

# **SOUTH CAROLINA ELECTRIC & GAS COMPANY**

*COLUMBIA, SOUTH CAROLINA*

## **SALUDA HYDROELECTRIC PROJECT**

*FERC PROJECT NO. 516*

### **CONSTRUCTION HISTORY**

#### **EXHIBIT C**

*DECEMBER 2007*

*Prepared by:*

***Kleinschmidt***  
*Energy & Water Resource Consultants*

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## EXHIBIT C

### 1.0 PROJECT HISTORY

The Saluda Hydroelectric Project was constructed between 1927 and 1930 by the Lexington Water Power Company, which merged in 1943 with SCE&G.

G. A. Guignard of Columbia incorporated Lexington Water Power Company in 1903. Guignard acquired the flowage rights on the Saluda River at Dreher Shoals, the present site of the Saluda Hydroelectric Project, and 20 miles upstream. He planned to build two dams - one at Dreher Shoals and another at Bear Creek five miles up the Saluda River.

Guignard sold the Dreher Shoals portion of the property in 1907. In 1925 the land became the property of General Gas & Electric Corporation, parent of Broad River Power Company and a unit of W. S. Barstow & Company, Inc. Guignard retained control of the Bear Creek site until May 1926 when the common stock of Lexington Water Power Company was purchased by the New York engineering firm of Murray & Flood.

Murray & Flood entered into an agreement with W. S. Barstow & Company for a mutual development of the Saluda Hydroelectric Project. On August 5, 1927 the Federal Power Commission (FPC, now the Federal Energy Regulatory Commission) issued a license to Lexington Water Power Company for construction of a dam and powerhouse at Dreher Shoals. At this point control of the company passed principally from Murray & Flood to General Gas & Electric Corporation.

Construction of the Project began in April 1927 with the Arundel Corporation in charge of construction of the dam. W. S. Barstow & Company, general contractor, was in charge of clearing work, spillway, power plant structures, machinery installations, substations, temporary and permanent housing, and the cableway connecting the dam and intake towers. Hydraulic works design was by J. G. White Engineering Corporation.

Lake Murray came into existence in July 1930, when the reservoir reached an elevation of 298.5 feet NAVD88<sup>1</sup>. In December of 1930 the first electric power was delivered to Duke

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<sup>1</sup>All elevation references in Exhibit C are given in North American Vertical Datum 1988 (NAVD 88); conversion to traditional plant datum (PD, used in numerous supporting studies for this license application and often erroneously referred to as MSL) requires the addition of 1.50 feet.

Power Company. Lexington Water Power Company was a production company only, and as such did not own any transmission lines. The Saluda Project was financed primarily through sales contracts with Carolina Power & Light Company, Duke Power Company and Broad River Power Company, all of whom built their own transmission lines to the Saluda Hydro Plant.

When the hydro plant was completed it had four turbines, each capable of producing 32,500 kilowatts (KW). When the dam was built, plans were formulated to later add fifth and sixth turbines. The intake tower and the associated tunnels to carry reservoir water under the dam to the future unit were constructed when the dam was originally built.

In 1931 Lake Murray reached an elevation of 348.5 feet, and in 1933 it reached 358.5 feet.

In 1936 heavy rains and insufficient spillway capacity caused the reservoir to reach its maximum elevation of record of 359.8 feet. As a safety measure the FPC directed that the reservoir be lowered to an elevation of 348.5 feet. After further study, the FPC then allowed the maximum reservoir elevation to be increased to 353.5 feet. This maximum elevation was maintained until the spillway capacity could be increased and better drainage achieved on the downstream face of the dam.

Between 1943 and 1946 two additional spillway gates were added, the spillway discharge channel was enlarged and partially rerouted, and the dam was strengthened by raising the crest elevation by 3 feet and adding rock excavated from the spillway channel to the downstream face of the dam. When these measures were complete, the FPC permitted the increase of the reservoir elevation to its maximum operating level of 358.5 feet.

In 1943, Lexington Water Power Company merged with SCE&G, in whose service area the Project was located. The project license was transferred to SCE&G on May 29, 1943. The FPC approved the Consolidation in an order issued in July 1943 [3 FPC 1046 (1943)].

Since the late 1950s, Lake Murray has also been used as a source of cooling water for the McMeekin steam electric generating plant. The FPC issued a finding and order on June 15, 1956 [15 FPC 1544 (1956)] approving the use of the Project reservoir (Lake Murray) for

supplying circulating cooling water to McMeekin Station. McMeekin Station, which is located near the Saluda Hydro Plant, was completed and began commercial operation in 1958.

In 1957 and 1958, Saluda Hydro was automated, giving the system dispatcher operational control of the plant.

In November 1966, a brake shoe holder failure on unit 3 generator caused damage to numerous stator coils. Subsequently, all the original asphaltic base coils for the stator were replaced with class B insulated coils. Improvements in the coil materials and design led to the generator capacity increasing to 47,000 KVA (up from 40,625 KVA). With the power factor changed from 0.80 to 0.90, the generator capacity increased to 42.3 MW. Since no modifications to the turbine were made at that time, Unit 3 is limited by turbine horsepower to 32.5 MW.

Engineering studies for adding a fifth generating unit at Saluda Hydro began in 1966. The FPC issued an amendment to the Project License, to include Unit No. 5, in December 1967 and construction began in 1968. The fifth generator, which is larger than the original four and is rated at 67.5 MW, was put into commercial operation during the summer of 1971, making the total generator capacity of the Saluda Hydro Plant 207.3 MW. Computers from the dispatching office in Columbia control all five generating units.

In November 1975, the upstream riprap armor between original dam stations 63+50 and 77+00 was replaced by placing new filter, bedding, and a 30 inch layer of armor stone. Spot repairs to the remainder of the upstream armor were made in October 1977.

In 1975 - 1976, the S.C. Department of Transportation (SCDOT) widened the crest of the original dam to 36 feet, in order to improve driver safety on SC Rt. 6.

In 1977, 81 stator coils were replaced by General Electric on the Unit 4 generator.

On May 12, 1980, the Federal Energy Regulatory Commission (FERC, formerly Federal Power Commission) issued an order approving the City of Columbia, SC to withdraw drinking water from Lake Murray at an eventual maximum rate of 100 million gallons per day (MGD) [11 FERC 62,103].

On June 1, 1984, the FERC issued a new 30 year license for the continued operation of the Saluda Hydroelectric Project (retroactive to the date of the original license expiration, August 4, 1977) [27 FERC 61,332].

In 1985, 5 stator coils on the Unit 2 generator were replaced by Westinghouse.

Between 1983 and 1995, all of the main step-up transformers were replaced with new or refurbished units.

On January 23, 1989, the FERC issued an order approving the City of West Columbia, SC to withdraw drinking water from Lake Murray at an initial rate of 6 MGD and an ultimate rate of 48 MGD [46 FERC 62,057].

As the Saluda Hydroelectric Project neared its 60th year of operation, a number of modifications were undertaken to insure its continued safe operation. Among these were removal of the original surge tanks on the Units 1 and 3 penstocks, and improvements to the intake towers and spillway.

In 1988, studies began to determine whether the badly deteriorated surge tanks on Saluda Unit Nos. 1 and 3 could be safely removed. Over the years since the original construction of Saluda Hydro, the electric system in which it operates had changed, alleviating the need for the rapid (about 6 second) wicket gate closure time which the two surge tanks provided for these units. Following analysis and testing that showed they could be safely removed; the tanks were demolished in late 1991, and the Unit 1 and 3 wicket gate closure timing was slowed down to about 25 seconds.

In early 1990 man-doors were installed in the five intake towers to prepare them for epoxy grouting of cracks in the concrete walls between elevations 343.5 and 358.5 feet. The crack grouting was accomplished in the fall of 1990 with Lake Murray at elevation 343.5 feet. Also in the fall of 1990, Spillway Gate Nos. 5 and 6 were painted, gate seals were replaced, and damaged structural members of Gate No. 6 were replaced.

Installation of post-tensioned anchors in the south abutment wall of the spillway was begun in late 1991 and completed in February 1992. This work was done to stop rotation of the wall.

The four original riveted steel spillway gates (Gate Nos. 1 - 4), which were badly deteriorated, were replaced in 1994 with new welded steel gates of similar design. Installation was complete and all four gates tested in December 1994.

On October 28, 1998, the FERC issued an order approving the City of Newberry, SC to expand its existing (since 1955) water withdrawal facility at Lake Murray from the previous capacity of 5 MGD to 10 MGD [85 FERC 62,056].

As a result of two of the articles in the license issued in 1984, two major modifications of the dam have been required. In 1989, a sheet pile wall with top elevation 375.5 was added to the crest of the dam at the upstream side of SC Highway 6, to protect the dam from overtopping in the event of a new, larger PMF. A computer based Flow Forecasting Model (FFM) was developed and is used to predict inflow to the project, using real-time data provided by the U.S. Geological Survey (USGS) and the National Weather Service (NWS). The development of the FFM in combination with the sheet pile crest wall allowed the project to meet current hydrologic safety requirements of the FERC, and raising the embankment further was not required.

In 2002, construction was started on a new backup dam immediately downstream of the original dam, which had been determined to be subject to possible failure during a reoccurrence of the 1886 Charleston earthquake. The new backup dam consists of rock fill embankment sections on the north and south ends, with a roller-compacted concrete gravity section in the center. The original dam remains in place; and during construction, additional material was added to it to provide a base for two additional lanes of SC Highway 6. Construction of the backup dam was completed in 2005.

On November 18, 2003, the FERC issued an order [105 FERC 61,226] extending the term of the 30 year license issued in 1984 (retroactive to 1977) by three years, to expire August 31, 2010. This was done in recognition that the drawdown of the reservoir to El. 343.5 feet, in order to safely construct the backup dam, would delay completion of the various studies required for the new license application.

In February 2006, repairs were completed on the upstream face riprap armor on the southern portion of the original dam, where wave action is most severe due to the long fetch and orientation with regard to prevailing winds. The armor repairs encompassed 3,000 linear feet

between original dam stations 45+00 and 75+00. A 200 linear foot section between stations 53+00 and 55+00 was completely excavated and new filter, bedding, and armor stone placed. The remaining 2,800 linear feet received additional armor stone and was graded to a uniform slope.

On June 9, 2006 [115 FERC 62,265] (revised by FERC order dated March 22, 2007 [118 FERC 62,210]), the FERC issued an order approving Saluda County for a municipal water withdrawal of up to 15 MGD.

The Project is subject to the Applicant's lien of the Indenture of Mortgage between South Carolina Electric & Gas Company and Bank of New York, f/k/a Nationsbank of Georgia, as Trustee, dated April 1, 1993, as amended and supplemented.