



# Regulatory Approaches for Adding Capacity to Existing Hydropower Facilities

Aaron Levine, Taylor Curtis, and  
Borna Kazerooni  
*National Renewable Energy Laboratory*

**NREL is a national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy  
Operated by the Alliance for Sustainable Energy, LLC**

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

**Technical Report**  
NREL/TP-6A20-70121  
December 2017

Contract No. DE-AC36-08GO28308



# Regulatory Approaches for Adding Capacity to Existing Hydropower Facilities

Aaron Levine, Taylor Curtis, and  
Borna Kazerooni  
*National Renewable Energy Laboratory*

Prepared under Task No. WAPP.10344.01.01.01

**NREL is a national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy  
Operated by the Alliance for Sustainable Energy, LLC**

This report is available at no cost from the National Renewable Energy  
Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

National Renewable Energy Laboratory  
15013 Denver West Parkway  
Golden, CO 80401  
303-275-3000 • [www.nrel.gov](http://www.nrel.gov)

**Technical Report**  
NREL/TP-6A20-70121  
October 2017

Contract No. DE-AC36-08GO28308

## NOTICE

This report was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

Available electronically at SciTech Connect <http://www.osti.gov/scitech>

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy  
Office of Scientific and Technical Information  
P.O. Box 62  
Oak Ridge, TN 37831-0062  
OSTI <http://www.osti.gov>  
Phone: 865.576.8401  
Fax: 865.576.5728  
Email: [reports@osti.gov](mailto:reports@osti.gov)

Available for sale to the public, in paper, from:

U.S. Department of Commerce  
National Technical Information Service  
5301 Shawnee Road  
Alexandria, VA 22312  
NTIS <http://www.ntis.gov>  
Phone: 800.553.6847 or 703.605.6000  
Fax: 703.605.6900  
Email: [orders@ntis.gov](mailto:orders@ntis.gov)

*Cover Photos by Dennis Schroeder: (left to right) NREL 26173, NREL 18302, NREL 19758, NREL 29642, NREL 19795.*

NREL prints on paper that contains recycled content.

## Acknowledgments

The authors gratefully acknowledge the EERE Water Power Technologies Office for its funding support. We also thank the following reviewers for their time and expertise: Corey Vezina and Tim Welch, U.S. Department of Energy, and Elise DeGeorge, Emily Newes, Dave Mooney, and Kathryn Ruckman (editor), National Renewable Energy Laboratory.

## Executive Summary

In 2015, hydroelectric generation accounted for more than 6% of total net electricity generation in the United States and 46% of electricity generation from all renewables. The United States has considerable hydroelectric potential beyond what is already being developed. Nearly 7 GW of this potential is found by adding capacity to existing hydropower facilities. To optimize the value of hydroelectric generation, the U.S. Department of Energy's *Hydropower Vision Study* highlights the importance of adding capacity to existing facilities. This report provides strategic approaches and considerations for Federal Energy Regulatory Commission licensed and exempt hydropower facilities seeking to increase generation capacity, which may include increases from efficiency upgrades. The regulatory approaches reviewed for this report include capacity and non-capacity amendments, adding capacity during relicensing, and adding capacity when converting a license to a 10-MW exemption.

# Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>1</b>
<b>2</b>	<b>Strategies to Adding Capacity to Existing Hydropower Facilities .....</b>	<b>3</b>
2.1	FERC License or Exemption Amendment Process.....	3
2.2	Adding Capacity or Efficiency Upgrades at the Time of Relicensing .....	7
2.3	Adding Capacity by Converting a License to a 10-MW Exemption.....	12
<b>3</b>	<b>Comparison of Approaches to Add Capacity to Existing Hydropower Facilities.....</b>	<b>15</b>
	<b>References.....</b>	<b>17</b>

# 1 Introduction

State renewable portfolio standards (RPSs)<sup>1</sup> and recent federal initiatives,<sup>2</sup> such as the 2013 Hydropower Regulatory Efficiency Act (HREA) encourage the development of small hydroelectric generation. Twenty-nine states and the District of Columbia allow some form of hydroelectric generation in their RPSs (DSIRE 2017b). States with aggressive RPSs such as Vermont and Hawaii encourage hydroelectric generation from new and existing facilities. Hawaii<sup>3</sup> and Vermont<sup>4</sup> both require that the states' retail electricity suppliers obtain 100% of their annual electricity from renewable sources, which includes any size hydropower facility existing or new, by 2045 and 2032, respectively. In addition, federal legislation enacted in the 113<sup>th</sup> Congress, including HREA, the U.S. Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act (Rural Jobs Act), and the Consolidated Appropriations Act of 2014, encouraged development of hydroelectric generation.

These policy trends, coupled with an aging hydropower fleet, have led to an increase of capacity additions to existing hydropower facilities (U.S. Department of Energy [DOE] 2016). In 2016, the hydropower fleet in the United States produced more than 6% (approximately 265,829 gigawatt-hours [GWh]) of the total net electricity generation (Martínez, Johnson, and O'Connor 2017.) From 2005 to 2013, capacity additions, including those from efficiency upgrades, accounted for 86% (1,638 MW) of the net installed capacity of hydroelectric generation (DOE 2016).

To optimize the value of hydroelectric generation, DOE's *Hydropower Vision* study modeled a scenario identifying 49 gigawatts (GW) of new deployable hydroelectric potential in the United States by 2050. The study estimates that nearly 7 GW of that hydroelectric potential can come from capacity additions and efficiency upgrades to existing facilities by 2050. DOE anticipates the development of this generation potential, from existing facilities, will help ensure hydropower's contributions towards meeting the nation's energy needs, maintaining national infrastructure, and improving energy security (DOE 2016).

The majority of existing hydropower facilities have reached a median age of 50 years and capital investment toward upgrading the aging fleet is consistently taking place. Between 2005 and 2015, the hydropower industry invested \$6 billion in refurbishments, replacements, and upgrades to existing facilities (DOE 2015; DOE 2016). This trend will likely continue as more than 500

---

<sup>1</sup> As of February 2017, 29 states and the District of Columbia allow some form of small hydroelectric generation in their RPSs. DSIRE, *Renewable Portfolio Standard-Hydroelectric Map*, available at <http://programs.dsireusa.org/system/program/maps> (last visited Feb. 16, 2017).

<sup>2</sup> Hydropower Regulatory Efficiency Act of 2013, PL 113-23, 127 Stat. 493 (Aug. 9, 2013) (codified in scattered sections of 16 U.S.C.) (expands the category of hydroelectric facilities that qualify for an exemption, promotes conduit hydropower projects, and requires FERC to examine the feasibility of a two-year licensing process), Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act, PL 113-24, 127 Stat. 498 (Aug. 9, 2013) (authorizes nonfederal hydropower development at all Bureau of Reclamation sites, and provides a preference for existing project sponsors in developing hydropower), Consolidated and Further Continuing Appropriations Act, 2013, PL 113-6, 127 Stat. 198 (Mar. 26, 2012) (providing new funding for the DOE to expand hydropower development at existing dams, as authorized under the Energy Policy Act of 2005).

<sup>3</sup> HAW. REV. STAT. §§ 269-91 – 269-96 (2015); H.B. 623, 28<sup>th</sup> Leg. (HI. 2015) (establishing a RPS which allows any “falling water”).

<sup>4</sup> 2015 Vt. Acts & Resolves 56 (establishing a RPS which allows any size existing or new hydroelectric facility).

licensed facilities are up for relicensing through 2030 (FERC 2016a; FERC 2016b). Oftentimes these upgrades change the nameplate capacity of installed generation from that stated in the authorized Federal Energy Regulatory Commission (FERC) license or exemption. These upgrades and expansions to existing facilities can yield increases in capacity between 10% and 30% at a given plant (DOE 2016).

Adding capacity or efficiency upgrades to an existing hydropower facility has the potential to be a time- and resource-intensive regulatory process requiring federal, state, and public review. Often, FERC approves capacity additions or efficiency upgrades through relicensing or a license/exemption amendment. In addition, certain FERC-licensed facilities may also consider adding capacity by converting a FERC license to an exemption since HREA amended Part I of the Federal Power Act (FPA) to expand the category of facilities that qualify for an exemption.

This report discusses four strategic approaches and considerations for adding capacity or making efficiency upgrades to existing hydropower facilities, including: (1) a license/exemption capacity amendment, (2) a license/exemption non-capacity amendment, (3) relicensing, and (4) converting a license to a 10-MW exemption.

Section 2 discusses strategies for adding capacity to existing projects, including

- FERC license and exemption capacity and non-capacity amendments
- FERC relicensing capacity additions
- Converting a FERC license to an exemption with added capacity.

Section 3 compares the benefits and challenges associated with each of the options for adding capacity to existing projects discussed in Section 2.



## 2 Strategies to Adding Capacity to Existing Hydropower Facilities

This report discusses four main strategies to consider when adding capacity or efficiency upgrades to an existing hydropower facility. Traditionally, existing facilities add capacity or efficiency upgrades through the license/exemption amendment process or at the time of relicensing; however, a more recent method may include converting a license to a 10-MW exemption.

The strategies available to add capacity to an existing facility will depend largely on the type of facility, the facility's size, its location, and the amount of additional capacity. Facilities adding a large amount of capacity will likely do so at the time of relicensing or through a capacity amendment, while certain licensed facilities adding a smaller amount of capacity may find it advantageous to convert a license to an exemption or add capacity through a non-capacity amendment.

### 2.1 FERC License or Exemption Amendment Process

This section outlines the different types of FERC license/exemption amendments, provides example case studies, and discusses key considerations for the amendment process. The Division of Hydropower Administration and Compliance (DHAC), a division of FERC, is responsible for conducting the review process for amendments to licenses and exemptions. An amendment is generally required for any change to a previously authorized FERC licensed or exempt facility.

#### 2.1.1 Capacity v. Non-Capacity Amendment

FERC commonly classifies license and exemption amendments as either a “capacity amendment” or a “non-capacity amendment.” FERC defines a capacity amendment as a change in a hydropower facility that involves additional capacity not previously authorized and that would:

- Increase the actual or proposed total installed capacity<sup>5</sup> of the project, and
- Result in an increase in the maximum hydraulic capacity<sup>6</sup> of the project of 15% or more, and
- Result in an increase in the installed nameplate capacity<sup>7</sup> of 2 MW or more (18 C.F.R. § 4.201(b)).

FERC considers capacity changes that do not meet the above criteria to be non-capacity amendments (18 C.F.R § 4.201[b]).

---

<sup>5</sup> The installed capacity is the sum of the nameplate capacity of all the generating units in a hydroelectric project. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

<sup>6</sup> The maximum hydraulic capacity is the maximum water flow rate that can be discharged simultaneously through all the project turbines for generation at any time. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

<sup>7</sup> The nameplate capacity of a generating unit is the manufacturer's rating of the generator as printed on the unit. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

The chief differences between capacity and non-capacity amendments are the consultation requirements and the required studies and exhibits. Most non-capacity-related amendments only require a single stage of consultation with relevant resource agencies, Indian tribes, and the public as well as a comment period (18 C.F.R. § 4.38[a][7]). Capacity-related amendments and certain non-capacity related amendments require a potentially time- and resource-intensive three-stage consultation process. Non-capacity changes that require a three-step consultation include:

- “The construction of a new dam or diversion in a location where there is no existing dam or diversion
- Any repair, modification, or reconstruction of an existing dam that would result in a significant change in the normal maximum surface area or elevation of an existing impoundment
- The addition of new water power turbines other than to replace existing turbines” (18 C.F.R. § 4.3[(a)[4][v]).

Nearly all capacity and non-capacity amendments require pre-filing consultation and compliance with the National Environmental Policy Act (NEPA), section 401 of the Clean Water Act (CWA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and the Wild and Scenic Rivers Act (WSRA) (FERC 2015).

### **2.1.2 Examples of Capacity and Non-Capacity Amendments**

**Capacity Amendment:** In December 2005, FERC issued a license to Black Bear Hydro Partners for the Orono project located on the Penobscot River in Penobscot, Maine. The Orono project originally consisted of an existing 1,178-foot-long by 15-foot-high dam with a 320-foot-long spillway, a 2.3 mile-long reservoir, an 866-foot-long concrete penstock, a single powerhouse containing four generating units with a total installed capacity of 2.78 MW, and a 325-foot-long, 2.4 kV transmission line (Orono Hydroelectric Project, 140 FERC ¶ 62,194 [2012]).

In May 2011, Black Bear filed an application for a capacity amendment for the Orono project to construct a second powerhouse with a new 12.5 kV, 600-foot-long overhead transmission line to connect the new powerhouse to the existing distribution system and to raise the impoundment by .6 feet. Black Bear sought to add 3.738 MW and increase the maximum hydraulic capacity by 342 cubic feet per second (cfs) (an increase of roughly 20%) to the existing 2.78 MW hydropower facility with an original maximum hydraulic capacity of 1,740 cfs (resulting in a total capacity of 6.518 MW and a maximum hydraulic capacity of 2082 cfs). In addition, Black Bear requested a 3-year extension to the license term to coincide with Black Bear’s nearby Stillwater project relicense. Black Bear supplemented the application seven times, as late as June 2012, and FERC issued the order approving the application in September 2012, 16 months after it initially received the application (Orono Hydroelectric Project, 140 FERC ¶ 62,194 [2012]).

**Non-capacity Amendment:** In September 2000, FERC issued a new license for the Ryan Development (part of the Missouri-Madison Hydropower Project) in several counties within Montana. The Ryan Development, as amended, consisted of a 1,465-foot-long by 82-foot-high curved concrete gravity dam with six 12-foot 8-inch diameter and 327-foot-long riveted steel penstocks, a powerhouse with six turbine-generator units with a total installed capacity of 63

MW, and a 4.6 mile-long 100 kV transmission line (Missouri-Madison Hydropower Project, 158 FERC ¶ 62,215 [2017]).

In December 2016, Northwest Corporation filed an application for a non-capacity amendment for the Ryan Development within the Missouri-Madison project to replace three turbines (units 1, 3, and 6) with three new stainless steel turbines and rewind generator units 3 and 6. Northwest Corporation sought to add 3 MW and increase the maximum hydraulic capacity by 170 cfs (an increase of roughly 2.8%) to the existing 63-MW hydropower facility at the Ryan Development, which had an original maximum hydraulic capacity of 6020 cfs (resulting in a total capacity of 66 MW and a maximum hydraulic capacity of 6190 cfs). The proposed upgrades sought to increase the total capacity for the Missouri-Madison project from 334.29 MW to 337.29 MW. Northwest supplemented the application one time in March 2017. FERC received no comments from federal or state resource agencies and issued the order approving the application in March 2017, 3 months after it initially received the application (Missouri-Madison Hydropower Project, 158 FERC ¶ 62,215 [2017]).

### 2.1.3 Key Considerations and Strategies

This section outlines some of the key considerations of the capacity and non-capacity amendment process.

**Pre-filing consultation can be a time-intensive process.** FERC recommends that nearly all capacity and non-capacity amendment applications conduct pre-filing consultation, particularly those applications associated with projects that require a state-environmental-related approval (FERC 2015). Before filing an amendment application, the applicant should consult with relevant federal, state, and interstate resource agencies, Indian tribes, and the public regarding the proposed amendment.<sup>8</sup>

**Consideration:** *If an applicant does not conduct pre-filing consultation and FERC determines that resource agencies or tribes should have been consulted, FERC will suspend the review and require the applicant to conduct the consultation before continuing review of the amendment request.*

**NEPA review can be a resource- and time- intensive process.** Capacity and non-capacity amendment applications may undergo NEPA review (FERC 2015). If required, FERC prepares and issues an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that examines alternatives and the likely effects to the human environment from the proposed amendment (FERC 2015). The applicant must conduct numerous studies and surveys before FERC can prepare an EA or EIS.<sup>9</sup> As part of this analysis, FERC must solicit and respond to

<sup>8</sup> The relevant federal, state, and interstate resource agencies include, but are not limited to, the National Marine Fisheries Service, the United States Fish and Wildlife Service, the National Park Service, the United States Environmental Protection Agency, the federal agency administering any federal lands or facilities utilized or occupied by the project, the appropriate state fish and wildlife agencies, the appropriate state water resource management agencies, and the certifying agency under section 401(a)(1) of the Clean Water Act, 33 U.S.C. § 1341(c)(1). 18 C.F.R. § 4.38(a)(1); 18 C.F.R. § 4.96(b); 18 § C.F.R. § 4.104(b).

<sup>9</sup> If the EA suggests that the proposed project will have significant environmental impacts, FERC will prepare an EIS. Compared to an EA, an EIS is a more comprehensive study in which FERC must “rigorously explore and objectively evaluate all reasonable alternatives” for the project. 40 C.F.R. § 1502.14.

resource agencies and public comments on the proposed project. Preparation of an EA only requires FERC to involve resource agencies and the public “to the extent practicable” (40 C.F.R. § 1501.4). The resources and time required to complete a NEPA review depends on the complexity of the proposed amendment and the potential environmental impacts of the project.

**Consideration:** *Unlike the Division of Hydroelectric Licensing, which processes license and preliminary permit applications, DHAC does not conduct de novo review<sup>10</sup> of all environmental and developmental matters associated with the project. DHAC examines environmental issues directly related to the specific amendment proposal and not the license or exemption itself.*

**Three-stage consultation is generally a complex, time- and resource- intensive process.**

Capacity and certain non-capacity-related amendments require an in-depth three-step consultation process when reviewing the proposed amendment. The three-stage consultation process requires numerous studies and surveys, and state and federal review. The consultation process mirrors the FERC traditional license process (TLP) and exemption consultation requirements (18 C.F.R. § 4.38). Similar to the TLP and exemption consultation requirements, the amendment process opens the existing hydropower facility to federal and state agency conditions and recommendations as well as public input. Resource agencies may revise license or exemption conditions and recommendations pursuant to their respective section 30(c), 4(e), and 18 powers under the FPA. In addition, possible interventions by third parties, during the amendment process, could broaden the scope of environmental review. The National Hydropower Association (NHA) has found that in “...some cases, the costs involved in pursuing an amendment can outweigh the incremental capacity gain for a small addition of capacity” (NHA 2010).

**Consideration:** *Currently, “...the three-stage consultation process is required even when federal and state resource agencies support or do not oppose, the proposed change....” (NHA 2010).*

**A proposed capacity or non-capacity amendment to a licensed or exempt hydropower facility may also require a waiver, revision, or issuance of a state water quality certification.** Under section 401 of the Clean Water Act (33 U.S.C. §§ 1251-1376 [1972]), a federal agency may not issue a license authorizing the construction or operation of a project which “...may result in any discharge into a navigable water...” unless the appropriate state agency first issues a water quality certification (33 U.S.C. § 1341[a][1]). Any limitation included in the state certification becomes a condition on the FERC license. If the state denies the water quality certification, FERC may not issue the amended license (33 U.S.C. § 1341[a][1]).

---

<sup>10</sup> When a court hears a case *de novo*, it is deciding the issues without reference to the legal conclusions or assumptions made by the previous court to hear the case. CORNELL UNIVERSITY LAW SCHOOL, *Legal Information Institute*, [https://www.law.cornell.edu/wex/de\\_novo](https://www.law.cornell.edu/wex/de_novo) (last visited Jan. 17, 2017).

**Consideration:** *Some states, including Vermont and New York, also require a section 401 water quality certification for FERC exempt hydropower facilities pursuant to the state’s section 30(c) power under the Federal Power Act.*<sup>11</sup>

**Generally, an applicant must provide evidence of a waiver or request for a new or revised water quality certification for any proposed capacity or non-capacity amendment that would result in a change in discharge at the existing hydropower facility (FERC 2015).** The applicant must provide this evidence with the amendment application to DHAC (FERC 2015). A change that would decrease the flow of water into a navigable waterway does not cause a “discharge” within the meaning of section 401 of the Clean Water Act (Alabama Rivers Alliance v. FERC, 325 F.3d 399 [2003]). However, a change that increases the flow does cause or result in a “discharge” requiring a waiver or request for a new or revised water quality certification from the appropriate state agency (Alabama Rivers Alliance v. FERC, 325 F.3d 399 [2003]).

**Consideration:** *The most common cause of delay in proceedings is receipt of a state water quality certification under the Clean Water Act (FERC 2001; DOE 2016).*

**The review of a section 401 water quality certification request can take anywhere from three months to 5 years depending on the state, the complexity of the proposed change, and the water resources affected by the proposed change (FERC 2001).** A common reason for delay in the amendment process is obtaining evidence of a waiver or request for a new or revised state water quality certification (FERC 2001, DOE 2016).

**Consideration:** *In order to allow the state agency sufficient time to analyze the impacts of the project on water quality and to meet the deadline for demonstrating compliance with section 401 of the Clean Water Act, the applicant should request a water quality certification review from the appropriate state authority early on in the FERC license or exemption amendment process.*

## 2.2 Adding Capacity or Efficiency Upgrades at the Time of Relicensing

This section outlines the relicensing process, provides example case studies, and discusses key considerations about adding capacity or efficiency upgrades at the time of relicensing. When a license expires, FERC can issue a new license (relicense) for 30–50 years to either the existing licensee or a new licensee.

Oftentimes capacity additions and efficiency upgrades coincide with relicensing. The closer the facility gets to license expiration, the more likely the aging infrastructure needs upgrades. Adding capacity and efficiency upgrades at the time of relicensing may save time and resources, as the facility must go through a thorough review during relicensing, regardless of whether the facility plans to add capacity additions or efficiency upgrades. Most hydropower facilities were

---

<sup>11</sup> See e.g., VERMONT AGENCY OF NATURAL RESOURCES – DEPARTMENT OF ENVIRONMENTAL CONSERVATION, SECTION 401 WATER QUALITY CERTIFICATION PRACTICE (2012), available at [http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/Section401\\_WQ\\_Cert\\_Practice.pdf](http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/Section401_WQ_Cert_Practice.pdf)

constructed in the mid-twentieth century and many of their original licenses expired or are due to expire (FERC 2001, DOE 2016, FERC 2016b). In fact, 6,000 MW of nonfederal hydropower will be up for relicensing over the next 5 years, with that number expected to more than double over the next 10 years (FERC 2016b, ACORE 2014). In total, more than 500 hydropower projects are up for relicensing between 2016 and 2030 (Ryan et al. 2017).

### 2.2.1 Relicensing Process

At least 5 years before a license expiration date, a licensee must file a notice of intent with FERC stating whether they intend to seek a new hydropower license (relicense) or not (18 C.F.R. § 5.5). At least 2 years before a license expires, the licensee must file an application for relicense (FERC 2017a). Before issuing a new license, FERC must assess the hydropower facility to ensure it represents the best public use of waterway resources (16 U.S.C. § 797[e]). In order to make the public use determination, FERC must extensively study the project, its surrounding environment, and related resources and give “equal consideration” to development and non-development values, including:

- Utilization of the site’s hydroelectric potential
- Potential benefits to interstate or foreign commerce
- Adequate protection, mitigation, and enhancement of fish and wildlife (including their spawning grounds and habitat)
- Other beneficial public uses, including energy conservation, irrigation, flood control, water supply, recreational opportunities, and other aspects of environmental quality.

FERC has interpreted “equal consideration” to mean that all non-development and development values must be given the same level of reflection and thorough evaluation (FERC 1990).

Relicensing also opens the project up to input from multiple stakeholders, including federal, state, and local agencies, nongovernmental agencies, and the public (Cumming 2015). Given the extensive evaluation and stakeholder input required, relicensing may have similar timelines and costs as the original licensing process.

The relicensing process allows federal and state land and resource agencies to revise or add new mandatory conditions or license recommendations for the facility pursuant to FPA.<sup>12</sup> Relevant provisions include:

- Section 4(e) of the FPA gives federal land management agencies authority to revise or add new mandatory conditions to hydropower facilities located within or directly affecting federal reservations. Federal reservations include “national forest, tribal lands...military reservations, and other lands and interests in lands owned by the United States...” (16 U.S.C. § 796[2]).

---

<sup>12</sup> 16 U.S.C § 797(e) (giving federal land management agencies authority to prescribe conditions on projects located on or directly affecting federal reservations); 16 U.S.C. § 811 (giving U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NOAA Fisheries) power to prescribe fishway passage requirements); 16 U.S.C. § 803(j) (requiring FERC to consider resource agency recommendations); 16 U.S.C. 801(a)(1) (requiring FERC to consider resource agency recommendations for comprehensive plan development).

- Section 18 of the FPA allows federal resource agencies (U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration (NOAA)<sup>13</sup> Fisheries) to prescribe mandatory fish passage requirements on any hydropower project that may affect the passage of fish species in the project area (or species planned for introduction in the area).
- Section 10(a) of the FPA requires FERC to consider a project’s consistency with federal and state comprehensive plans for improving, developing, or conserving a waterway. Specifically, FERC must solicit and consider resource agency recommendations on how to make the facility more consistent with federal or state comprehensive plans.
- Section 10(j) of the FPA requires FERC to solicit and consider recommendations from federal and state fish and wildlife agencies regarding the development, operation, and management of the hydropower facility and its impact on fish and wildlife.

In making a relicensing decision, FERC must also comply with NEPA and other federal statutes including: the Fish and Wildlife Coordination Act (FWCA), the ESA, the CWA, the WSR, the Coastal Zone Management Act (CZMA), and the NHPA (FWS 2010).

### **2.2.2 Example of Relicensing Capacity Addition**

**Relicensing Capacity Addition:** In February 1976, FERC issued a license for the Otter Creek Hydroelectric Project in Addison and Rutland Counties, Vermont, with an effective date of April 1, 1962, and a termination date of December 31, 1993 (eventually extended to March 2012).<sup>14</sup> As originally licensed, the Otter Creek project had an installed capacity of 14.349 MW spread over three developments within the project (the Proctor, Beldens, and Huntington Falls developments) (Otter Creek Hydroelectric Project, 149 FERC ¶ 62,048 [2014]).

In March 2010, Vermont Marble Power, Division of Omya, Inc., filed an application for a new license to continue operation and maintenance of the Otter Creek project. After a series of license transfers, the Otter Creek project was eventually transferred to Green Mountain Power Corporation in September 2012. The license application sought to increase the Otter Creek project by slightly greater than 8 MW by adding power at the Proctor and Huntington Falls developments for a total generating capacity of 22.807 MW. Green Mountain Power amended the license application one time in August 2011. FERC staff issued a draft EA in December 2012 analyzing the impacts of the proposed relicensing as well as alternatives to it. FERC reviewed filed comments on the draft EA and issued a final EA in July 2013, which received no comments. After completing the relicensing process, FERC issued an order for a new license in October 2014, roughly 4.5 years after the new licensing application was filed (Otter Creek Hydroelectric Project, 149 FERC ¶ 62,048 [2014]).

### **2.2.3 Key Considerations and Strategies**

This section outlines some of the key considerations of the relicensing process.

#### **Public interest determinations require in-depth analysis and extensive stakeholder input.**

As part of the relicensing process, FERC must determine “whether a new license is in the public

<sup>13</sup> National Oceanic and Atmospheric Administration.

<sup>14</sup> In 1981, FERC extended the license term by 18 years, expiring in March 2012. Thereafter, Otter Creek operated under annual licenses pending re-licensing of the project.

interest, providing equal consideration to power development and non-power uses of the river (e.g., fish and wildlife habitat, recreation, aesthetics)” (Bowman 2002; 16 U.S.C. § 797[e]). In making a public interest determination, FERC must extensively study the project, its surrounding environment, and related resources.<sup>15</sup> FERC must also consider recommendations and at times, implement mandatory conditions from federal and state resource agencies and the public when making a public interest determination.

**Consideration:** *Public interest considerations are important, especially given that many of the hydropower facilities due for relicensing were constructed before the enactment of many federal environmental laws.*

**Federal land and resource agencies may revise and add new mandatory conditions to the facility during the relicense process.** Section 4(e) of the FPA allows federal land management agencies to revise or prescribe new conditions on a hydropower facility relicense located within or directly affecting federal land. Section 18 of the FPA also allows the U.S. Fish and Wildlife Service and NOAA Fisheries to prescribe upstream and downstream fish passage requirements on the relicense. These conditions may require additional mitigation measures or resource protections not required by the original license.

**Consideration:** *FERC may not alter or reject mandatory conditions prescribed pursuant to section 4(e) or section 18 of the FPA.*

**Federal and state land and resource agencies may recommend conditions to the facility during the relicense process.** The relicensing process opens the hydropower facility up to input from federal and state land and resource agencies. Under section 10(a) of the FPA, FERC must consider the facility’s consistency with federal and state comprehensive plans for improving, developing, or conserving a waterway. In addition, FERC must consider recommendations from federal and state resource agencies regarding the hydropower facility’s impact on fish and wildlife resources pursuant to 10(j) of the FPA. These recommendations may lead to additional mitigation measures or resource protections not required by the original license.

**Consideration:** *FERC can alter or reject 10(a) and 10(j) recommendations.*

**NEPA review required for relicensing.** FERC must prepare an EA for relicensing applications (18 C.F.R. § 380.5). As discussed above, NEPA review is potentially a resource- and time-intensive process. The applicant must conduct numerous studies and surveys before FERC can prepare an initial EA. As part of this analysis, FERC must solicit and respond to resource agency and public comments on the proposed project. If the proposed project will have significant environmental impacts FERC will prepare an EIS, a more comprehensive study in which FERC must “rigorously explore and objectively evaluate all reasonable alternatives” for the project (40 C.F.R. § 1502.14).

---

<sup>15</sup> Sensiba, Charles R., *Hydropower*, THE LAW OF CLEAN ENERGY EFFICIENCY AND RENEWABLES, 479, 484-85 (Michael B. Gerrard ed. 2011) (“Because the relicensing process...requires a renewed evaluation of the project and its environs, many projects emerge from the relicensing process with different operational, recreational, and environmental conditions....”).



**Consideration:** *FERC must prepare an EA pursuant to NEPA for relicensing applications.*

**The relicensing process triggers compliance with multiple federal and state environmental statutes.** In addition, while the FPA and NEPA establish the legislative basis for hydropower relicensing proceedings and decisions, several other federal and state statutes can affect relicensing. For instance, relicensing triggers review pursuant to the FWCA, the ESA, the CWA, the WSRA, the CZMA, and the NHPA (FWS 2010). These required reviews often provide opportunities for resource agencies, nongovernmental agencies, and the public to intervene and influence FERC’s decision.<sup>16</sup>

**Consideration:** *Relicensing of a hydropower facility requires compliance with numerous federal statutes in addition to the FPA and NEPA.*

**The relicensing process opens the hydropower facility up to bids from new licensees.** The relicensing process not only opens the project to comments and input from multiple stakeholders but also opens the project to bids from new applicant licensees. A new license applicant may compete against the incumbent licensee for an existing project during relicense (16 U.S.C. § 808[a][1]). FERC may issue a “new license”<sup>17</sup> (i.e., relicense) either to the incumbent licensee or to the competing license applicant “whose plans are best adapted to serve the public interest” (16 U.S.C. § 808[a][1]-[2]). While the FPA establishes a marginal preference<sup>18</sup> to incumbent licensees, in theory a competing applicant could take the licensed project away from the incumbent licensee. To date, FERC has not awarded a license to a competing applicant (Ryan et al. 2017). However, competing applicants have established interests in existing facilities, through the relicensing process, by way of settlement agreements.<sup>19</sup> Some of these settlement agreements have resulted in the incumbent licensee transferring the project to the competing license applicant.<sup>20</sup> Given the amount of hydropower licenses up for relicense and the increasing value of hydropower projects, the number of competing license applications at relicense may increase in the near future.

---

<sup>16</sup> The Fish and Wildlife Coordination Act, The Endangered Species Act, the Clean Water Act, the Wild and Scenic Rivers Act, The Coastal Zone Management Act, the National Historic Preservation Act, and state statutes and regulations.

<sup>17</sup> A license issued by FERC after the expiration of the initial license for that project is referred to as a “new license.” See 18 C.F.R. §§ 4.30(b)(19), 16.2(a).

<sup>18</sup> 16 U.S.C. § 808(a)(2) (providing that, in evaluating competing applications, FERC “shall ensure that insignificant differences...between competing applications are not determinative and shall not result in the transfer of the project.”).

<sup>19</sup> See *Portland Gen. Elec. Co.*, 93 FERC ¶ 61,183 (2000) (approving global settlement agreement); *Portland Gen. Elec. Co.*, 111 FERC ¶ 61,450 (2005) (issuing new license), *order granting reh’g in part*, 117 FERC ¶ 61,112 (2006)(resulting in the incumbent and the competitor entering into a settlement agreement that resulted in the two parties merging their applications and becoming co-applicants); see also *The Montana Power Co.*, 32 FERC ¶ 61,070 (1985) (resulting in a settlement agreement where the incumbent licensee and the competitor agreed to become joint licensees, with the incumbent holding and operating the project for the first 30 years of the 50-year license and the competitor holding and operating the project for the remaining years); *Utica Power Auth.*, 104 FERC ¶ 62,121 (2003) (resulting in a settlement agreement where the incumbent licensee transferred projects to the competitor).

<sup>20</sup> *Utica Power Auth.*, 104 FERC ¶ 62,121 (2003) (resulting in a settlement agreement where the incumbent licensee transferred projects to the competitor).

**Consideration:** “An incumbent licensee does not automatically retain its license at the expiration of the existing license term” (Ryan et al. 2017).

## 2.3 Adding Capacity by Converting a License to a 10-MW Exemption

FERC-licensed facilities seeking to add capacity may also consider applying for an exemption as an alternative to a license amendment or relicensing (18 C.F.R. § 16.2[a]). A licensee may surrender a FERC license and apply for a FERC exemption or, if occurring at the time of relicensing, simply apply for an exemption as discussed above in Section 2.2. In either scenario, however, an applicant for the FERC exemption would need to include the details of the proposal to add capacity to the existing facility. To date, only one project (the Williams Fork Reservoir Hydroelectric Project) has converted a license to an exemption and added capacity.<sup>21</sup> However, since the passage of HREA, a large number of small hydropower facilities may now qualify for this option, which could increase the use of this strategy in the future.

HREA in part amended subsection (d) of section 405 of the Public Utility Regulatory Policies Act of 1978 to allow FERC to provide license exemptions to projects up to 10 MW (previously 5 MW). Existing licensed facilities with an installed capacity of less than 10 MW could potentially qualify for a FERC exemption if the facility adds capacity. Generally, to qualify for a 10-MW or less exemption the hydropower facility must:

- Propose to install or add capacity to a hydropower facility located at a nonfederal,<sup>22</sup> pre-2005 dam, or at a natural water feature
- Have an installed capacity of 10 MW or less
- Have all real property interests or an option to obtain the interests in any non-federal lands (18 C.F.R. § 4.30[29]).

A 10-MW exemption must go through a potentially time- and resource- intensive three-stage consultation process (18 C.F.R § 4.38) and must comply with the ESA, the NHPA, the WSRA, the CZMA, and NEPA.

### 2.3.1 Conversion Process

When seeking to convert a license to an exemption, FERC will accept an application for an exemption of the project only if the exemption applicant is the existing project licensee (18 C.F.R. § 16.2[a]; 18 C.F.R. § 4.33[d][1][ii]). Generally, the licensee must file with FERC a notice of intent to either relicense or surrender the license and apply for an exemption at least 5 years, but not more than 5.5 years, before the license expiration date (18 C.F.R. § 5.5[d]). However, a licensee may file with FERC a notice to surrender the licensee and apply for an exemption prior to 5.5 years before the license expiration date. If a qualified exemption applicant is the first to file and have its license application accepted (i.e., there is no earlier-file license application), the applicant may request that the license application be treated as an exemption application by notifying FERC in writing as well as showing the applicant holds any necessary property rights as required by 18 C.F.R. § 4.31 The licensee must notify FERC by the last date for filing protests or motions to intervene as prescribed in a public notice issued for the license

<sup>21</sup> See Williams Fork Reservoir Hydroelectric Project, 116 FERC ¶ 62,244 (2006).

<sup>22</sup> The hydropower facility can be located on federal lands but cannot be located at a federal dam.

application under 18 C.F.R. § 4.31(d)(2). The licensee must file an exemption application no later than 24 months before the license expires.<sup>23</sup>

### 2.3.2 Example of Converting a License to an Exemption with Added Capacity

In January 1963, FERC issued a license to Denver Water (City and County of Denver, Colorado) for the Williams Fork Hydroelectric Project on the Williams Fork River in Grand County, Colorado, with an effective date of January 1, 1957. As originally licensed, the Williams Fork project had an installed capacity of 3.15 MW (Williams Fork Reservoir Hydroelectric Project, 116 FERC ¶ 62,244 [2006]).

In December 2004, Denver Water filed an application for a new license at the Williams Fork project, asking that FERC first consider the project as an exemption application. The exemption application sought to increase the installed capacity by 0.5 MW for a total installed capacity of 3.65 MW. In addition, Denver Water's exemption application sought to install a new 30-inch penstock and a 66-inch butterfly valve (to divert flows from the existing penstock before it enters the existing turbine inlet), as well as construct a concrete tailrace to provide for the new discharge. FERC accepted the application for processing as an exemption application in April 2005. In June and August 2005, the Department of Interior filed one condition and a revision of that condition in furtherance of its FPA section 30(c) mandatory conditioning authority for fish and wildlife conditions. The 30(c) condition addressed protection of federally listed fish and wildlife in the nearby Colorado River basin. In April 2006, FERC issued an EA for the Williams Fork project containing analysis of impacts, support for exemption conditions, and the basis for a finding of no significant impact on the human environment. FERC issued an order for a new license in September 2006, roughly 21 months after Denver Water filed its initial application (Williams Fork Reservoir Hydroelectric Project, 116 FERC ¶ 62,244 [2006]).

### 2.3.3 Key Strategies and Considerations

This section outlines some of the key considerations of converting a license to a 10-MW exemption from licensing by surrender of a FERC license and approval of a FERC exemption, or approval of a FERC exemption at the time of relicensing.

**Exemption applicants must have all real property rights to develop and operate a hydropower project.** To qualify for a 10-MW exemption the hydropower facility must have all real property interests or an option to obtain the interests in any non-federal lands (18 C.F.R. § 4.30). FERC licensees have the power of eminent domain and do not have to show proof of ownership over the land at the time of filing an application (16 U.S.C. § 814).

**Consideration:** *FERC licensees have the power of eminent domain while exemptees do not.*

**FERC issues exemptions in perpetuity.** FERC issues 10-MW exemptions in perpetuity. FERC may issue a license up to 50 years, at which time the licensee must either surrender the license or apply for a new license through the relicensing process discussed above in Section 2.2.

---

<sup>23</sup> 18 C.F.R. § 16.9(b)(1) (stating that an applicant who indicates in the notice of intent that they will file a new license or exemption must file a new application at least 24 months before its existing license expires).

**Consideration:** *FERC issues 10-MW exemptions in perpetuity, whereas a licensed facility requires a new license every 30-50 years.*

**Three-stage consultation is generally a complex, time- and resource- intense process.** Like the licensing/relicensing process, exemption applications must also undergo a three-stage consultation process. Before filing an application for exemption, the applicant should consult with relevant federal, state, and interstate resource agencies, Indian tribes, and the public regarding the exemption application. In addition, the three-stage consultation process requires numerous studies and surveys, and state and federal review.

**Consideration:** *Three-stage consultation is required for a new license or an exemption.*

**Exemptions are subject to mandatory federal and state fish and wildlife conditions.** Under section 30(c) of the FPA, the U.S. Fish and Wildlife Service, NOAA Fisheries, and state fish and wildlife agencies may issue mandatory terms and conditions for hydropower projects that are exempt from the FERC licensing process in order to prevent the loss of, or damage to, fish or wildlife resources (16 U.S.C. § 823a[c]).

**Consideration:** *An exemption will be subject to some mandatory conditions from fish and wildlife agencies that would be recommendations under a new license.*

**Section 401 of the Clean Water Act does not require exempt hydropower projects to obtain a state water quality certification.** Typically, a license or amendment to a license requires a waiver, revision, or issuance of a state water quality certification, while an exemption may not.

**Consideration:** *Some states, including Vermont and New York, require a 401 water certification for FERC exempt hydropower facilities pursuant to the state's section 30(c) power under the FPA.*

### 3 Comparison of Approaches to Add Capacity and/or Efficiency Upgrades to Existing Hydropower Facilities

This section provides a brief summary of the requirements for utilizing the approaches to add capacity to an existing FERC-licensed hydropower facility as well as high-level key considerations.

**Table 1: Comparison of Capacity Addition Approaches for Existing Hydropower Facilities**

Process Type	Capacity Amendment	Non-Capacity Amendment	Relicensing	License Conversion to Small Hydropower (10 MW) Exemption
<b>Requirements</b>	<p>Licensee seeks to:</p> <ol style="list-style-type: none"> <li>Increase the actual or proposed total installed capacity<sup>24</sup> of the project, and</li> <li>Increase the maximum hydraulic capacity<sup>25</sup> of the project of 15% or more, and</li> <li>Increase the installed nameplate capacity<sup>26</sup> by 2 MW or more (18 C.F.R. § 4.201(b)).</li> </ol>	<p>Licensee seeks to add capacity below the thresholds established for a capacity amendment.</p>	<p>Licensee seeks to add capacity at time of relicensing facility. Licensee must provide notice to FERC at least 5 years, but not more than 5.5 years, prior to the expiration of the current license.</p> <p>Licensee must file application for new license at least 2 years before the expiration of the current license.</p>	<p>Licensee seeks to add capacity to an existing license and convert the license to an exemption.</p> <p>Generally, to qualify for a small hydropower exemption the facility must:</p> <ol style="list-style-type: none"> <li>Propose to install or add capacity to a hydropower facility located at a nonfederal,<sup>27</sup> pre-2005 dam, or at a natural water feature</li> <li>Have an installed capacity of 10 MW or less</li> <li>Have all real property interests or an option to obtain the interests in any non-federal lands (18 C.F.R. § 4.30[29]).</li> </ol>

<sup>24</sup> The installed capacity is the sum of the nameplate capacity of all the generating units in a hydroelectric project. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

<sup>25</sup> The maximum hydraulic capacity is the maximum water flow rate that can be discharged simultaneously through all the project turbines for generation at any time. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

<sup>26</sup> The nameplate capacity of a generating unit is the manufacturer’s rating of the generator as printed on the unit. FERC, GUIDE TO HYDROELECTRIC LICENSE AND EXEMPTION AMENDMENT PROCESS 5 (1992).

<sup>27</sup> The hydropower facility can be located on federal lands but cannot be located at a federal dam.

<p><b>Key Considerations</b></p>	<p>Requires 3-stage consultation process</p> <p>Requires compliance with other applicable federal laws including NEPA, ESA, CWA, NHPA, and WSRA</p>	<p>Generally only requires single-stage consultation process</p> <p>Requires compliance with other applicable federal laws including NEPA, ESA, CWA, NHPA, and WSRA</p>	<p>Requires 3-stage consultation process</p> <p>Requires compliance with other applicable federal laws including NEPA, ESA, CWA, NHPA, WSRA, and CZMA</p> <p>Fish and wildlife agencies may recommend conditions to protect fish and wildlife under FPA section 10(j)</p> <p>FERC issues licenses for a period of 30-50 years.</p> <p>Power of eminent domain</p>	<p>Requires 3-stage consultation process</p> <p>Requires compliance with other applicable federal laws including NEPA, ESA, CWA, NHPA, WSRA, and CZMA</p> <p>Fish and wildlife agencies may require mandatory conditions to project fish and wildlife under FPA section 30(c). Some states may utilize FPA section 30(c) authority to require a CWA section 401 Water Quality Certification.</p> <p>FERC issues exemptions in perpetuity</p> <p>No power of eminent domain</p>
----------------------------------	---	---	---	--

## References

ACORE (American Council on Renewable Energy). 2014. "The Outlook for Renewable Energy in America." Washington, D.C.: American Council on Renewable Energy. [http://acore.org/files/pdfs/ACORE\\_Outlook\\_for\\_RE\\_2014.pdf](http://acore.org/files/pdfs/ACORE_Outlook_for_RE_2014.pdf)

Bowman, Margaret. 2002. *Leal Perspectives on Dam Removal*. 52 BIOSCIENCE 739, 740.

Cornell University Law School, 2017. *Legal Information Institute Webpage*, Ithaca, NY: Cornell University Law School. [https://www.law.cornell.edu/wex/de\\_novo](https://www.law.cornell.edu/wex/de_novo) (last visited Jan. 17, 2017).

Cumming, Catherine. 2015. *The Hydropower Regulatory Efficiency Act: Not Giving a Dam for Negative Externalities and Stakeholder Oversight*, 16 MINN. J.L. SCI. & TECH. 917.

DOE (U.S. Department of Energy). 2015. *2014 Hydropower Market Report*. DOE/EE-1195, Washington, D.C.: U.S. Department of Energy.

DOE (U.S. Department of Energy). 2016. *Hydropower Vision Study*. Washington, D.C. <https://energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source>.

DSIRE. 2017a. *Database of State Incentives for Renewables & Efficiency Webpage*. Raleigh, NC: North Carolina State University. [www.dsireusa.org](http://www.dsireusa.org). (accessed Jul. 17, 2017).

— 2017b. *Renewable Portfolio Standard-Hydroelectric Map*. Raleigh, NC: North Carolina State University. <http://programs.dsireusa.org/system/program/maps> (accessed Feb. 16, 2017).

FERC (Federal Energy Regulatory Commission). 1990. "Hydroelectric Project Relicensing Handbook." Washington, D.C.: Federal Energy Regulatory Commission.

1992. "Guide to Hydroelectric License and Exemption Amendment Process." Washington, D.C.: Federal Energy Regulatory Commission.

2001. "Staff Report to Congress, Report on Hydroelectric Licensing Policies, Procedures, and Regulations – Comprehensive Review and Recommendations Pursuant to Section 603 of the Energy Act of 2000." Washington, D.C.: Federal Energy Regulatory Commission.

2015. "Division of Hydropower Administration and Compliance, Compliance Handbook." Washington, D.C.: Federal Energy Regulatory Commission.

2016a. "Complete List of Active Licenses." Washington, D.C.: Federal Energy Regulatory Commission. (last updated Dec. 9, 2016).

2016b. "Expected Relicense Projects FY 2015-2030." Washington, D.C.: Federal Energy Regulatory Commission. (last updated Dec. 9, 2016).

2017a. *Applications for New Licenses (Relicenses) Webpage*. Washington, D.C.: Federal Energy Regulatory Commission. <https://www.ferc.gov/industries/hydropower/gen-info/licensing/app-new.asp> (last accessed Sept. 5, 2017).

2017b. “Hydropower Primer: A Handbook on Hydropower Basics.” Washington, D.C.: Federal Energy Regulatory Commission. <https://www.ferc.gov/legal/staff-reports/2017/hydropower-primer.pdf>

FWS (U.S. Fish and Wildlife Service). 2010. “Overview of the Federal Power Act and the Hydropower Relicensing Process.” Washington, D.C.: U.S. Fish and Wildlife Service, <https://www.fws.gov/policy/hydrochap2.pdf>

Martínez, R., M. Johnson, P. O’Connor. 2017. “U.S. Hydropower Market Report 2017 Update (April).” Oak Ridge National Laboratory, prepared for the U.S. Department of Energy Water Power Technologies Office. [https://energy.gov/sites/prod/files/2017/04/f34/US-Hydropower-Market-Report-2017-Update\\_20170403.pdf](https://energy.gov/sites/prod/files/2017/04/f34/US-Hydropower-Market-Report-2017-Update_20170403.pdf).

NHA (National Hydropower Association). 2010. *Small Hydro Council Initial Report*. Washington, D.C.: National Hydropower Association. Jul. 2010. <http://anf5l2g5jkl16p6te3ljwwpk.wpengine.netdna-cdn.com/wp-content/uploads/2011/01/Small-Hydro-Council-Initial-Report-July-2010.pdf>

Ryan, J., Harrison, J., and Hook, M., 2017. *Competing Relicensing Applications: Assessing the Threat to Existing Licensees*, HYDRO REV. 17 (Jan. 2017).

Senisba, Charles R., 2011. *Hydropower*. THE LAW OF CLEAN ENERGY EFFICIENCY AND RENEWABLES, 479, 484-85 (Michael B. Gerrard ed. 2011).

Vermont Agency of Natural Resources. 2012. “Vermont Agency of Natural Resources – Department of Environmental Conservation, Section 401 Water Quality Certification Practice.” Montpelier, VT: Vermont Agency of Natural Resources. [http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/Section401\\_WQ\\_Cert\\_Practice.pdf](http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/Section401_WQ_Cert_Practice.pdf)

Wis. Pub. Serv. (Wisconsin Public Service). *Relicensing Timeline Webpage*. Green Bay, WI: Wisconsin Public Service. [http://www.wisconsinpublicservice.com/copany/hydro/relicensing\\_timeline.aspx](http://www.wisconsinpublicservice.com/copany/hydro/relicensing_timeline.aspx) (accessed Apr. 4, 2015).

## **Federal and State Acts, Statutes, and Bills**

Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act, PL 113-24, 127 Stat. 498 (43 U.S.C. §§ 485h et seq. [Aug. 9, 2013]).

Clean Water Act of 1972, PL 92-500, 86 Stat. 47 (33 U.S.C. §§ 1251-1376 [1972]).

Coastal Zone Management Act of 1972, PL 92-583, 86 Stat. 1280 (16 U.S.C. §§ 141-1464 [Oct. 27, 1972]).

Consolidated and Further Continuing Appropriations Act, 2013, PL 113-6, 127 Stat. 198 (codified in various sections of 10 and 42 U.S.C. [Mar. 26, 2012]).

Endangered Species Act of 1973, PL 93-205, 87 Stat. 884 (16 U.S.C. §§ 1531-1544 [Dec. 28, 1973]).



Federal Power Act of 1920, PL 66-281, 41 Stat. 1063 (16 U.S.C. §§ 791-823d [June 10, 1920]).

Hydropower Regulatory Efficiency Act of 2013, PL 113-23, 127 Stat. 493 (codified in scattered sections of 16 U.S.C [Aug. 9, 2013]).

National Environmental Policy Act of 1969, PL 91-190, 89 Stat. 852 (42 U.S.C. §§ 4321 – 4347 [Jan. 1, 1970]).

National Historic Preservation Act of 1966, PL 102-575, 80 St. 915 (16 U.S.C. §§ 470 et seq. [Oct. 15, 1966]).

Wild and Scenic Rivers Act of 1968, PL 90-542, 128 Stat. 3791 (16 U.S.C. §§ 1271 – 1287 [Oct. 2, 1968]).

2015 Vt. Acts & Resolves 56, An act relating to establishing a renewable energy standard.

HAW. REV. STAT. §§ 269-91 – 296-96 (2015), Renewable Portfolio Standards.

H.B. 623, 28<sup>th</sup> Leg. (HI. 2015), Renewable Portfolio Standards.

## **Federal and State Regulations**

18 C.F.R §§ 4.1 – 50.11 (1947), Regulations under the Federal Power Act.

18 C.F.R. §§ 380.1 – 380.16 (1987), Regulations implementing the National Environmental Policy Act.

40 C.F.R. § 1501 – 1518.4 (1978), Council on Environmental Quality.

## **Case Law and Orders**

Alabama Rivers Alliance v. FERC, 325 F.3d 399 (2003).

*City of River Falls, Wisconsin*, 153 FERC ¶ 62,175 (2015).

Missouri-Madison Hydropower Project, 158 FERC ¶ 62,215 (2017).

Montana Power Company, 32 FERC ¶ 61,070 (1985).

North Carolina v. FERC, 112 F.3d 1187 (D.C. Cir. 1997).

Orono Hydroelectric Project, 140 FERC ¶ 62,194 (2012).

Otter Creek Hydroelectric Project, 149 FERC ¶ 62,048 (2014).

Portland General Electric Company, 93 FERC ¶ 61,183 (2000).

Portland General Electric Company, 111 FERC ¶ 61,450 (2005).

Utica Power Authority, 104 FERC ¶ 62,121 (2003).

Williams Fork Reservoir Hydroelectric Project, 116 FERC ¶ 62,244 (2006).