Non-Federal Hydropower Development at Federal Facilities

Getting Through the Regulatory Maze

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Introduction

U.S. Army Corps of Engineers (USACE) policy supports public and private development of environmentally sustainable hydropower at their facilities (Memorandum of Understanding for Hydropower Among the Department of Energy, the Department of the Interior, and the Department of the Army, March 24, 2010). To use USACE facilities, a developer must obtain a license from the Federal Energy Regulatory Commission (FERC), Section 408 (Rivers and Harbors Act) and Section 404 (Clean Water Act) permits from the USACE, a Section 401 Water Quality Certification from the state in which the discharge is located, Endangered Species Act (ESA) Section 7 consultation approvals from the U.S. Fish and Wildlife (USFWS) and/or the National Marine Fisheries Service (NMFS), Section 106 of the National Historic Preservation Act approval from the State Historic Preservation Officer (SHPO), a Coastal Zone Consistency Determination (CZMA), and potentially numerous additional state and local permits. In California, the State also conducts a California Environmental Quality Act (CEQA) review. This paper focuses on the USACE's permitting process and the FERC's licensing process with specific application to the Lake Clementine Hydropower Project. The licensing experience at Lake Clementine may benefit other developers intending to use USACE facilities for hydropower generation.

Project Background

The USACE owns and maintains the North Fork Dam (also known as Lake Clementine Dam) on the North Fork American River, near Auburn, California (Figure 1). Completed in 1939 by the California Debris Commission, the dam is a constant angle concrete arch debris dam. The dam is 139 feet high with a crest at elevation 718 feet and a lower crest, ungated spillway at elevation 715 feet. The dam has a crest length of 620 feet and a dam thickness varying from 6.8 feet at the top to 22 feet at the base. A three-foot diameter outlet gate is located 50 feet below the crest of the dam.

Under current conditions all water flows over the spillway (Figure 2), except for rare times when the low-level outlet is operated. The 280-acre upstream reservoir water level fluctuates in response to inflow. Historic flows have ranged from low flows of less than 30 cubic feet per second (cfs) in the late

summer and early fall to a maximum of 65,400 cfs, with the average flow being 800 cfs. During low flows, flow depth over the crest is about 0.4 feet, whereas during average and higher flows, depth typically varies from 1.4 feet to several feet.

Proposed Facilities and Operations

On October 2, 2009 America Renewables, LLC (AR) received a preliminary permit from the FERC to study the feasibility of adding hydropower at the existing North Fork dam (Lake Clementine Hydroelectric Project, FERC Project No. 13432). Other developers have historically sought and received preliminary permits to study the hydropower feasibility at the site, but abandoned their proposals for a variety of reasons including (1) the proposed downstream Auburn Dam authorized to be constructed by the U.S. Bureau of Reclamation (USBR) whose upstream reservoir would flood the proposed powerhouse, (2) water rights issues associated with the Auburn dam, (3) economic and financial feasibility concerns, and (4) concerns over reservoir sedimentation rates. On December 2, 2008, the California State Water Resources Control Board (SWRCB) revoked the water rights permit for the USBR Auburn Dam, although the USBR retains authorization to construct the project.

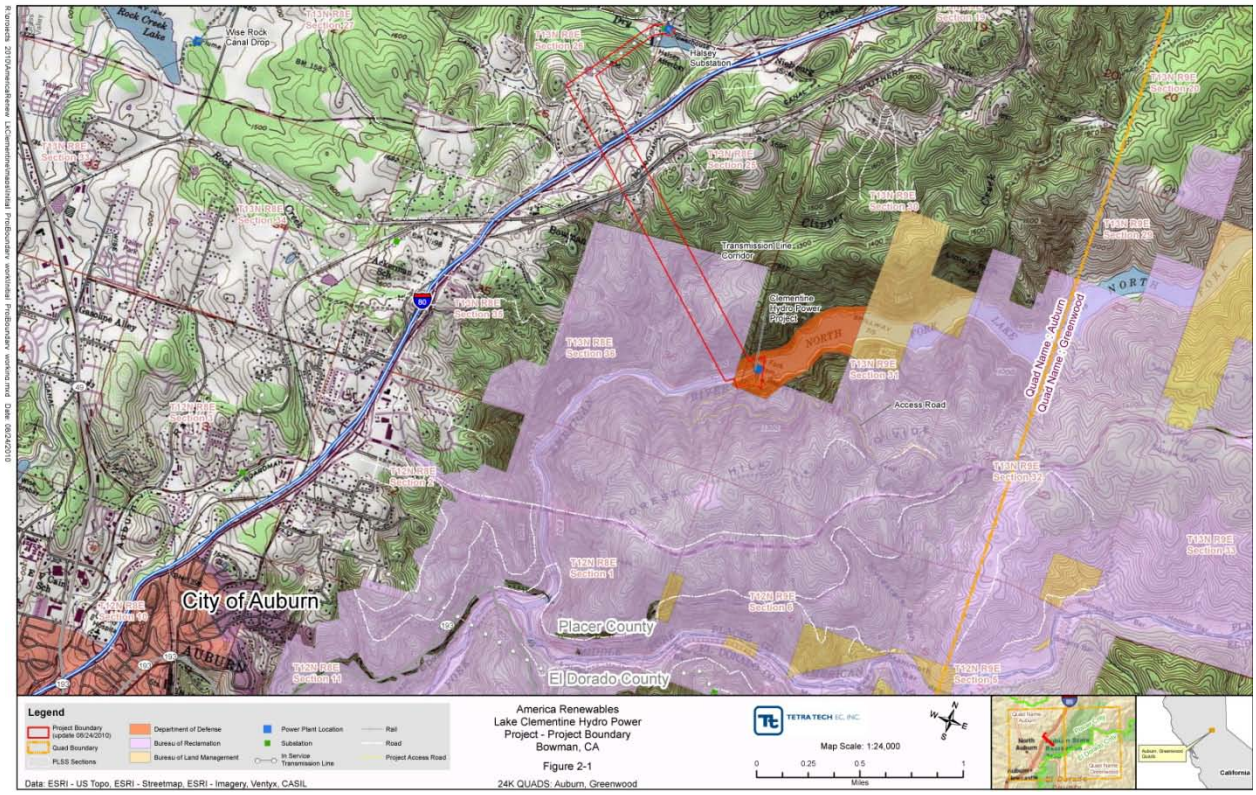

Figure 1. Location of the Lake Clementine Hydroelectric Project No. 13432-000 (Source: America Renewables, LLC, 2010).

In 2010, AR conducted a feasibility study and concluded that with existing power rates in California, a 15-MW hydropower plant can be economically constructed at the North Fork Dam. The project will include the construction of: 1) an intake with dimensions of approximately 21 feet wide and 64 feet

high, 2) a 180-foot long, 14-foot diameter penstock, 3) an 80-foot diameter silo-type powerhouse, 4) two 7 MW Francis turbines and associated generators and a 1 MW unit for low flow conditions[1], 5) two 16-foot-wide draft tube tunnels, 6) switchyard, 7) 2-foot high flashboards on the existing Lake Clementine spillway, 8) a 2-mile long transmission line, 9) appurtenant facilities, and 10) environmental mitigation measures (See Figure 3). The penstock will penetrate the North Fork dam near the top of the dam to minimize both construction costs and potential impacts to the dam. Based on the historic flow record (USGS gage 11427000), the Project would have an estimated annual energy production of about 41 gigawatt-hours (GWH) per year.

Figure 2. Flow Over North Fork Dam Spillway

During operations, AR proposes to operate in a run of river mode and maintain the reservoir elevation just below elevation 717 feet when flows are less than the hydraulic capacity of the project (i.e., 1,574 cfs). During flood flows, AR proposes to lower the flashboards and keep reservoir levels minimally below reservoir levels that would occur under existing conditions. During high flow conditions of about 1,574 cfs, reservoir levels would essentially be at the same elevation as what would occur during existing conditions. When flows are less than 1,574 cfs, AR would maintain a constant pool just below elevation

[1] Unit sizes will be optimized during the design process.

717 feet. Outflow would equal inflow. However, during the receding limb of the hydrograph, flows would be about 4 cfs lower than under existing conditions. Given that Lake Clementine is popular recreation destination, the maximum summer reservoir level would be set to enhance lake recreation and not adversely affect the campgrounds that are located within the reservoir area.

In the event of unit shutdown during project operations, the project would operate to maintain a continuous flow downstream. This could be achieved by lowering flashboards or by providing a bypass flow around the powerhouse. Specific details will be worked out with resource agencies and interested parties. If a bypass flow is provided, a valve would be installed in the penstock that would be actuated in the event of an emergency shutdown of the powerhouse.

Because outflow would be set to equal inflow, ramping rates would mimic natural conditions. A small reservoir level deviation (e.g., approximately 0.1 foot) may be required to balance outflow with inflow. During the summer stratification period the intake design would permit water to be withdrawn from nearer the surface to mimic existing water temperatures for downstream recreation.

FERC Licensing Status

On August 30, 2010, AR issued the Pre-Application Document (PAD) for the project and requested use of the Traditional Licensing Process (TLP). FERC granted the request on October 27, 2010. On December 2, 2010, AR held a site visit and joint meeting with resource agencies, Indian tribes and interested parties. During the meeting AR described the project, the proposed schedule and identified potential resource issues from the construction and operation of the project. Key issues included effects of operation on water temperature and dissolved oxygen; fish distribution , size and relative abundance primarily for entrainment impacts; entrainment survival through the turbines and over the spillway; the potential for mobilization of sediment during construction and operation; construction and operation effects on habitat for California Red-Legged Frog, Foothill Yellow-Legged Frog, and the Northern Pond Turtle; project effects on special status plant species; visual effects of reducing spillway flows; and potential cultural resources effects on the North Fork Dam and cultural resource sites within the Area of Potential Effect (APE), as well as the effects on Traditional Cultural Properties.

A particularly important issue for the project is the potential restoration of steelhead and salmon in the American River basin. The North Fork American River upstream of Lake Clementine has been recognized as having potential spawning and rearing habitat for restoration of steelhead and salmon. AR is willing to work with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation and other parties in a cooperative effort to restore steelhead and salmon. However, if the cost burden is placed solely on AR, the cost for downstream passage would be prohibitive. Given the high recreational usage of the North Fork American River, there are no current plans to decommission the North Fork dam. Nonetheless, given the significance of ESA to the FERC licensing process, steelhead and salmon restoration will necessitate consultation among the parties and likely among other hydropower licensees in the basin. AR recognizes that a satisfactory solution to this issue will be important to the success of the project.

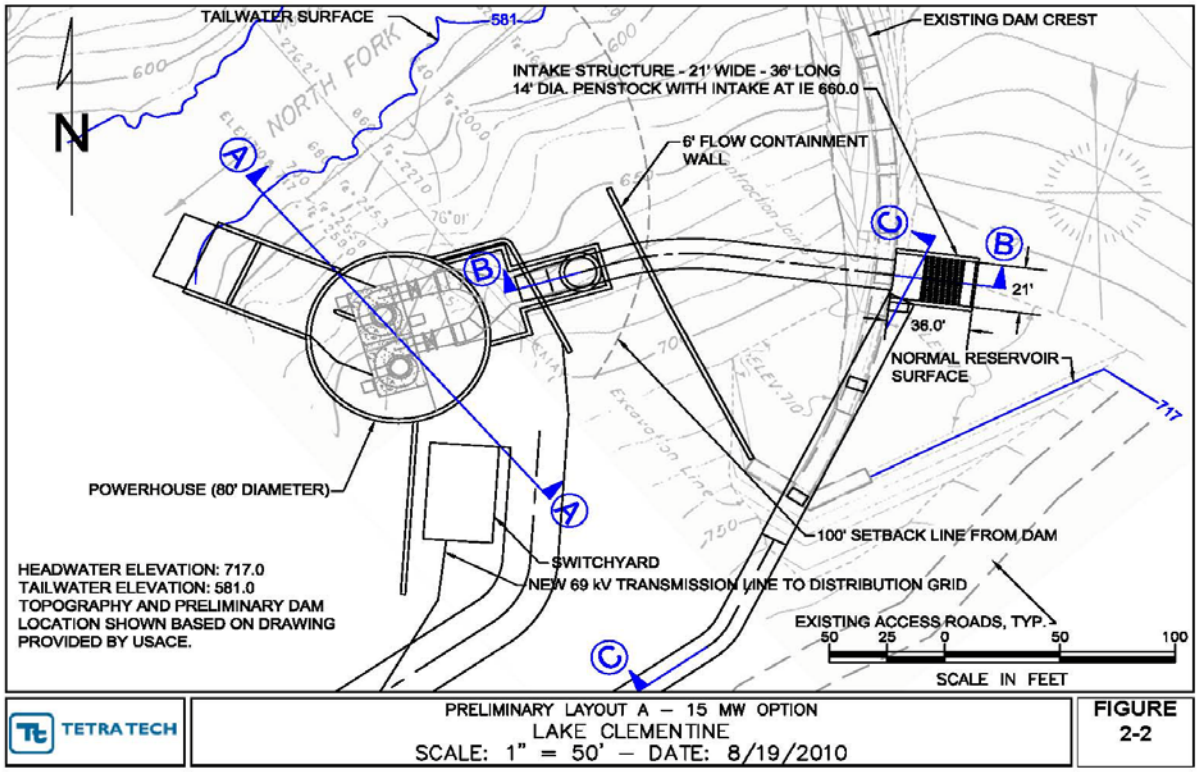

Figure 3. Lake Clementine Hydropower Project – Preliminary Design

An additional factor discussed during the December 2, 2010 joint meeting and potentially affecting the FERC licensing of the project is the Wild and Scenic River designation of the North Fork upstream of Lake Clementine. Although the project itself will not affect the reach upstream of the reservoir, the wild and scenic aspects of the river remain a FERC consideration.

Based on AR's preliminary assessment of potential project impacts and the input of participants, particularly during the December 2, 2010 joint meeting, AR developed nine draft study plans to address the resource issues. The draft study plans were distributed to the parties on January 9, 2011. Comments from various parties were received in February and March 2011 and were factored into the study plans. Final agreement on the study plans will be required as the licensing process proceeds.

The FERC licensing process will enable AR to comply with the ESA consultation, the SWRCB's 401 Water Quality Certification process, and the SHPO Section 106 NHPA process. Although linked with, the licensing process does not address the USACE's Section 408 or Section 404 permitting processes. However, the FERC and the USACE signed a Memorandum of Understanding on Non-Federal Hydropower Projects in March 2011 to mutually cooperate for facilitating non-Federal hydropower development. The Section 404 wetlands permitting approval process can rely on FERC's National Environmental Policy Act (NEPA) document for issuing a 404 permit and FERC can condition the license to include USACE approvals for construction and operation. The USACE can adopt the FERC NEPA document when it makes its decision on the 408 process. Although the USACE will coordinate with FERC during its permitting approval process, the Section 408 process has requirements that the USACE must follow. At this time, the USACE has not issued a formal guidance document on the 408 permitting

process. However the USACE and AR are working together on the process to ensure that it satisfies both parties' interests. The balance of this paper describes the 408 permitting process and provides an example of how a hydropower applicant can work with the USACE on its 408 permitting process and integrate it into the FERC process.

USACE Section 408 Permitting Process

An applicant with a preliminary permit to study the feasibility of adding hydropower at a USACE dam should consult with the USACE to develop a 408 permitting process tailored to their needs. The 408 process is currently being revised by USACE HQ and guidance on the 408 process as it specifically relates to hydropower is being developed. The following information is likely to evolve as these revisions to the 408 process take place. However, based on current knowledge of the existing 408 process, it is advisable that an applicant consider the following steps (not necessarily in sequential order as numerous items will be required to occur at once):

1. Conduct initial meeting(s) with the USACE as part of a continuous communication program.
2. Develop a plan for submitting a 408 permit application to the USACE.
3. Execute the plan including any required field studies such as geotechnical investigations.
4. Modify the conceptual plan based on study results (approximately 30 percent design). On several projects in the past and currently ongoing, the Sacramento District of the Army Corps of Engineers has reviewed the 30 percent (conceptual) designs and provided feedback to the applicant.
5. Incorporate the modified conceptual plan into the draft FERC application.
6. Having feedback from the USACE is valuable to the process at this point because the license application must include a Supporting Design Report (SDR). The SDR must demonstrate that the existing and proposed structures are safe and adequate to fulfill their stated functions. Specifically, the SDR must address reservoir stability; stability and stress analyses for all major structures and critical abutment slopes under all probable loading conditions, including seismic and hydrostatic loading forces up to the Probable Maximum Flood; and the bases for determination of seismic loading and the Spillway Design Flood. The USACE has similar requirements.
7. Initiate the detailed design process. This could occur at application filing, FERC's Ready for Environmental Analysis (REA) or at license issuance. The key here will be applicant's risk profile, likelihood of license issuance, and applicant's available funding.
8. Complete detailed design to 65 percent design level and complete any critical analyses required by the USCAE. Through frequent communication with the USACE, critical analyses can be specified early in the process.
9. The current 408 process encourages concurrent engineering and environmental analysis. Realistically, concurrent engineering and environmental analysis is necessary for rapid approval. Section 408 approval requires compliance with NEPA. The Sacramento District USACE office experience with the current 408 process has indicated that with concurrent engineering and environmental analysis, 408 and NEPA approval can be obtained in 9 – 18 months depending on the scope of the project and the NEPA document. This is heavily dependent upon the applicant's desire to move the project quickly and efficiently. Currently funding for hydropower related 408

reviews is being provided by USACE HQ, although other 408 reviews in the Sacramento District office have required funding from the permit applicant to expedite the review. These funds have been provided via Section 214 of the Water Resources Development Act of 2000. (Memorandum on Implementation Guidance for Utilizing Section 214 of the Water Resources Development Act of 2000, as amended, to Accept Funding from Non-Federal Public Entities to Expedite the Evaluation of Permits pursuant to 33 U.S.C. 408, dated June 2010)

10. FERC will work on a NEPA document, presumably based on a conceptual design that is similar to the final design. The alternatives analysis should include alternatives acceptable to both the USACE and FERC. The FERC licensing can be separated from the 408 process at this point as long as the USACE is comfortable with the conceptual design. However, the further separated the processes are the more likely it is that a design change might become necessary, thereby requiring a supplemental NEPA document. If significant changes occur to the design, FERC, the lead agency, would have to supplement the NEPA document. In some situations it will be desirable for an applicant to have the 408 issued about the same time as the license, if the licensee's (applicant's) goal is to get the project on line ASAP. In some instances a licensee may not have a power sales agreement at the time the license is issued and may want to have the power sales agreement and financing locked up before proceeding to final design. This will vary on a case by case basis. Hence it may not be in the best interests of an applicant to have a prescriptive 408 process.
11. A Section 408 action review requires the following major elements: 1) Safety Assurance Review (Independent External Peer Review), 2) Risk and Uncertainty Analysis, and 3) Approval by HQ. It is recommended that both budget and time in the schedule be allocated for this process. The USACE can require design changes to meet dam safety and other engineering design requirements. The FERC can condition the license to require the licensee to meet any USACE imposed design requirements.
12. USACE is not able to approve the Section 404 permit until after the 408 permit is issued, and typically not until after the FERC license is issued. However the 404 permitting process can be streamlined by ensuring that the NEPA document used for the FERC license can also be used for the 408 and 404 permitting process. Each of these permits have their own requirements which the NEPA must address, so early coordination is important.
13. Even after the FERC license is issued, the licensee will still need to obtain final approval using 100% plans and specifications from the USACE before construction can commence. FERC will also require a Quality Construction and Implementation Plan before it gives final approval for construction.
14. Non-Federal hydropower developers are recommended to develop a written agreement with the local Corps district to determine the terms and conditions for the use of the outlet facilities/storage space/other Corps facilities being used. This agreement should include the direct financial reimbursement of the local Corps district for any additional O&M costs that are incurred as a result of the presence of the hydropower facility. (Such an agreement is mentioned in ER 1110-2-1462)

The schedule for the Lake Clementine Hydroelectric Project follows the process laid out above. Consultation with the USACE was initiated shortly after the preliminary permit was issued. However, detailed discussions with the USACE did not commence until June 2010. Through the summer and fall of 2010 AR met with the USACE hydropower coordinator and technical staff to discuss the Section 408 requirements. During those meetings the following were identified as needed items for the design development and Section 408 permit approval process:

- USACE design criteria and existing USACE site design data.
- A plan for taking concrete core samples from the dam.
- Specifications for laboratory testing of the structural properties of the concrete cores.
- Specifications for pressure testing the concrete joints in the dam.
- Specifications for a geotechnical investigation of the bedrock at the abutments. This was considered important because the original dam construction required spread footings of the dam on the left bank of the river because the foundation rock in that area was fractured to a considerable degree. Also several landslides occurred near the downstream face of the dam after initial filling and operation. The proposed powerhouse is located about 150 feet downstream of the left abutment.
- A plan to produce the design seismic event information, based on the seismic analysis which has been performed at the nearby Auburn Dam site.
- A plan to assess the hydraulic conditions at the dam.
- A plan for the preliminary and final structural analysis of the dam based on USACE design criteria.

AR conducted a bathymetric and topographic survey of the reservoir near the dam in 2010. The bathymetric survey indicated that although sedimentation had occurred at the upstream face of the dam, it was less than what had been presumed. The data already collected and the additional data to be collected will not only assist AR in designing a robust project, but it may also serve to assist the USACE in the safe operation and maintenance of the North Fork dam. AR intends to complete the engineering studies to further the project design and corresponding Section 408 permitting process in the latter half of 2011 and in 2012.

By working cooperatively with the USACE, AR anticipates that most of the design concerns will be addressed during conceptual design development. This should minimize the likelihood of significant design changes during either the FERC or USACE permitting processes and should expedite the permitting process for both FERC and the USACE.

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Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction with the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certificated by the Federal Energy Regulatory Commission, dated May 2002

Memorandum from Director of Civil Works, Clarification Guidance on the Policy and Procedural Guidance for the Approval of Modifications and Alterations of Corps of Engineers Projects, dated November 2008

Memorandum from Director of Civil Works, Policy and Procedural Guidance for the Approval of Modifications and Alterations of Corps of Engineers Projects, dated October 2006

Memorandum of Understanding between the Army Corps of Engineers and the Federal Energy Regulating Commission for Interstate Natural Gas Pipeline Projects, dated July 2005

Memorandum of Understanding between United States Army Corps of Engineers and the Federal Energy Regulating Commission on Non-Federal Hydropower Projects, dated 30 March 2011

Memorandum of Understanding on Coordination of Environmental Reviews for Pipeline Repair Projects, dated May 2004

Memorandum of Understanding on Early Coordination of Federal Authorizations and Related Environmental Reviews Required in Order to Site Electric Transmission Facilities, dated August 2006

Memorandum on Implementation Guidance for Utilizing Section 214 of the Water Resources Development Act of 2000, as amended, to Accept Funding from Non-Federal Public Entities to Expedite the Evaluation of Permits pursuant to 33 U.S.C. 408, dated June 2010

Memorandum to Delegate Authority to District Commanders of 33 U.S.C. 408 of Minor, Low Impact Modifications to Flood Protection Works Operated and Maintained by Non-Federal Sponsors Previously Being Considered under 33 CFR 208.10 (a) (5), dated June 2010

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