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Krishanu Das Chowdhury
 Research Scholar, Department
 of History, Cooch Behar
 Panchanan Barma University,
 West Bengal, India

The process of electrification in Darjeeling hills with special reference to Sidrapong hydropower project

Krishanu Das Chowdhury

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Abstract

The paper gives an overview of the origins and development of hydroelectricity in Darjeeling hills during colonial period and the process of electrification of the region. As the history of the city gained lots of attention from scholars due to its colonial heritage, but its legacy in the production of hydroelectric power wasn't gained so much attention till now. Darjeeling was one those earliest cities in India, which experienced the luxury of electricity in 19th century India. Here the special focus will be shifted on the Sidrapong power plant, which is known as the earliest hydroelectricity plant in India. Even the production of hydroelectricity was started here with the Sidrapng plant, later various other production units and extensions were installed in the areas like Lebong, Karseong and Kalimpong. In this article, an attempt was made to discuss factors behind the establishment of the project, important events during its developmental stages, production capacity, management, later extensions and other related things elaborately. The paper also contains several unknown data and details and statistics about those projects.

Keywords: Electricity, hydro, production, technology, extension, supply

Introduction

The history of power generation is long and convoluted, marked by myriad technological milestones, conceptual and technical, from hundreds of contributors. Many accounts begin power's story at the demonstration of electric conduction by Englishman Stephen Gray, which led to the 1740 invention of glass friction generators in Leyden, Germany. That development is said to have inspired Benjamin Franklin's famous experiments, as well as the invention of the battery by Italy's Alessandro Volta in 1800, Humphry Davy's first effective "arc lamp" in 1808, and in 1820, Hans Christian Oersted's demonstration of the relationship between electricity and magnetism ^[1]. In 1820, in arguably the most pivotal contribution to modern power systems, Michael Faraday and Joseph Henry invented a primitive electric motor, and in 1831, documented that an electric current can be produced in a wire moving near a magnet-demonstrating the principle of the generator. Perhaps the most important improvement then arrived in 1870, when a Belgian inventor, Zenobe Gramme, devised a dynamo that produced a steady direct current well-suited to powering motors-a discovery that generated a burst of enthusiasm about electricity's potential to light and power the world ^[2]. By 1877-as the streets of many cities across the world were being lit up by arc lighting. In case of India, PW Fluery & Co. used light bulbs to demonstrate electricity on the streets of Calcutta in 1879. Kilburn and Co., which later became Calcutta Electricity Supply Co., electrified Harrison Road (renamed MG Road) in Calcutta in 1889 ^[3]. This was the first street to have electric light bulbs in India. As the same time, an attempt also took place to install first electric power supply station took place at Surat, which later swept away by the floods of Tapti River ^[4].

Besides those partial initiatives, the colonial government's plans to introduce electric lighting and machinery in factories from the 1880s onwards, which were met with continuous resistance from Indian factory owners and politicians. They believed that electrification of industry was 'the most suicidal step in the history of the industry the evil consequences of which would be immensely far reaching aye, more than people have any idea of at present ^[5].' For these reasons, many of the efforts of colonial government became failed, but they worked continuously upon it.

Corresponding Author:
Krishanu Das Chowdhury
 Research Scholar, Department
 of History, Cooch Behar
 Panchanan Barma University,
 West Bengal, India

In the present day, it is one of the most popular sources of energy. So, two types of hydroelectricity projects are generally set up all over the world. The first one is, Run-of-the-river systems, where the force of the river's current applies pressure on a turbine. The facilities may have a weir in the water course to divert water flow to hydro turbines and Storage systems, where water accumulates in reservoirs created by dams on streams and rivers and is released through hydro turbines as needed to generate electricity. In India, at the earlier stages the second method followed largely. As Darjeeling was one of the most attractive destination for the British aristocrats and situated in an ideal place to test the potentiality of hydroelectric in India, got the opportunity to install first hydroelectric power plant in India.

After the treaty of Sagauli (1816), the presence of the British officials was increased in the region of North Bengal due to political as well as military purpose. By this treaty, Nepalese ceded the 4000 sq miles of territory to the East India Company, which in turn by a treaty signed at Titaliya (1817), was handed over to the Rajah of Sikkim due to some specific reasons^[6]. But the friendly relation between Raja of Sikkim and British East India Company became worse soon. As officials like J.C. Grant, General Lloyd visited the region regularly due to negotiate with the king. They impressed with the geographical importance and pleasant climate of this region and submitted official reports to develop the region, especially Darjeeling as a Sanatorium. Soon Company also realized the future possibilities of Darjeeling hill and appointed General Lloyd to negotiate with the Rajah for reacquiring the place. As their efforts became successful when in 1835, Rajah of Sikkim signed a treaty and gifted a portion of Darjeeling hills in exchange of Rs.3000/- per year. From then Darjeeling developed as a Sanatorium, but soon the British administrators realized the economic possibilities of this region. The Anglo-Sikkim conflict (1850) and Anglo-Bhutan war (1864) increased strategic importance of the region from military point of view. From 1860's the plantation agriculture also (tea, cinchona, orange) commercially introduced here, which changed economic scenario of Darjeeling^[7]. Besides this, due to its pleasant climate the place became very much popular among British officials and Indian Zamindars, so they utilized the city as a Summer Capital. Several branches of government organizations, Rest houses of Viceroys and other high officials, summer palaces of Indian Zamindars and wealthy merchants were constructed in Darjeeling from 1880's. So, colonial government took very much interest to develop the basic infrastructure and luxury arrangements in the city.

Due to geographical advantages, Darjeeling and its adjoining areas were very much suitable to establish a hydroelectric power plant in this region. Natural slopes of the hills and several Pahari Jhoras made the place more ideal for it. At the same time, the growing demand of electricity among the rich businessman and British officials also influenced the authorities to think about it. As a result, Darjeeling Municipality started to discuss on that matter with the higher officials of the government. Mr. R. T. Greer, the chairman of Darjeeling Municipality, sent a proposal to the higher authorities to form a 500KW hydroelectric power plant in this area. British government also realized the necessities of that kind of project soon and gave primary clearance to form India's first hydroelectric plant here. After receiving the initial clearance, the authorities of Darjeeling

Municipality started to survey various lands adjoining with the town for the proposed project. Even there were a number of places shortlisted which were suitable for the project, Sidrapong was selected finally^[8]. The place, situated in the lower portion of Arya Tea Estate, had a natural slope with a couple of Pahari Jhoras. According to the experts, among those Jhoras, Barbati Khola (from the sides of Ghoom and Barbatia), Lower Hospital Khola (from the sides of Happy Valley and Singtam) and Kotowali Khola (from the sides of Kotowali Thana and Burdwan Palaace) will be able to serve necessary water for this project. After selecting Sidrapong as the perfect place to form the power project, Darjeeling Municipality decided to take over the land to start the construction works soon. But Bijay Chad Mehtab, the Maharaja of Burdwan, owned the land and he already constructed a pleasure palace here. Even Maharaja wasn't ready to hand over the property to government at initial stage, but soon he realized the importance of this project and gifted it to Municipality^[9].

The exact spot of the Power Station and Hydraulic Works are presently situated at the foot of the Sidrapong spur which is roughly 4 miles below the Railway Station and about 3,500 feet above sea-level. On the other hand, with the special initiative of R. T. Greer, provincial government also granted a loan of rupees one lakh to Darjeeling Municipality for the project. So, the work for the installation of the power station started immediately and Messrs. Kilburn and Co. got the responsibility to complete the project within one year. The company had to import all essential machines and turbines from Britain. It was not easy to erect a hydro power plant in the region like Darjeeling in those days, when there being no proper road communication system existed. So all equipment, machinery and turbines had to be transported manually; which was a Herculean task, inconceivable in the still in present day. Even after such difficulties, Messrs Kilburn & Co. completed the work within the scheduled time period. Finally on 10th February, 1897, Mr. C. C. Stevens, then acting Lieutenant Governor of Bengal, inaugurated the project^[10]. This began the functioning of the Sidrapong Hydel-Power Station, the first Hydel Power station in India. It is a noteworthy fact that the first power utility run on commercial basis for use of general public in India was developed in public sector under state patronage. This station was soon taken over by the Municipality and added to considerably from time to time. In the first phase, the plant consisted of two 65KW Crompton-Brunton single phase, 2300 volt 83.3 Hz alternators coupled with two Gunther's turbines. The water which works the turbines is collected in two reservoirs, among them, the first was built in 1897 measures 112'x47'x13' and contains 68,432 cubic feet water. It is a noteworthy fact that the first power utility run on a commercial basis for the use of the general public in India was developed by the public sector under state patronage. Even loan of 1 lakh was sanctioned in the initial stage, but the total cost of the project reached up to Rs.1,20,000/- till the end. The power plant started to serve electricity commercially to the Darjeeling town from the end of the year of 1897^[11]. According to Dadhiram, whose predecessors worked in the project for four generations, 'On the day, People were very excited to see how the light will glow. For many, making electricity out of the water was nothing short of magic. The town was filled with people from all over the tea gardens, up to the Shrubbery Ground.'

He also said 'in the evening when daylight was dying out, the Power House started the Electricity supply. Everyone jumped in happiness, some became emotional, and some events crying at such an out-of-the-world events. Some described it as stars, while others even they described to others sang songs like the famous Darjeeling Sahar Batti ko Lahar Baikunda Jhasto cha ^[12].' At first the government offices, residential houses of wealthy Indians and British officials got the connections. Among them Burdwan Palace, Shrubbery Ground (Nightingale Park at present), Lad Shab (Governor House at Present), Mall Road, Jail, Thana, Hospital, VIP Cottages were noticeable. After that Darjeeling Municipality decide to lighten the prominent roads (Mall Road) of the town ^[13]. Thee street lighting distribution was carried out with wires on A.B poles and ordinary insulators. There were 200 16 HP lamps in waterproof fittings on galvanised brackets, spaced about every 200 meter for main thoroughfares ^[14].

Even the plant got initial success in power generation and supply, the original plant buried in the great slips which occurred in September, 1899. The town was in consequence plunged in total darkness for a period of two months during which repairs were being effected. As the plant became totally inactive, the government took it as a serious issue and soon the whole project revived in its previous condition. Till the first of 20th century, the hydro-electric power plant wasn't operated in profit by the Darjeeling Municipality. In 1905, The Electrical Review stated that in the period of soon after its installation in 1897, the Sidrapong plant in Darjeeling was operating at a loss. The annual municipal report for 1903-04 shows that the experience of the municipality in its electric lighting has not been a happy one. The installation, which cost Rs.1,60,000/- (or rather over £10,600) five or six years ago, has been worked at a loss throughout, while during the last financial year, another loan of Rs.60,000/- had to be raised in order to prevent the head works at Sidrapong slipping down the hillside ^[15]. Still the government showcased the success of the project in case of its electricity production and use it as a model to develop later plants in various parts of India. High officials of the project invited many prominent educational institutions to share their experience with the students. While making a case for domestic electrification in a lecture at the Civil Engineering College in Sibpur in March 1900, John Willoughby Meares, then Engineer-in-charge of the Sidrapong Hydroelectric Project in Darjeeling and, later in his career, the Electrical Adviser to the Government of India; emphasised how greater use of electricity was beneficial to both consumers and electricity suppliers ^[16]. He asserted that since any excess electricity produced by an electricity generating plant could not be stored, plants could be run more efficiently in case of maximum demand and maximum output.

But soon the demands of electricity increased in Darjeeling town with the growing population. The demand increased

such a stage that Municipality decided to upgrade the production capacity of the project. So another reservoir was constructed in 1905, which has the following dimensions-209'x59'x13' and contains water of 160,303 cb. ft. The total storage capacity of these two tanks thus reached 228,735 cb. ft., which was just sufficient to run a 100 H. P. set for about 15 hours. With this extended water storage capacity, another 135KW turbine also installed here which fulfilled the increasing demand of the town. Again in 1909, government decided to increase the power generation capacity of the plant as they installed another 135KW turbine at Sidrapong. As a result of such extensions the project soon became a commercially profitable organization of Darjeeling Municipality. With all this power generated, the plant at Sidrapong, was found again incapable of meeting the growing demands of the town and the two cantonments. As the place being too small a new power house was built in 1916 at a higher location, now known as Jubilee Power House. In this way, the total capacity of the station grew from 130KW in 1897 to 1000KW ^[17]. But owing to the limited supply of water, the generation could not be increased to match the growing demand of the town and of neighboring tea gardens to run their factories. Various schemes were prepared to install larger power station elsewhere.

To solve the problem, His Excellency Lord Carmichael was accordingly invited on July, 24th, 1914, to visit the Power Station in connection with the new scheme. It was a plan of Municipality to extend the project again and for the supply of electricity to the Lebong and Jalapahar Cantonments, where estimated cost was Rs.1,70,000/-. The above scheme, however formulated by the late Mr. G. P. Robertson, Municipal Engineer, while out on survey in this connection was drowned in the Great Rangneet river ^[18]. He focused on the problem with full consideration of a much larger scheme by which the needs of the tea gardens throughout the district right down to Dam Dim (Jalpaiguri, Duars) on the east and Nuxalbarie (Siliguri district) on the west, including the town of Siliguri, could be fully met. With this end in view Mr. Stonebridge, whose services were specially engaged, had been touring the Tista Valley the whole of the winter of 1914-15 and had lately submitted proposals and plans for the first of the four proposed stations, viz., the erection of one at the junction of the Little and Great Rangneet rivers just near the Tukvar Tea Estate at an estimated expenditure of Rs.3,50,000/- ^[19]. As the whole scheme was so extensive a one it follows that a number of years must elapse before it can be carried out in its entirety. However, British officials knew well when proposed project will completed, tea gardens, which now depend upon the forest for their fuel supplies, will have a clean and economical motive power at command which should materially reduce the working expenses and consequent cost of production, and, it is to be hoped, the market value of the manufactured article Tea.

Table 1: Here a list of the detail statistics of Darjeeling and Kalimpong power project given below

	Darjeeling Municipality (Agent Messrs & Co.)	Kurseong Hydroelectricity (Managing Goenka & Co.)
Installed capacity (Kilowatts)	1,960	400
Minimum continuous power, April (Kilowatts)	680	30
Peak loads so far handled (Kilowatts)	1,506	140
Total units sold, 1943-44	3,246,000	202,764
Ditto, 1944-45	5,191,000	
Non-industrial units sold, 1943-44	2,148,000	163,524
Ditto, 1944-45	3,431,000	
Population, 1943-44	50,000	15,000
Net rates charged, annas per unit lighting (including tax)	4	6
Heating (1 st 100 units per month)	.75	.75
Heating (over 100 units)	.50	.50
Power Average	.875	

Source: Dash, Arthur Jules, Bengal District Gazetteers: Darjeeling, p-151

Although the production of electric power was only a small scale in Darjeeling district in the first decades of 19th century, but soon it achieved remarkable success in this field for its possession of abundant easily developable water power. In addition to the hydroelectric plant in Sidrapong, the Municipality had its own a peak load and standby diesel eclectic generating station of 200 kilowatts near Lebung. Later another similar power generation plant was set up at Kalimpong also. The total cost of the installation was 3.5 Lakhs and it also became commercially successful soon ^[20]. On the other hand, water power, after critical investigation, was rejected as a means of generating power at Kalimpong and oil driven generating machinery was installed in 1938 by the Kalimpong Electro' Supply Co. Ltd. (managing Agents Messrs. H. K. Banerjee & Sons, Narayananj) with an issued and subscribed capital of 3 Lakhs. Originally the power unit consisted of two 40KW sets but soon these were found insufficient. Then in 1943, a third generator of 140KW capacity was installed ^[21]. In addition to these three stations mentioned above, many tea gardens had their own electric generating plants powered either by water or oil engines. Those were used both for lighting and for driving factory machinery. The installations were expected to cope with normal expansion of the town for the next few years.

The war has, however, compelled a recast of the above scheme, necessitating an addition only to the existing plant, which will generate just half as much again as the present out-put. This project would have been completed early in 1916, but the first set of machinery ordered for the project were submerged in deep blue sea, due to the enemy attack on its journey. The second set was in full working order by the end of October, 1916 ^[22]. In the meantime the demand for power grew rapidly. The old engine phase system of Sidrapong being outdated, unsuitable for a modern supply system and wasteful, the Municipal Commissioners resolved in meeting held on 9th June, 1931 to replace all the old machines and recondition the system of supply from single-phase 83 Hz to third-phase 50 Hz. In 1931, in place of 7 old machines in single-phase system with a total capacity of 1000 KW, five 200 KW units in the new 3 phase system were installed, of which one at the Lower Power House. Since water was found insufficient to run 4 sets of 200 KW set each in the present power house, one 200 KW set was later in 1942 shifted to a still lower location at Singtam Power Station, which may be called third stage of Sidrapong since it runs in tandem with Sidrapong Power House utilizing the discharge water from its tailrace. Till

Independence, therefore, consists of 3 sets of 200KW turbines installed at Sidrapong Power House besides one DC Hydel Generation set of 20KW for auxiliary power ^[23]. In 1947, the average income of the Municipality was about Rs.6, 50,000 from rates and taxes, markets and slaughter houses, rents of lands and buildings, hydroelectric receipts and other sources, while the expenditure was the same ^[24]. After Independence, Darjeeling municipality looked over the project till 1978, until West Bengal State Board of Electricity, took over the power station as they engrossed Darjeeling Electric Supply undertaking, on January 30 the same year. Sidrapong PowerStation was about to reach a century mark of providing electricity when it was heavily damaged by a landslide in 1980s. This led to the closing of the antique power station for almost decade. The number of workers at the power plant dwindled and the machinery fell into disrepair. During the Gorkhaland political agitation, the local residents struggled to preserve the station from rival groups. The central government and the WBSEB revived the power station in 1997 to mark its centenary. In a special ceremony, the station was accorded cultural heritage status by the central government, with a pledge to revive the power plant ^[25]. However, efforts at repairing the plant and restarting operations languished for 6 years owing to persistent technical problems and lack of attention from state authorities. The residents of the towns of Sidrapong, Risheehat, Arya and Bloomfield formed a committee on 2003 to revive and resuscitate the historic and monumental hydel project. This followed by GTA receiving Rs.8 Cr from the central government for the renovation of his historic monument in 2014. Currently, only one unit is functioning to generate electricity out of the three installed turbines.

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