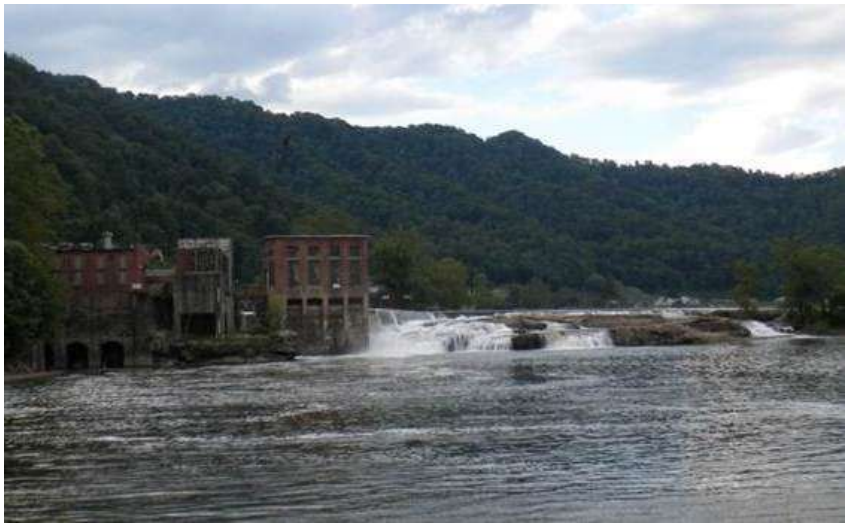
GLEN FERRIS HYDROELECTRIC PROJECT

(FERC NO. 14439)

DRAFT LICENSE APPLICATION
VOLUME I OF V



Prepared for:
Hawks Nest Hydro, LLC

Prepared by:

AUGUST 2015

GLEN FERRIS HYDROELECTRIC PROJECT (FERC No. 14439)
DRAFT LICENSE APPLICATION
VOLUME I OF V

TABLE OF CONTENTS

Section **Title** **Page No.**

GLEN FERRIS HYDROELECTRIC PROJECT (FERC No. 14439)
DRAFT LICENSE APPLICATION
VOLUME I OF V

TABLE OF CONTENTS

GLEN FERRIS HYDROELECTRIC PROJECT (FERC No. 14439)
DRAFT LICENSE APPLICATION
VOLUME I OF V

TABLE OF FIGURES

Section **Title** **Page No.**

GLEN FERRIS HYDROELECTRIC PROJECT (FERC No. 14439)
DRAFT LICENSE APPLICATION
VOLUME I OF V

TABLE OF TABLES

Section **Title** **Page No.**

List of Acronyms

Brookfield	Brookfield Renewable Energy Group
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulations
cfs	cubic feet per second
EA	Environmental Assessment
FERC	Federal Energy Regulatory Commission or Commission
FLA	Final License Application
FPA	Federal Power Act
Glen Ferris	Glen Ferris Hydroelectric Project or Project
Hawks Nest Hydro	Hawks Nest Hydro, LLC, Applicant, or Licensee
hp	horsepower
HPMP	Historic Properties Management Plan
Hz	hertz
ILP	Integrated Licensing Process
ISR	Initial Study Report
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
msl	mean sea level
MW	megawatt
MWh	megawatt-hours
NASCC	North America System Control Center
NGOs	non-governmental organizations
NOI	Notice of Intent
NRC	New River Conservancy
PAD	Pre-Application Document
PLC	programmable logic control
PMF	Probably Maximum Flood
PM&Es	protection, mitigation, or enhancement measures

List of Acronyms (Continued)

PSP	Proposed Study Plan
rpm	rotations per minute
RSP	Revised Study Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SPD	Study Plan Determination
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
USR	Updated Study Report
VDC	Voltage Directs Current
WQC	Water Quality Certification
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Division of Natural Resources
WVPRO	West Virginia Professional River Outfitters Association

Executive Summary

1.0 INTRODUCTION

The Federal Energy Regulatory Commission ("FERC" or "Commission"), under the authority of the Federal Power Act (or "FPA"), 16 USC § 791(a), et seq., may issue licenses for up to 50 years for the construction, operation, and maintenance of non-federal hydroelectric developments. Hawks Nest Hydro, LLC ("Hawks Nest Hydro" or "Licensee"), a wholly owned subsidiary of Brookfield Renewable Energy Group (Brookfield), is hereby applying for a new license for the Glen Ferris Hydroelectric Project (FERC Project No. 14439) ("Glen Ferris Project" or "Project"). The current operating license for the Project was issued on December 11, 1987 and expires on December 31, 2017. In accordance with applicable regulations, 18 Code of Federal Regulations (CFR) § 16.9(b), Hawks Nest Hydro must file its application with the FERC for a new license no later than December 31, 2015.

Presently the Glen Ferris development and the upstream Hawks Nest development are licensed by the Federal Energy Regulatory Commission (FERC or Commission) as a single Project ("Hawks Nest-Glen Ferris Hydroelectric Project," FERC Project No. 2512). Hawks Nest Hydro is applying for separate licenses, and filing separate license applications, for each of the Hawks Nest and Glen Ferris developments.

Hawks Nest Hydro is applying for a 40-year license for each the Hawks Nest Project and the Glen Ferris Project. Hawks Nest Hydro believes that the level of investment in terms of environmental measures proposed in this license application, in combination with the major investment in the past 5 years to redevelop the Project, support this requested license term. Additionally, aligning the license expiration dates for the Hawks Nest and Glen Ferris Projects will, consistent with the Commission's policy, maximize future consideration of combined effects and licensing process efficiency for all parties.

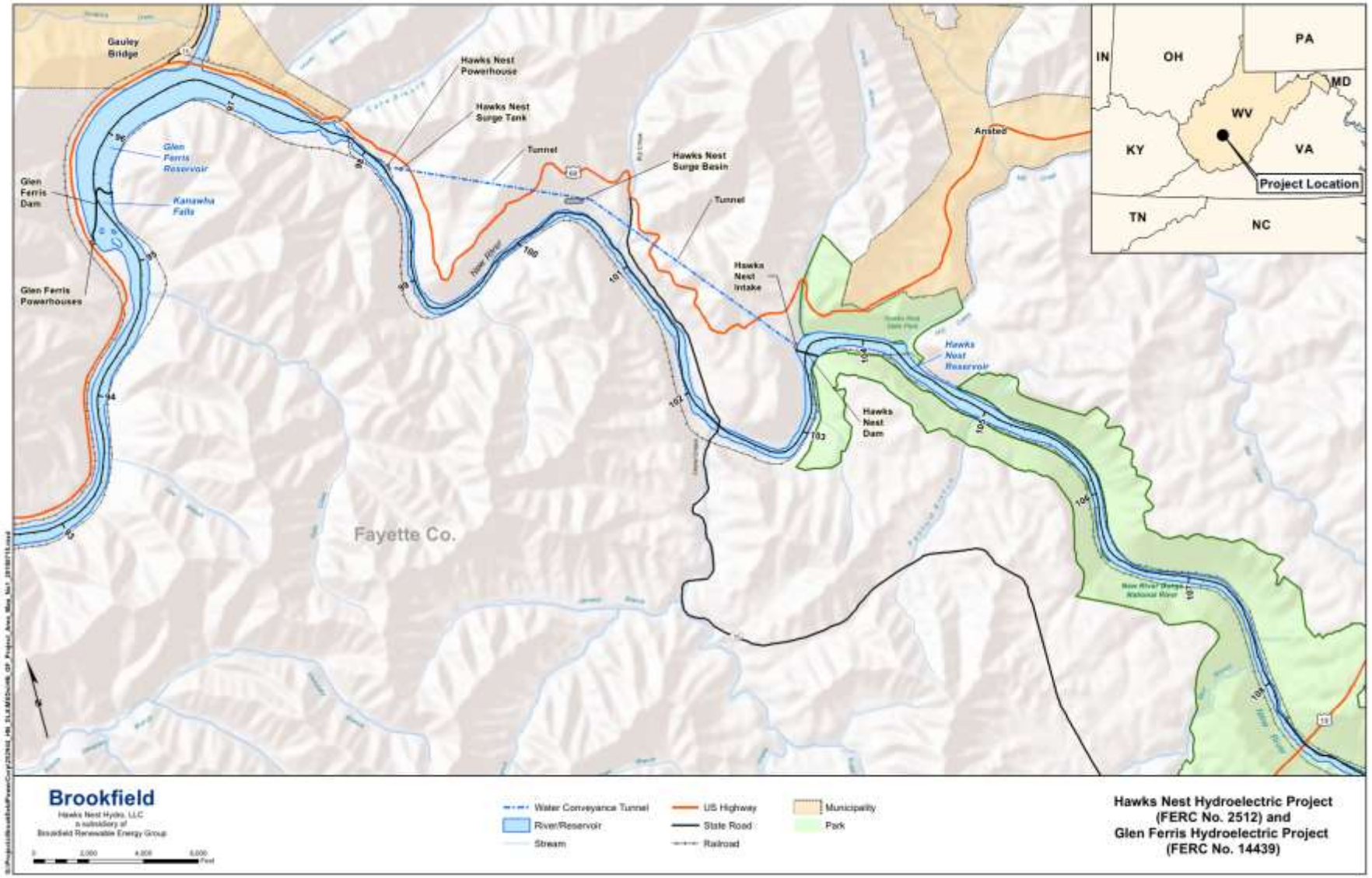
2.0 SUMMARY OF THE GLEN FERRIS PROJECT

Hawks Nest Hydro, LLC is the Licensee, owner, and operator of the Glen Ferris Project in Fayette County, West Virginia. The Project consists of the 6.159-megawatt (MW) Glen Ferris

development on the Kanawha River, which is formed by the confluence of the New and Gauley rivers downstream of the Hawks Nest powerhouse.

Power generation and ferro-alloy production at the site of the existing Glen Ferris Project began in 1899, and the site was acquired by Union Carbide prior to construction of the Hawks Nest development. Glen Ferris stopped generating power in late 2002 due to significant repair and maintenance problems. Following acquisition by Hawks Nest Hydro in 2006, Glen Ferris underwent a $19 million overhaul to redevelop power generation at this facility in 2010-2013. With this investment, the Glen Ferris Project is estimated to generate approximately 41,482 megawatt-hours (MWh) of clean renewable electricity annually.

FIGURE ES-1 PROJECT LOCATION MAP



3.0 AGENCY CONSULTATION AND THE RELICENSING PROCESS

Due to the proximity of the Hawks Nest and Glen Ferris Projects to each other, the expected overlap in resources to be evaluated during relicensing, and in the interest of efficiency of document preparation and overall relicensing activities, Hawks Nest Hydro prepared a single Pre-Application Document (PAD), Initial Study Report (ISR) and Updated Study Report (USR), and individual study reports that covered both the Hawks Nest and Glen Ferris Projects. For the same reasons as those described above, Hawks Nest Hydro has prepared a single Exhibit E that addresses both the Hawks Nest and Glen Ferris Projects.

Hawks Nest Hydro followed FERC's Integrated Licensing Process (ILP) in support of preparing this application for new license. On July 24, 2012, Hawks Nest Hydro filed a PAD for the Projects. Hawks Nest Hydro filed separate Notices of Intent (NOI) for the Projects; FERC subsequently assigned Glen Ferris the project number P-14439, while Hawks Nest retained project number P-2512.

The PAD provided a description of the Projects and summarized existing, relevant, and reasonably available information to assist resource agencies, federally recognized Indian tribes, non-governmental organizations (NGOs), and other interested parties (collectively, "stakeholders") in identifying issues, determining information needs, preparing study requests, and analyzing the license application. A preliminary list of potential studies and information needs was included in Section 6.3 of the PAD, including studies or surveys that may provide additional information regarding the Projects' effects on specific resources.

FERC issued Scoping Document 1 (SD1) for the Projects on September 20, 2012. SD1 was intended to advise stakeholders as to the proposed scope of the Environmental Assessment (EA) and to seek additional information pertinent to the Commission's analysis of the license application(s). As provided in 18 Code of Federal Regulations (CFR) §§ 5.8(a) and 5.18(b), the Commission issued a notice of commencement of proceeding concomitant with SD1. On October 17 and 18, 2012, the Commission held public scoping meetings in Ansted, West Virginia, to solicit comments regarding the scope of issues and analysis for the EA. Pursuant to 18 CFR § 5.8(d), the Commission also held a site visit in conjunction with the scoping meetings.

By FERC notice dated September 20, 2012, stakeholders were afforded a 60-day period to request studies and provide comments on the PAD and SD1. FERC issued Scoping Document 2 (SD2) on January 2, 2013 to reflect issues or alternatives to be considered in the EA, based on stakeholder comments and study requests filed in response to SD1.

Pursuant to the schedule and requirements of the ILP, Hawks Nest Hydro developed a Proposed Study Plan (PSP) to address the comments and study requests submitted by stakeholders. The PSP also provided FERC and stakeholders with a plan and descriptions of the studies proposed by Hawks Nest Hydro. The PSP was filed with FERC and made available to stakeholders on January 4, 2013. In accordance with 18 CFR § 5.11(e), Hawks Nest Hydro held a PSP Meeting on January 29, 2013, in Charleston, West Virginia. The purpose of the PSP Meeting was to clarify the intent and contents of Hawks Nest Hydro's PSP, explain any initial information gathering needs, and address outstanding issues associated with the proposed studies.

In response to the comments on the PSP, Hawks Nest Hydro developed a Revised Study Plan (RSP) that was filed with FERC and made available to stakeholders on May 6, 2013. On May 31, 2013, FERC issued a Study Plan Determination (SPD) for the Projects approving the studies outlined in the RSP. The SPD directed Hawks Nest Hydro to conduct 10 studies:

1) Water Quality Study
2) Fish Entrainment Study
3) Aquatic Species Composition and Abundance Survey
4) Rare, Threatened, and Endangered Aquatic Species Study
5) Bypass Reach Aquatic Habitat Use and Instream Flow Study
6) Wetland and Riparian Habitat Survey
7) Rare, Threatened, and Endangered Terrestrial Species Study
8) Recreation Flow Assessment
9) Recreation Use and Needs Assessment
10) Cultural Resources Study

In accordance with 18 CFR § 5.15, Hawks Nest Hydro has completed the approved studies in accordance with the schedule and methods described in the RSP and FERC's SPD.

Hawks Nest Hydro filed the ISR, including draft study reports for five completed studies, on May 30, 2014, conducted the ISR Meeting on June 12, 2014, and filed the ISR Meeting Summary with the Commission on June 27, 2014.

By letters to the Commission dated July 21, 2014 and July 24, 2014, respectively, the New River Conservancy (NRC) and West Virginia Professional River Outfitters Association (WVPRO) filed timely comments on the ISR and the ISR Meeting Summary. No comments or disagreements were filed by Commission staff or any other relicensing participants. On August 25, 2014 Hawks Nest Hydro filed with the FERC responses to the comments received from NRC and WVPRO. On September 25, 2014 FERC determined that no modifications would be required to the previously approved study plans.

Hawks Nest Hydro filed the USR, including draft study reports for four completed studies,[1] on May 29, 2015, conducted the USR Meeting on June 11, 2015, and filed the USR Meeting Summary with the Commission on June 26, 2015.

By letters to the Commission dated July 24, 2015 and July 26, 2015, respectively, WVAM and American Whitewater filed timely comments on the USR and the USR Meeting Summary, as well as the study reports filed with the USR. Hawks Nest Hydro's response to these comments is due to FERC on August 25, 2015, after the filing of the draft license applications, and therefore the final license applications may include further review as the final license applications are developed.

4.0 SUMMARY OF PROPOSED ACTION AND ENHANCEMENT MEASURES

The Licensee proposes to continue to operate the Glen Ferris Project in the manner currently licensed, as described in Exhibits A and B of this license application. The Licensee also proposes additional protection, mitigation, or enhancement measures (PM&Es) for the Project. Proposals presented in this Draft License Application represent provisional proposals which are subject to further refinement and finalization within the Final License Application.

[1] The Cultural Resources Study report was filed with FERC as Privileged under 18 CFR § 388.112 on June 9, 2015.

As further described in Exhibit E, additional PM&Es proposed by the Licensee are as follows:

- Continue to provide the annual fish compensation payment to the WVDNR at the existing level of compensation to continue to provide funding for WVDNR activities to enhance aquatic resources and develop and maintain public river access sites in the vicinity of the Glen Ferris Project, and to mitigate for potential turbine-induced impacts to fish.
- Every 5 years, prepare in consultation with WVDNR and USFWS and file with the Commission a Resource Enhancement Plan reporting on activities completed by WVDNR utilizing the annual fish compensation payment funding during the previous period and anticipated for the next 5 years.
- Continue to annually provide $25,000 (equivalent to current funding level, as separate funding proposed for the Hawks Nest Project) to WVDNR for maintenance of and enhancements to recreation facilities on lands that have been deeded to WVDNR.
- Provide one-time funding of $50,000 to WVDNR for improvements or enhancements to the downstream Kanawha Falls Public Access Site, with specific improvements to be identified in consultation with WVDNR.
- Develop and implement an updated Recreation Management Plan, describing recreational facilities and access within and immediately adjacent to the project boundary.
- Develop and implement a Historic Properties Management Plan for the Project (to be filed with the final license application) to provide for the protection and management of historic properties within the area of potential effect.

5.0 APPLICATION ROAD MAP

This Draft License Application is composed of five volumes.

VOLUME I OF V

Volume I contains Public information and exhibits as follows:

- **Table of Contents**
- **Executive Summary**
- **Initial Statement**

- **Additional Information Required by 18 CFR §4.32**
- **Exhibit A – Project Description:** Describes the existing and proposed Project facilities.
- **Exhibit B – Project Operation and Resource Utilization:** Describes the existing and proposed operation of the Project and how the resource is utilized.
- **Exhibit C – Construction History and Proposed Construction Schedule:** Provides a construction history and schedule for proposed construction activities.
- **Exhibit D – Cost and Financing:** Provides information on the cost and financing of the Project including fair market value estimates and net book costs of the existing facilities as prescribed for a new License Application.

VOLUME II OF V

Volume II contains Public information and includes Exhibit E, the Environmental Exhibit. As described above, Hawks Nest Hydro has prepared a joint Exhibit E that is identical in each application. However, there are sections of Exhibit E and the related Exhibit E appendices that only address either the Hawks Nest Project or the Glen Ferris Project. For example, Exhibit E treats the Projects separately in discussing proposed PM&Es and each Project's economics. Nevertheless, in many instances Exhibit E provides information (such as a description of the affected river basins, applicable laws, and affected environment) that is generally applicable to both Projects.

Exhibit E is further split into three parts as follows:

- Part 1 – Exhibit E
    - Table of Contents
    - General Description of the River Basins
    - Cumulative Effects – Geographic and Temporal Scope
    - Applicable Laws
    - Project Facilities and Operations
    - Environmental Analysis - Affected Environment and Environmental Effects (by Resource Area)

- Economic Analysis
- Consistency with Comprehensive Plans
- Literature Cited

- Part 2 – Exhibit E Appendices, including Consultation Summary
- Part 3 - Final Study Reports[2] (Public) *(to be included with the final license application [FLA]; however, draft study reports were included as part of the ISR and USR filings and are publicly available on the relicensing website[3])*
  - Water Quality Study
  - Fish Entrainment Study
  - Aquatic Species Composition and Abundance Survey
  - Rare, Threatened, and Endangered Aquatic Species Study
  - Bypass Reach Aquatic Habitat Use and Instream Flow Study
  - Wetland and Riparian Habitat Survey
  - Rare, Threatened, and Endangered Terrestrial Species Study
  - Recreation Flow Assessment
  - Recreation Use and Needs Assessment

VOLUME III OF V

Volume III contains Public information and includes:

- **Exhibit F – List of General Design Drawings:** Includes the list of design drawings filed as Critical Energy Infrastructure Information (CEII) in accordance with 18 CFR § 388.112.
- **Exhibit G – Project Map:** Includes map showing the project boundary for the Glen Ferris Project. (*Electronic project boundary files to be included with the FLA.*)
- **Exhibit H – Ability to Operate:** Describes the commitment and responsibility of Hawks Nest Hydro as a Licensee to continue to operate and maintain the Project and the needs and

[2] The Cultural Resources Study reports are being filed with FERC in Volume IV of the license application, as Privileged under 18 CFR § 388.112.

[3] http://www.hawksnestandglenferris.com/content/documents-35722.html

costs for power from the Project or alternate sources. (*This section is still under development and will be included with the FLA.)*

VOLUME IV OF V (PRIVILEGED)

- **Summary Archaeological and Historic Resources Tables and Figures:** Contains summary information about the location and nature of identified historic and archaeological resources within the Project's Area of Potential Effect.
- **Cultural Resources Study Reports**
- **Historic Properties Management Plan (HPMP):** Identifies the nature and significance of historic properties that may be affected by Project maintenance and operation and describes measures for considering and managing the effects on historic properties over the term of the new license. Because much of the information in the HPMP is confidential, it is filed with FERC but not made available to the public. *(This plan is still under development and will be included with the FLA.)*

VOLUME V OF V (CEII)

Volume V contains CEII materials, and includes:

- Exhibit F – General Design Drawings
- Exhibit H – Single-Line Diagram of the Transmission System

Initial Statement (18 CFR §4.51(a))

BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

APPLICATION FOR A NEW LICENSE FOR A MAJOR WATER POWER PROJECT - EXISTING DAM

GLEN FERRIS HYDROELECTRIC PROJECT
(PROJECT NO. 14439)

1. Hawks Nest Hydro, LLC applies to the Federal Energy Regulatory Commission for a new license for the Glen Ferris Hydroelectric Project (FERC No. 14439), as described in the attached Exhibits.

2. The location of the Project is:

State or Territory:	West Virginia
County:	Fayette
Township or Nearby Town:	Gauley Bridge
Stream or Other Body of Water:	Kanawha River

3. The exact name and business address of applicant is:

Hawks Nest Hydro, LLC
399 Big Bay Road
Queensbury, NY 12804

4. The exact name and business address of each person authorized to act as agent for the applicant in this application is:

Steven P. Murphy
Manager, Licensing
Brookfield Renewable Energy Group
33 West 1st Street South
Fulton, New York 13069
(315) 598-6130
steven.murphy@brookfieldrenewable.com

5. The applicant is a domestic corporation and is not claiming preference under section 7(a) of the Federal Power Act.

6. (i) The statutory or regulatory requirements of West Virginia that affect the Project as proposed, with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing and transmitting power and in any other business necessary to accomplish the purpose of the license under the Federal Power Act are:

    a. Hawk's Nest Hydro is a Delaware LLC registered to do business in West Virginia, and, as such, can engage in the activities set forth in its organizational documents, which includes the generation, transmission, and distribution of electricity from the Project.

    b. Section 401 of the Federal Clean Water Act, 33 USC §1341 requires that any applicant for a federal license or permit to conduct an activity that will or may discharge into waters of the United States (as defined in the Clean Water Act) must present the federal authority with a certification from the appropriate state agency. Pursuant to W. Va. Code §§22-1-6(d)(7), the West Virginia Department of Environmental Protection (WVDEP) is the state agency designated to carry out the certification requirements prescribed in Section 401 of the Clean Water Act for waters of West Virginia.

    c. The Dam Control and Safety Act, W. Va. Code §§20-14-1 to 22-14-22 is intended to provide for the regulation and supervision of dams to the extent necessary to protect the public health, safety and welfare. This Act makes it unlawful for any person to place, construct, alter, repair, remove or abandon any dam under the jurisdiction of the West Virginia Division of Natural Resources (WVDNR) without having obtained a certificate of approval. Since no modifications to the Project are proposed, this Act has no present applicability to the Project. Additionally, the Dam Control and Safety Act exempts federally licensed Projects and so does not apply to Glen Ferris.

    d. W. Va. Code §24-2-11 prohibits any public utility, person or corporation from applying for or obtaining any franchise, license or permit from any municipality or other governmental agency, except ordinary extensions of existing systems in the

ordinary course of business, until it obtains a certificate of public convenience and necessity from the Public Service Commission. This section, when read in its entirety, only applies to utility services furnished to the public. No such public service is contemplated by Hawks Nest Hydro; this section has no present applicability to the Project.

e. Water rights involved are merely the riparian rights appurtenant, under West Virginia law, to the various lands needed for dam site, flowage and tailrace purposes.

(ii) The steps the applicant has taken or plans to take to comply with each of the laws cited above are:

a. Applicant has complied with the requirements of the laws of the State of West Virginia with respect to the right to engage in the business of developing and transmitting power.

b. Applicant will apply to the WVDEP for a Water Quality Certification (WQC) pursuant to Section 401 of the Federal Clean Water Act, 33 USC §1341 and W. Va. Code §§22-1-6(d)(7) and West Virginia Legislative Rule §47CSR5A. Hawks Nest Hydro will apply for the WQC no later than 60 days after FERC issues the notice of ready for environmental analysis. A copy of the letter requesting certification will be filed with FERC following filing this application.

c. Applicant has performed a number of studies associated with water quality, aquatic resources, terrestrial resources, wetlands, recreation, and cultural resources in support of the associated environmental analyses.

7. The Glen Ferris Project has an installed generating capacity of 6.159 MW. The Project consists of the 6.159 MW Glen Ferris development on the Kanawha River.

8. The Glen Ferris Project does not occupy any lands of the United States.

9. The Glen Ferris Project is an existing constructed project.

Additional Information Required by 18 CFR § 4.32(a)(2)

(1) Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate, or maintain the project:

Hawks Nest Hydro presently holds, and will continue to hold the proprietary rights necessary to operate and maintain the Project.

(2) Identify (providing names and mailing addresses):

(i) Every county in which any part of the project, and any Federal facilities that would be used by the project would be located:

Fayette County
County Clerk
P.O. Box 569
100 Court Street
Fayetteville, WV 25840

(ii) Every city, town, or similar local subdivision:

(A) In which any part of the project, and any Federal facilities that would be used by the project, would be located:

Town of Gauley Bridge
PO Box 490
Gauley Bridge, WV 25085

(B) That has a population of 5,000 or more people and is located within 15 miles of the project dam:

City of Oak Hill
Fred Dickinson, Mayor
100 Kelly Avenue
Oak Hill, WV 25901

(iii) Every irrigation district, drainage district, or similar special purpose political subdivision:

(A) In which any part of the project, and any Federal facilities that would be used by the project, would be located:

The Project is not located in any irrigation district, drainage districts, or similar special purpose political subdivisions and does not utilize any federal facilities.

(B) That owns, operates, maintains, or uses any project facilities or any Federal facilities that would be used by the project:

There are no irrigation districts, drainage districts, or similar special purpose political subdivisions that own, operate, maintain, or use any project facilities. The Project does not use any federal facilities.

(iv) Every other political subdivision in the general area of the project that there is reason to believe would likely be interested in, or affected by, the application:

There are no other political subdivisions in the general area of the Project that there is reason to believe would likely be interested in, or affected by, the application.

(v) All Indian tribes that may be affected by the project:

There are no Indian reservation lands within the project boundary or immediate project vicinity.

VERIFICATION

(To be included in FLA)

This application is executed in the

State of : New York

County of : Oswego

By : Steven P. Murphy
Manager, Licensing
Brookfield Renewable Energy Group
33 West 1st Street South
Fulton, NY 13069

The undersigned being duly sworn, deposes and says that the contents of this application are true to the best of his knowledge or belief. The undersigned applicant has signed this application this ____ day of December, 2015.

_____

Steven P. Murphy

Subscribed and sworn to before me, a Notary Public of the State of New York, this ___ day of December, 2015.

_____

Notary Public

Exhibit A

Project Description (18 CFR §4.51(b))

A.1 PHYSICAL COMPOSITION, DIMENSIONS, AND GENERAL CONFIGURATION (18 CFR §4.51(B)(1))

The Glen Ferris Project is located downstream of the Hawks Nest Project, on the Kanawha River just downstream of the confluence of the New and Gauley Rivers. The Project is located in the town of Gauley Bridge, in Fayette County, West Virginia. As described in detail below, the Glen Ferris Project generally consists of a low concrete dam, a 190-acre impoundment, two powerhouses located at the west end of the dam with a total installed capacity of 6.159 MW, and appurtenant structures and facilities. The Glen Ferris Project was originally constructed between 1899 and 1901, with the second powerhouse being added in 1918. The Glen Ferris Project was extensively rehabilitated during 2010-13 by the Licensee. In December 2011, the rehabilitation of the larger two generators (Unit 7 and Unit 8) was completed and the generators placed back into service. The rehabilitation of the six smaller generators (Units1 thru 6) was completed and the generators returned to service in the third quarter of 2013.

A.1.1 Dam

Glen Ferris Dam is a low concrete overflow dam located across the Kanawha River just above and following the contour of the Kanawha Falls, opposite the town of Glen Ferris, in Fayette County, WV. The spillway portion of the dam is approximately 2,850 feet long and has a crest elevation of 651.0 feet mean sea level (msl).[4] The dam varies in height from 3 feet to 12 feet above the river bed and is founded on solid rock. It is of mass concrete except for the sluiceway, trash, and intake/powerhouse sections which are reinforced.

From left to right[5], the dam consists of a 590-foot-long left spillway section that generally curves upstream; a 128-foot-long five-bay stoplog sluice; a 2,132-foot-long right spillway that runs generally linearly diagonal in a downstream direction; a trash sluice section; the east integral powerhouse/intake; a section between the powerhouses that formerly supported a frequency

[4] All elevations in this license application are based on the msl National Geodetic Vertical Datum of 1929 (NGVD29), unless otherwise noted.

[5] Throughout this volume, all references to "left" and "right" are defined from the perspective looking downstream.

converter and filter station with connecting bulkhead walls; and the west powerhouse which has an upstream forebay with trashracks and an abandoned upstream forebay headworks structure that directly joins the right abutment.

The 128-foot-long stoplog sluice is noted to have a sill elevation of about 640.0 feet and consists of five 16-foot-wide bays separated by 8-foot-wide, pointed nose piers. The timbers that make up the stoplogs are indicated to be about 12-inches by 14-inches in cross-sectional dimension, and extend the full height of the dam. There is a wooden removable trash spillway stoplog section 8-feet-long and 2-feet-deep located on each side of the east powerhouse intake.

There are no spillway flood gates at the Glen Ferris Project.

A.1.2 Intakes

There is an intake integral with each powerhouse that consists of steel trashracks supported by concrete and cut stone at each intake. The intake for the west powerhouse is of concrete and cut stone and is approximately 82 feet, 3 inches wide at the rack section. It tapers in a distance of approximately 190 feet to a width of 49 feet at the entrance to the flumes. The west powerhouse trashracks have a clear bar spacing of 1.75 inches. The river bed at the rack section is approximately at elevation 642.5 feet. The intake for the east powerhouse is of concrete construction and is 62 feet wide at the rack section, which is integral with the powerhouse. It tapers in a distance of 23 feet to a width of 45 feet at the entrance to the flumes. The trashracks at the east powerhouse have a clear bar spacing of 3.12 inches. The river bed at the rack section is approximately at elevation 635.0 feet.

The forebay of the west powerhouse consists of a headwall and two sidewalls which are founded on solid rock. The walls consist of cut stone, brick and concrete. The headwall steel headgates were removed during the 2010-2013 rehabilitation. Drainage of the forebay for maintenance work on the racks and stop log sections for the west powerhouse is accomplished by using bulkheads.

A.1.3 Powerhouses

The Glen Ferris Project includes two powerhouses, the west (old) powerhouse built circa 1901 and the east (newer) powerhouse built in 1918.

The west powerhouse is of steel frame and brick construction on a cut stone masonry substructure. It is 64.5 feet long by 63 feet wide by 17 feet high and is founded on solid rock. Above the generator floor at elevation 661.1, the west powerhouse is divided by a steel reinforced masonry wall into a generator room and control room. The substructure contains three open concrete flumes, each approximately 15 feet wide and 45 feet long with a floor elevation of 641.58 feet. Each flume is equipped with a stoplog section at its entrance and contains the settings for two turbines. In the substructure of each flume are located two steel turbine draft tubes 6.0 feet in diameter which are connected to a common 8.5-foot steel draft tube leading to the tailrace. The forebay divider wall between the forebay and water upstream of the east powerhouse has a crest elevation of 657.0 feet.

The east powerhouse is of steel frame and brick construction on a concrete substructure, which adjoins the west end of the dam. It is approximately 54 feet long by 38 feet wide by 35 feet high and is founded on solid rock. The generator floor elevation is 661.1 feet. The substructure contains two open concrete flumes each 21 feet wide and 36 feet long with a floor invert elevation of 633.0 feet. Each flume is equipped with a stoplog section at its entrance and contains the setting for one turbine. There is an 8-foot 8-inch diameter steel spreading draft tube within the substructure of each flume that measures 23.5-feet-wide by 14.5-feet-high at the tailrace.

Powerhouse doors, windows, roofing and lighting were rehabilitated or replaced and the access bridge to the east powerhouse (Units 7-8) was also reconstructed during the 2010 – 2013 rehabilitation project.

A.2 IMPOUNDMENT SPECIFICATIONS (18 CFR §4.51(B)(2))

The 1.9-mile-long impoundment extends from the dam up to just below the confluence of the New and Gauley Rivers. The total length of the impoundment shoreline is approximately 5.3 miles, with an additional 0.7 miles of shoreline present along small islands.

The surface of the reservoir is normally maintained at the spillway elevation of 651.0 feet, except when river flow exceeds the plant capacity. The surface area at elevation 651.0 feet is approximately 190 acres.

The gross storage capacity of the reservoir is approximately 1,500 acre-feet at the normal maximum surface elevation of 651.0 feet. Since the reservoir is normally maintained at the crest of the dam (elevation 651.0 feet), there is no usable storage capacity.

A.3 TURBINE AND GENERATOR SPECIFICATIONS (18 CFR §4.51(B)(3))

There are six identical turbine-generator sets (Unit Nos. 1-6) installed in the west powerhouse. The turbines are Kiser Hydro (rehabilitated, S. Morgan Smith "McCormick" style turbine originally) vertical Francis units with a combined electrical installed capacity of 3,000 kilovolt-ampere (kVA), with each turbine rated at 503 horsepower (hp) and 120 rotations per minute (rpm) with a maximum head of 27 feet.

Each turbine drives an L&S Electric (rehabilitated, Westinghouse originally) umbrella generator, with each generator rating as 3-phase, 60 cycle, 4,160 volts, 500 kVA, and 120 rpm.

Units No. 1 – 6 do not have wicket gates. The turbines are equipped with cylinder gates that operate either fully open or closed.

There are two identical turbine-generator sets (Unit Nos. 7-8) installed in the east powerhouse. The turbines are Kiser Hydro (rehabilitated, S. Morgan Smith originally) vertical Francis units with a combined electrical installed capacity of 4,600 kVA, with each turbine rated at 2,597 horsepower and 100 rpm at a maximum head of 27 feet.

Each turbine drives an L&S Electric (rehabilitated, Westinghouse originally) umbrella generator, with each generator rated as 3-phase, 60 cycle, 4,160 volts, 2,300 kVA, and 100 rpm.

As the Commission stated in the September 12, 2013 Order Amending License and Revising Annual Charges[6], the Glen Ferris turbine units have a total installed capacity of 6.159 MW, and the generators have a total installed capacity of 7.6 MW. Because the authorized installed capacity means the lesser of the ratings of the generators or turbine units, the Glen Ferris Project is considered by FERC to have a total authorized capacity of 6.159 MW.

Turbine and generator details are summarized in Tables A-1and A-2.

TABLE A-1 GLEN FERRIS TURBINE SPECIFICATIONS

	West Powerhouse (Units 1-6)	East Powerhouse (Units 7-8)
Type	Vertical, Francis	Vertical, Francis
Manufacturer	S. Morgan Smith (Original) Kiser Hydro LLC (Rehabilitated)	S. Morgan Smith (Original) Kiser Hydro LLC (Rehabilitated)
Year Installed	2013	2011
Rated capacity (hp)	503	2,597
Runner Material	Carbon Steel	Stainless Steel
Rated head (ft.)	27	27
Speed (rpm)	120	100
Minimum hydraulic capacity (cfs)	199 (each)[a]	704 (each)
Maximum hydraulic capacity (cfs)	199 (each)	957 (each)

[a] Units No. 1 – 6 do not have wicket gates. The turbines are equipped with cylinder gates that operate either fully open or closed.
cfs – cubic feet per second

TABLE A-2 GLEN FERRIS GENERATOR SPECIFICATIONS

	West Powerhouse (Units 1-6)	East Powerhouse (Units 7-8)
Type	Umbrella	Umbrella
Manufacturer	Westinghouse (Original)	Westinghouse (Original)
Rewind Contractor	L&S Electric (Rehabilitated)	L&S Electric (Rehabilitated)
Year Rewound	2013	2011
Rating (kVa)	500	2,300
Phases	3	3
Frequency (Hz)	60	60
Speed (rpm)	120	100
Voltage (V)	4,160	4,160

[6] 144 FERC ¶ 62,233

A.4 TRANSMISSION LINE AND EQUIPMENT SPECIFICATIONS (18 CFR §4.51(B)(4-5))

A.4.1 Transmission Lines

Energy from Glen Ferris is delivered from a 60-Hertz (Hz) G.F. substation, constructed as part of the 2010-2013 rehabilitation, which includes a step-up transformer, a breaker, and associated equipment to interconnection equipment at the Alloy substation, the interconnection point for 60-Hz power generated from Glen Ferris to the grid (PJM Interconnection).

The outdoor switchgear consists of one three-phase, Generator Set-Up transformer rated at 6.0/8.0 megavolt-amperes, 60 cycle, 4.16-kilovolt (kV) "D"/13.8 kV "Y." In addition, located outside is a three-phase, 15 kV, 1200 amp vacuum circuit breaker, which connects Glen Ferris to the Alloy substation transmission line, a lighting transformer, lightning arrestors, disconnecting switches, and other miscellaneous metering and control equipment.

The Glen Ferris Project includes a 4-mile-long, 13.8-kV transmission line that connects the Glen Ferris substation to the Alloy Substation. (The transmission line runs in parallel with the two 69-kV Hawks Nest Project transmission lines that connect the Hawks Nest powerhouse with the Alloy Substation.)

A.4.2 Appurtenant Equipment

The six Kiser turbines in the west powerhouse (S.Morgan Smith originally) are controlled by a Limitorque gear drive gate operator located on each turbine.

The two Kiser turbines (S. Morgan Smith originally) in the east powerhouse are equipped with I&S Governor systems including the required accumulators and pumping units.

Each powerhouse has an overhead crane. The crane in the west powerhouse has a capacity of 10 tons while its counterpart in the east powerhouse has a capacity of 25 tons. These cranes were replaced in kind during the 2010-2013 rehabilitation project.

The controls for the Glen Ferris powerhouses are located in the west powerhouse. The controls consist of a Plant Controller programmable logic control (PLC), and each unit has a slave controller PLC. Static excitation for each unit is provided by Basler Electric Excitation systems.

All of the auxiliary equipment, including fans, lighting, etc., is connected to the 480 volts auxiliary bus switchboard. The station service transformer is a HPS Millennium general purpose medium voltage distribution transformer located on the furnace deck under a small shelter, and it is a 300 kVA dry type transformer. The primary side is 4,160 volts and is stepped down to 480 volts. This transformer is fed directly off of the 4,160 volts bus, and it feeds an 800 amp distribution panel board located in the west powerhouse. This panel board can also be fed by the local utility (American Electric Power) via a manual transfer switch. From this distribution panel board, two motor control centers are fed along with lights, welding outlets, and the west powerhouse crane. There are also 60 Alpha Cell OPzS Stationary Flooded tubular Lead acid batteries at Glen Ferris on a battery rack that has a secondary containment along with absorption and neutralization pads. Battery voltage is 125 Voltage Directs Current (VDC). New static exciters; circuit breakers and controls for all units and governors for Units 7-8 were included in the 2010-13 rehabilitation project.

The Glen Ferris Project is monitored and operated (i.e., starting and stopping the units) by Brookfield's North America System Control Center (NASCC) located in Marlborough, MA. NASCC is able to transfer authority for operation of the station to the control desk located in the Hawks Nest control room, if needed. In the event of the loss of communications, a local operator would be dispatched to operate the facility manually.

A.5 UNITED STATES LANDS WITHIN PROJECT BOUNDARY (18 CFR §4.51(B)(6))

There are no lands of the United States included within the project boundary of the Glen Ferris Project.

Exhibit B

Project Operation and Resource Utilization (18 CFR§4.51(c))

B.1 DESCRIPTION OF PLANT OPERATIONS (18 CFR §4.51(C)(1))

B.1.1 General Project Description and Overview

B.1.1.1 Drainage Basin Description

The Glen Ferris Project is located downstream of the Hawks Nest Project, on the Kanawha River, which is formed by the confluence of the New and Gauley Rivers.

The watershed above Hawks Nest Dam extends into North Carolina and Virginia and drains a total area of 6,913 square miles. The New River flows in a general north-northwest direction, with its origins in the Blue Ridge Mountains. There are five dams located on the mainstem New River upstream of Hawks Nest, with the two closest to Hawks Nest being Bluestone Dam (owned and operated by the U.S. Army Corps of Engineers – Huntington District) (USACE), located in Summers County, West Virginia, approximately 65 miles above the mouth of the New River, and then Claytor Dam (owned and operated by Appalachian Power Company, a subsidiary of American Electric Power). Stream flow records are available from 25 locations on the river, so the river flow is well documented. The New River stream flow characteristics are typical of the West Virginia area: the summer and fall are usually dry, and the winter and spring are usually wet. The land elevation varies from 5,400 feet on Rich Mountain near the southern extreme of the drainage basin to 800 feet at Hawks Nest Dam. The relief is characterized by plateau lands, dissected plateau lands, and limestone valleys and mountain ridges in approximately equal amounts. The majority of the streams in the watershed are relatively steep, and most of the valleys are narrow and flanked by steep hillsides.

The USACE Summersville Dam is located on the Gauley River, in Nicholas County, West Virginia. Summersville Dam, which was constructed between 1960 and 1966, controls Gauley River flows above the Gauley River's confluence with the New River. The Gauley River begins in Pocahontas County, West Virginia, at an elevation of about 4,600 feet. The mouth of the Gauley River, 107 miles from its source, is at an elevation of about 600 feet. Downstream from

Summersville Dam, the river has cut a gorge of up to 500 feet deep in places. The Gauley River flows through the gorge for approximately 24 miles with a stream gradient of 28 feet per mile. Within the gorge, the river is characterized by alternating pools and rapids with torrential water, boulders and exposed bedrock.

The Upper Kanawha watershed is in portions of Boone, Kanawha, Fayette, and Raleigh counties in southern West Virginia. The watershed, a component of the Kanawha River watershed, encompasses nearly 521 square miles. The average elevation in the watershed is 1,448 feet. The highest point is at 3,132 feet on Paint Mountain, which is along the southwestern boundary of the watershed. The minimum elevation is 561 feet at the surface of the Kanawha River (Hawks Nest Hydro, LLC 2012).

B.1.1.2 Glen Ferris Reservoir and Upstream Area

Both the Glen Ferris Project and the upstream Hawks Nest Project are operated in a run-of-river mode, with Project discharge approximating the sum of inflows to each Project.

Inflow to the Hawks Nest Project is primarily regulated by USACE's Bluestone Dam, which was constructed for flood control, recreation, and fish and wildlife enhancement by authority of an Executive Order of the President on September 12, 1935, and the Flood Control Acts of June 22, 1936 and June 28, 1938. Bluestone Dam was constructed in 1949, after construction of Hawks Nest Dam in the 1930s, and more recently than the flood of record for the New River (1940, 244,000 cfs at the historical U.S. Geological Survey (USGS) Caperton Gage). The Bluestone Reservoir/Dam controls 4,565 square miles of the Project watershed and stores 631,000 acre-feet when full. With regard to the probable maximum flood (PMF) at Bluestone, the peak inflow is 1,086,000 cfs and the peak outflow is 1,010,780 cfs. Bluestone Dam provides a limited extent of flood control for the basin year-round and is typically operated with a drawn down seasonal reservoir level during the winter and early spring months, for additional flood control storage during the time of year when general flooding most frequently occurs. Under typical flood operation, USACE limits the maximum control discharge from Bluestone Dam to 90,600 cfs at the Hinton gage.

For approximately 7 miles downstream of the Hawks Nest Dam, the New River follows a narrow valley with an average slope of 17 feet per mile to its confluence with the Gauley River, where the rivers continue to form the Kanawha River.

The Gauley River also contributes to Glen Ferris Project inflows. As described above, the Gauley River is regulated by USACE's Summersville Dam, which was constructed to control flooding in an 803-square-mile watershed along the Gauley River and the Kanawha River. Summersville Dam is typically operated with a drawn down seasonal reservoir level during the fall and winter months, for additional flood control storage during the time of year when general flooding most frequently occurs, and at a higher elevation in the summer for recreation.

B.1.2 Project Operation

The Glen Ferris Project is staffed by Hawks Nest Hydro travelling operators based at the Hawks Nest Project and is monitored and automatically operated (i.e., starting and stopping the units) from Brookfield's North America System Control Center (NASCC) in Marlborough, Massachusetts, which is staffed 24 hours per day, 7 days per week, including weekends and holidays. NASCC is able to transfer authority for operation of the station to the control desk located in the control room in the Hawks Nest powerhouse if needed. In the event this situation arises (e.g., in the event of loss of remote terminal unit communications), the station can be operated by remote control from the Hawks Nest control desk or manually at Glen Ferris.

The surface of the reservoir is normally maintained at the spillway elevation of 651.0 feet, except when river flow exceeds the plant capacity. The surface area at elevation 651.0 feet is approximately 190 acres. There are no spillway gates to operate, and the spillway is an uncontrolled overflow structure. Consequently, there are no special flood operations at the dam.

The dam and powerhouses are observed daily by operating personnel. Additionally, the Project structures are inspected annually by Brookfield engineers, as well as after significant earthquakes (felt earthquakes or earthquakes that have occurred locally which have received coverage by local news reporting outlets) and significant floods. Inspections of the Glen Ferris Project are also conducted tri-annually by the FERC Division of Dam Safety and Inspections - New York Regional Office.

B.1.3 Project Operations during Low- and Mean-Flow Periods

The Glen Ferris reservoir has no usable storage capacity and is operated as a run-of-river facility under all conditions of stream flow. When Kanawha River inflow is between minimum and maximum turbine capacity, the units are operated using the available water. When inflow is less than minimum turbine capacity, the unit(s) are shut down accordingly with water automatically spilled over the crest of the dam. The water discharge from the Glen Ferris powerhouses and the dam overflow approximates inflows to the Project.

B.1.4 Project Operations during High-Flow Periods

Under high river flow conditions, the eight hydro generating units are operated to their maximum discharge capability with the balance of the flow automatically spilling over the crest of the dam.

The Kanawha River average flood flow is about 80,000 cfs, with the 100-year flood having a peak flow of about 152,500 cfs.

B.1.5 Plant Factor

Based on today's estimated average annual generation of 41,482 MWh as described below and a rated turbine capacity of 6.159 MW, the plant capacity factor is estimated to be 0.769.

B.2 ESTIMATED ENERGY PRODUCTION AND DEPENDABLE CAPACITY (18 CFR §4.51(C)(2))

The average annual generation for the Glen Ferris Project for the period 1938 through 1982 was 34,000 MWh. The estimated average annual generation for the Project for the new license term based on the rehabilitated units is expected to be 41,482 MWh. The Project experiences significant seasonal and annual variations in generation due to its run-of-river operating mode and seasonal precipitation events. Table B-1 provides a summary of monthly generation for the period following the rehabilitation of the east and west powerhouses. It should be noted that due to continued unit maintenance associated with the rehabilitation, all units were not available for generation throughout the period shown in Table B-1.

TABLE B-1
GLEN FERRIS PROJECT MONTHLY GENERATION (MWH), 2012-2014

	2012	2013	2014
Jan	2,321	1,863	1,830
Feb	2,268	1,170	1,978
Mar	2,123	1,163	3,198
Apr	2,226	920	3,702
May	2,066	1,086	3,134
Jun	718	1,457	2,087
Jul	1,731	1,782	706
Aug	1,252	2,054	1,447
Sep	1,781	2,891	1,608
Oct	1,893	2,529	1,414
Nov	1,651	1,701	1,970
Dec	2,195	1,765	2,118
Total	22,226	20,381	25,193

*Shaded cells denote periods when all units were not available for generation

The estimated dependable capacity at Glen Ferris is 2,490 kW based on a stream flow of 1,648 cfs (Hawks Nest Hydro, LLC 2012). This is the lowest average thirty consecutive day stream flow recorded during the period of record, which has been defined by the Licensee as 1954 to present. The Licensee notes that this period of record generally reflects the construction of two major projects which have altered New River flows above Hawks Nest (Claytor Lake in 1939 and Bluestone Lake in 1949) as well as the construction of Summersville Dam on the Gauley River in 1965, and is representative of current and future stream flows.

B.2.1 Flows

The USGS gage 03193000, "Kanawha River at Kanawha Falls, WV" is located 2 miles downstream of the confluence of the New and Gauley rivers. Since there are no significant tributaries between the powerhouses and the gauging station, stream flow at Glen Ferris is considered the same as at the Kanawha Falls gauge. Consequently, specific flow information pertinent to the Glen Ferris site can be retrieved from the Kanawha Falls gauge records.

Table B-2 provides flow data for the Kanawha River downstream of the Glen Ferris Project.

TABLE B-2 KANAWHA RIVER FLOW DATA IN THE VICINITY OF THE GLEN FERRIS HYDROELECTRIC PROJECT, 1954 THROUGH 2014

Month	Flow, cfs			
	Average	Minimum	Median	Maximum
January	16,237	1,694	11,358	110,589
February	19,363	1,823	14,446	107,600
March	23,918	3,228	17,834	113,578
April	18,187	3,507	13,948	105,607
May	15,112	2,580	11,059	87,574
June	9,200	1,793	6,197	82,493
July	6,220	996	4,543	89,069
August	5,411	1,255	3,656	66,154
September	4,914	1,026	3,402	66,951
October	6,329	1,126	4,065	85,781
November	9,810	1,405	6,680	93,353
December	13,687	1,504	9,863	94,549
Annual	12,333	996[a]	7,771	113,578[b]

[a] July 30, 1966
[b] March 13, 2010

An annual as well as monthly flow duration curves for flows through the Glen Ferris Project are included at the end of this Exhibit (Figure B-3). The flow duration curves are based on flow data from 1954 through 2014 for the Kanawha River at Kanawha Falls, WV USGS gage, adjusted for the Hawks Nest and Glen Ferris Projects' drainage area,

Due to the overflow nature of the spillway, and since there is no usable storage at the Glen Ferris Project, the release from the Glen Ferris Project is equal to inflows to the Project.

B.2.2 Capacity Curve

Since the Glen Ferris reservoir has essentially no significant storage and the impoundment level is generally maintained at the crest of the dam, a site specific area-capacity curve and impoundment rule curve have not been developed for, nor is necessary to the current and future operation of the Project.

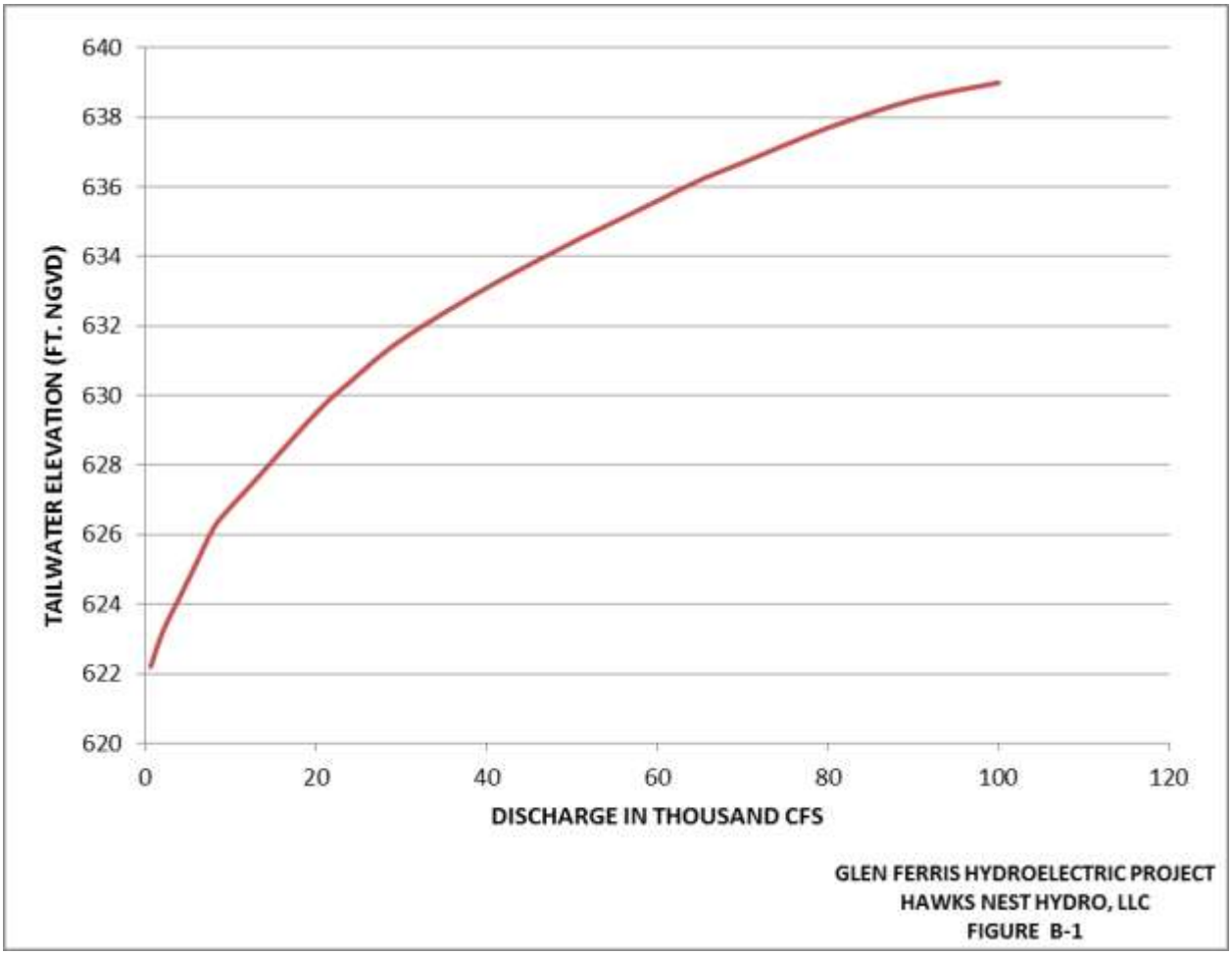
B.2.3 Hydraulic Capacity

The estimated hydraulic capacity of the power plant is 3,108 cfs. This generating discharge results in 6,159 kW of generation. The minimum hydraulic capacity of the Project is 199 cfs.

B.2.4 Tailwater Rating Curve

Figure B-1 depicts the tailwater curve associated with the Glen Ferris Project.

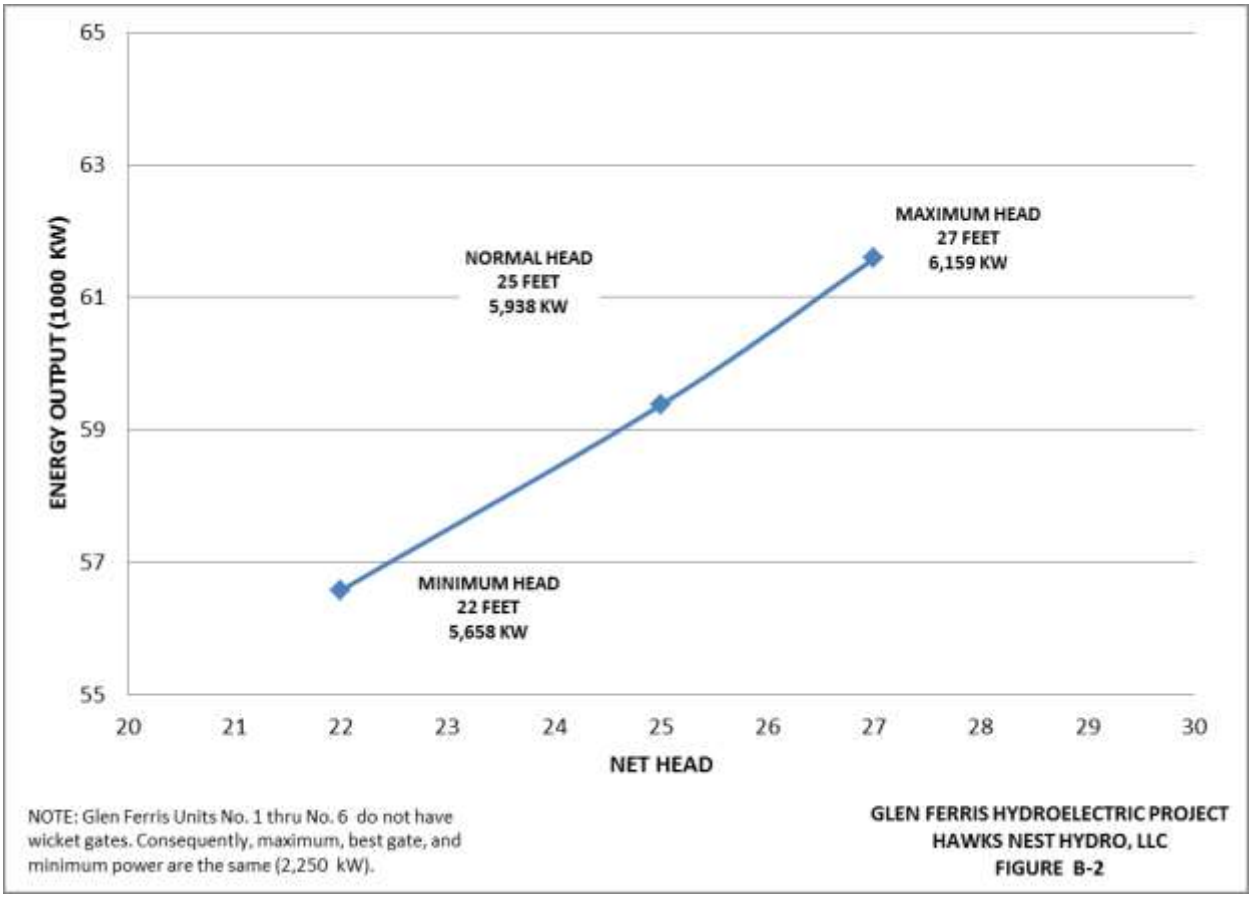
FIGURE B-1. GLEN FERRIS PROJECT TAILWATER RATING CURVE



B.2.5 Powerplant Capability versus Head

Figure B-2 shows a curve displaying power plant capability as a function of head. The maximum, normal and minimum heads are noted on the curve.

FIGURE B-2. GLEN FERRIS PROJECT CAPABILITY AS A FUNCTION OF HEAD



B.3 STATEMENT OF POWER UTILIZATION (18 CFR §4.51(C)(3))

Hawks Nest Hydro sells the electricity generated at the Glen Ferris Project as a market participant in the PJM. The Project is interconnected with the Appalachian Power Company distribution and transmission system. The exact amount of station service power required is not available, but it is estimated to be between 1 and 2 percent of total annual generation.

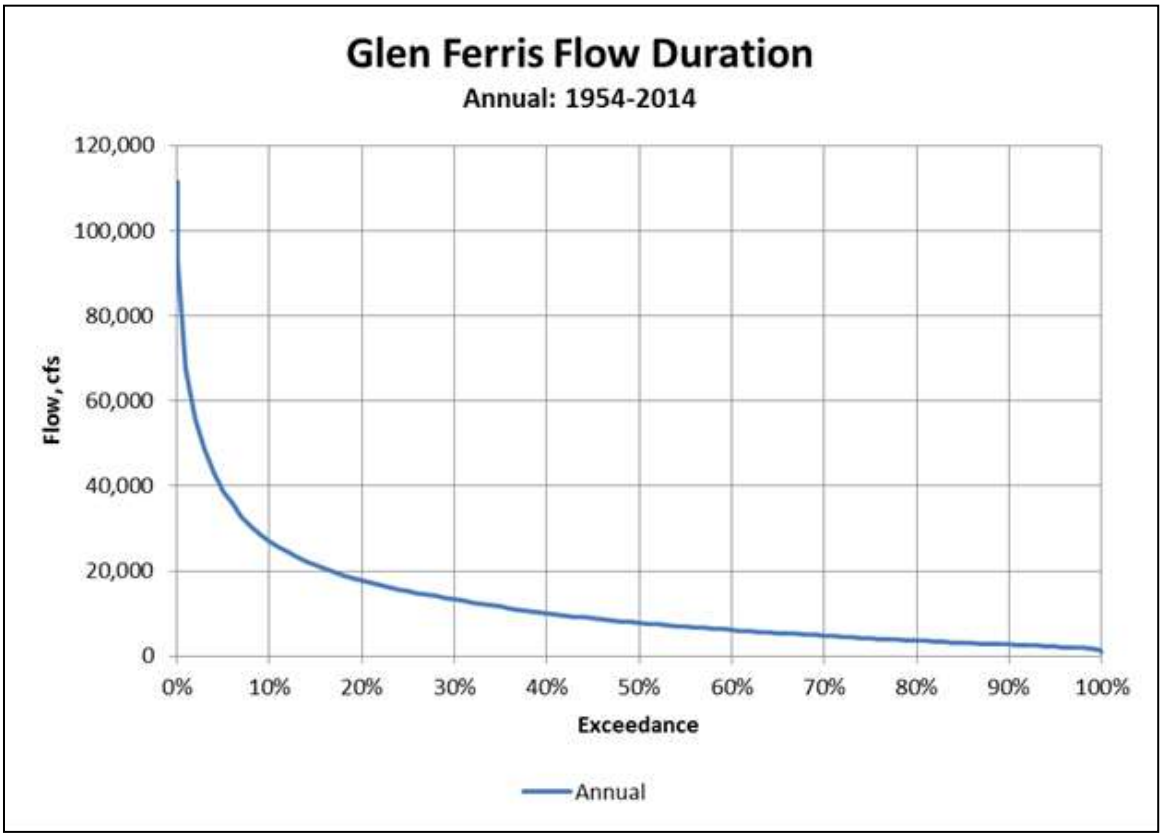
B.4 FUTURE DEVELOPMENT (18 CFR §4.51(C)(4))

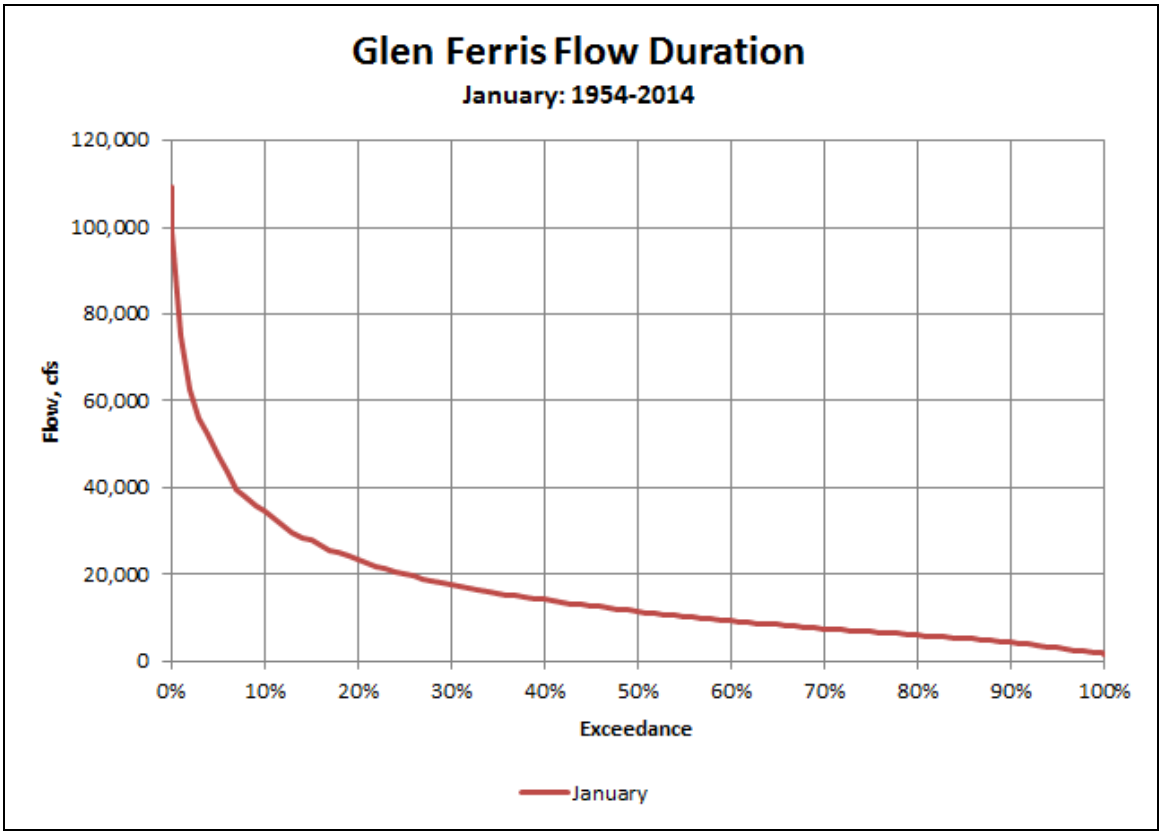
The Glen Ferris Project was extensively rehabilitated during 2010 - 2013 by the Licensee. In December 2011, the rehabilitation of the larger two generators (Unit 7 and Unit 8) was completed, and the generators were placed back into service. The six smaller generators (Units 1

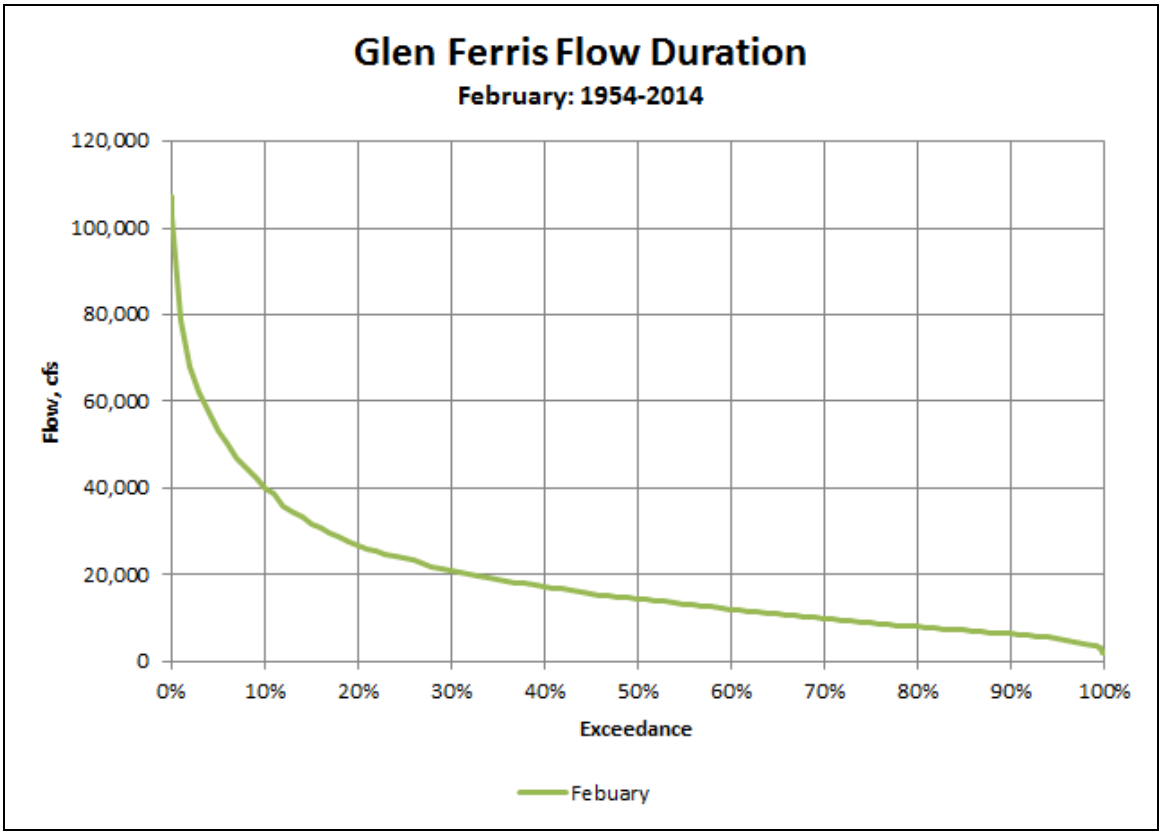
through 6) were returned to service in September 2013. The Licensee has no further redevelopment plans proposed as part of this proceeding.

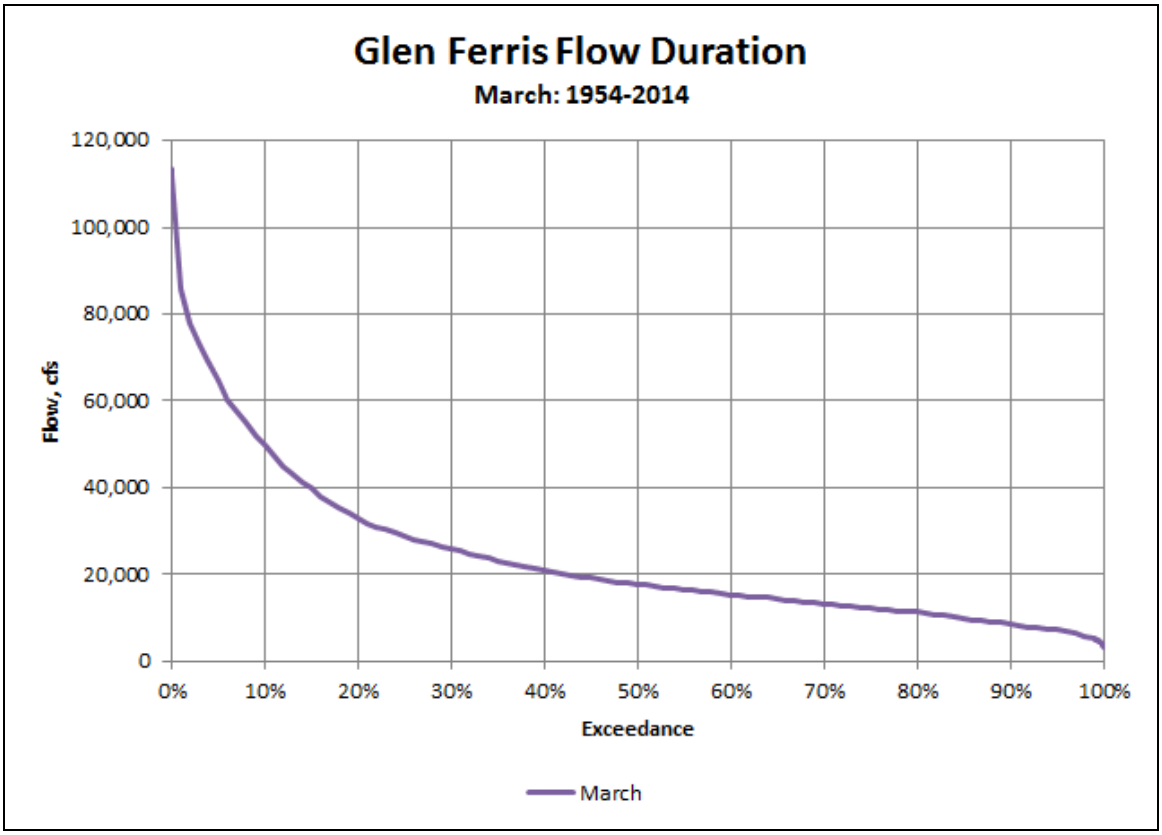
FIGURE B-3. GLEN FERRIS PROJECT ANNUAL AND MONTHLY FLOW DURATION CURVES

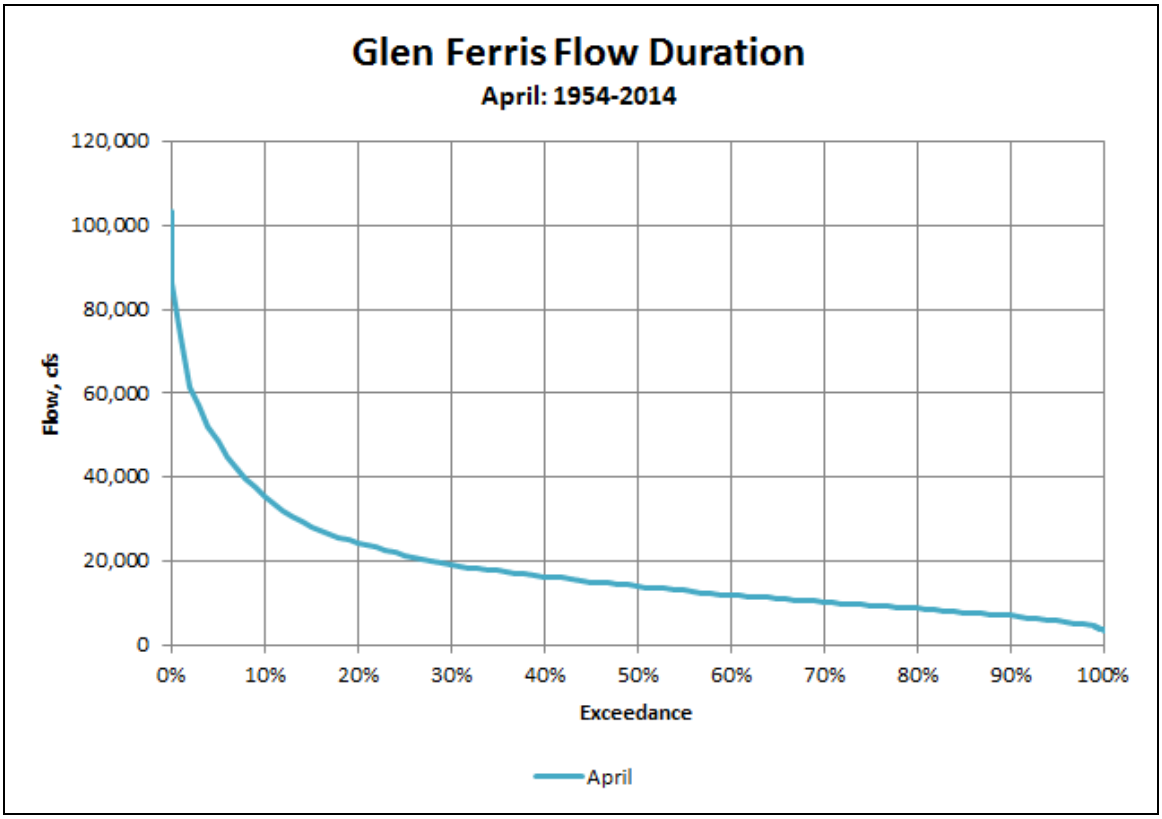
(Based on data from Kanawha River at Kanawha Falls, WV USGS gage, adjusted for the Hawks Nest and Glen Ferris drainage area)

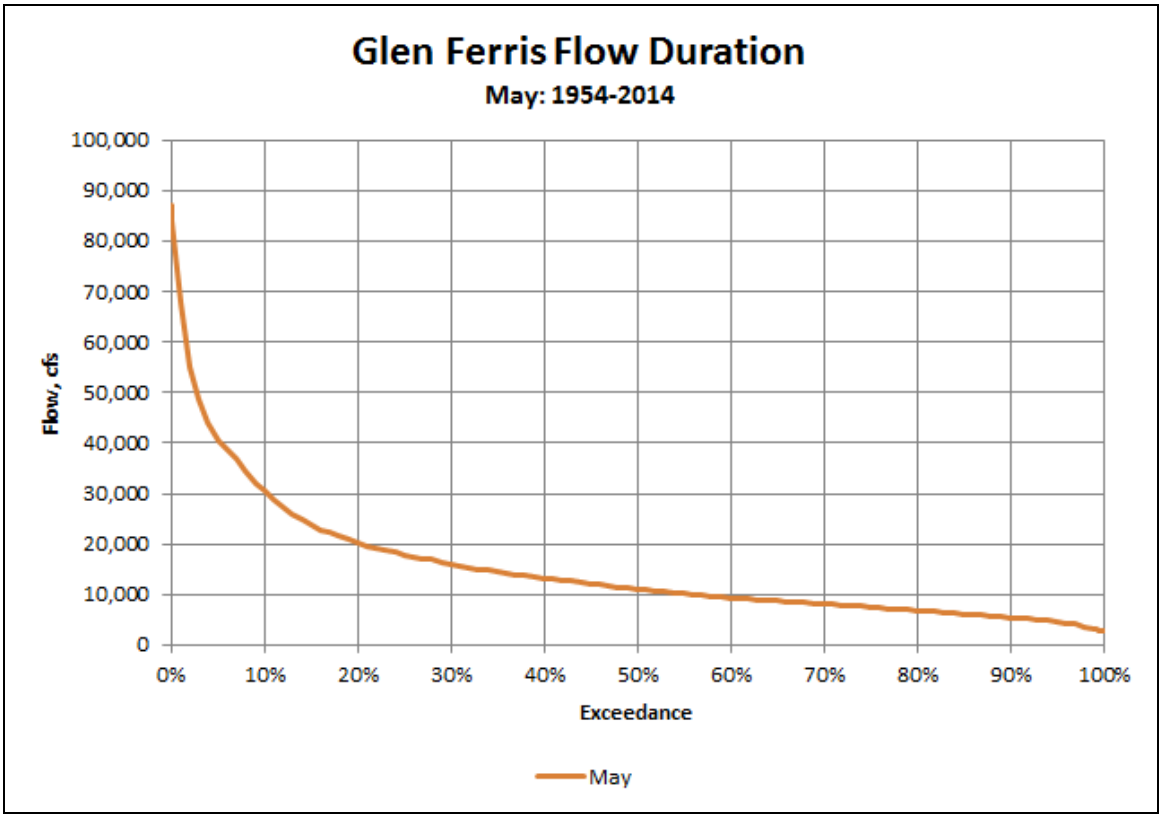


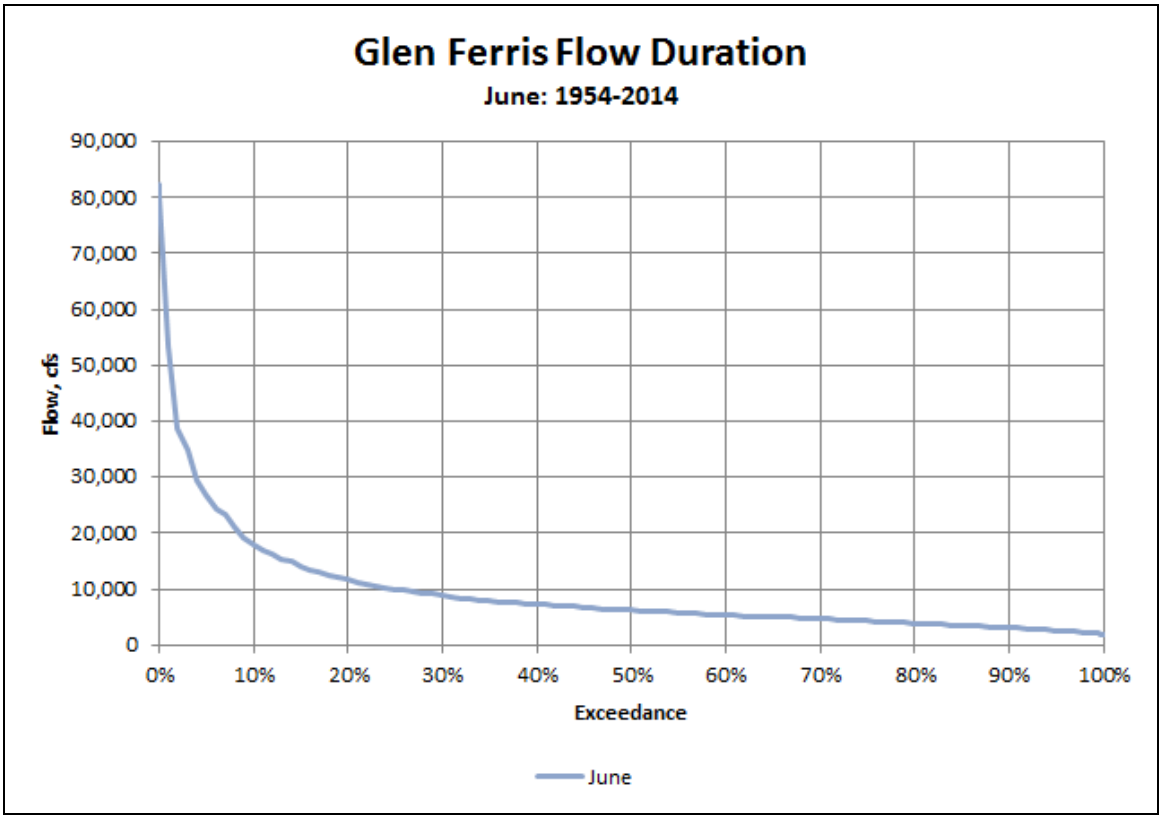


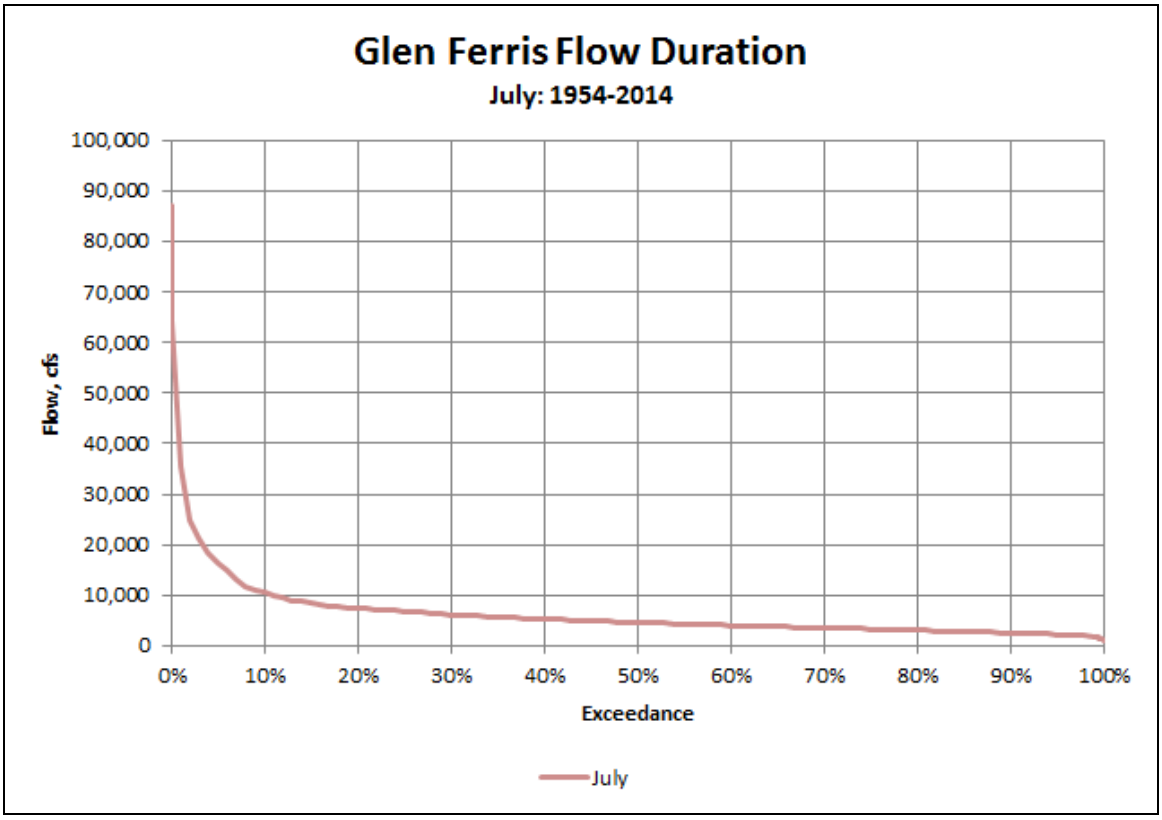


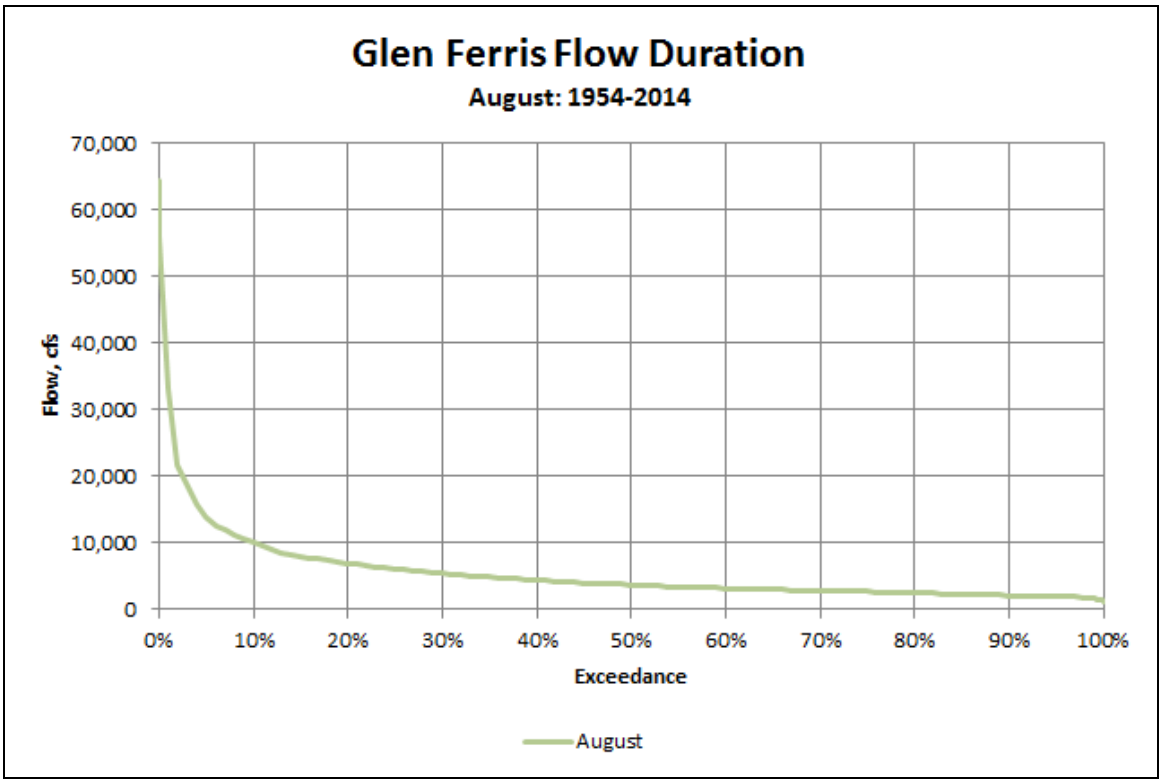


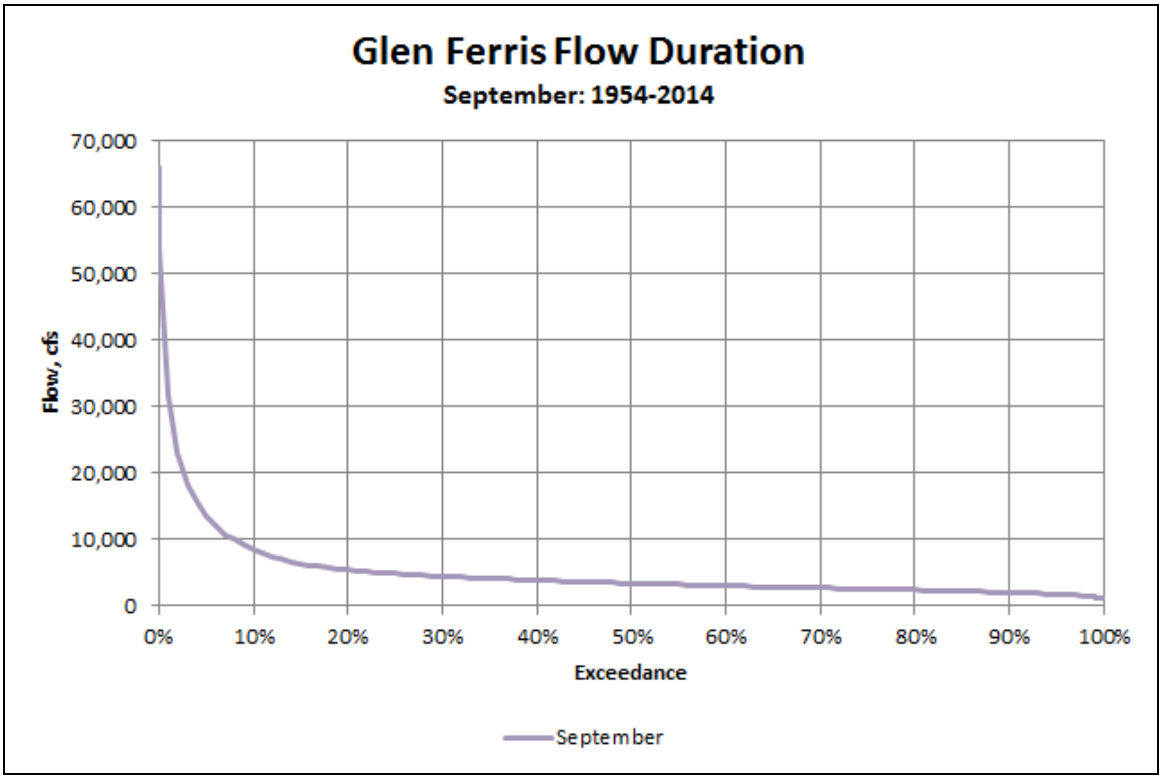


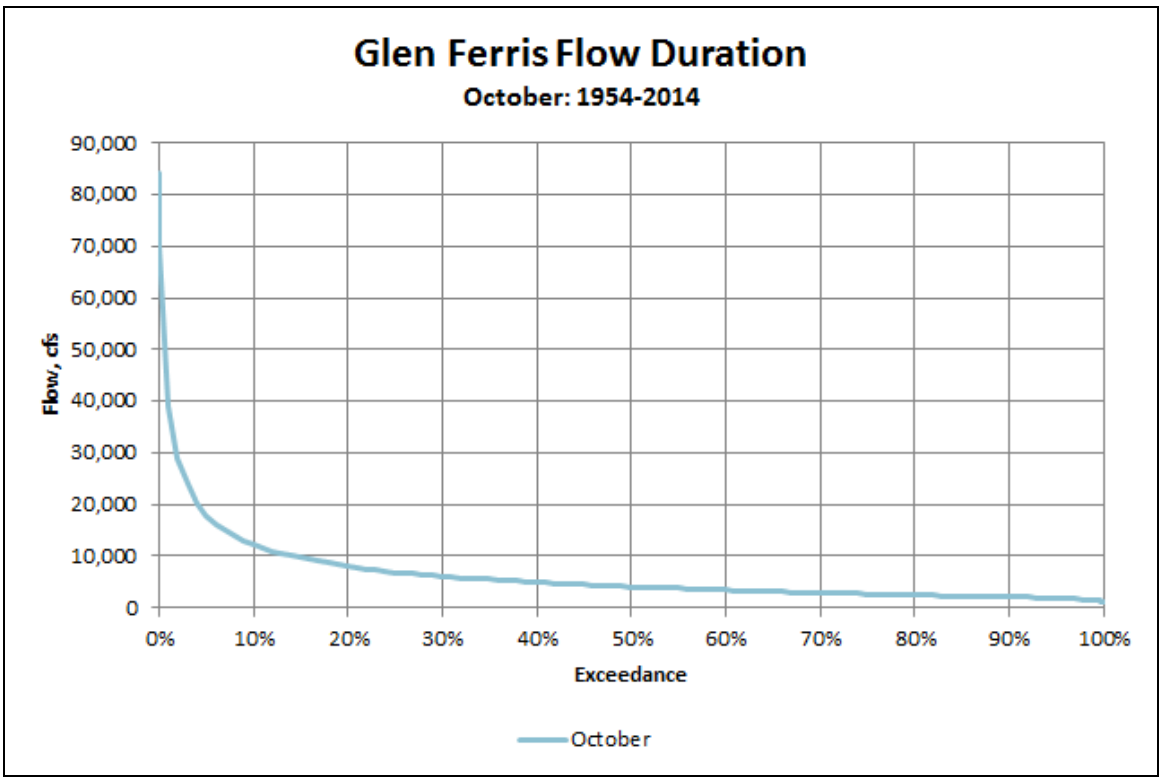


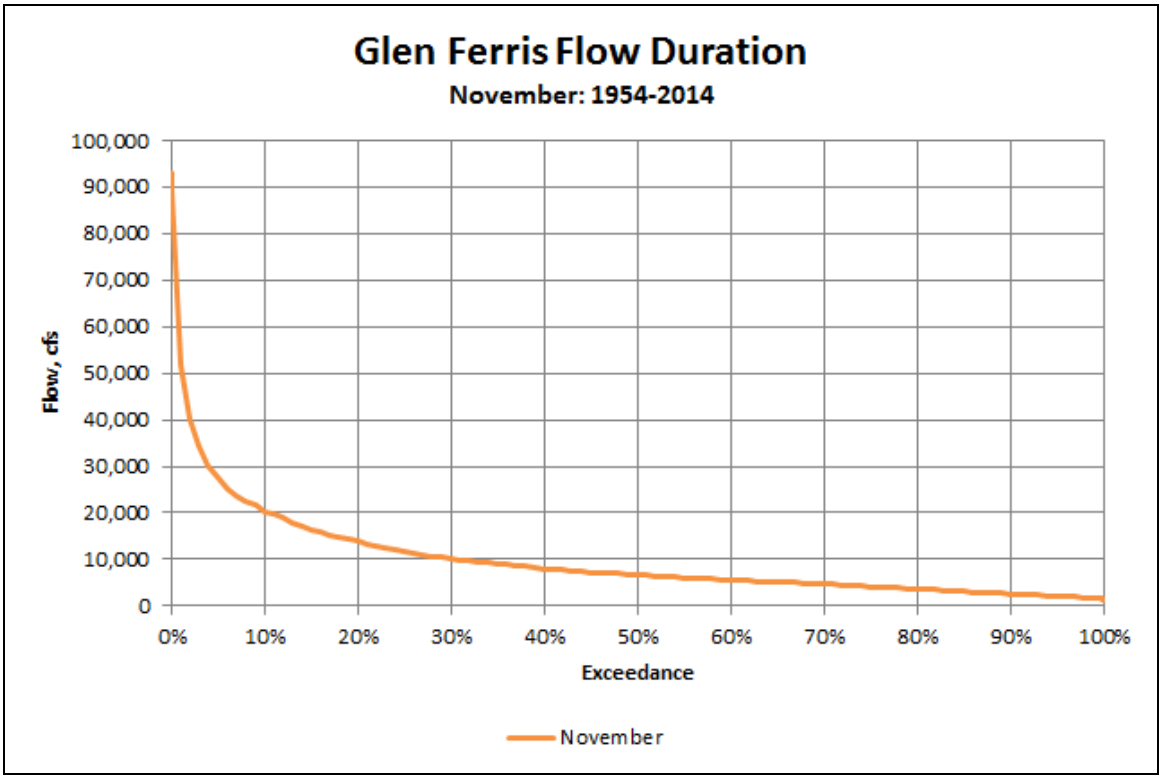












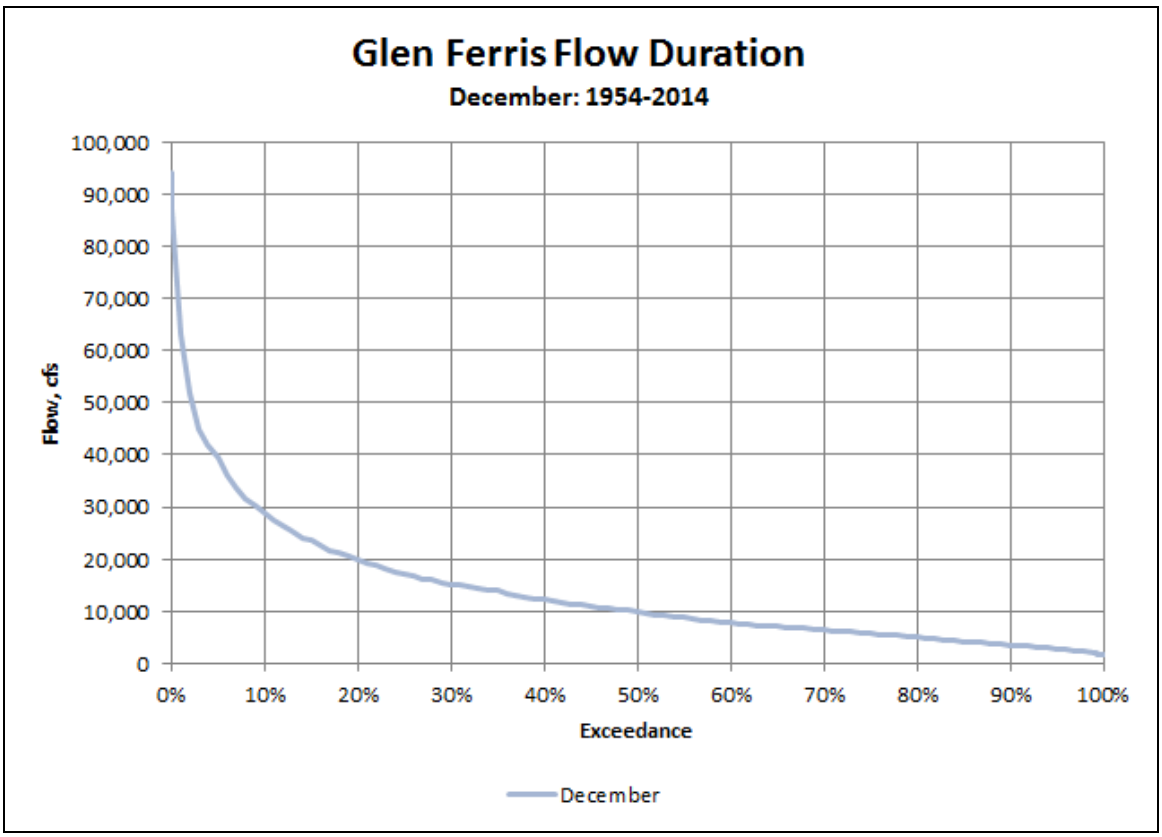


Exhibit C

Construction History and Proposed Construction Schedule (18 CFR §4.51(d))

C.1 CONSTRUCTION OF EXISTING FACILITIES (18 CFR §4.51(D)(1))

Because 18 CFR §4.51(d)(1) requires a construction history only for applications for an initial license, a construction history is not required for this relicensing application for the Glen Ferris Project. However, to provide general and background information a brief summary of the construction history of the Glen Ferris Project is provided below.

Pursuant to a permit issued February 27, 1899, by the Secretary of War of the United States of America, a wooden dam and a powerhouse were constructed at the location of the present Glen Ferris Project by the Wilson Aluminum Company of Spray, North Carolina. The Glen Ferris Project was commissioned in 1901 to furnish power to furnaces producing ferroalloys in a furnace room adjoining the powerhouse. The original equipment consisted of three horizontal type 600 kW generators, each of which was connected by wooden bevel gears to two vertical turbines. The plant was purchased by Electro Metallurgical Company in 1901 and was operated by that company until March 31, 1911, when the powerhouse superstructure was destroyed by fire.

The powerhouse was rebuilt, and between 1911 and 1918 numerous changes and additions were made to the buildings and equipment. These included replacing, in 1913, the three 600-kW horizontal generators with six 350-kVA vertical generators, and building a second powerhouse containing two 1875-kVA, 2400-V vertical type generators, which was completed in February 1918. During 1919 and 1920 a major part of the old wooden dam was replaced by a reinforced concrete dam. The replacement dam has the same crest elevation of 651.0 feet as did the original timber dam.

In 1954 production of ferroalloys was discontinued on-site at Glen Ferris, and a 7,100 hp frequency changer was put in service at Glen Ferris to convert 60-Hz generation to 25-Hz for use at Alloy in the common 25-Hz system for metal production.

In 2003, the Glen Ferris Project suffered from mechanical malfunctions and became inoperable. In early 2010, the Licensee elected to bring both powerhouses back online, undertaking a rehabilitation project. Construction began in June of 2010. In December 2011, the rehabilitation of the larger two of the generators (Unit 7 and Unit 8) was completed and the generators placed back into service. The rehabilitation of the six smaller generators (Units 1 thru 6) was completed and the generators returned to service during September 2013. The project also included construction of a new access bridge to the powerhouses, upgrade of the cranes in both powerhouses, installation of new step-up transformers, generator breakers and controls. After completion of the rehabilitation project, the plant capacity is approximately 6.159 MW.

The construction and major events/alterations/repairs to the Glen Ferris Development are listed as follows:

- 1899-1901 Project constructed (wooden dam and powerhouse)
- 1901 Project commissioned
- 1911 Powerhouse superstructure destroyed by fire
- 1913 Replacement of three 600-kW horizontal generators with six 350-kVA vertical generators
- 1918 Completion of new second powerhouse (east)
- 1919-1920 Major part of wooden dam replaced by a reinforced concrete dam
- 1954 Frequency changer installed to convert 60-Hz generation to 25-Hz
- 1964 Westinghouse Redac Control System installed to allow remote operation
- 2003 Facility suffered mechanical malfunctions and became inoperative
- 2010-2013 Major rehabilitation of the generating equipment to bring the plant back on line

C.2 PROPOSED CONSTRUCTION SCHEDULE (18 CFR §4.51(D)(2))

Hawks Nest Hydro has examined the potential for Project life extension, unit upgrade, and capacity addition, and has determined that continued life extension of the rehabilitated existing facilities is the only economical consideration for the Project at this time. There is no fixed schedule for Hawks Nest Hydro's life-extension program. This program consists of an ongoing

program to maintain, repair, modify, or replace the civil, mechanical, or electrical components of the Project on an as-needed basis. Hawks Nest Hydro reserves the right to reevaluate the potential for unit upgrades or capacity additions in the future.

The new environmental enhancements proposed by Hawks Nest Hydro will be implemented consistent with the schedule presented in Table C-1.

TABLE C-1
SCHEDULE FOR IMPLEMENTATION OF ENVIRONMENTAL ENHANCEMENTS

Environmental Enhancement	Proposed Completion (Months After New License Issuance)
Provide first annual fish compensation payment to WVDNR	12 months
Prepare first 5-Year Resource Enhancement Plan in consultation with WVDNR and USFWS and file with FERC	60 months
Prepare final Recreation Management Plan in consultation with agencies and file with FERC for approval	9 months
Provide first annual recreation facility maintenance payment to WVDNR	12 months
Provide one-time recreation facility enhancement payment to WVDNR	12 months
Implement Historic Properties Management Plan	1 month of FERC-approval of final HPMP

Exhibit D

Costs and Financing (18 CFR §4.51(e))[7]

D.1 ORIGINAL COST OF PROJECT

Since Hawks Nest Hydro is applying for a new license for an existing project, as compared to an initial license, a tabulated statement providing the actual or approximate cost of Project construction is not applicable.

D.2 PROJECT TAKEOVER COST PURSUANT TO SECTION 14 OF THE FPA (18 CFR §4.51(E)(2))

D.2.1 Fair Market Value

Fair market value is not defined in the FPA or its implementing regulations. Consequently, many principles applicable in determining this component of takeover compensation are uncertain. Accordingly, the fair market value provided is only an estimate and is subject to final determination in the event that a takeover occurs. Hawks Nest Hydro reserves the right to file appropriate revisions to its statement should administrative, legislative, or judicial decisions clarify the principles and definitions of takeover compensation.

Hawks Nest Hydro has estimated the fair market value of the Project through an evaluation of recent acquisitions throughout the United States, which have ranged from $2,500 to $5,000 per installed kW. Based on this evaluation, the estimated fair market value of the 6.159-MW Glen Ferris Project could be considered to range from $15,397,500 to $30,795,000.

D.2.2 Net Investment

The FPA defines "net investment" as the original cost, plus additions, minus the sum of the following items (to the extent that such items have been accumulated during the period of the license from earnings in excess of a fair return on such investment): (a) unappropriated surplus;

[7] Financial information presented in this Draft License Application represent provisional information which is subject to further refinement and finalization within the Final License Application.

(b) aggregate credit balances of current depreciated accounts; and (c) aggregate appropriations of surplus or income held in amortization, sinking fund, or similar reserves.

The current net investment in the Glen Ferris Project is $20,270,000. This should not be interpreted as the fair market value of the Project.

D.2.3 Severance Damages

Severance damages are not clearly defined in the FPA or its implementing regulations and many principles applicable in determining this component of takeover compensation are uncertain and can only be estimated. However, Hawks Nest Hydro believes that potential severances inflicted by a takeover of the Project would be significant. Therefore, given the challenges of estimating damages associated with severance, Hawks Nest Hydro is reserving the right to provide the Commission with such an estimate should the Commission consider a federal takeover of the Project.

D.3 ESTIMATED COSTS OF NEW FACILITIES AND MEASURES (18 CFR §4.51(E)(3))

New facilities to be constructed and measures to be performed as a result of a new license are limited to the proposed environmental enhancements associated with an additional license term. The environmental enhancements will not require any new Project lands or water rights for which Hawks Nest Hydro does not already have ownership or rights. Table D-1 presents preliminary costs associated with the enhancement measures.

TABLE D-1
PRELIMINARY COST ESTIMATE OF PROPOSED ENVIRONMENTAL MEASURES

Item	Capital Cost (2015 dollars)	Incremental O&M[a] or Annual Cost (2015 dollars)
Provide first annual fish compensation payment to WVDNR	-	$30,000
Prepare first 5-Year Resource Enhancement Plan in consultation with WVDNR and USFWS and file with FERC	-	$1,000
Prepare final Recreation Management Plan in consultation with agencies and file with FERC for approval	$8,000	$1,000
Provide first annual recreation facility maintenance payment to WVDNR	-	$25,000
Provide one-time recreation facility enhancement payment to WVDNR	$50,000	-
Historic Properties Management Plan and implementation	$10,000[b]	$1,000
Total	**$68,000**	**$58,000**

[a] O&M = operations and maintenance
[b] Pre-license issuance cost if plan filed with FLA

D.4 AVERAGE ANNUAL COST OF PROJECT (18 CFR §4.51(E)(4))

There is no fixed schedule for Hawk Nest Hydro's life-extension program, rather a sequence of activities designed to be implemented when needed. Accordingly, there is not a fixed annual budget allocated for life-extension activities. These activities would be performed on an as-needed basis using existing planning procedures that provide short- and long-term windows to evaluate, schedule, and budget replacements and rehabilitation work in an orderly fashion.

D.4.1 Current Annual Costs

Based on operations and maintenance cost for 2014, the estimated annual costs for the Glen Ferris Project are presented in Table D-2.

TABLE D-2
OPERATING COST FOR 2014

Description	Cost
Annual operation, maintenance, expenses, fees, insurance, overhead, depreciation[a]	$262,570
Local, state, and federal taxes	$316,400
Total	**$578,970**

[a] Does not yet include depreciation for the recent Project rehabilitation, to be included in the FLA.

D.4.2 Estimated Future Annual Costs

Given the proposed environmental measures presented in this application, future estimated annual O&M costs of the Glen Ferris Project are presented in Table D-3. Note that the estimated future annual costs do not include additional capital expenditures.

TABLE D-3
ESTIMATED FUTURE ANNUAL COSTS

Description	Cost
Current total annual costs	$578,970
Annual cost of proposed environmental measures[a]	$58,000
Total estimated future annual costs	**$636,970**

[a] Additional annual O&M cost associated with proposed PM&E measures.

D.5 VALUE OF PROJECT POWER (18 CFR §4.51(E)(5))

Table D-4 presents the value of power for the run-of-river Glen Ferris Hydroelectric Project based upon the average annual generation for 1938 through 1982. The value of Project power can be based upon a 30-day rolling average PJM market price of approximately $40/MWh (FERC 2015). Given that these values can vary greatly depending upon the market conditions for electricity, these values should only be used as an approximation of the value of power.

TABLE D-4
VALUE OF POWER GENERATED

Description	Energy[a] (MWh)	Nominal Average Market Price ($/MWh)	Average Gross Annual Revenue
Total generation	34,000[c]	$40	$1,360,000
Ancillary Services and Other Revenue[b]	-	-	-
Total Gross Revenue	-	-	**$1,360,000**

[a] Based on average generation from 1938 through 1982.
[b] To be included in FLA, as may be applicable.
[c] Future energy generation estimate not used for the purposes of this table since a historical record has yet to be established.

D.6 SOURCES AND EXTENT OF FINANCIAL AND ANNUAL REVENUES (18 CFR §4.51(E)(6))

If determined to be needed, Hawks Nest Hydro's general plan for financing the environmental enhancements and life-extension cost of the Project initially will be to issue short-term debt (either bank line of credit or commercial paper) and to generate internal funding consisting of depreciation, retained earnings, and deferred federal income taxes. If short-term financing options become unattractive, Hawks Nest Hydro will issue permanent securities (i.e., long-term debt, preferred stock, and common stock) to replace short-term debt. This financing plan will adhere to Hawk Nest Hydro's overall corporate construction financing requirements.

D.7 COST TO DEVELOP THE LICENSE APPLICATION (18 CFR §4.51(E)(7))

Hawks Nest Hydro estimates that the cost to develop the license applications for the Hawks Nest and Glen Ferris Projects, including studies, consultants, and internal management and administrative costs, is approximately $2.75 million.

D.8 ESTIMATED AVERAGE DECREASE IN GENERATION (18 CFR §4.51(E)(9))

Based on the proposed environmental measures to be implemented following the issuance of a new license, the Glen Ferris Project is not expected to experience any substantial annual reduction of generation.

Literature Cited

Federal Energy Regulatory Commission. 2015. Market Oversight. Online [URL] http://www.ferc.gov/market-oversight/mkt-electric/pjm/elec-pjm-rto-pr.pdf. Accessed July 2015.

Hawks Nest Hydro, LLC. 2012. Pre-Application Document for Hawks Nest-Glen Ferris Hydroelectric Project (FERC Project No. 2512). Hawks Nest Hydro, LLC, Montgomery, West Virginia.