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United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form

This form is for use in documenting multiple property groups relating to one or several historic contexts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. For additional space use continuation sheets (Form 10-900-a). Type all entries.

A. Name of Multiple Property Listing

Pre-TVA Hydroelectric Development in Tennessee, 1901-1933

B. Associated Historic Contexts

Pre-TVA Hydroelectric Development in Tennessee, 1901-1933

C. Geographical Data

State of Tennessee

☐ See continuation sheet

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards for Planning and Evaluation.

Herbert L. Harper — 12/18/89

Signature of certifying official — Date

Deputy State Historic Preservation Officer, Tennessee Historical Commission

State or Federal agency and bureau

I, hereby, certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Amy Federman — 2/9/90

Signature of the Keeper of the National Register — Date

E. Statement of Historic Contexts

Discuss each historic context listed in Section B.

PRE-TVA HYDROELECTRIC DEVELOPMENT IN TENNESSEE, 1901-1933

The first production of electricity in Tennessee by means of hydropower was an early twentieth century phenomenon. While strides had been made in the late nineteenth century in other areas of the United States and in Europe, it was not until 1901, when entrepreneurs in Tennessee, seeing the potential to electrify cities, factories and towns with hydropower, initiated the first hydroelectric construction in the state. Some smaller attempts utilizing the limited power of creeks and streams were successful earlier, but these were extremely limited and idiosyncratic in nature. Hydroelectric power would, however, develop in Tennessee to the stature of giant public utility corporations producing electricity for the entire state by means of hydro- and coal-burning steam-powered generating facilities between 1901 and 1930.

Hydroelectricity is produced by means of diverting the flow of water by means of a dam across a river, through a water conveyance system. The water then drives a wheel called a turbine, which is situated in a powerhouse. The turbine shaft rotates a brush which breaks the field of a magnet housed in an electrical generator. The electricity thus produced is then sent to distant cities, factories, and homes and consumed for any of a number of industrial or domestic uses. There are two kinds of electricity, whether or not it is produced by steam power or by water. They are alternating current (or a.c.) and direct current (d.c.). At first, only direct current was produced because the object of consumption was literally close to the source of production. That is, the electric company was in the city - or even neighborhood - it served, and its power was not sent over great distances. Once it was found that alternating current's voltage could be transformed, or stepped up for transmission, and later stepped down upon reaching its destination, it was possible to build hydroelectric power plants at great distances from the cities they would serve.

The technology and design of electrical systems and the institutions formed to administer them matured together. In his book, Networks of Power, Thomas P. Hughes, perhaps the foremost historian of the field, reveals three stages in the development of light and power in the United States from roughly 1890 to 1930. Varying in detail, the evolution of Tennessee's electrical supply system before the advent of the Tennessee Valley Authority (TVA) correspond to the delineations Hughes discerns. This is not to suggest, however, that the evolution of hydroelectric power generation occurred in a lock-step manner, one phase leading inevitably, logically, and instantaneously to the next in an orderly, chronological procession of pre-ordained events. Indeed, as circumscribed by the temporal limits of this narrative, development was more spasmodic.

The main characteristic of the first stage was the emergence of low voltage, small, direct current (d.c.) lighting companies. As the forerunner of the contemporary electrical utility industry, these local and centrally-located hydroelectric plants supplied light and electricity only to nearby municipalities. Because such low-voltage d.c. systems as these could serve only the small geographic areas to which they were confined, by want of future developments in long distance electrical transmission, the number, not the size, of hydroelectric plants grew. By the end of the

[X] See continuation sheet

nineteenth century, there were more d.c. than alternating - or polyphase - current (a.c.) hydroelectric stations in America. It was an era identified by consistency in transmission load and supply, as the term d.c. implies. The loads consisted almost entirely of incandescent lights, and power production elements utilized to provide a town with electricity were located at one site, while the allocation system was powered by a uniform voltage from the hydroelectric site to customers at the same standard voltage. Examples of this stage of development in Tennessee might best be illustrated by: Mullins Mill in Bedford County, on the Duck River, 1913; Newport, in Cocke County, in 1914; Manchester, in Coffee County, in 1915; The Loop, 1901, on the Elk River in Franklin County; in Greene County, on the Nolichucky in 1913; Harm's in 1922 and Bearden's in 1919 mills in Lincoln County, on the Elk River; the Lunn site in Verona in Marshall County, ca. 1925; Crawford's Mill, 1916, on the Roaring River in Overton County; in Sevier County in Sevierville 1912, on the Little Pigeon River; and in White County at Sparta on the Calfkiller River, 1909.

According to Hughes, 1893 marks the initiation of the second era, or the so-called "universal supply system," as introduced at the 1893 Chicago World's Fair. Although it did not occur in one quick and orderly convulsion, increased heterogeneity marked this era, with a wide range of transmission and generating capabilities, serving a market characterized by diversity and quick growth. Generators with different polar characteristics were interconnected within a single plant, and different outputs were connected into a single transmission system by means of synchronous generators, transformers, and couplers. It was possible to serve a diversified load after the invention of the rotary converter, which allowed both a.c. and d.c. to be combined into a single system. Examples in Tennessee might include sites such as the Shelbyville site of 1925, in Bedford County and on the Duck River; Lillard's Mill, 1928, and its sister at Columbia, 1925, also on the Duck River; the McMinnville site, 1923, in Warren County and on the Barren Fork River; the Burgess Falls site, 1929, in Putnam County, on the Falling Water River; the Walter Hill site in Rutherford County on the East Fork of the Stones River, ca. 1920; and the Estill Springs site, 1922, on the Elk River in Lincoln County.

Two rudimentary principles of management shaping the organization of electric companies resulted during this stage of "universal supply systems," namely the diversity factor and the load factor. The latter, which measured the efficiency with which the generating and transmission equipment was being used, was the ratio of an average to a maximum load over a specified period of time. The diversity factor, the ratio of the sum of the peaks of the separate loads to the actual peak load, indicated the amount of equipment and capital needed to operate the hydroelectric station. The application of these two components, according to Hughes, would prove to be critical to growth of future planned electrical systems.

The third phase, according to Hughes, is marked by an even greater degree of heterogeneity as seen in the regional systems of the 1920s and 1930s. In the third stage:

> different kinds of energy sources were combined according to the more recently articulated concept of economic mix. Turbines and high-voltage transmission stimulated the construction of far-flung systems, and the spread of these was so extensive as to include natural resources of various kinds. The engineers and managers of utilities took advantage of the presence of such varied energy sources as hard coal, bituminous coal, brown coal, high-head water, and low-head water in their supply areas to obtain an economic mix.[1]

Examples of this third stage would include the Hale's Bar complex in Marion County, 1913; Ocoee No. 1 and No. 2 on the Ocoee River, 1912, 1913 respectively; the Wilbur Dam on the Doe River in Carter County, in 1911; the Calderwood facilities in Blount County, 1930; and the Great Falls complex in Warren County, 1917. These sites all developed in the state within the time frame established in this nomination, 1901-1930.

The earliest commercial application of electricity in Tennessee was in the City of Chattanooga on May 6, 1882, when a small steam-powered electrical generating plant lit some street lights.[2] But state-wide successful

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1 Thomas P. Hughes, Networks of Power: Electrification in Western Society, 1880-1930, (Baltimore: Johns Hopkins University Press, 1983), p. 366 (hereafter: Hughes, Networks). See also: Abram John Foster, The Coming of the Electrical Age to the United States, (N.Y.: Arno Press, 1979), pp.67-134, 194-223. (hereafter: Foster, Electrical Age.)

2 John D. Ryder, Donald G. Fink, Engineers and Electrons: A Century of Electrical Progress, (New York: Institute of Electrical and Electronics Engineers Press, 1984), pp. 35, 101-102; and Thomas P. Hughes, "The Science-Technology Interaction: The Case of High-Voltage Power Transmission Systems," Technology and Culture, vol. 17 (1976), pp. 647-659; and Hughes, Networks, p. 79-105; and Richard B. Morris, ed.,

commercial utilization of hydroelectricity would wait until scientific discoveries made it profitable. Most important, this meant the practical use of alternating current (a.c.) to extend transmission distances. Alternating current systems would be to hydroelectric power as the standard gauge had been to the railroad industry, providing the paradigm for future development in the industry. Moreover, throughout the state, the systems of production and delivery and markets themselves would remain local in both their physical proximity to large concentrations of population and physical sites. Public financial or private-sector-capitalistic-venture parameters would also remain local until a.c. systems were standard.[3]

Consumer demand for electricity was also an important factor, but was limited, at first, to lighting needs and public transportation in the cities. While all of Tennessee's major cities developed electric-trolley systems of transportation, and so spurred the demand for electricity and its subsequent expansion, the best example can be found in Chattanooga. By the late 1880s, it became apparent to managers of electrical production facilities that business was not expanding as they would like. This was due to the fact that customers used electric lights only a few hours each evening, even though plants had the capacity to provide full service.

Following the introduction of traction street car systems the electricity sold by the central stations could be substantially inflated with only a small increase of capital investment. Beginning in 1875 Chattanooga Street Rail Road expanded its routes until, in 1889, the Chattanooga Electric Street Railroad Company provided services as competition to the animal-

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<u>Encyclopedia of American History</u>, 6th ed., (New York: Harper & Row, 1982), p. 725 (hereafter: Morris, <u>Encyclopedia</u>).

3 <u>Chattanooga Times</u>, May 7, 1882; "Chattanooga's First Electric Lights," <u>Electro Topics</u>, vol. XVI, no. 2 (March/April, 1933), pp. 10-11; and Maxwell Benton, "Cannon Boomed When Nashville Turned on First Lights," <u>Electro Topics</u>, vol. XVI no. 3 (May/June, 1933), pp. 4-5, 12; and "Looking Back - Electricity in Chattanooga," <u>System Control News</u> (newsletter of the Power Dispatching and Protection Branch of the TVA), No. 49, May 1, 1972, No. 49, p. 2 (hereafter: <u>SCN</u>). <u>SCN</u>, June 1, 1972, pp. 1-2; and <u>SCN</u> July 1, 1972, No. 51, p. 1. See also: "The First Home of the Power Industry in Chattanooga," <u>SCN</u>, November 1, 1973, No. 67, pp. 1-3; and <u>SCN</u> October 1, 1972, No. 54, p. 1; and; Hughes, <u>Networks</u>, pp. 1-15, 85-86, 91, 131, 93-95, 243-44, 265. James W. Livingood, <u>A History of Hamilton County, Tennessee</u>, (Memphis: Memphis State University Press, 1981), pp. 394-397,403, 406, 407.

powered trollies. Soon the electric trolley superceded the older means of conveyance; but what is of more interest here is that Chattanooga Electric Light Company provided electricity to the trolley company and, in 1896, built a new generating plant which "continued to be the city's source of electricity until hydroelectricity from the Ocoee River was introduced in 1912." In 1909, the Chattanooga Railways Company and the Chattanooga Electric Light Company merged to form the Chattanooga Railway and Light Company (CR&L). It was no coincidence that the E. W. Clark & Company of Philadelphia, which then controlled electrical transportation properties in a number of American cities, purchased the new company. It was no happenstance that E. W. Clark & Company was the managing company of both CR&L as well as the Eastern Tennessee Power Company, which would build the Parksville hydroelectric plant on the Ocoee River, also given the sobriquet Ocoee No. 1, in 1912.[4]

However, this is not to give the impression that the first efforts at hydroelectric development were focused solely upon providing power to traction systems. Indeed, the earliest pushes for hydroelectric development in the Volunteer State were much smaller in stature, bound and determined by dependence upon geographic conditions. Additionally, the market for electricity was centered in areas long known as water-powered milling or manufacturing centers. Their chronology provides an outline of the embryonic growth of the public utility industry in Tennessee from 1901

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4 "Early Electrical History of Chattanooga," SCN, July 1, 1972, No. 51, pp. 1-2; "The Parksville Dam," SCN, October 1, 1972, pp. 1-4; David H. Steinberg, And to Think It Only Cost A Nickel! The Development of Public Transportation in the Chattanooga Area, (Chattanooga: by the author, 1975), pp. 5-30, 35. See also: Forrest McDonald, Let There Be Light: The Electric Utility Industry in Wisconsin, 1881-1955, (Madison, Wisc.: American History Research Center), pp. 4-5. [The ownership of transportation facilities in Tennessee by northeastern capitalists was not without precedent. For example, the Louisville & Nashville Railroad was controlled by New York financiers Jay Gould, Thomas Fortune Ryan, Jacob Schiff, and August Belmont, all members of the board of directors. Behind them stood English investors, represented by Belmont. See: Ray Ginger, Age of Excess: The United States from 1877 to 1914, 2d ed., (New York: Macmillan & Co., 1975), p 71. Generally overlooked is the fact that the Ocoee No. 1 dam impounds the first man-made recreational lake in Tennessee, which may have provided an object lesson for the TVA in later years.] Chattanooga Daily Times, January 28, 1912. (Hereafter: CDT.)

to 1930. (See Appendix A) They served local markets because complete hydroelectric development in Tennessee was limited, not only by contemporary reliance upon polyphase technology but the sobering knowledge that such systems could not be built just anywhere. That is, hydroelectric stations could be erected only when relatively rare optimum physiographic conditions could be met in the state. A further restricting factor was an initial lack of necessary local capital reserves to construct such large projects.

The record of pre-Tennessee Valley Authority hydroelectric development in the Volunteer State is not confined to the experiences illustrated by large corporate endeavors. In Tennessee, the areas possessing the proper geographic and geologic attributes for hydroelectric development are not found in West Tennessee, but exclusively in the Middle and Eastern sections of the state. Here, stream flow and high hills or mountains created a positive environment for hydroelectric development. Even in these two sections, however, the use of rivers or nearby streams to produce electrical power was limited, at first, to small, private efforts.[5] These efforts were small, idiosyncratic, and even frivolous in comparison to later developments in the state. Because the choice of locations for hydroelectric plants would be restricted to those with the proper volume and velocity of water, sites occurring only in particular areas within a given river system, they represent a critical contemporary connection between the conservation of cultural and natural non-renewable resources in the state's history.

Also, early hydroelectric developments throughout the width and breadth of the state of Tennessee shared one of the major characteristics of urban steam-powered electrical production, that is local production for local needs, provided generally by local private sector venture-capitalists and entrepreneurs. Just as early steam-powered electrical production was

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5 John A. Switzer, and George H. Ashby, "The Utilization of Small Water Powers in Tennessee," The Resources of Tennessee, vol. 1, no. 1 (July, 1911), pp. 6-7. National Register of Historic Places portfolios for Readyville Mill, and Falls Mill, on file at the Tennessee Historical Commission, Nashville, Tennessee, and interview with John Lovett, owner of Falls Mill, March 23, 1989; and James B. Jones, Jr., "Pre-TVA Hydroelectric Power Development in Tennessee, 1901-1933," The Courier, Vol. XXV, No. 2, February, 1987, pp. 4-6. See also: Fountain Green Hydroelectric Plant Historic District National Register of Historic Places Nomination, March 8, 1989, Utah SHPO, Section F, p.2.

limited to cities where demand was high enough to insure profitability and transmission hurdles were miniscule, initial hydroelectric site development was similarly restricted - except that they occurred in cities or towns located in very close proximity to geographic circumstances that had historically been the sites where hydropower had been utilized for milling or would allow for the facile development of hydroelectric power. A brief narrative account of these early hydroelectric sites, which roughly conform with the first phase of such development is instructive.

Winchester, in Franklin County, became the first Tennessee city to develop a hydroelectric power station, and was an example of private and public sector cooperation for electrical development in the state. In 1901 the "Loop" hydroelectric plant was built. This development was the first "direct connected waterwheel and generator designed as a hydroelectric unit to be placed in Tennessee." A few miles upstream, another hydroelectric facility would be constructed at Estill Springs, in 1922, on the foundations of a razed factory.[6]

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6 A. W. Crouch, C. R. Matlock, "Small Hydro Plants Passing Into History," Electro Topics, vol. XVII, no. 1 (January/February, 1934), p. 12. See also: J. C. Crouch, "History of the Tennessee Electric Power Company" TEPCO Collection, box 1, folder 2, at the Tennessee State Library and Archives, Nashville. (Hereafter cited as: Crouch, "History.") [See also: A. W. Crouch, The Caney Fork of the Cumberland, (Nashville, Tennessee: 1973), pp. 53-61.] SCN, January 1, 1973, No. 57, pp. 1-4, and May 1, 1973, No. 61, pp. 3-10; and "Preliminary Survey Generating Stations Southern Cities Power Company" ca. 1929, in the unprocessed Jo Conn Guild Photographic Collection held by TVA, [hereafter; "Preliminary Survey"] and; Mr. and Mrs. Richard Lowndes, "Early Hydroelectric Plants in Tennessee: The Loop and the Estill Springs Plants," Franklin County Historical Review, vol. III, No. 2 (June 1972), pp. 31-33; and "The First Hydroelectric Plant in Tennessee," Franklin County Historical Review, Vol. XVIII, No. 1, (1987), pp. 39-47. [According to one knowledgeable source, an attempt at establishing a subterranean dam with which to run a mill or a hydroelectric site was established in Franklin County in the early 1920s. The dam worked only too well and soon had to be destroyed as impounded water leaked and inundated surrounding farm land. See: Thomas C. Barr, Jr., Caves of Tennessee, (Nashville: Department of Conservation, 1961, rpt. 1972) p. 199; and correspondence from William Janey to James B. Jones, Jr. May 6, 1989.]

Other similar small-scale hydroelectric power stations, intended to serve the immediate localities of cities, were to develop shortly thereafter, and may be regarded as part of the general zeitgeist of municipal reform, boosterism, and the idea of capitalist-industrial progress associated with the so-called Progressive Era in American history and are found near Lawrenceburg, in Lawrence County, and Cookeville, in Putnam County.[7]

Around 1915, a small hydro-plant was built at Manchester, in Coffee County, on the Duck River. The dam remains extant today, impounding Lake Morton, while portions of the original concrete penstock supports can be seen along the Duck River.[8] Other earlier examples in the state show this continuity as well. Although mystery exists concerning the exact date, in either 1898, 1901, 1912, 1918, 1920, or 1926, a small power station was built by the Murfreesboro Light and Power Company, 6 miles from Murfreesboro, in Rutherford County, at Walter Hill, on the East Fork of the Stones River, a mill site since 1804.[9]

According to Sevier County, Tennessee Historian, Mrs. Beulah D. Linn, on October 28, 1914 the concrete dam was finished, and within a month the facility began generating electricity in Sevierville. Local competition flourished and soon there were two hydroelectric stations on the Pigeon

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7 Gerald N. Grob, and George Athan Billias, Interpretations of American History: Patterns and Perspectives, vol. II, 4th ed., (New York: The Free Press, 1982), pp. 163-208; and Morris, Encyclopedia, pp. 316-333; and Richard N. Current, T. Harry Williams, Frank Freidel, Alan Brinkley, American History: A Survey, 6th ed.,(New York: Alfred A. Knopf, 1983), pp. 617-671.

8 Basil B. McMahan, Coffee County, Tennessee: Then and Now, 1983, (Manchester: by the author, 1983), pp. 388-389.

9 TVA, Small Hydro, Reconnaissance Report for Walter Hill Dam, Report No. WR28-2-510-112, p.2; and Application for Preliminary Permit before the Federal Energy Regulatory Commission, submitted by the Middle Tennessee Electric Membership Corporation, Murfreesboro, Tennessee, October 17, 1980. See also: Carlton C. Sims, ed., A History of Rutherford County,(Murfreesboro, Tenn.: Carlton C. Sims, 1947), p. 217, and an unprocessed photograph of the Murfreesboro Light and Power Company on the Stones River at Walter Hill, ca. 1920-1929, in the Jo Conn Guild Collection, held currently by the TVA, in Norris, TN. The photograph helps explain the missing third wall on the power house.

Forge River.[10] An early hydrostation was built in Sparta early in the twentieth century, in 1902, but it burned a few years later. It was replaced in 1909 with the structure that now remains extant on the Calfkiller River, in Warren County.[11]

At McMinnville, in Warren County, electricity was supplied by a steam-powered generator until 1907, when the Walling Light and Power Company installed a generator in an old flour mill on Barren Fork River. It was, as in the example of Sparta, an impromptu affair, and was utilized for only a few months until a new facility was built, later in 1907. After the floods of 1922 destroyed the facilities, a new concrete powerhouse was constructed in 1923.[12]

In Overton County, is another of the many examples of early hydroelectric private-sector entrepreneurial development found in the state of Tennessee. In 1916 a hydrostation was built at Crawford's Mill about 6 miles west of Livingston. A dam (still extant) and flume were built to convey water from the Roaring River to a steel penstock. As the demand for electricity grew, the ability of the station to provide it was outstripped. TEPCO purchased the facility in 1927, and, in 1939, the Cumberland Electric Membership Corporation was formed and bought the TEPCO facilities.[13]

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10 Correspondence from Sevier County Historian, Mrs. Beulah D. Linn, January 18, 1989, and her unpublished typed manuscript,"Sevierville Light and Power Company," pp. 1-5; and, TVA, Small Hydro, Reconnaissance Report for Walker Mill Dam, Report No. WR28-2-510-114.

11 SCN, January 1, 1973, No. 57, p. 5; and A. W. Crouch, C. R. Matlock,"Small Hydro Plants Passing Into History," Electro-Topics, vol. XVII, no. 1 (January/February, 1934), p. 12, (hereafter: "Small Hydro Plants Passing Into History."); and TVA, Small Hydro Feasibility Report for Sparta Dam, TVA/ONR/WR-82-11, WSDB Report No. WR28-1-510-133, February, 1982 (hereafter: Small Hydro Feasibility Report, etc.).

12 Correspondence from James A. Dillon, Jr., Warren County Historian, January 11, 1989, and his typed manuscript "History of Electricity in Warren County," pp. 1-4; and SCN, January 1, 1973, No. 57, pp. 4-5; and Small Hydro Feasibility Report for the Mcminnville Dam. [See also: Walter Womack, McMinnville at a Milestone, 1810-1960. A memento of the sesquicentennial year of McMinnville, Tennessee, 1960, and Warren County, 1958, (McMinnville, Tenn: Womack Printing Co. and Standard Publishing Co. 1960), pp. 96-101, for an entertaining account of a failed attempt at a hydroelectric facility in McMinnville in 1889.]

13 SCN, August 1, 1973, no. 64, pp. 1-6.

In Lincoln County, about 5 miles southwest of Fayetteville, and on the Elk River, stand the remains of the Harms Mill hydroelectric powerhouse and dam. In 1905, an electrical generator was installed in a factory to power the operation of textile production. In 1920 a new concrete dam and powerhouse (extant today) were completed by 1922. TEPCO purchased the facilities in 1929. All four turbines drove a single electrical generator through a system of wooden bevel gears and a "lay" shaft. Perhaps no better example of the heterogeneity characteristic of the second and third eras of early electrical development can be found in the State of Tennessee.[14]

Yet another hydroelectric site on the Elk River was located much closer to Fayetteville, namely Bearden's Mill. It was constructed in 1919 on an established mill site south of the city. Inasmuch as it contained one generating unit driven by a vertical shaft and three turbines, and had been constructed three years earlier, it most likely served as the example for Harms Mill. The dam, powerhouse, and machinery were destroyed by the TVA in the 1940s.[15]

Another early hydroelectric site in Tennessee, Mullins Mill, is found in Bedford County, in Shelbyville just west of the city and on the Duck River. In 1915 a new hydroelectric plant was constructed at Shelbyville at the site of an old mill. A modern brick structure was built at the end of the old dam. In 1925, this Shelbyville plant was replaced by a new concrete

14 SCN, February 1, 1973, No. 58, pp. 2-4; and "Preliminary Survey Generating Stations Southern Cities Power Company" ca. 1929, in unprocessed Jo Conn Guild Collection held by TVA; and Small Hydro Program Reconnaissance Report for Harms Dam, TVA Report No. WR28-2-510-103, May, 1980, p. 2 correspondence with Dr. Reuben Crawford, Lincoln County Historian, January 27, 1989; and Hughes, Networks, p. 366.

15 SCN, February 1, 1973, No, 58, p. 5; and correspondence from Dr. Reuben Crawford, Lincoln County Historian, January 27, 1989; and "Preliminary Survey Generating Stations Southern Cities Corporation," ca. 1929, as part of the unprocessed Jo Conn Guild Photographic Collection held by TVA. [A site survey and investigation of the Mullins Mill site in Shelbyville, in Bedford County, on March 28, 1989, revealed the following words pressed into the concrete tail race/drive shaft supports: "Sam Bearden, Aug. 1913." The identity of Bearden is not known, but he may have been the source for the name of the mill in Fayetteville and possibly an early vernacular hydroelectric plant designer in Middle Tennessee, basing his concepts on grist mill designs.]

dam and powerhouse, (extant today) along with the earlier 1915 steam plant foundations incorporated into the dam. It was owned by one of the regional public utility firms in the state, the Southern Cities Power Company, a regional public utility firm. TEPCO acquired the property in 1929.[16]

The story of the development of the Southern Cities Company is typical of capitalistic development in the hydroelectric-public-utilities business in Middle Tennessee. In 1915, the Public Light and Power Company formed consolidated the Stone Fort Power Company and the Columbia Improvement Company. The new firm had as its object the development of hydroelectric power and its extension to a number of towns in the Duck River area. This Tennessee business consortium formed the Southern Cities Power Company in March of 1918. As the demand for electric power increased beyond facilities consistent with the first stage of hydroelectric development in the state of Tennessee as addressed above, the Southern Cities Company began a program of expansion, and built new stations on the Elk River at Estill Springs (1922) and in South Central Tennessee, on the Duck River, at Shelbyville, in Bedford County, in 1925, and at Columbia, in Maury County. The Columbia station was built just below the old steam plant, and is quite similar in design to the hydroelectric site in Shelbyville, and at Lillard's Mill in Marshall County, in 1928. This is hardly surprising in that the same firm, Foster & Creighton, built both facilities.[17] One small

16 TVA, Hydropower Planning Section, Small Hydro Feasibility Report, "Shelbyville Dam," pp. 1-2; and SCN, January 1, 1973, No. 57, p. 5; and Crouch,"History," pp. 12-15; and "Preliminary Survey Generating Stations Southern Cities Power Company," ca. 1929 on file at TVA, Division of Cultural Resources, as part of the as yet unprocessed Jo Conn Guild Photographic Collection. See also: J. A. Switzer, "Conservation of the Water Powers of Tennessee," The Resources of Tennessee, vol. III, no. 2, (April, 1913), pp. 74-79. See also: "Company Takes Over Southern Cities System," Electro Topics, vol. XII, no. 6 (November, 1929), pp. 2-5; and SCN January 1, 1973, No. 57, p. 5; and SCN, March 1, 1973, No. 59, p. 5; and correspondence from Richard R. Poplin, Bedford County Historian, December 30, 1988. On fish ladders or fishways see: Frank Koester, Hydroelectric Developments and Engineering: A Practical and Theoretical Treatise on the Development, Design, Construction, Equipment and Operation of Hydroelectric Transmission Plants, illus., (New York: D. Van Nostrand Company, 1909), p. 37.

17 "Small Hydro Plants Passing Into History," Electro Topics 1934, p. 13; and SCN, February 1, 1973, No. 58, p. 4; and "Preliminary Survey Generating Stations Southern Cities Power Company," ca. 1929, for

and apparently vernacular hydroelectric site is found in Verona, in Marshall County, on Big Rock Creek. Roland Lunn, a local entrepreneur, presumably built a concrete, one or two story hydroelectric generating station and dam at the site of a mill, to electrify the hamlet of Verona, probably in the late 1920s.[18]

A confident, University of Tennessee professor of experimental engineering, John A. Switzer, optimistically reported in February, 1912, that the "year 1912 will be notable in the annals of Tennessee, because it marks the beginning of a new era - the era of water power development." Switzer claimed that "the inauguration of the Watauga Power Company's plant in Carter County, and of the Eastern Tennessee Power Company's in Polk [County] are of greater significance than we are likely to realize." This was because "it means the inevitable, and the prompt expansion of our manufacturing interests; since the certainty of obtaining power at a low cost will assuredly attract manufacturing enterprise." On a larger scale were the early hydroelectric power developments in the eastern part of the state, and noted for their potential as a source for hydroelectric power production. By November 1911, the Watauga Power Company had completed its hydro-plant at the"horse-shoe" on the Watauga River, 6 miles above Elizabethton. According to one contemporary account "the people of Bristol and Elizabethton do not yet fully realize the magnitude and importance of the enterprise." The dam and site were later purchased by the TVA. This hydroelectric site was, in large measure, responsible for attracting industry to the Elizabethton/Bristol area, in the form of woodworking, textile, and copper refining plants. Indeed, boosters in Elizabethton soon advertised the town as "the City of Power" as a result of the development.[19]

Shelbyville, Columbia, and Lillard's Mill hydrostations; and Small Hydro Program Feasibility Reports for Old Columbia Dam, and Shelbyville Dam.

18 Telephone conversation with Mr. John Lunn, son of Roland, Capitol Building, Nashville, Tennessee, March 30, 1989; and Morris, Encyclopedia, p. 391.

19 John A. Switzer, "The Ocoee River Power Development," The Resources of Tennessee, vol. 11, no. 2 (February, 1912), p. 42; and George Byrne, "Tennessee to Have Another Great Water Power," The Resources of Tennessee, vol. II, no. 1 (January, 1912), pp. 19-22; and Francis R. Weller, "The Watauga Power Company's Hydroelectric Development," The Resources of Tennessee, vol. 1, no. 5 (November, 1911), pp. 183-187; and Frank Merritt, Later History of Carter County, 1865-1980, (Elizabethton, Tenn.: Homecoming '86 Heritage Project, 1987), pp. 36, 38, 40, 41, 105-106, 117-118, 120-122, 125; and William A. Doran, "Early Hydroelectric

It is difficult to prove or positively demonstrate the incidence of "growth in industry" as a mathematical function of the increase in production of kilowatts of electrical energy. Research paradigms requiring months of research and data input to seek such a correlation are far beyond the periphery of this MPDF effort. Impressionistic evidence, however, may suggest a general connection between the two. For example, according to Robert E. Corlew: "The number of manufacturing establishments [in the State of Tennessee] increased approximately 45 per cent from 1904 to 1909, and five years later, when [World War I] began, factory growth showed considerable development that continued throughout [the conflict]....After the recession of 1920-1921, industry again developed strongly in the state until the depression began in 1929. The average number of wage earners in manufacturing increased 179 percent during the thirty-year period from 1899 to 1929."[20] Thus the apparent increase in jobs and factories in the period 1901-1930, loosely the temporal limits of this study, could be related to hydroelectric output, but this is far from certain. The noted growth of Chattanooga in the first two decades of the twentieth century[21] appears to have been related to the Hale's Bar complex - only the Tennessee River provided the current necessary to produce the sheer number of electrical kilowatts generated there. Because it offered a much larger power source than did the smaller rivers of Tennessee, it was perhaps inevitable that Chattanooga's industrial growth was concurrent with hydroelectric development.

Ocoee No. 1 was the first hydroelectric facility in the state of Tennessee large enough to provide power to Chattanooga and other regional cities. In December 1911, the Eastern Tennessee Power Company was nearing the completion of the first hydroelectric generating facility on the Ocoee River at Parksville, Tennessee. Actual work began in 1910, and the first concrete was poured in 1911. The plant began operation on January 27, 1912, and has operated ever since. The dam is a gravity type with a curvilinear design, and the first power was delivered on January 27, 1912. It was to serve the interstate-electrical needs of Cleveland, Chattanooga, Athens, Sweetwater, Loudon, Lenoir City, and Knoxville, Tennessee, as well

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Power in Tennessee," Tennessee Historical Quarterly, Vol. XXVII, No. 1 (Spring 1968), pp. 76-77 (hereafter: Doran, "Early Hydro").

20 Robert E. Corlew, Tennessee: A Short History, 2d ed.,(Knoxville: University of Tennessee Press, 1981), p. 517.

21 James W. Livingood, A History of Hamilton County, Tennessee, (Memphis, Tenn.; Memphis State University Press, 1981), pp. 304-331. (Hereafter: Livingood, Hamilton County.)

as those of Rome and Dalton, Georgia.[22] Then known as the "Caney Creek plant" of the Tennessee Power Company was the second Ocoee River hydroelectric facility, today known as Ocoee No. 2. Construction began on March 1, 1912, and production of electricity was started on October 23, 1913. According to one source, the statewide significance of this site in Tennessee lies in the fact that at Ocoee No. 2 is an example of "a broad distribution through an integrated system tie line...[in what is]... one of the earliest examples of what today is a minimum standard for electrical power sharing."[23]

By 1914, three new hydroelectric plants were in operation on the Nolichucky, Ocoee, and Tennessee rivers. On the Nolichucky was the power plant of the Tennessee Eastern Electric Company, located nine miles from Greeneville. It was built by the Tennessee Eastern Electric Company in 1913, and was constructed in two phases. The original construction included a two-unit powerhouse with provisions for two incremental units to

22 "Progress in Water Power Development," The Resources of Tennessee, vol. 1, no. 6 (December, 1911), pp. 238-241. See also: E. Raymond Evans, and Vicki Karhu, "Inventory of Historic Architecture in Polk County, Tennessee," October, 1984, pp. 17-20, Tennessee Historical Commission; and Robert L. Johnson, "Comparative Evaluations and Proposals for Preservation of TVA's Oldest Hydroplants," December, 1988; and TVA, Office of Natural Resources and Economic Development, Division of Water Resources, Water Systems Development Branch, Rehabilitation Studies, Ocoee No. 1, Report No. WR28-1-63-100, May, 1986; and CDT, May 11, 12, 1911; and SCN, August 1, 1974, No. 76; and "The Ocoee Hydroelectric Development," Engineering Record, vol. 65, no. 25, pp. 676-679; and Doran, "Early Hydro," pp. 73-74; and John A. Switzer, "The Ocoee River Power Development," The Resources of Tennessee, vol. II, no. 2 (February, 1912), p. 42. [There could be opportunities for archaeological study comparing the material culture remains of the three separate worker subculture compounds. Moreover, the curvilinear dam would impound Tennessee's first artificial lake, possibly providing a model for future TVA activities.]

23 National Register of Historic Places Portfolio for Ocoee No. 2, on file at the Tennessee Historical Commission; and Robert L. Johnson, "Comparative Evaluations and Proposals for Preservation of TVA's Oldest Hydroplants," December, 1988; and J. A. Switzer, "Recent Water Power Developments in Tennessee," The Resources of Tennessee, vol. IV, no. 3 (July, 1914), p. 128.

be added later. In 1922, construction on the second stage was begun. The TVA acquired the Nolichucky project in 1945.[24]

While the Ocoee River project provided the initial electrical needs for the aluminum reduction facilities of Alcoa in Maryville, the Aluminum Company of America (ALCOA) soon realized its needs eclipsed the capacity of both the Ocoee No. 1 and No. 2 plants. Not only would this major industry locate a reduction plant in Tennessee as a direct result of the Ocoee hydroplants, but it would create the village of Alcoa in Blount County, in the process of building the Calderwood Dam and Powerhouse on the Little Tennessee River. Construction began in August, 1928, and was finished, with all three units in operation, on June 22, 1930.[25]

Perhaps the largest pre-TVA hydroelectric development in the state of Tennessee was the Chattanooga and Tennessee River Power Company's Hale's Bar lock and dam, in Marion County, thirteen miles east of Chattanooga on the Tennessee River. It was a joint federal/private sector sponsered project, and construction, which required as many as 5,000 workers. It began in October 1905, and was planned to be completed in 1909 at a cost of

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24 TVA, Office of Natural Resources, Division of Water Resources, Water Systems Development Branch, Hydropower Rehabilitation Preliminary Feasibility Report, Nolichucky Project, Report No. WR28-2-62-100, April, 1982. See also: Ray Stahl, Greater Johnson City: A Pictorial History, (Norfolk, Va.; The Donning Co., 1983), p. 142.

25 Switzer,"The Ocoee," (Feb. 1912), p. 129; and Inez E. Burns, History of Blount County, Tennessee: From War Trail to Landing Strip, 1795-1955, (Nashville, Tenn.: Tennessee Historical Commission, 1957), pp. 284-285; and Aluminum Company of America, "CALDERWOOD PROJECT: Summary of Principal Features," March, 1970; and "Blount County Architectural Survey, 1983-84," Tennessee Historical Commission, folders 4358 and 4359. See also: Donald C. Jackson, Great American Bridges and Dams, The Great American Places Series, (Washington, D.C.: Preservation Press, 1988), p. 185 [The state geologist, J. A. Switzer, was concerned about the development of Tennessee's rivers by "private monopoly." In an address to the State Legislature on February 3, 1913, he advocated a law to conserve these natural resources for the purposes of "prohibiting mergers and agreements in restraint of trade or for the...limiting output or controlling prices." His slogan was: "The water powers of Tennessee for the benefit of all the people of Tennessee!" See: John A. Switzer, "Conservation of the Water Powers of Tennessee," The Resources of Tennessee, vol. III, no. 2 (April, 1913), pp. 74-79, esp. pp. 77 and 79; the state never adopted any such law.]

four million dollars. Eight years (1913) and nine million dollars later, after labor difficulties and unforeseen construction problems the plant was formally placed in operation. It was to be the largest hydroelectric facility in the state, and the first dam to stem the Tennessee River. As such it was capable of creating electricity for many Tennessee cities, houses, and factories.[26]

The Tennessee River Power Company would soon become the property of TEPCO, and soon after its formation in 1922 (see Appendix B) the electric power company began to expand its generating capacity so as to meet the new heavy demand on its facilities and as insurance when water levels were low. The Parksville Plant, or Ocoee No. 1, had a steam generator added in 1916 in a manner consistent with the third phase of hydroelectric development as described by Hughes, especially inasmuch as it shows the use of varying types of energy sources consolidated as a result of the then more recently enunciated notion of economic mix. In 1923, work began on a new steam plant at Hale's Bar and was completed in December 1924. Ever-increasing demands from an increasing industrial and domestic market called for expansion. Hale's Bar Steam Plant was the only steam plant built in Tennessee by TEPCO. The Hale's Bar facility and those on the Ocoee River helped stimulate an already-thriving manufacturing economy in Chattanooga, giving the city the timely sobriquet, "the Dynamo of Dixie."[27]

The Great Falls Power Company was established in March of 1901. After years of being unable to raise the necessary capital for the hydroelectric

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26 J. A. Switzer, "The Power Development at Hale's Bar," The Resources of Tennessee, vol. II, no. 3 (March, 1912), p. 90. See also: James W. Livingood, Hamilton County, pp. 323-324, 388, 396. (For a comprehensive treatment of the corporate history see: Crouch, "History," and Doran, "Early Hydro," pp. 72-82; and SCN, November 1, 1972, No. 55, pp. 1-7, October 1, 1973, No. 66, pp. 1-5, and January 1, 1975, No. 81, pp. 2-10. (For an Agrarian's nostalgic and disapproving view of hydroelectric development along the Tennessee River see: Donald Davidson, The Tennessee: The New River, Civil War to TVA, vol. 2 of 2, illus. by Theresa Sherrer Davidson, (New York: Rinehart & Company, 1948), chapter XI, "The Uneasy Reign of King Kilowatt I," pp. 176-194.

27 SCN, November 1, 1973, No. 55, October 1, 1973, No. 66, December 1, 1974 No. 80, January 1, 1975, No. 81; and Davidson, The Tennessee, vol. 2, pp. 176-178; and Chattanooga News Free-Press, March 19, 1966; and Hughes, Networks, p. 366, and CDT, November 14, 1913, and James W. Livingood, A History of Hamilton County, Tennessee, (Memphis: Memphis State University Press, 1981), p. 324.

project, its promoters had by 1909 found the venture capital. Shortly thereafter, a Chicago firm purchased controlling interest. On April 24, 1912, the Tennessee Power Company was organized, and it purchased the Great Falls Power Company and began buying land and developing plans for a power development. By 1916-17, a dam was built, a tunnel was drilled through the narrows of the Collins and Caney Fork Rivers, and penstocks, powerhouse, and transmission equipment were in place. Great Falls was placed in operation on New Year's Day, 1917. The facility was acquired by TEPCO soon after its formation in 1922, and was sold to the TVA in 1939.[28]

Although documentary evidence is slim, it is known that the City of Lawrenceburg, in Lawrence County, built and operated two hydroelectric sites. Both were examples of publicly-financed and owned alternatives to private sector capitalist development of public utilities in the state of Tennessee. Site No. 1 was built in 1907. Construction of the site began in 1905-06, at the Horseshoe bend on Shoal Creek, about 1.8 miles southwest of Lawrenceburg. A dam was built and water was impounded and diverted across the Horseshoe Bend through a tunnel to the powerhouse on the other side and then returned to Shoal Creek. By 1915, Shoal Creek No. 1 could no longer supply the needs of the city, and a second plant was built approximately 2.8 miles downstream. The powerhouse at No. 1 is a reinforced concrete structure situated on a steep bank above Shoal Creek, and is nearly inaccessible. The two plants operated as municipal public utilities until 1939 when the TVA began increasingly to provide electricity to the city.[29] Designs utilizing narrow "horseshoe" bends in the state were located also at the Loop (1901), Great Falls (1917), and Estill Springs (1922), and Calderwood (1930).

The other example of a publicly-owned hydroelectric facility in the state of Tennessee is that of the Cookeville plant at Burgess Falls. City ownership of such public utilities is a hallmark of the Progressive Era in Tennessee and American history. Cookeville had its first steam-powered generator in 1904. In 1919, the city officials, realizing that more power

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28 SCN, October 1, 1974, No. 78, pp. 1-9; and Crouch, "History,", pp. 13-14; and A.W. Crouch, The Caney Fork of the Cumberland, (Nashville: np, 1973), pp. 53-61.

29 Small Hydro Feasibility Report for Shoal Creek No. 1 Dam; and correspondence with Marymaud Killen-Carter, Lawrence County Historian, March 3, 1987; and Viola H. Carpenter and Marymaud Killen-Carter, Our Hometown, Lawrenceburg: Crossroads of Dixie, (Lawrenceburg, Tenn.: Lino-Litho Printers, 1986), pp. 92-94, 180, 182, 183.

system began operating and would continue to run until the floods of June 1928 destroyed both the earthen dam and powerhouse about a mile downstream. A new steel-reinforced-concrete dam and powerhouse were built in 1929,; and the plant operated continually until 1951, and its contents were sold for salvage. In 1973, the City of Cookeville sold its interests in the property to the[30] State of Tennessee which has developed the domain as a state natural area.

A commonplace and ironic characteristic of advanced free-market capitalism is the tendency for competition to decrease as mergers increase the size of one corporate entity at the expense of the other(s). Such an example is found in the Tennessee Electric Power Company (TEPCO), the largest private-sector electrical power monopoly in Tennessee's early twentieth century history. It was formed on May 27, 1922, when the Tennessee Power Company and CR&L and the Chattanooga and Tennessee River Power Company merged. Through outright absorption of smaller companies and stock ownership, TEPCO controlled the Toccoa Electric Power Company, Blue Ridge Corporation, Nashville Railway and Light Company, Lookout Incline Railway Company, Lookout Mountain Railroad Company, and the Tennessee Transportation Company. In all, TEPCO was composed of the assets of forty-five different Tennessee companies, some formed in the nineteenth century.(See Appendix B)

The bulk of the hydropower production units within the TEPCO system were operated by independent firms long before the merger took place in 1922, and later in 1929 when Southern Cities Corporation was taken over. That is, pioneers in the development of hydroelectricity in the state built and operated the smaller more regional systems before TEPCO had been formed. For example, the Chattanooga and Tennessee River Power Company had begun construction in 1905 on the dam at Hales Bar on the Tennessee River, below Chattanooga and in Marion County. The Eastern Tennessee Power Company had constructed Ocoee No. 1 and No. 2, and the hydroelectric site at Great Falls on the Caney River all before 1916. A number of smaller, municipal plants in Middle Tennessee, built between 1901 and 1929, were controlled by either the Southern Cities Power Company (1918) or owned by the

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30 Small Hydro Program Feasibility Report for Burgess Falls Dam; and Kelly Thompson, "Burgess Falls Dam Revival Eyed Again," Cookeville Herald-Citizen, May 20, 1988, and Ibid., February 5, 1975; and Carl F. Ledbetter, "Burgess Falls, Indians, Industry, Intrigue," Current Lines, the Newsletter of Upper Cumberland Electric Membership Corporation, Vol. 7, No. 1, January, 1989, pp. 1-3; and Mary Jean DeLozier, Putnam County, Tennessee: 1850-1970, (Nashville, Tenn.; McQuiddy Printing Company, 1979), pp. 230-231. Also see, pp. 149-150.

either the Southern Cities Power Company (1918) or owned by the municipalities of Cookeville and Lawrenceburg, and would be absorbed by TEPCO in 1929. TEPCO would forge all these properties into a single network, in turn would be absorbed by the TVA as a result of the Supreme Court Case of TEPCO vs. TVA in 1939.[31]

The East Tennessee Light and Power Company (ETL&PC) (See Appendix C) was organized in October 1929. On June 1, 1929, ETL&PC acquired the property and assets of a number of companies, including: Watauga Power Company, Bluff City Electric Light and Power Company, Butler Light and Power Company, and Roan's Creek Light and Power Company, all in Tennessee. ETL&PC, an interstate corporation, operated in two counties in Virginia, one county in North Carolina, and four counties in Tennessee, serving as its primary consumption centers Bristol, Tennessee and Bristol, Virginia, Elizabethton, and Erwin, Tennessee. It would operate a number of facilities until 1945 when the TVA would purchase its assets and add them to its public jurisdiction.

Another private sector firm, the Tennessee Eastern Electric Company (TEEC), was incorporated in June 1912. (See Appendix C) The company, soon thereafter, acquired the property and assets of the Watauga Electric Company, Greeneville Electric Company, and the Jonesboro Electric Company. A regional monopoly, TEEC was the sole electrical power provider for Washington, Greene, Unicoi, Carter, and Sullivan counties in East Tennessee, including Greeneville, Johnson City, and Jonesboro as the principal cities.[32]

The introduction of cheap electrical power into the homes of the average Tennessean was not entirely accomplished until the Rural Electrification Program initiated by the TVA took place in the late 1930s and 1940s. Nevertheless, electricity had a definite impact upon everyday life, as well

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31 "Tennessee Electric Power Company, 1922-1939," Accession 180, Local History Department, Chattanooga-Hamilton County Bicentennial Library, pp. 1-2. See also: "A History of the Tennessee Electric Power Company," Bedford County Historical Quarterly, Vol. IV, No. 2 (Summer 1978), pp. 32-40; and Thomas K. McCraw, TVA and the Power Fight, 1933-1939, (New York: J.B. Lippincott Company, 1971), pp 104-107, 116-119; and "Company Takes Over Southern Cities System," Electro-Topics, vol. XII, no. 6 (November 1929), pp. 4-5.

32 Norma Thomas, "East Tennessee Light and Power Company Records, 1898-1945," Accession Number 156, Archives of Appalachia, East Tennessee State University, Johnson City, Tennessee, pp. 1-2.

as its noted effects in hastening the pace of industrialization. Chattanooga earned the sobriquet the "Dynamo of Dixie" as an indication of the perception that electricity was cheap and available to electrify manufacturing. As one historian put it, among the preferential factors influencing industrial growth in Chattanooga were "abundant power sources." Across the state of Tennessee, from Memphis to Bristol, electricity offered a cleaner more efficient power source with which to power businesses ranging from nurseries near Winchester; cotton mills in Shelbyville, Nashville, and Chattanooga; the Cumberland Cement Company plant near Cowan; the Armour Company's fertilizer plant near Columbia; office buildings in Chattanooga, Nashville, Shelbyville, Knoxville, and Johnson City; and textile mill villages; and even the nascent Krystal hamburger firm.[33] The Chattanooga Daily Times for October 30, 1911, said of the construction of the Parksville facility:

> Within a few months, cheap power will be available in Chattanooga, Knoxville, and all other intermediate towns. With the modern electrical power transmission methods, it is possible to carry this energy for hundreds of miles without appreciable losses, a thing almost unknown fifteen years ago....[34] [Emphasis added.]

Additionally, electricity-powered traction systems, which made cheap transportation available in the state's cities, stimulated the growth of residential suburbs for blue- and white-collar commuters. (Serious labor management disputes connected with inter-urban trolley companies and the rapid utilization of internal combustion engine automobiles and buses, however, would lead to the termination of electric trollies in Tennessee's - and nearly all other states' - cities.) After nearly three decades of private sector hydroelectric development, perhaps nowhere else can be found a better contemporary summation of the effect of electrical power upon the everyday life of Tennesseans than in the Seventeenth Biennial Report of the Railroad and Public Utilities Commission of the State of Tennessee (1929). In addressing what it called "The Glamor of Electricity," the Commission report stated:

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33 Livingood, A History of Hamilton County, pp. 304-331, and Marirose Arendale, "Lupton City: Chattanooga's Model Village," Tennessee Historical Quarterly, Vol. XLII no. 1 (Spring, 1984), p. 69; and "Reddy Gazes Into the Krystal," Electro-Topics, vol. XVII, no. 5 (Fall 1934), pp. 3-4; and "Company Takes Over Southern Cities System," Electro-Topics, vol. VII, no.6 (November, 1929, pp. 2-5.

34 CDT, October 30. 1911.

> In discussing public utility progress, naturally our...thoughts turn to electricity.
> The major part of the utility investment in the State is for electric service.
> If we think of the development of our water powers, we think only of hydroelectric development.
> The building of a dam across a stream to create a reservoir for municipal water supply would create little or no public interest, while the building of a dam for hydroelectric development... would be announced in block letters on the front pages of all our newspapers.
> No one ever enthuses over the water supply or gas supply in his home, but just mention electricity and the most humdrum citizen immediately becomes a poet, and when we think of it, there is no other servant of humanity that performs so many useful duties for us.
> It lights our houses, operates our domestic refrigerators for us and manufactures ice, it may be used in the other extremes to cook our food or heat our water; it operates fans to keep us cool in summer and operates our fuel oil furnaces to keep us warm in winter. It operates our washing machines and our ice cream freezers, our sewing machines and our curling tongs.
> It starts our automobiles and creates a pathway of light for them, so that it is almost as easy to travel by night as by day.
> It operates gigantic motors and most delicate radio sets.
> With all these wonderful characteristics it is little wonder that the great mass of the public looks upon electric development with the keenest interest....[35]

One TEPCO advertisement for 1933 refers to the good old days, when lighting meant coal oil with its "good ole [sic] smell, soot, shadows, smoke, and some more soot and smoke." Not only was it a fire hazard, but "a nice business builder for the local optician." The potato-spigot oil can had to be kept handy so that when "a flicker told of a wick running dry" it could be refilled. "Of course, in her courtin' days maybe Mom and her lamp do just that on purposes of [sic] a Sunday evening after church." Clean electric lights eliminated the Saturday morning chore of having to clean

35 Railroad and Public Utilities Commission of the State of Tennessee, Seventeenth Biennial Report, December 1, 1926 to November 30, 1928, (Nashville: State of Tennessee, 1929), p.89; and Foster, Electrical Age, pp. 230-348.

the lamp chimneys with paper and cloth. "Children of today know nothing of this unpleasant task for electricity has banished it."[36]

A full spectrum of new household conveniences were made possible by electricity. These electric devices were touted as ending much of the drudgery of life in the past and included: irons, coffee makers, toasters, waffle irons, electric clocks, baby-bottle warmers, curling irons, vacuum cleaners, radios, water heaters, room or space heaters, sun lamps, ranges, refrigerators, washing machines, and heating pads. Moreover, mining operations, water pumps, cabinet making equipment, dairy farms, and the family stove could be operated electrically because of hydroelectric development. To better understand the changes wrought by such devices it is necessary only to consider the differences between the electric water pump and the manual variety. Many such early twentieth-century artifacts are found in museum collections today, but their insertion into everyday life was, in large measure, the direct result of hydroelectric development in the United States and Tennessee from 1901 to 1933.[37]

"Reddy Kilowatt," the cartoon/commercial symbol for TEPCO, and indeed the entire electrical energy industry, used electricity to advance consumerism throughout the state this way:

Let Reddy make your ice for you,
Just plug him in, that's all you do,
Then buy in quantities galore,
When prices suit you at the store,
Thus saving you money, time and toil,
He never lets your foodstuffs spoil.[38]

One of the major and more inveterate federal bureaucracies established by the New Deal of Franklin D. Roosevelt, in 1933, was the TVA. Reflecting a commonly-held distrust of big business, the TVA would have as its mandate

36 "In the Good Old Days," advertisement in Electro Topics, Vol. VXI, no. 3 (May/June, 1933), p. 20.

37 "How many electrical conveniences did you have in the 'good old days?'," Electro Topics, Vol. XV, no. 6 (Nov./Dec. 1932), p. 32.See also: Thomas W. Martin, "Hydroelectric Development in the South," pp. 241-262, in Fifty Years of Southern Progress: The South's Development; A Glimpse of the Past; The Facts of the Present; A Forecast of the Future, Part II, December 11, 1924, Manufacturers' Record, Baltimore, p. 261.

38 Electro-Topics, vol. XVII, no. 5 (Fall 1934), p. 3.

the complete control of electrical power development in the seven-state Tennessee River Valley area. In the process In the process of developing the resources of the area, TVA absorbed TEPCO assets in 1939, would continue until just after World War II. As historian William A. Doran put it, this era, particularly 1910-1920:

> saw private power companies recognize the potential for hydroelectric power in Tennessee, with enough sites developed to prove that potential. The issue became, not whether the power could be exploited, but how. Full development of these resources had to wait...until there was agreement that something could be done....The question of who should or could best do so is the sort of problem where accepting one answer precludes the possibility of exploring the other and adherents of either view can, after the fact, merely continue to assert the advantages of the one or the other without possibility of proof.[39]

The creation of the TVA, often controversial and certainly powerful, would concluded private-sector initiatives in hydroelectric development in the state of Tennessee. The contemporary primacy of the TVA has tended to diminish and otherwise obscure the role and contributions of private-sector enterprises, as well as some significant examples of earlier public-sector resourcefulness in the development of hydroelectricity in the Volunteer State. Thus the possibility of exploring and preserving pre-TVA hydroelectric sites became, as Doran stated, the "sort of problem where accepting one answer precludes the possibility of exploring the other...." The material culture reminders of these important activities are testaments to this era and kind of private and public endeavors to modernize their environment and conquer their surroundings through the utilization of hydroelectric power in Tennessee from 1901-1930.. Their day has come and gone. That they ultimately did not prevail matters less than the fact that they were the first examples of Tennessee's participation in the process of electrification, which provided the foundations for future development of the electric energy industry and to its largely public control. As such,

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39 Thomas K. McCraw, TVA and the Power Fight, 1933-1939, Critical Periods in History Series, (New York: J.B. Lippincott Company, 1971), pp.64, 104-107, 116-119 133-138, 152; and Davidson, The Tennessee, Vol. 2, pp. 213-271, 306-333; and Robert E. Corlew, Tennessee: A Short History, 2d ed., (Knoxville: University of Tennessee Press, 1981), pp. 472-474. The quotation by Doran is in his "Early Hydroelectric Power" THQ, Vol XXVII, no. 1 (Spring 1968), p. 82. See also: Martin, Fifty Years, pp. 241-262.

these sites, even though they vary as to size and current condition, are the kinds of resources that are at the very core of cultural resource management, because of their ability "to serve as tangible links to the past from which they have survived, in a way that written or narrated histories cannot."[40]

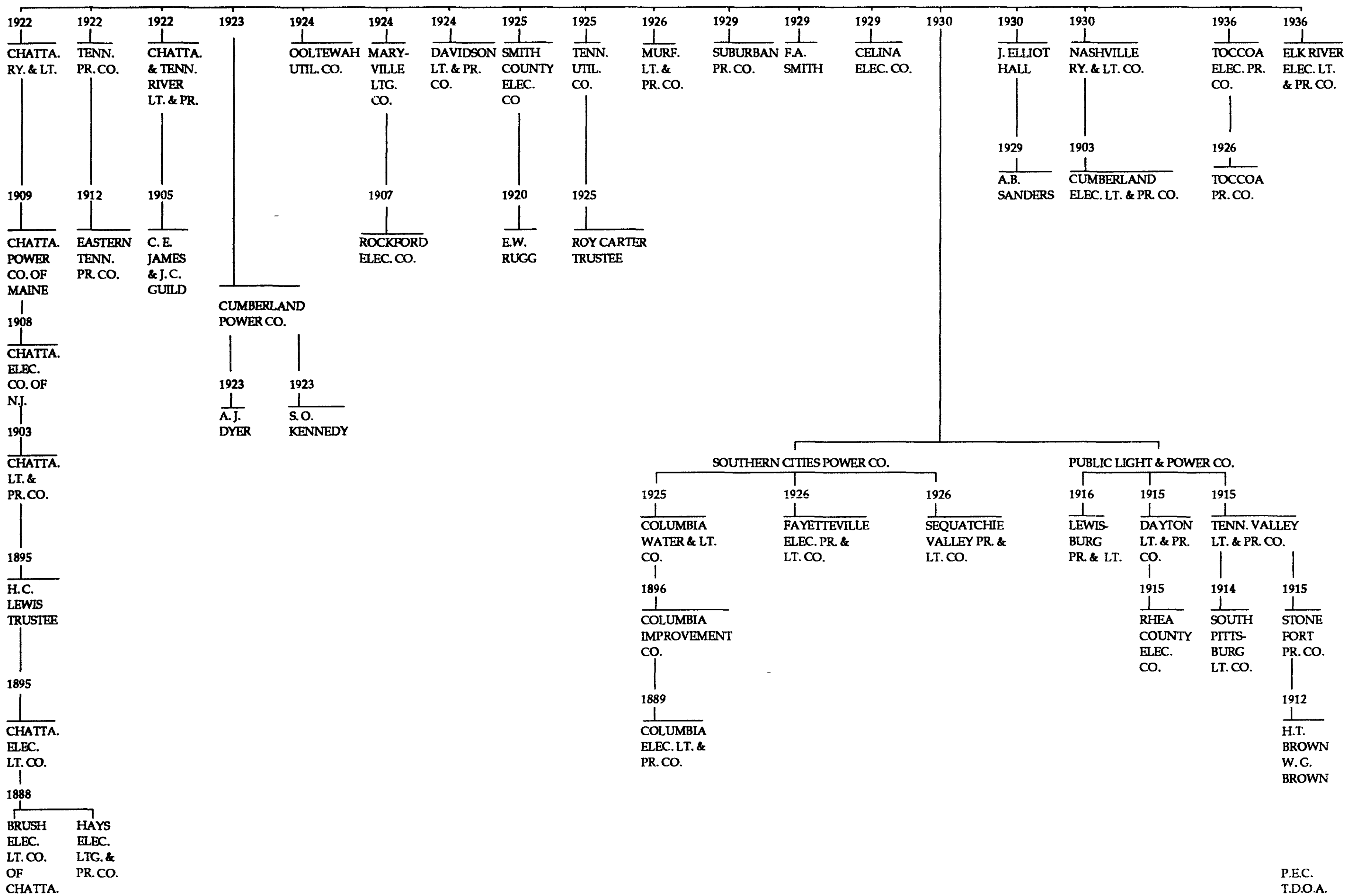
40 William D. Lipe, "Value and Meaning in Cultural Resources," p. 4, in Henry Cleere, ed., Approaches to the Archaeological Heritage: A Comparative Study of World Cultural Resource Management Systems, (New York: Cambridge University Press, 1983).

APPENDIX A

PRE-TENNESSEE VALLEY AUTHORITY HYDROELECTRIC SITES IN TENNESSEE, 1901-1933, LISTED CHRONOLOGICALLY.

COUNTY	SITE	RIVER	YEAR COMPLETED
Franklin	The Loop	Elk	1901
Lawrence	Lawrenceburg	Shoal Creek(No. 1)	1906
White	Sparta	Calfkiller	1909
Carter	Wilbur Dam	Doe	1911
Polk	Ocoee No. 1	Ocoee River	1912
Sevier	Walker Mill	Little Pigeon	1912
Polk	Ocoee No. 2	Ocoee River	1913
Bedford	Mullins Mill	Duck	1913
Greene	Greeneville	Nolichucky	1913
Marion	Hale's Bar	Tennessee	1913
Cocke	Newport	Pigeon	1914
Coffee	Manchester	Duck	1915
Lawrence	Lawrenceburg	Shoal Creek(No. 2)	1915
Overton	Crawford's Mill	Roaring River	1916
Warren	Rock Island	Caney Fork	1917
Lincoln	Bearden's Mill	Elk	1919
Rutherford	Walter Hill	E Fork Stones River	1920
Franklin	Estill Springs	Elk	1922
Lincoln	Harms Mill	Elk	1922
Warren	McMinnville	Barren Fork	1923
Bedford	Shelbyville	Duck	1924
Marshall	Verona	Rock Creek	ca. 1925-30
Maury	Columbia	Duck	1925
Marshall	Lillard's Mill	Duck	1928
Putnam	Burgess Falls	Falling Water	1929
Blount	Calderwood	Little Tennessee	1930

APPENDIX B. TENNESSEE ELECTRIC POWER COMPANY (TEPCO) - DIAGRAM SHOWING TRANSFERS OF ELECTRIC FRANCHISES ABSORBED BY THE TENNESSEE ELECTRIC POWER COMPANY WHICH WERE ORIGINALLY GRANTED TO OTHER COMPANIES OR INDIVIDUALS. FROM THE TEPCO COLLECTION IN THE CHATTANOOGA/HAMILTON COUNTY LIBRARY, CHATTANOOGA, TENNESSEE, ADDITION 2, BOX 5, ITEM 10, "SOURCE OF ORIGINAL COSTS," ca. 1937.



P.E.C.
T.D.O.A.
06/15/1989

APPENDIX C. EAST TENNESSEE LIGHT & POWER CO.

- EAST TENNESSEE LIGHT & POWER CO.
  - ROAN MTN. DISTRIBUTION SYSTEM
  - PINEOLA DISTRIBUTION SYSTEM
  - ERWIN ELECTRIC LIGHT & POWER CO.
  - ROANS CREEK LIGHT & POWER CO.
  - ELK PARK ELECTRIC LIGHT & POWER CO.
  - NEWLAND LIGHT & POWER CO.
  - BUTLER ELECTRIC LIGHT & POWER CO.
  - BLUFF CITY ELECTRIC LIGHT & POWER CO.
  - MINNEAPOLIS DISTRIBUTION SYSTEM
  - WATAUGA POWER CO.
    - DOE RIVER LIGHT & POWER CO.
    - ELIZABETHTON LIGHT & POWER CO.
  - BRISTOL GAS & ELECTRIC CO.
  - BRISTOL ELECTRIC LIGHT & POWER CO.
  - CONSUMERS ELECTRIC CO.
  - BRISTOL GAS & ELECTRIC LIGHT & POWER CO.
  - BRISTON GOODSON ELECTRIC LIGHT & POWER CO.
  - THOMPSON-HOUSTON ELECTRIC CO.
  - TENNESSEE EASTERN ELECTRIC CO.
    - JONESBORO ELECTRIC LIGHT & POWER CO.
    - GREENEVILLE ELECTRIC LIGHT & POWER CO.
    - WATAUGA ELECTRIC CO.
      - WATAUGA LIGHT & POWER CO.
      - JOHNSON CITY ELECTRIC LIGHT & POWER CO.
    - JOHNSON CITY TRACTION CORP.
    - TEPCO NO. 1
  - TENNESSEE REALTY COMPANY
  - TENNESSEE ELECTRIC POWER CO.

P.E.C.
T.D.O.A.
06/16/1989

F. Associated Property Types

I. Name of Property Type Hydroelectric Power Generating Facilities

II. Description

III. Significance

IV. Registration Requirements

[X] See continuation sheet

[ ] See continuation sheet for additional property types

G. Summary of Identification and Evaluation Methods

Discuss the methods used in developing the multiple property listing.

[X] See continuation sheet

H. Major Bibliographical References

[X] See continuation sheet

Primary location of additional documentation:

- [X] State historic preservation office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Specify repository: ______

I. Form Prepared By

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city or town Nashville state Tennessee zip code 37243-0442

DESCRIPTION

A difference in the dominant definitional paradigm relating to the property type, Hydroelectric Power Generating Facilities, is found in the distinctions characteristic between "high head" and "low head" systems. The contrast is, however, largely inconsequential when the commonalties found in hydroelectric systems are illustrated by the generic components standard to either kind of system complex. Head is defined as the distance from the penstock level to the point on the turbine wheel where the water strikes causing it to rapidly rotate and thus drive an electrical generator.

High, medium, and low head systems are composed of the following components: 1) a reservoir; 2) dam/intake structure, water conveyance system, including a canal, pipeline, penstocks, and a forebay; 3) pressure regulators, including stand pipes or surge tanks; 4) a power house, including electrical generating and transmission equipment.

While there are distinctions there are also commonalties, at least insofar as functions are concerned. For example, all hydroelectric facilities will demonstrate the presence of transmission systems, reservoirs, dams, and dam-spillways as essential parts of the hydroelectric production system. (The terms describing the more constituent components indicative of most extant pre-TVA hydroelectric sites in Tennessee, whether or not they can be characterized as high, medium, or low head systems are found in Appendix D.)

Low head systems utilized old style, but not inefficient, water wheels and pressure or reaction turbines of the Francis type. High head systems generally utilized the impulse wheel. The differences are also a matter of sheer size in Tennessee's case. That is, most of the earliest examples of pre-TVA hydroelectric stations in Tennessee were low head, and usually quite small when compared to the larger high head systems. Yet this is not always the case inasmuch as the hydroelectric site at Hale's Bar, across the Tennessee River, was quite large (12 generators) yet it did not utilize penstocks as part of its water conveyance system. Ocoee No. 1 and No.2, Calderwood, Burgess Falls and Great Falls all qualify as high head systems, while the Nolichucky and Wilbur sites belong in the medium head range. Calderwood's water conveyance system is not composed of penstocks but of three concrete tunnels that serve the same function, while the Nolichucky and Wilbur sites utilize smaller penstocks that are built into the dam. The sites at Lawrenceburg, Murfreesboro, Lillard's Mill, Columbia, Shelbyville, Hale's Bar, Estill Springs, Winchester, Manchester, McMinnville, Verona, Harm's Mill, Bearden's Mill, Walker Mill, and Mullin's Mill all qualify as low head systems, yet they are not as grand in scale as

Hale's Bar. Of these low head systems, only the sites at Manchester and at Crawford's Mill appear to have utilized a penstock, as evidenced by historic photographs. All the foregoing only echo the observation of one early twentieth-century hydroelectric engineer, Frank Koester, who wrote in 1909:

> Hydraulic power plants have no standard arrangement, as there are so many types of turbines which are fed under various conditions; low heads may be utilized by horizontal or vertical turbines, requiring an entirely different proposition in the layout of the plant. The same is true for average as well as high head turbines....[1]

Hydroelectric dam designs, regardless of dam-type, associated with pre-TVA development in Tennessee are of two kinds: 1)gravity; and 2) curvilinear. Both are constructed of steel reinforced concrete. Gravity dams are so named because their linear projection works with the flow of the water to keep the center of gravity immovable and thus insures dam integrity. All but two of the hydroelectric dams associated with the temporal and thematic limits of this multiple property documentation form nomination are of the gravity type. Each concrete gravity dam may demonstrate a curved or trapezoidal configuration when seen in cross-section. Curvilinear dams, such as found at Calderwood and at Ocoee No. 1, utilize the force of the reservoir of water the dam impounds against an upstream bulge or arch in the dam to further exert pressure outward on the dam footings and abutments and thus hold back the water and maintain the dam's integrity.

The earliest powerhouses in Tennessee's hydroelectric experience were frame buildings, usually grist mills retro-fitted to hold electrical generating equipment. This is true, for example, of Mullin's, Harm's, Crawford's and Bearden's, Mills, and the early facility in Sparta. While the "Loop" in Winchester was likewise at first a frame structure, it was built intentionally as a hydroelectric site. Soon, however, the use of steel

1 Tennessee State Library and Archives, Looking Back in Tennessee Photographic Collection, Photograph No. CF-133, and System Control News, August 1, 1973, No. 64, and; Frank Koester, Hydroelectric Developments and Engineering: A Practical and Theoretical Treatise on the Development, Design, Construction, Equipment and Operation of Hydro-Electric Transmission Plants, (New York: D. Van Nostrand Company, 1909), p. 88.

reinforced concrete and brick was common inasmuch as it was more cost effective and it better withstood the deteriorating forces of rushing water. For example, the McMinnville and Walter Hill sites extant today were built after floods destroyed wooden structures. These structures concealed the water-driven turbines, usually in a vertical configuration, and the electrical generators.

Their vertical emphasis, best illustrated by the Walter Hill site in Rutherford County, and the Walker Mill site in Sevier County, (both low head systems), was a result of the perpendicular placement of machinery. The power house foundation at Walter Hill was built of steel reinforced concrete and generally the powerhouse itself was either composed of brick or reinforced concrete and sat atop the concrete foundation. This construction technique was common if not universal. Additionally, the funding of publicly owned systems, such as Lawrenceburg (low head) and Cookeville (medium head), was conditional and qualified upon the satisfaction of the taxpayers, and these materials offered greater economy. The remains of the power station at Estill Springs, on the Elk River, show a unique combination of concrete construction adapted to fit atop the ruins of a massive brick textile mill. Its forebay, foundation, intake, tailrace and even dam were built of massive rubble stone masonry.

Bearden's and Harm's Mills sites on the Elk River in Franklin County both utilized a horizontal generator drive configuration in generating electricity, hence the same emphasis in their arrangement. Hale's Bar in Marion County also shows a rectangular plan, but not due to a horizontal drive system at Harm's Mill. That is, the sheer number of generators it housed (12) determined its shape.

Another site, such as at medium head Nolichucky (1913) power house and dam near Greeneville in Greene County, demonstrate architectural design more commonly associated with early water powered factories, being essentially a three story brick structure with symmetrically placed lights, gable ends. The similarities between the Nolichucky site and Falls Mill National Register site are striking in terms of their shared use of brick construction, lighting, but not in terms of specific function. The "Loop," Shoal Creek No. 1, Harm's and Bearden's Mills, the McMinnville site, and even the Lunn site in Verona, all low head systems, utilized concrete, sans bricks as their construction fabric. All also are rectangular but vertically emphasized. While Hale's Bar is rectangular and constructed of bare concrete its placement in horizontal. Nearly everything is geometrically placed providing an asymmetrical balance. The two story generating wing housed 12 generators and was later extended by the TVA to hold two more.[2]

While only five of the twenty five (20%) pre-TVA hydroelectric sites in Tennessee still actually generate electricity (Ocoee Nos. 1 and 2, Calderwood, Walker Mill, and Wilbur Dam), the remaining sixteen vacant powerhouses once safeguarded massive electrical generating equipment and indicated the preponderance of low head systems in Tennessee's pre-TVA hydroelectric experience. Low head systems, with or without penstocks, would generally use a reaction type wheel, whereas high head systems utilized the impulse wheel. (See Appendix D.)

This is true even in the case of Ocoee No. 1, currently TVA's oldest extant and operating hydroelectric dam. An exemplary report by Robert D. Johnson shows that Ocoee No. 1 has horizontal-shaft hydraulic reaction turbines, which while original, may or may not have been generically common to all pre-TVA units in this nomination.[3]

Smaller hydroelectric plants, those whose origins were local in nature, used an eclectic collection of equipment that often changed with owners, after destruction by flood or fire, and when corporate mergers or increased demand resulted in modifications.[4] This kind of evolution was the rule in much of Tennessee's pre-TVA hydroelectric development history.

At times some of the resources display remarkable similarities, as is most certainly the case when considering the Lillard's Mill, Columbia and Shelbyville hydroelectric sites on the Duck River, in Marshall, Maury, and Bedford Counties respectively. This is largely because they were all built for the Southern Cities Electric Corporation in the late 1920s. All three

2 System Control News, October 1, 1973, No. 66, p. 1, and November 1, 1972, No. 55, (Hereafter: SCN.) Washington Hydro, section F pp. 6-7.

3 Robert L. Johnson, "Comparative Evaluations and Proposals for Preservation of TVA's Oldest Hydroplants," December, 1988. On file with the Review and Compliance (section 106) records at the Tennessee Historical Commission/State Historic Preservation Office, Nashville, Tennessee. (Hereafter: Johnson, "Oldest Hydroplants."), and; TVA, Rehabilitation Studies, Ocoee No. 1 Project," Report No, WR28-1-63-100, May 1986, pp. i-vi, and; SCN, August 1, 1974, No. 76 See also: "The Ocoee Hydro-Electric Development, Engineering Record, June 22, 1912, Vol. 65, no. 125, pp. 676-679.

4 Ibid., January 1, 1973, No. 57.

were designed by the Nashville engineering firm of Freeland, Roberts and Co., and built by the well-known Nashville construction firm, Foster & Creighton.[5]

The largest of all pre-TVA hydro electric sites is also the last built before TVA was created. It is the Calderwood site (1930) built on the Little Tennessee River. Its reservoir affects two counties, Blount and Monroe, in Tennessee and two others on the North Carolina side, while total drainage at the dam is 1,856 square miles. There are three tunnels directing water to powerhouse on the other side of the mountain ridge.[6]

The most mysterious example of a known pre-TVA hydroelectric site in Tennessee is the Lunn site in Verona, in Marshall County on Rock Creek. The dam and powerhouse remains are almost certainly of vernacular construction. That is, while it is constructed of steel reinforced concrete, it does not demonstrate the distinguishing visual hallmarks characteristic of a professionally designed and constructed structure. The extant structure appears to have housed a turbine. The powerhouse sits on the right side of the dam. All available evidence suggests it was a local private-sector effort built during the late 1920s.

[5] "Preliminary Survey Generating Stations Southern Cities Power Company, Columbia Dam" circa 1930, part of TVA's unprocessed TEPCO collection. (Hereafter: "Preliminary Survey.") "Feasibility Report - Columbia Dam," pp.1-2, and ; Hunter, Industrial Power, pp. 374, 392-393. The Columbia site was constructed in 1925.

[6] Calderwood Project: Aluminum Company of America, "Summary of Principal Features, March 1970 for Calderwood Dam." On file at THC.

SIGNIFICANCE

Pre-TVA hydroelectric sites in Tennessee are located only in the Middle or Eastern sections. That is, Tennessee is traditionally divided into three sections, the Eastern, Middle, and Western areas. Each section has its own distinctive topographical characteristics. Briefly, the East is mountainous with rapidly flowing streams and rivers, while the geography of the Middle section is identified by rolling hills and a generous number of rapidly flowing rivers. By contrast, the Western section is characterized by flatlands, and slowly flowing shallow rivers and streams. Because this is so, the areas most likely to have the natural resources capable of sustaining hydroelectric development will be found only in East and Middle Tennessee. They are, moreover, significant material culture resources revealing the history of the rapidly changing technology of hydroelectric power development in the twentieth century, as well as the emerging governmental and business relationships that emerged to harness and distribute that power to an ever increasing domestic and industrial market. The installations are inextricably linked with the development of the private-sector electrical industry and even of the Tennessee Valley Authority and the state's urban, economic, social, and political evolution.

Engineering Significance, Criterion C
Level of Signficance: state

Power plant installations demonstrate the changes that occurred in the configuration of electrical supply systems between 1901 and 1933. While Tennessee was not a pioneer in the use of high capacity turbines and long, high voltage transmission systems, these developments were utilized effectively in the Volunteer State, allowing a greater degree of control over the environment through the practical use of that environmental resources. The larger sites such as Calderwood, Ocoee Nos. 1 and 2, the Wilbur Dam, and Nolichucky, however, demonstrate the application of hydroelectric engineering principles on medium and high head scales in the state. They likewise indicate the presence of large scale electrical supply networks that developed to meet the surge of market demand for electrical power throughout the state.

Corporate and Government Significance, Criterion A
Level of Signficance: state or local

Hydroelectric development in Tennessee sprang from the example of the small isolated communities favored with an abundance of water power through the growth of corporate giants such as TEPCO. At first each community had its own hydrostation, and as monopolistic public utility conglomerates developed local facilities would be absorbed and added to larger power networks, transforming their local identity and isolation into statewide electrical supply networks. (See Appendices B and C). In this way hydroelectric development helped in the process of modernization, of creating a more homogeneous political, cultural and political landscape. Hydroelectric stations may be significant in either the areas of commerce or government. Additionally, the municipal systems in Tennessee, in Lawrenceburg and in Cookeville, were a response to the perceived evil of privately owned public utility monopolies, demonstrating a government response to the problem of providing the community with electricity. Nevertheless, by 1924 there were a total of sixty eight privately owned utilities furnishing electrical service in Tennessee with a total assessed value of $17,097,802.[1] Additionally, twenty four Tennessee cities had electrical traction trolley systems. The larger power companies were amongst the largest corporations in the state, managing regional operations at a scale rarely realized outside that of the railroad industry. These corporations would purchase local concerns and exercised an influence over public affairs that was unusual for other kinds of private concerns. In terms of government or public response, the Tennessee Railroad Commission officially extended its focus to include public utilities in 1919. It was renamed the Tennessee Railroad and Public Utilities Commission.[2] The Commission, however, could not stop the development of monopoly, and in its biennial report for 1929-1930 it was demonstrated that while over a hundred companies provided electricity in 1921, only twenty-eight existed in 1930. This was of no concern to the Commission because the number of communities served increased, and private companies were making efforts to extend their services to outlying areas, a task subsequently the task of the Tennessee Valley Authority, an institution of the federal government. Later, the TVA would be provided an already established power generating and distribution network, a base for further development in future decades, a firm footing that would allow the expansion of this federal bureaucracy so that it would effectively end private sector hydroelectric development initiatives in the seven state TVA area.

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1 State of Tennessee, Fifteenth Biennial Report of the Railroad and Public Utilities Commission of the State of Tennessee: December 1922 to November 30, 1924, (Nashville: 1925), pp. 150-53, 210-211.

2 State of Tennessee, Report of the Tennessee Railroad and Public Utilities Commission for the Years 1919-1920, (Nashville: 1920), pp. 165-173, and State of Tennessee, Eighteenth Biennial Report of the Railroad and Public Utilities Commission, December 1, 1928 to November 30, 1930, (Nashville: 1931), pp. 12-13.

Archaeological Significance:

A number of pre-TVA hydroelectric sites in Tennessee, might qualify for National Register eligibility for information potential to the engineering phenomena. As one contemporary expert on historical TVA hydroelectric material culture puts it:

> As contemporary Industrial Archaeologists survey the technology of hydro power generation for examples of earlier structures and artifacts that have managed to survive into modern times, their choices are...limited, and increasingly threatened.[3]

Archaeological significance, however, remains unevaluated by professional archeologists.

These sites include Ocoee Nos. 1 and 2, as well as the trio of smaller sites on the Duck River, and ALCOA's facility at Calderwood, as well as the remains at Crawford's Mill in Livingston County, on the Roaring River. The other larger and smaller sites, whether in a physical state of ruin, atrophy, or disuse should also be measured significant, inasmuch as they bear witness to the first hydroelectric developments in the state's industrial growth and, ultimately, cultural landscape. They testify to the spirit and presence of venture-capitalism in American life, of the profitable and environmentally-conscientious exploitation of natural resources in the state of Tennessee. The early utilization of hydropower to produce electricity was vibrant at throughout the state wherever finance, geographic conditions, then existing technology, and available engineering know-how melded to produce the first examples of hydroelectric development in Tennessee's history. With increased power came increased industrial development, while the growth of cities was sparked as factories provided jobs and created demands for housing and inexpensive urban-transportation. All were fundamentally a partial result of the development of hydroelectricity in the state of Tennessee, 1901-1930.

[3] Robert L. Johnson, "Comparative Evaluations and Proposals for Preservation of TVA's Oldest Hydroplants," December, 1988, p. 2.

REGISTRATION REQUIREMENTS

Pre-TVA Hydroelectric Power Generating Facilities will generally be eligible for listing on the National Register of Historic Places if they are significant:

1. in the history of hydroelectric generation engineering and electric transmission technology, design principles, and construction techniques (criteria A & C); or
2. in the social, economic, and industrial development of the locality of the state (criterion A); or
3. examples of hydroelectric power systems built by renowned engineers for either their design elements or their engineering significance (criterion C); or
4. as a rare example, early example, or a significant representative example of a high or lowhead hydroelectric site (criterion C).

Because Pre-TVA Hydroelectric Power Generating Facilities are composed of a variety of components (dams, powerhouse, reservoir, spillway, etc.), each site must be evaluated according to its extant features and their integrity and the area of significance under which the facility is eligible.

Pre-TVA Hydroelectric Power Generating Facilities can be eligible under criterion A if sufficient portions of the dam and/or powerhouse remain to identify the site. Loss of secondary components will not compromise the significance of most pre-TVA hydroelectric sites if the dam remains and retains its integrity of design and/or materials. The powerhouse, although an important component of the hydroelectric facility, can demonstrate a loss of integrity of materials if the facility has been abandoned and the generating machinery removed or if new machinery has been added.

Pre-TVA Hydroelectric Power Generating Facilities eligible under criterion C for their importance to hydroelectric generation engineering or electric transmission technology must retain integrity of most of its components, sufficient so that the significance of the total system is represented. Facilities eligible for their design features or the engineering significance of the dam may demonstrate a greater loss of secondary components. Loss of some components will not irreversibly compromise the integrity of the facility if the surviving features convey the significance on their own.

Integrity requirements were based upon the National Register standards for evaluating integrity. These standards were elaborated to address the unique integrity of the sites and property types associated with them.

Requirements for integrity were also based upon historical knowledge of antecedents to contemporary condition of existing properties and on an understanding of the historic function and operation of the properties and how these factors affected integrity.

Appendix D:

Terminology describing component elements associated with Pre-TVA Hydroelectric Power Generating Facilities.

Storage Dam: a dam with a reservoir that is capable of holding water from the annual high-water season until the beginning of the following low-water season. Ocoee No. 1 and Calderwood are examples of high storage capacity storage dams.

Run-of-the-river-dam: a dam that has very little storage capacity. Most of Tennessee's pre-TVA dams are of this kind, with Calderwood and Ocoee No. 1 as major exceptions.

Cushion dam: a smaller dam usually located near the bottom of the downstream side of a larger dam. Its purpose is to create a reservoir that will decrease the potential for damage to the dam caused by rushing water during flood situations. A singular example is found at the Calderwood hydroelectric site.

Spillway: this part of the dam acts as a safety valve allowing pressure resulting from increased river flow to be bled off and thus avoid flooding.
The spillway is usually slightly lower than the shoulders of the dam and are that part of the dam over which water is generally seen falling.

Fishladder: a wild-life conservation device built into hydroelectric (and other) dams designed to allow the passage of fish upstream during spawning season.

Sluice: generally a square-shaped cavity at the bottom of a storage dam or flume utilized as an emergency outlet for water during threatening flood conditions.

Flume: an open channel or ditch constructed of wood or concrete or cut into stone which may direct water to a penstock or directly to a turbine located in the power house. They were usually built of wood or concrete and followed the contour of the ground. Excellent examples of flumes are found at the Sparta site (concrete) and at the Ocoee No. 2 site (wooden).

Penstocks: steel pipes used as a water conveyance system directing water from the forebay to the turbines. Their size depends upon the volume of water to be carried and the head available. They are constructed so as to follow the shortest route from the source of the water to the forebay and then to the turbine, and generally built so as to avoid sharp curves. In cases where more than one penstock is utilized they are laid in a parallel fashion. Penstocks are generally associated with larger high head or medium head hydro-electric systems.

Surge tank: that part of a penstock that is perpendicular to the horizon in which water travelling at high velocity is allowed to surge, by means of a butterfly valve in the penstock, so that the water flow can be controlled and prevented from damaging the turbine as a result of what is known as "hammering." They serve as pressure regulators.

Intake: part of the hydroelectric system's water conveyance system, the intake is the entrance to a turbine unit at a hydroelectric powerhouse site.

Powerhouse: The most prominent architectural structure of any hydroelectric station, where the generating equipment is housed. It is here that the water, after being diverted by a dam through a penstock or flume, or combination of both, meets the turbine and in turn creates the power to generate electricity. They may be large or small, depending on the number of forebays, turbines, and generators.

Trash rack: usually a grid of flat steel rods located directly upstream from hydroelectric sites designed to form a screen and thus to keep floating debris from entering the forebay and impairing the operation of the turbine.

Forebay: immediately upstream and attached to the powerhouse, the forebay is that part of the powerhouse intake which serves as a container or canal from which water is taken to run a turbine. Also known as the headrace, they are located upstream so as to deflect all foreign material and feature metal, usually steel, trash racks.

Sluice Gates: these are for controlling the water supply in the headrace, and are usually vertical moving devices. The may be composed of wood but most often of iron.

Tailrace: the channel or canal carrying water away from the powerhouse and/or dam; that area immediately adjacent to the downstream side of the power house in which water is discharged after working the turbine blades.

Francis or Leffel reaction turbine wheel: a patented type of turbine wheel that reacted directly to water flow and was utilized most often in low head systems. Also most often found in early examples of hydroelectric development and utilized widely in late nineteenth century grist mills. It would be located in the forebay.

Generator: the generator consists of a series of strong magnets set in a circular arrangement; a brush, driven by the turbine wheel, interrupts the magnetic field and causes electricity to be produced. Generators were built by different companies and would typically have different kilowatt ratings, and were essential to the production of electricity.

Other structures: structures that may be associated with pre-TVA hydroelectric property types include standing or the remains of ancillary steam powered generating buildings, the remnants of construction railroad beds, railroad bridge piers, massive cranes both inside and outside the powerhouse steel power-transmission towers, large ceramic resistors, and the underground remains of construction camps, and the office buildings and domestic structures and recreational built in company towns which housed the employees operating and maintaining the hydroelectric facility. Storage sheds may likewise be a property type, either of wooden, concrete, or brick construction. Access ramps or bridges constructed as part of the power facility's dam are also other property types that may be part and parcel of hydroelectric sites.

Pre-TVA hydroelectric sites were surveyed and inventoried as the result of staff's efforts to link survey and planning to the National Register of Historic Places. The historic context of the Multiple Property Documentation Form was created in 1985 as a comprehensive planning study unit entitled, "Pre-TVA Hydroelectric Development in Tennessee, 1901-1933." The study unit identified some twenty-five sites which had been surveyed between March and May of 1989.

Research beyond the original study unit was carried out in the State Library and Archives in Nashville, at the TVA Regional Technical Libraries in Chattanooga and Knoxville, and at the TVA cultural resources division's holdings in Norris, which includes the Jo Conn Guild Collection. Federal Energy Regulatory Commission (FERC) portfolios, located in the Review and Compliance records on file at the State Historic Preservation Office, were also consulted. On-site interviews were conducted at five of the sites. Many county historians in whose jurisdiction these sites are located participated in the survey and research portions of the project by contributing well-documented histories of the sites and providing access and directions to those sites which were often difficult to locate. Of some small help, as well, were the headquarters of the various rural electrification cooperatives. All surveyed properties were photographed in black and white and in color transparency medium, located on both U.S.G.S. Quadrangle Maps and County Tax Maps and recorded on video tape. A special survey form was created by the SHPO staff in order to record each site, since hydroelectric sites are of a unique character, not always lending themselves to more traditional descriptions.

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