some licensees are familiar with the compliance process, others may be new to the process and need clarification of requirements for license compliance. Even experienced licensees may benefit from a "refresher" meeting with Commission staff, and a discussion of specific requirements of the license.

⁴⁵ Hotlines are typically toll-free numbers that allow the public to report incidents directly to a licensee.



5.5 Shoreline Management

Licensees have a responsibility to ensure that the reservoir shorelines within their project boundaries are managed in a manner that is consistent with project purposes, license requirements, and operations. Project purposes may include operation and maintenance, flowage, public recreation, public access, shoreline control, and the protection of environmental resources. Additionally, licensees must have sufficient property rights to manage project lands to protect and maintain project purposes.

A comprehensive shoreline management plan (SMP), can assist a licensee in meeting its responsibilities throughout the term of its license and in managing the multiple resources and uses of the project's shorelines in a manner that is consistent with license requirements and project purposes, and with the needs of the public. SMPs are best developed during project licensing, but circumstances may arise during the term of the license that would require development of an SMP. The Commission expects all licensees developing SMPs to involve the public and allow for agency consultation, review, and comment.

An SMP typically consists of the following components: (1) a description of the purpose and goals of the plan; (2) shoreline use classifications for protecting sensitive shoreline resources and allowing for existing and future use and development of the shoreline; (3) GIS location data and maps showing the shoreline classifications in relation to the project reservoir and project boundary; (4) permitting and enforcement programs or guidelines for managing shoreline development and uses; and (5) provisions for periodic review and update of the plan in consultation with interested stakeholders and agencies to determine the need for any changes to the plan. It is important to note that an approved SMP only applies to those lands and waters within the project boundary to the extent the licensee has ownership or rights over such property and does not, in itself, change existing property rights. As part of its approval of a proposed SMP, Commission staff may

require the licensee to conduct an inventory of its project shoreline property and file a comprehensive report to identify property rights and address any encroachments on project lands and waters. To assist licensees in meeting shoreline management challenges and stakeholder interests in a manner consistent with their license obligations, Commission staff has regularly conducted technical workshops with licensees throughout the United States on a variety of shoreline management and development topics.

Commission staff also has prepared and recently updated outreach materials related to shoreline management: (1) *Guidance for Shoreline Management Planning at Hydropower Projects*, and (2) *Guidelines for Preparing Shoreline Development Applications*. These guidance documents provide information on a number of related topics to assist both licensees and stakeholders and are available on the Commission's website.

5.6 Recreation Facilities

The Commission's policy is to seek development of the recreational resources of all projects, consistent with the needs of the project area and the primary purposes of the project. While a variety of recreation facilities may exist within the project boundary of Commission-licensed hydropower projects, only those required by Commission action are considered Commission-approved, and licensees are required to specify Commission-approved recreation facilities on Form 80 (see section 3.3).

Commission-approved recreation facilities may be required by the project license, an approved recreation plan or recreation plan amendment, or any other requirements that address the provision of recreation at the project (e.g., a water quality certificate). Other recreation facilities at the project that are not necessarily required by the Commission may include state parks, municipal and/or county agency facilities, and/or non-project uses at the project. Typically, Commission-approved recreation facilities are incorporated into the project boundary, and the licensee is ultimately responsible for the operation and maintenance of the recreation facilities, or may contract with others to manage the facilities. Other non-project recreation opportunities may be located either in the project boundary or in the vicinity of the project, but the licensee is not responsible for operation and maintenance of such facilities. Finally, Commission staff collaborates with licensees to participate in workshops to discuss recreation management and compliance issues at Commission-licensed hydro projects, including the Form 80 process.

5.7 Compliance Penalties

The Commission has the authority to issue penalties to licensees who fail to comply with license requirements and other violations of Part I of the FPA, as a means to prompt the licensee to comply. These penalties are in the form of civil penalties (fines). Congress established this civil monetary penalty at \$10,000 in 1986. The Commission's civil monetary penalty authority was increased in 2002 to \$11,000 per violation per day, under section 31(c) of the FPA. Based on inflation between October 1986⁴⁶ and October 2015, which was 115.628 percent, the civil penalty authority was increased to \$21,563 per violation per day.⁴⁷ OEP staff may consult with staff in the Commission's Office of Enforcement to determine appropriate penalties.

Before the Commission can assess penalties, Commission staff notifies the licensee of the violation and provides ample and reasonable opportunity for the licensee to bring the project into compliance, determined by the seriousness of the violation and all of the consequences of non-compliance. If the Commission determines that the licensee's actions or inaction warrant a penalty, it will issue a notice of proposed penalty, to which a licensee may respond, and can then assess penalties.

5.8 Headwater Benefits

Headwater benefits are the additional electric generation that occurs at a downstream hydroelectric project resulting from regulation of river flow by upstream projects, usually by increasing or decreasing the release of water from upstream reservoirs. Commission staff performs an assessment to determine if headwater benefits occur and sets annual charges that the downstream beneficiary project is required to pay the Commission for these benefits. The Commission then distributes the funds to the owner(s) of the upstream project(s), which may include both federal agencies (for federal dams) and non-federal entities. These charges amount to an equitable part of the annual costs of interest, maintenance, and depreciation expenses for the headwater project and the Commission's costs of determining the headwater benefits charges. The owner of any downstream project that receives headwater benefits must pay these charges, unless the project has an installed generating capacity of 1.5 MW (2,000 horsepower) or less. The Commission has exempted these small projects from the requirement to pay headwater benefits charges. The benefits are determined as outlined in 18 CFR Parts 11.11 through 11.16.



⁴⁶ Electric Consumers Protection Act of 1986, Section 12(c), Pub. L. 99-495, 100 Stat 1243.

⁴⁷ See Bureau of Labor Statistics, Table 24, Historical Consumer Price Index for All Urban Consumers (CPI-U): U.S. City Average, All Items-Continued, <http://www.bls.gov/cpi/cpid1602.pdf> (last visited March 22, 2016), Statement of Administrative Policy Regarding the Process for Assessing Civil Penalties (Docket No. AD07-4-000), 117 FERC ¶ 61,317 (2006), and Civil Monetary Penalty Inflation Adjustments, (Docket No. RM16-16-000; Order No. 826), 155 FERC ¶ 61,320 (2016).

6. DAM SAFETY AND INSPECTIONS OF HYDROPOWER PROJECTS

6.1 Overview

Mission

FERC’s dam and public safety program’s mission is to protect life, health, property, and the environment of regulated projects by implementing numerous strategies including the Commission’s programs on dam safety, physical security, cyber security, and public safety.

Responsibilities

Develop and implement policies, programs, and standards for dam safety, and inspect/evaluate jurisdictional projects.

Take action to ensure that jurisdictional projects are inspected and evaluated in their design, construction, operation, and maintenance phases in order to: (1) protect life, health, property and the environment; and (2) assess project compliance with the terms and conditions of licenses and exemptions.

6.2 Regulations

The requirements and guidelines for the dam safety program come from Part 12 of the Commission’s regulations which concerns the safety of water power projects and project works under FERC jurisdiction. It is based on Order 122, issued in 1981. Part 12 describes the responsibilities of the Commission regarding dam safety and the requirements of licensees/exemptees for reporting to the Commission. Part 12 addresses, in pertinent parts, reports and recording keeping, Emergency Action Plans, inspections by Independent Consultants,⁴⁸ public safety, and other responsibilities of the applicant or licensee. Emergency Action Plans and Inspection by Independent Consultants are discussed further below. Part 12 applies not only to licensed projects, but also to existing unlicensed projects that the Commission has determined require licensing. Part 12 also applies to certain exempted projects if the Commission conditioned the exemption on compliance with any particular provisions of Part 12 (18 CFR § 12.1).

Number of Dams under FERC Dam Safety Jurisdiction and their Hazard Potential Classifications (as of December 2016)

Hazard Potential Classification	ARO	CRO	NYRO	PRO	SFRO	Total
High	183	171	190	112	159	815
Significant	14	24	104	16	27	185
Low	114	223	533	266	382	1,518
Total	311	418	827	394	568	2,518

Hazard Potential

Dams are classified as having high, significant, or low hazard potential in order for Commission staff to assign the proper level of resources (i.e., inspection frequency) and design requirements (low hazard dams do not have to meet the same strict stability requirements as high hazard dams).

This rating does not reflect the dam’s stability but rather the potential losses should the dam fail. High hazard dams are assigned that classification because their failure or mis-operation would cause a probable loss of human life. Significant hazard dams are those for which failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or other concerns. They are often located in predominantly rural or agricultural areas, but could be located in areas with population and significant infrastructure. Low hazard dams are those for which failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.⁴⁹ Dams with “high” and “significant” hazard potential classification are inspected annually by Commission staff and those assigned a “low” hazard potential classification are inspected every three years.

⁴⁸ An Independent Consultant is defined as a licensed professional engineer who has at least 10 years of experience and expertise in dam design and construction and in the investigation of the safety of existing dams.

⁴⁹ For more information about hazard potential classification, see 18 CFR § 12.31(b) and the Engineering Guidelines, Section 1-2 of chapter 1.

Pursuant to Part 12, Commission staff ensures that the water-retaining features of hydropower projects are designed, constructed, operated, and maintained using current engineering standards that meet the federal guidelines for dam safety. Commission staff inspects projects to investigate potential dam safety problems, complaints about constructing and operating a project, safety concerns related to natural disasters, and issues concerning compliance with the terms and conditions of a license. Every 5 years, a Commission-approved independent consulting engineer must inspect and evaluate projects with dams higher than 32.8 feet or with a total storage capacity of more than 2,000 acre-feet, or that are classified as high-hazard potential. The inspection reports include detailed engineering studies that provide a recommendation as to whether a dam is safe or requires a plan of action for further investigation or potential remediation.

6.3 Reporting Safety-Related Incidents

Under Part 12, Subpart B, licensees are required to report conditions affecting the safety of a project or its works to the Regional Engineer. Such reporting includes oral reports to the Regional Engineer as soon as practicable after the condition is discovered, followed by a written report that should include the cause of the condition, measures taken to prevent worsening of the condition, and a description of the damages to project works or any personal injuries. The level of detail of the written reports must be commensurate with the severity and complexity of the condition.

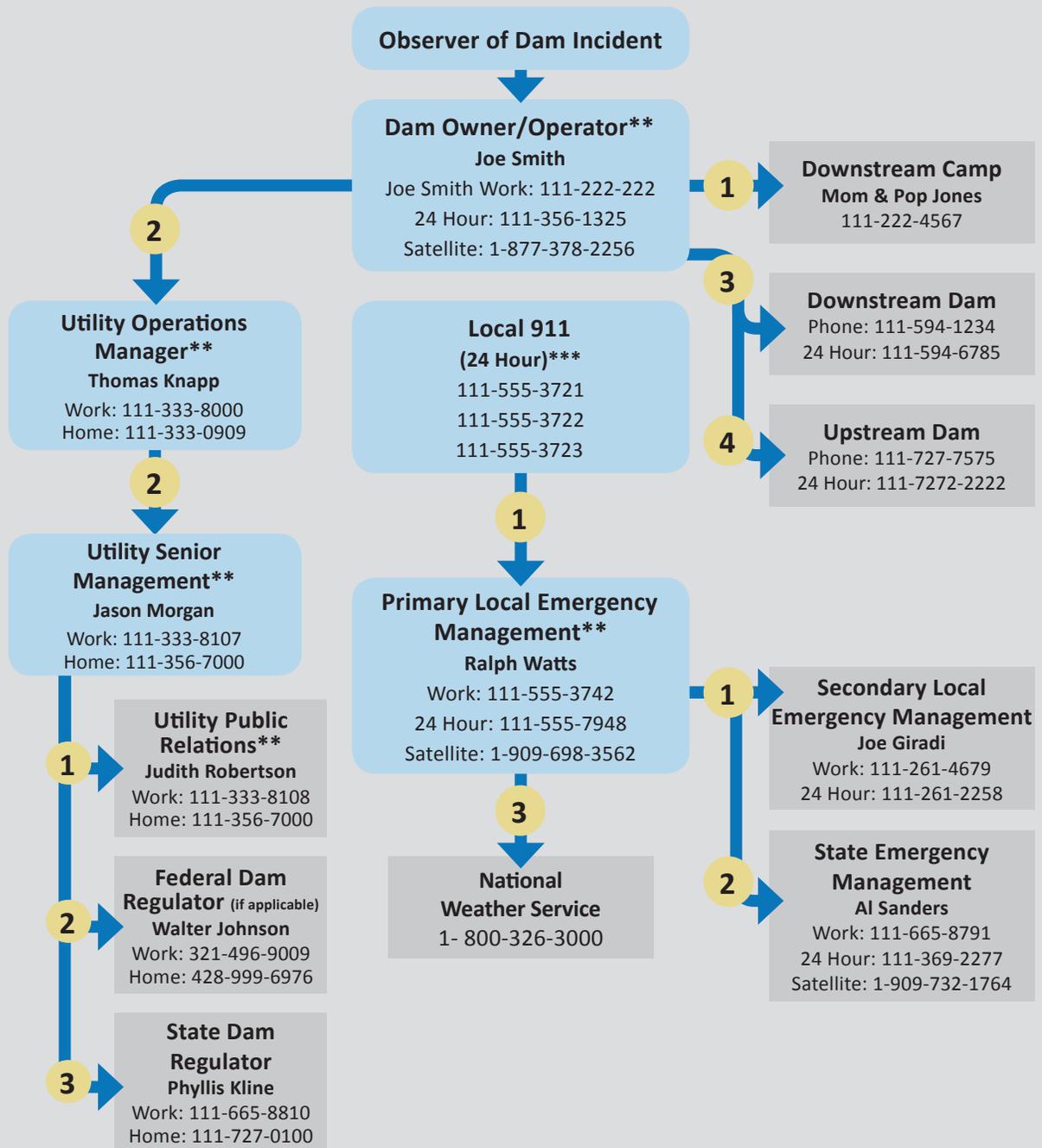
Drownings or other accidents resulting in serious injury or death must also be reported, in writing, to the Regional Engineer. The written report should include a description of the cause and location of the accident and, if appropriate, remedial actions taken or proposed to avoid or reduce the chance of a similar occurrences in the future.

6.4 Emergency Action Plans

Emergency action plans (EAPs) are required under Part 12, Subpart C, for all projects unless the applicant or licensee satisfactorily demonstrates to the appropriate Regional Engineer that no reasonably foreseeable project emergency would endanger life, health, or property. EAPs are developed in consultation and cooperation with appropriate federal, state, and local agencies responsible for public health and safety and are designed to provide early warning to upstream and downstream inhabitants, property owners, operators of water-related facilities, recreational users, and other persons in the vicinity who might be affected by a project emergency. Project emergencies in this case are defined in the regulations as an impending or actual sudden release of water at the project caused by natural disaster, accident, or failure of project works. EAPs must include: (1) instruction to project operators and attendants and other responsible personnel about the actions they are to take during a project emergency; and (2) detailed plans for notifying federal, state, and local agencies, including public safety and law enforcement bodies. Licensees must review their EAP annually to determine if the plan is adequate and update the plan if changes are necessary. The two main parts of an EAP are a notification flowchart and inundation maps. The sample notification flowchart on the following page illustrates the public notification process and shows the types of contact information required. An inundation map is a map that shows the maximum potential areal extent that the water released from a dam failure could impact. The EAP guidance includes more complex example inundation maps that may be warranted depending on the structures and hazards that are located within the inundation area.⁵⁰

⁵⁰ <https://www.ferc.gov/industries/hydropower/safety/guidelines/eap.asp>.

Example Notification Flowchart*



= call sequence

* Use this chart in coordination with Notification Contact Table for additional contact information.

** Utility personnel should refer to EAP for sample warning messages.

*** Call Dam Operator if 911 is notified by non-utility observer.

These names and numbers are for example purposes only.

As part of the EAP, each licensee must annually test the state of training and readiness of key licensee personnel and coordinate with state and federal emergency management agencies. Such testing would occur in the form of one or more of the following exercises:

EAP Seminar

An EAP seminar is an informal discussion, designed to orient participants to new or updated plans, policies, or procedures (e.g., a seminar to review a new evacuation standard operating procedure).

EAP Drill

An EAP drill tests, develops, or maintains skills in a single emergency response procedure (e.g., conducting a call-down drill of contacts listed on the notification flowchart).

EAP Tabletop Exercise

An EAP tabletop exercise involves key personnel (i.e., the licensee and EAP plan holders, including state and local emergency management officials) discussing simulated scenarios in an informal setting. Tabletop exercises are used to assess plans, policies, and procedures.

EAP Full-Scale Exercise

A full-scale EAP exercise evaluates the operational capability of all facets of the emergency management system (both licensee and state and local emergency management authorities) interactively in a stressful environment with the actual mobilization of personnel and resources. It includes field movement and deployment to demonstrate coordination and response capability.

EAP Functional Exercise

An EAP functional exercise simulates a dam failure and other specified events in a stress-induced environment with time constraints. The participants act out their actual roles in a simulated emergency. It tests participants' responses in a full simulation under real life conditions, but without a field deployment of resources.

A seminar and a drill would be conducted annually, except in a year when a tabletop, functional, or full-scale exercise is planned. A tabletop exercise is recommended at least 30 days before a functional or full-scale exercise or as required by the Regional Engineer. A functional or full-scale exercise is required every 5 years.

6.5 Independent Safety Inspections

Independent safety inspections are required under Part 12, Subpart D, for all licensed projects that have a dam that: (a) is more than 32.8 feet (10 meters) in height above the streambed (as measured in section 12.31(c)); (b) impounds a reservoir with a gross storage capacity of more than 2,000 acre-feet (2.5 million cubic meters); or (c) has a high hazard potential and is determined by the Regional Engineer or other authorized Commission representative to require inspection by an Independent Consultant under Subpart D (18 CFR § 12.30).

The inspection must include:

- due consideration of all relevant reports on the safety of the development made by or written under the direction of federal or state agencies and submitted under Commission regulations, or made by other consultants;
- physical field inspection of the project works and review and assessment of all relevant data concerning: settlement, movement, erosion, seepage, leakage, cracking, deterioration, seismicity, internal stress and hydrostatic pressures in project structures or their foundations or abutments, the functioning of foundation drains and relief wells, the stability of critical slopes adjacent to a reservoir or project works, and regional and site geological conditions; and
- specific evaluation of: the adequacy of spillways; the effects of overtopping of non-overflow structures; the structural adequacy and stability of structures under all credible loading conditions; the relevant hydrological data accumulated since the project was constructed or inspected under this subpart; the history of the performance of the project works through analysis of data from monitoring instruments; and the quality and adequacy of maintenance, surveillance, and methods of project operations for the protection of public safety (18 CFR § 12.35).

The report must include any recommendations by the independent consultant for emergency corrective measures or for new or additional monitoring instruments, periodic observations, or other methods of monitoring project works or conditions that may be required (18 CFR § 12.37).

After the initial independent safety inspection report has been approved, the licensee is required to hire an independent consultant to complete a new inspection and file a report not later than every 5 years from the date of the last report (18 CFR § 12.38).

Depending on the results of the report, Commission staff may require additional information or may require a licensee to take action to address concerns raised in the report (18 CFR § 12.39).

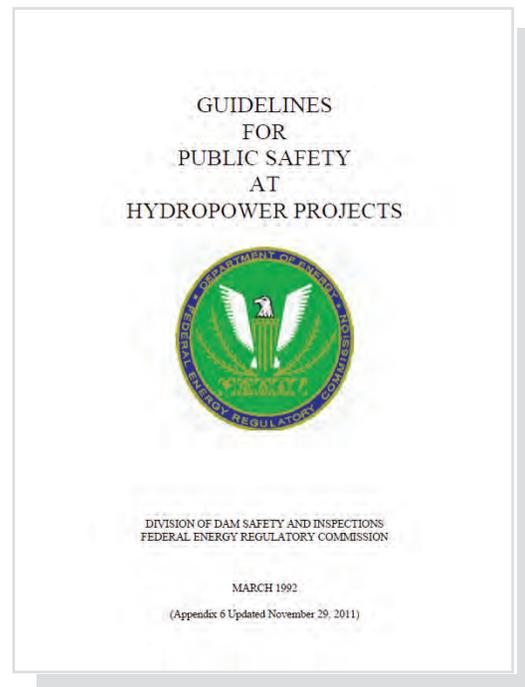
6.6 Public Safety

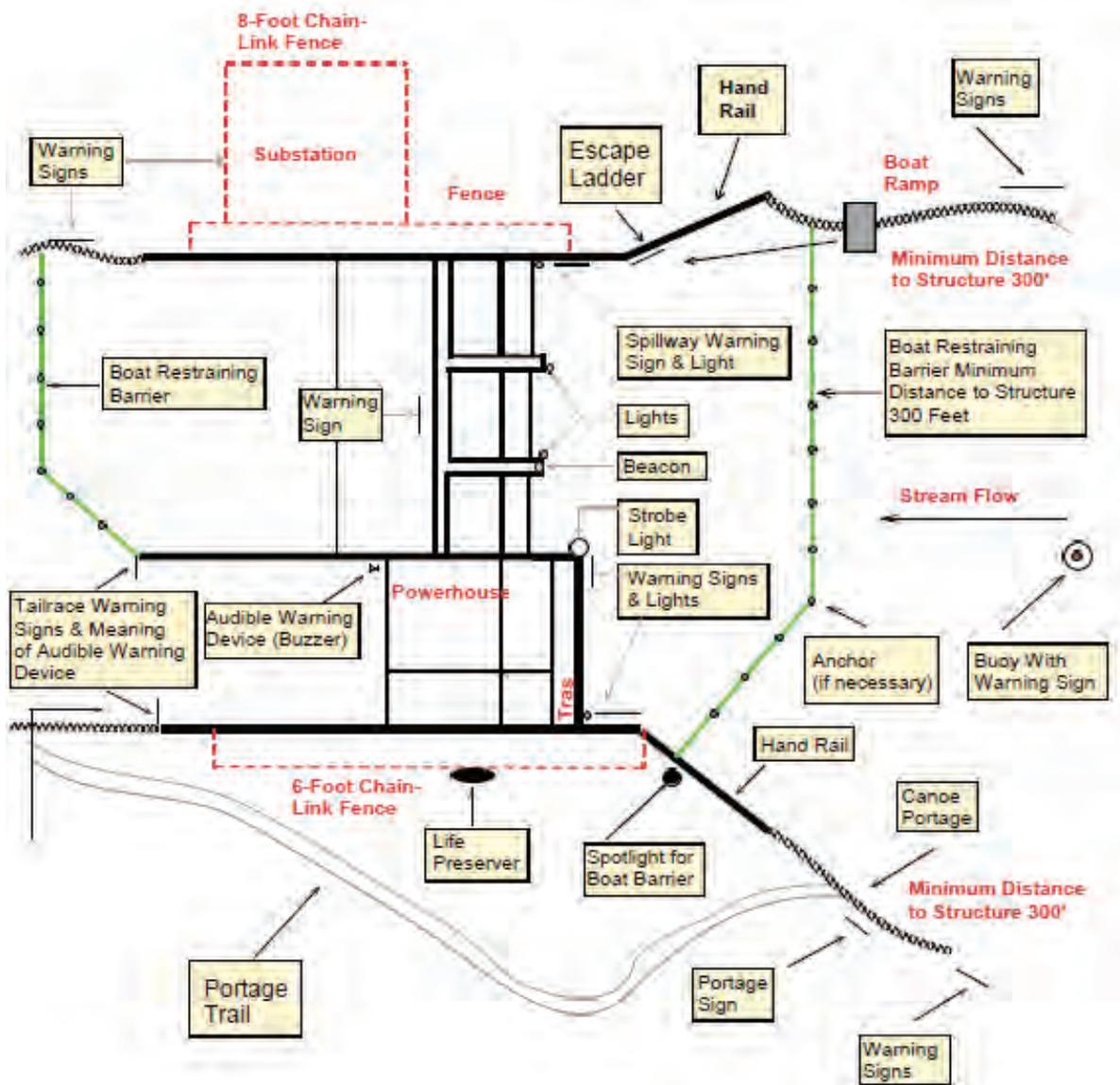
Ensuring public safety around hydropower projects is ultimately the responsibility of the project owner; however, public safety is one of the Commission's many oversight responsibilities. Part 12 Subpart E Section 12.42 of the Commission's regulations gives each Regional Engineer the authority to require licensees to install "...safety devices that may reasonably be necessary or desirable to warn the public of fluctuations in flow from the project or otherwise to protect the public in the use of the project lands and waters."

Public safety measures include: educational and informational signage, warning devices, restraining devices, escape devices, and project operating procedures. Warning devices include danger and warning signs, audible devices, lights, beacons, buoys, and verbal announcements. Restraining devices are boat barriers, fences, and trashracks. Escape devices include life preservers, safety ropes, escape nets, escape ladders, suspended cables, canoe/kayak portages, and boat ramps.

At most projects, the Commission has required owners to file public safety plans (PSPs) as a means to oversee and monitor an owner's public safety efforts. The Commission's requirement for PSPs at non-federal hydropower projects originated in 1991 following an incident where several boaters were injured or killed at a project, and questions arose regarding which public safety devices were required at the site. Since that time, the Commission has required project owners to file PSPs that (i) are not overly complex, (ii) list each existing safety device at the project, and (iii) include a schematic drawing showing the general location of each device. A schematic of a public safety plan is shown below.

The Commission has developed guidelines entitled Guidelines for Public Safety at Hydropower Projects, which is available on the Commission's website at: <https://www.ferc.gov/industries/hydropower/safety/guidelines/public-safety.pdf>.





Schematic of Typical Public Safety Devices

Commission staff reviews public safety measures during their routine dam safety inspections and during periodic environmental and public safety specific inspections of the project. From these inspections, additional actions may be required to enhance public safety at the project.

6.7 Security

The Commission also regulates physical and cyber security at hydropower projects. The Commission has developed a guidance document entitled *Security Program for Hydropower Projects*.⁵¹

The foundation for the FERC Hydropower Security Program is the three security groups (Security Groups 1, 2, and 3) which are based on potential dam hazard classification, project size, potential upstream and downstream consequences, and installed generation capacity. As a special focus of the dam safety inspections, the project engineer conducting the dam safety inspection assesses the level of security, both physical and cyber, in place at the project. Although the criteria for the Security Groupings are not published, dams with a higher potential consequences and asset vulnerability (as well as being accessible and attractive as a target) were grouped higher than those with lower potential consequences when paired with their vulnerabilities. Requirements vary depending on the assigned Security Group, but may include vulnerability assessments, security assessments, security plans, annual security compliance certification letters, and cyber and industrial control systems (e.g., supervisory control and data acquisition) security.

6.8 Engineering Guidelines

The Commission developed Engineering Guidelines for the Evaluation of Hydropower Projects to assist staff in implementing the dam safety program as well as provide information to licensees.⁵²

These guidelines provide technical guidance for the dam safety evaluation of hydropower project facilities that are included in applications for a license or exemption. The guidelines also are used to evaluate proposed modifications to dams and project facilities that are required under Part 12 of the Commissions regulations. The guidelines include chapters covering various topics on the evaluation of the safety of various types of dams and other structures- including spillway design, stability analyses, hazard potential evaluation, seismic impacts, flood loading, geotechnical and foundation explorations, and instrumentation and monitoring. These guidelines also include information on Emergency Action Plans and Independent Safety Inspections.

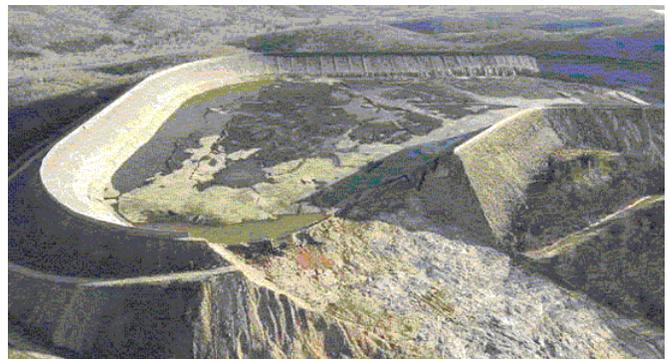
⁵¹ <https://www.ferc.gov/industries/hydropower/safety/guidelines/security.asp>.

⁵² <https://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp>.

6.9 Owners Dam Safety Program

The Owners Dam Safety Program is an important element in maintaining safe dams and preventing dam failures. Dams with owners who do not have an effective Owners Dam Safety Program represent a higher risk. Recognizing the lessons learned from recent dam failures (e.g., Teton dam – 1976, Silver Lake dam – 2003, Taum Sauk dam- 2005), Commission staff developed, and provided to owners, an Owner’s Dam Safety Self-assessment Evaluation form designed to assist dam owners in judging the effectiveness of their programs. The form is composed of questions related to the basic principles of a good dam safety program, including: acknowledgments of dam safety responsibilities, communication, clear designation of responsibility, allocation of resources to dam safety, and learning organization.

A dam safety program that is well documented, reviewed annually, and up-to-date sends a message to all affected parties up to the highest level of authority, both within and outside an owner’s organization, that dam safety is important. Recognizing that each organization is unique, an Owners Dam Safety Program should be specifically tailored to the particular situation considering the portfolio of dams, dam types, and the associated life safety and financial risks.



Taum Sauk failed dam



Taum Sauk rebuilt dam

6.10 Dam Safety Performance Monitoring Program, Potential Failure Mode Analysis, and Risk-Informed Decision Making

The licensee is required to institute a dam safety performance monitoring program. This program focuses on the licensee's surveillance and monitoring of instrumentation and equipment. The program is meant to ensure that project structures are performing properly and to identify any developing problems so they can be addressed before becoming serious dam safety problems.

The licensee of a high or significant hazard dam is also required to conduct a potential failure mode analysis (PFMA) as described in the Commission's Engineering Guidelines. A potential failure mode is the chain of events leading to an unsatisfactory performance of the dam or a portion thereof. A PFMA is an exercise to identify and assess all potential failure modes under normal operating water levels, floods, earthquakes and any other pertinent external loading conditions for the water retaining structures. The PFMA determines those potential failure modes of significance that warrant continued awareness and attention to visual observation, monitoring, and remediation as appropriate.

The Commission's 2014 to 2018 Strategic Plan had a stated objective to minimize risk to the public. One strategy to achieve this goal has been identified as incorporating risk-informed decision-making (RIDM) into the Commission's dam safety program. RIDM is a method of dam safety evaluation that uses the likelihood of loading, dam fragility, and consequences of failure to estimate risk. Commission staff developed draft guidelines on RIDM, convened workshops with licensees and consultants on RIDM procedures, and is implementing a RIDM pilot program at several projects.

6.11 Dam Safety Remediation

The Commission may require a licensee to perform modifications to their dams to correct deficiencies found in the design or if conditions are discovered that may affect dam safety. Deficiencies can be identified by an owner, operator, FERC inspector, or Independent Consultant either through a site inspection, review of instrumentation data, and/or engineering analysis. For major and complex construction, the Commission requires licensees to retain the services of a Board of Consultants to oversee investigations and the design and construction of remedial measures needed to correct the deficiency.⁵³ Since 1981, the Commission has directed the completion of about 600 dam safety modifications at a cost of about \$1.5 billion, with costs ranging from about \$2,000 to \$460 million (Saluda dam in South Carolina – FERC Project Number 516). Currently there are over 100 dams that do or may require some type of dam safety remediation. It is anticipated that the majority of dam safety fixes will either be completed or under construction over the next few years. The remaining ones are those that require additional analyses to determine the need for remediation.

The number of new projects at existing dams is increasing and the dam safety program has oversight over the construction of new powerhouses and facilities at existing dams. While the number of new dams under construction diminishes, and the number of existing dams requiring upgrades decreases, the next era of the dam safety program will concentrate more on performance monitoring coupled with potential failure modes identification to make certain that the dams are performing properly and new construction is done appropriately. The dam safety program will continue to identify any developing problems so they can be addressed before they become serious dam safety problems.

⁵³ A Board of Consultants is approved by the Director, Division of Dam Safety and Inspections, to review the design, plans and specifications, and construction of the project. The Board is expected to assess the construction inspection program, construction procedures, and progress, planned instrumentation, the filling procedures for the reservoir, and plans for surveillance during initial filling of the reservoir.

7. PUBLIC RESOURCES AND OUTREACH

Public involvement is an important part of authorizing hydropower projects that are best adapted to comprehensive improvement/development of U.S. waterways. As a result, the Commission provides significant opportunities for the public and other stakeholders (e.g., state and federal agencies, Indian tribes, local landowners, and NGOs) participation in licensing, exemption, and post-licensing proceedings with mandated consultation opportunities, scoping, comment periods, and public meetings, as described in chapters 4 and 5. Commission staff encourages licensees, resource agencies, and other stakeholders to contact staff with questions or concerns regarding any aspect of a project. In order to facilitate stakeholder involvement, the Commission has developed numerous tools and guidelines to provide education about the many aspects of the Commission’s Hydropower Program and to make it easier for stakeholders to provide and access information about projects under the Commission’s jurisdiction.

7.1 Electronic Systems

An important tool available to anyone with internet access is FERC Online, the Commission’s portal to documents and dockets. All services are free and available via any internet connection (no installation required). The electronic systems available on FERC Online include:

- **www.ferc.gov** – The overall FERC website that provides comprehensive information about FERC (all industries and resources) and links to all electronic systems available.
- **eLibrary** – A free, centralized, searchable records information system that contains more than 20 years of documents submitted to and issued by FERC; use project number, docket number, and date ranges to narrow search.

- **eRegister** – Used to create an account with FERC Online; create a username and password to access eFiling, eSubscription, and eService.
- **eFiling** – Used to file comments, study requests, interventions, etc. electronically, and other public and non-public documents; faster than mailing, secure, reduced cost and paper use.
- **eSubscription** – Receive automatic email notification of issuances and filings for projects; subscribe by project or docket number, and manage individual subscriptions.
- **eService** – Method by which intervening parties receive Commission issuances; intervenors must be eRegistered, and eRegistered users can access the service list to fulfill their service obligation.

The following are helpful links to the FERC electronic systems described above.

- Guide to Electronic Information at FERC: <http://www.ferc.gov/docs-filing/elec-info-guide.pdf>
- Hydropower Filing Guide: <http://www.ferc.gov/industries/hydropower/safety/guidelines/filing-guide.pdf>
- eRegister User guide: <http://www.ferc.gov/docs-filing/eregister-user-guide.pdf>
- eFiling User guide: <http://www.ferc.gov/docs-filing/efiling-user-guide.pdf>
- How to Intervene: <http://www.ferc.gov/help/how-to/intervene.asp>
- Ex Parte: <https://www.ferc.gov/legal/maj-ord-reg/land-docs/exparte.asp>
- eService User guide: <http://www.ferc.gov/docs-filing/eservice-user-guide.pdf>



7.2 Outreach

Outreach activities with licensees and stakeholders are an important opportunity to hear all applicable views and opinions, educate parties about the licensing process and all it entails, and identify unforeseen problems. This may include evaluation of projects on site with the licensee and other stakeholders, or participation by Commission staff in both industry and environmental conferences and workshops that allow both industry and environmental (agency) stakeholders to gain a better understanding of the Commission's regulatory program.

One of the most important periods for public and other stakeholder involvement in Commission regulatory activities is during the initial and subsequent licensing of a hydroelectric project. As described in Section 4.3, all licensing processes used by the Commission (the ILP, ALP, and TLP) have significant opportunities for stakeholder participation. Stakeholder participation is also available for other Commission activities, including preliminary permits, license amendments, exemptions, preparation of NEPA documents (EAs and EISs), and issuances of proposed regulations. The Commission has a guide that provides additional information on the licensing process and how the public can participate in the licensing process (Hydropower Licensing—Get Involved. A Guide for the Public), available on the Commission's website. Other sources of information on Commission activities and the opportunities for stakeholder participation include the following handbooks and publications:



1. Handbook for Hydroelectric Project Licensing
www.ferc.gov/industries/hydropower/gen-info/handbooks/licensing_handbook.pdf
2. Hydroelectric Project Handbook For Filings Other Than Licenses And Exemptions
http://www.ferc.gov/industries/hydropower/gen-info/handbooks/post_licensing_handbook.pdf
3. Compliance Handbook
www.ferc.gov/industries/hydropower/gen-info/handbooks/compliance_handbook.pdf
4. Information for Citizens
www.ferc.gov/for-citizens/for-citizens.asp



8. GLOSSARY

Arch dam: An arch dam is similar to a gravity dam but thinner, and it curves upstream in a narrowing curve that directs the water pressure against the shoreline (typically canyon rock walls), providing the force to compress and maintain the strength of the dam.

Area of Potential Effect (APE): According to the Advisory Council on Historic Preservation’s regulations, the APE is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.”

Baseload power: Baseload power is the electrical power needed to satisfy minimum demand on an electrical grid. That demand is called the baseload requirement and is the minimum level of demand over 24 hours. Baseload power is typically provided by thermal and other power plants that operate continuously.

Black-start capabilities: Black-start capability is the capability to restore an electric power station or a part of an electric grid to operation without relying on the external transmission network. Normally, the electric power used within the plant is provided from the station’s own generators.

Bypassed reach: A bypassed reach is the stretch of river from which water is diverted into a canal or penstock leading to the powerhouse, where it is used for generation and then returned to the river.

Canal: A man-made open channel for conveying water typically from a reservoir to a powerhouse.

Commerce Clause: The Commerce Clause of the U.S. Constitution (Article I, Section 8, Clause 3) gives Congress power to regulate commerce with foreign nations and among the states and with Indian tribes.

Critical Energy Infrastructure Information (CEII): Specific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure (physical or virtual) that:

1. Relates details about the production, generation, transmission, or distribution of energy;
2. Could be useful to a person planning an attack on critical infrastructure;

3. Is exempt from mandatory disclosure under the Freedom of Information Act; and
4. Gives strategic information beyond the location of the critical infrastructure.

Diadromous fish: Diadromous fish include anadromous species, which spawn in freshwater and reside in the ocean, and catadromous species, which spawn in the ocean and reside in freshwater.

Draft tube: A draft tube is a water conduit that maintains a flow of water from the turbine outlet to the downstream water level.

EAP seminar: An EAP seminar is an informal discussion, designed to orient participants to new or updated plans, policies, or procedures (e.g., a seminar to review a new Evacuation Standard Operating Procedure).

EAP drill: An EAP drill tests, develops, or maintains skills in a single emergency response procedure (e.g., conducting a call-down drill of contacts listed on the notification flowchart).

EAP full-scale exercise: A full-scale EAP exercise evaluates the operational capability of all facets of the emergency management system (both licensee and state and local emergency management authorities) interactively in a stressful environment with the actual mobilization of personnel and resources. It includes field movement and deployment to demonstrate coordination and response capability.

EAP functional exercise: An EAP functional exercise simulates a dam failure and other specified events in a stress-induced environment with time constraints. The participants act out their actual roles in a simulated emergency. It tests participants’ responses in a full simulation under real life conditions, but without a field deployment of resources.

EAP tabletop exercise: An EAP tabletop exercise involves key personnel (i.e., the licensee and EAP plan holders, including state and local emergency management officials) discussing simulated scenarios in an informal setting. Tabletop exercises are used to assess plans, policies, and procedures.

eLibrary: eLibrary is a database of documents that have been issued by or submitted to the Federal Energy Regulatory Commission that is accessed on the Commission's website, www.ferc.gov. This database is accessible to the public, but access to some documents may be limited if labeled as privileged or CEII. Privileged or CEII materials may be requested using the process at <https://www.ferc.gov/legal/ceii-foia.asp>.

Embankment dam: Massive dam created by the placement and compaction of a complex semi-plastic mound of various compositions of soil, sand, clay and/or rock, with a typically dense impervious core.

Essential fish habitat: Under the Magnuson-Stevens Fishery Conservation and Management Act, EFH applies to federally managed species. EFH includes all types of aquatic habitat where these managed fish spawn, breed, feed, or grow to maturity.

Exemption: An exemption is a small hydroelectric project having limited environmental impacts and meeting certain criteria so that it is exempt from licensing under Part I of the FPA. Exemptions are issued in perpetuity, and include mandatory environmental terms and conditions prescribed by state and federal fish and wildlife agencies.

Flume: A man-made structure for conveying water in the form of an open, declined gravity chute with walls that are raised above the surrounding terrain.

Gate: A structure, typically on a dam or canal, that allows passage of water when open.

Generator: A device that converts the rotational energy from a turbine to electrical energy.

Gravity dam: Constructed from concrete or stone masonry and designed to hold back water by primarily using the weight of the dam itself to resist the horizontal pressure of water pushing against it.

Head: Head is the difference between the water surface elevations upstream (the reservoir) and downstream of a project (the tailrace), providing the energy for the falling water.

Intervenor (or motion to intervene): Pursuant to 18 CFR §385.214, any stakeholder may file a "motion to intervene," and become an intervenor in a Commission proceeding for a project, meaning an official party to the proceeding who is entitled to receive a copy of any filing made on the project by any other party, including the Commission. Intervenor must also serve any filings with all other parties to the proceeding.

An intervenor has the right to seek rehearing of a license order and to appeal the Commission's final decision to the appropriate federal court. Stakeholders may also file a "motion to intervene, in opposition," meaning that the intervening party is opposed to licensing the project.

Littoral habitat: Wetted habitat that is close to the shoreline of a water body.

New license: A new license (relicense) is issued for an existing hydroelectric project that is subject to sections 14 and 15 of the FPA. License terms (of 30 to 50 years) are based on the amount of redevelopment, new construction, new capacity, or environmental mitigation, and other factors such as coordination of license terms for multiple projects in a river basin.

Original license: An original hydropower license authorizes a licensee to construct and operate a new hydroelectric project. An original license is granted for a period of up to 50 years.

Peaking project: Project in which water can be stored in a reservoir until needed, and then released through turbines to generate power to help supply the peakload demand.

Penstock: An enclosed pipe-like structure that typically conveys water directly from a reservoir to a powerhouse.

Powerhouse: The building that houses the project's turbines/generating units.

Preliminary permit: A preliminary permit authorizes a permittee for a hydroelectric project to study a project site for a 3-year period, with the option to extend the permit for an additional 2 years, if the Commission finds that the permittee has carried out activities under the permit in good faith and with reasonable diligence during the first 3 years of the permit. During this period, the permittee has priority for that site over other potential license applicants.

Privileged material: Materials that customarily are treated by a party as sensitive or proprietary and are not available to the public.

Public safety plan: A public safety plan is a plan that ensures that public safety is protected in the vicinity of a project, and at a minimum, includes a listing of each existing safety device at a project and a schematic drawing showing the general location of each device. All safety devices, including fences, signs, boat barriers, buoys, log booms, alarms, illumination and beacon lights are listed and shown on the drawing. Additional information, such as height and type of fences, size and type of boat barriers, distance of barriers from spillways and intakes, sign wording, and type and schedule of alarms are also provided.

Recommendations, prescriptions, and terms and conditions:

Upon notice by the Commission that a project is ready for environmental analysis, agencies and other stakeholders submit recommendations, prescriptions, and terms and conditions that these stakeholders believe should become conditions of any license that may be issued. Recommendations are not mandatory, but prescriptions and some agency conditions are mandatory and must be included in any license issued.

Rehearing: If any intervenor is harmed by the Commission's final order, that intervenor may file a request for rehearing, which is a request that the Commission reconsider its decision. If rehearing is granted, Commission staff reexamines the record, to determine whether the final Commission decision should be affirmed or revised.

Riparian habitat: Terrestrial habitat found along the banks of a river or stream.

Rockfill dam: A type of embankment dam constructed of compacted free-draining granular earth typically with an impervious zone, using a high percentage of large particles (rock).

Roller compacted concrete (RCC) dam: A gravity dam constructed using a mix of cement/fly ash, water, sand, aggregate and common additives, but containing less water, compacted by vibratory rollers.

Runner: A runner is the rotating part of the turbine that converts the energy of falling water into mechanical energy.

Run-of-river project: A type of hydropower project in which limited storage capacity is available and water is released at roughly the same rate as the natural flow of the river.

Scroll case: A scroll case is a spiral-shaped steel intake guiding the flow into the wicket gates located just prior to the turbine.

Slab and buttress dam: Reinforced concrete buttresses proportioned to transfer the water load to the foundation rock through individual buttress footings, using the weight of the impounding water and the weight of the structure to provide resistance against sliding and overturning.

Stakeholders: State and federal agencies, Indian tribes, local landowners, the general public, and NGOs.

Subsequent license: A subsequent license (also a relicense) authorizes a licensee to continue to operate an existing minor project not subject to sections 14 and 15 of the FPA. License terms (of 30 to 50 years) are based on the amount of redevelopment, new construction, new capacity, or environmental mitigation, and other factors such as coordination of license terms for multiple projects in a river basin.

Take: Pursuant to Endangered Species Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct, for any federally listed threatened or endangered species.

Transmission lines: Those lines that convey electricity to the interconnected grid (referred to as "primary lines").

Transmission yards: Electrical substations that receive power generated by a project and increase the voltage for transmission to the power grid.

Turbine: A machine that produces continuous power in which a wheel or runner revolves, pushed by a fast-moving flow of water.

Undertaking: According to the Advisory Council on Historic Preservation's regulations, an "undertaking" means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including: (1) those carried out by or on behalf of the federal agency; (2) those carried out with federal financial assistance; (3) those requiring a federal permit, license, or approval; and (4) those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency.

Wicket gates: Wicket gates are adjustable elements that control the flow of water to the turbine.

9. LIST OF ACRONYMS AND ABBREVIATIONS

AIR	additional information request
ARO	Atlanta Regional Office
ALP	Alternative Licensing Process
BA	biological assessment
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CRO	Chicago Regional Office
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
Dam Safety and Inspections	Division of Dam Safety and Inspections
EA	environmental assessment
EAP	emergency action plan
EFH	essential fish habitat
EIS	environmental impact statement
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FWCA	Fish and Wildlife Coordination Act
FWS	U.S. Fish and Wildlife Service
HPMP	Historic Properties Management Plan
Hydropower Administration	Division of Hydropower Administration and Compliance
Hydropower Licensing	Division of Hydropower Licensing
ILP	Integrated Licensing Process
LNG	liquefied natural gas
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MW	megawatt
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
Northwest Council	Pacific Northwest Planning Council
NYRO	New York Regional Office
OEP	Office of Energy Projects
PAD	preliminary application document
PFMA	potential failure mode analysis
PRO	Portland Regional Office
RIDM	risk-informed decision-making
SFRO	San Francisco Regional Office
THPO	Tribal Historic Preservation Officer
TLP	Traditional Licensing Process



HYDROPOWER PRIMER

A Handbook of Hydropower Basics

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