

10. Water and Electricity

Let's look at water and electricity together, because the two were often linked in the early days through hydro-electric plants.

In 1831 British scientist Michael Faraday discovered the basic principle of electricity generation: creating or "inducing" electric current by moving magnets inside coils of copper wire. Typically coal or hydroelectric power was used to generate the movement of the magnets, and that is why so many of the first electric power plants were located near dams and sources of water.

It might be helpful to look at what electricity is, to understand the challenges of getting electricity to towns and farms. This short history from Edison Tech Center can help:

Direct Current Beginnings:

DC power systems dominated in the 1870's and 1880s. "Small" systems were sold to factories around the world, both in urban areas, and remote undeveloped areas for industrial/mining use. Thomas Edison, Charles Brush, and Werner von Siemens lead the industry in DC systems. DC systems powered factories and small downtown areas but did not reach 95% of residents. Electric lighting was a luxury found only in hotels and other businesses as well as in the mansions of people like George Westinghouse and J.P. Morgan.

The first methods used to power both DC and AC generation plants were coal-fired steam engines and hydroelectric power. Since most industrial cities were already located at waterfall/rapids, utilizing traditional mill power, it was natural to convert to hydroelectric power. Since coal was costly, early businesspeople envisioned sending great power over distance from dams to cities not already blessed with reliable hydro power. To send DC power over distance one needed to use high voltage:

HVDC Power - This was the first method of transmitting electric power over distance. HVDC is the oldest and "newest" method of distance transmission, today it has reemerged in an advanced form to possibly replace major AC high-voltage routes.

Alternating Current - AC Power provided the solution to distance transmission. AC also provided a solution to interconnect generation sites. The development of the 3-phase AC power system in the late 1880s proved the effectiveness of the system and electrification of entire cities and regions began in the 1890s.

Now let's look at this very good short history of how electricity came to towns and farms in Iowa, where I spent my childhood. This is from *Iowa Pathways*, *Iowa Public Television*. This information is important because it shows us not only what electricity meant to people when it first arrived, but more importantly, something seldom thought about: that during the 15 to 20 years or so between the time people in town and people on farms had electricity, some people on farms actually left those farms to seek the ease and comfort of a life with electricity in town. When electricity came to the farms, people did not have to leave the farm to get the comfort and ease of electricity in the city.

Shortly before the start of the 20th century (1900), electricity began to improve the lives of Iowa families in many ways. However, few farm families had the new service. Farm families began to feel that life on the farm was not as good as life in town, and some farm families began wishing that they could quit farming and live somewhere else.

In 1880, Thomas Edison invented a working model of a light bulb. Two years later Edison built the first municipal electrical generator to make electricity in New York City. Soon electric wires were going up in towns all across America as people discovered the wonders of electrical current.

Little improvements began showing up everywhere. In Jefferson, Iowa, guests at the hotel pressed a button to ring for someone to get their suitcases. Telephones connected homes and businesses. Town families replaced their kerosene lamps with light bulbs and quit washing up the soot-stained glass covers of the lamps.

Most women did their washing on Monday and ironing on Tuesday. Ironing day was long and hard. Women stood by a hot stove that heated their irons and then lugged the heavy irons back and forth over shirts and dresses. Electric irons were much lighter, and they could be used anywhere. Soon so many women in Jefferson were using electric irons on Tuesday that the local electric company had to boost the output on the generators to keep up with the demand.

Soon many town families began to buy electric toasters, stoves, vacuum cleaners, fans and hot water heaters. The town put up electric lights along the streets and sidewalks. Many children growing up in towns after World War I had never lived in a home without electricity.

Farm families were not so fortunate. It cost more money to run long lines through the country to hook up farm homes. Some estimates put the cost between \$1,000 and \$2,000 per mile. Private electric companies found it more profitable to serve two homes in town built close together. Farm families continued to cook their meals on wood-burning stoves, use outdoor toilets and light their rooms with kerosene lanterns. In 1925, the census reported that in Greene County, only 265 out of 2,000 farms had electric lights, heat and indoor toilets.

In 1936 the federal government stepped in to help farm families get electricity. Congress passed the Rural Electric Act (REA) setting up an agency to loan money to farmers to build and operate rural electric cooperatives, or co-ops. The co-ops were not created to make money selling electricity. They were owned by the farmers themselves and any "profits" were distributed back to the electricity users, the farmers themselves. The co-ops hired men to dig the holes for the electricity poles and power lines began going up across the countryside. At first, the co-ops purchased their electricity from nearby private electrical companies, but later they built their own generators.

One woman has a special memory of the day electricity came to her farm. Her mother had a refrigerator already plugged in, ready to go as soon as the co-op could get an electrical line to the farmhouse. When she and her mother heard the refrigerator motor start, they jumped into the car and headed towards town. What did they buy? Jell-O. Jell-O needs a cool place to set up and become firm. Before farm families had electric refrigerators, only town families could make Jell-O. To that family, the REA meant that they could have Jell-O, just like town families.

Another woman remembers that the electric crew finished connecting the wires to their farm home just as the sun was going down and it was growing dark. The whole family stood in the yard while her older brother ran inside to turn on the electric lights. She remembers that her mother stood there crying. At the time, the woman thought her mother was happy because she would have electrical appliances to make her work easier. Many years later, she understood that it was much more than that. With electricity, her mother knew her daughter could choose to live on the farm and not have to live in a second-class home. With the coming of electricity, one of the big reasons farm families often wanted to leave farm ended. The differences between homes in the country and homes in the town grew smaller.



What was my childhood like on the farm in New Vienna, Iowa? This section from Iowa Pathways tells us that before the government hooked up farmhouses to electricity, farm life was very different and much more work. There were no electric lights, radios, air conditioners, washers and dryers, electric irons. Of course, there were no computers, televisions, microwave ovens, or video games. In farmhouses and barns, light came from kerosene lamps that were so dim "you almost had to use a flashlight to see if they were on," says Stan Jensen. He also says that radio batteries could help with the feelings of isolation on the farms, but that they could go dead at the worst moment, like in the final rounds of the decade's most important boxing match.

"Hollis Miller's boyhood home didn't have electricity. He says children did their homework by kerosene lamp. At milking time, they hung kerosene lanterns in the barn so they could see from one cow to the other and so they wouldn't 'get kicked too bad.' Elroy Hoffman says he had to carry 'a dang old kerosene lantern. You had to light a match to see if it was burning.' On the farm, men and women, boys and girls did the work by hand: hauling water, milking cows, pitching hay, picking corn, and cranking the cream separator or corn shelling machines by hand. Farmwomen cooked meals on a stove that burned wood. Before electric irons, women pressed clothes with a wedge of iron heated on the stove. The family's bathroom was outdoors, an unheated shack over a deep pit. Before the REA strung electric lines to connect rural homes, a few farmers bought battery systems to run lights, crude appliances and, most important, a radio. And to get lights before electric lines were connected, some houses had a carbide gas light system with a buried tank of water and pellets to create gas to burn. So how did towns first get electricity? This short history from the northwestern Iowa city of Spencer tells the way it usually happened:

In 1881, a group of Spencer businessmen and investors organized a stock company to build and operate an electric light and power plant. A brick powerhouse was constructed near the present location of SMU, poles were set, and lines were laid. By late 1881, the people of Spencer were

enjoying electric light for the first time. Maintaining an electric system in those early days was an expensive task, and by 1897, the electric company was facing financial difficulties. At a Sheriff's sale, the property of the electric company was sold to First National Bank for \$10,000. In 1901, the City of Spencer purchased the electric utility from the bank at a price of just under \$17,000. The electric utility, along with the water utility, were operated by the city under the direction of the City Council until 1942.

As the demand for electricity grew, so did the electric utility. A new steam engine and electric generator were put into service in 1914. The 44-ton machine known as the "Sleeping Giant" remained in operation until the late 1930's when it was replaced by a more efficient steam turbine. The old engine is now on exhibit at the Shield International Museum in Waverly, Iowa.

Wisconsin prided itself on its early advances in electricity, as we see in this essay *How Wisconsin Became an Electrical Pioneer*.

In the 1890s many cities had electric streetcars and electric lamps. Rapid industrialization spurred by the requirements of World War I increased the development of electricity. Large electricity generating plants were built by the governments to provide power to munitions factories, automotive manufacturers, and transportation suppliers. By the 1920s many cities had electricity in their homes. Rural areas sometimes got electricity from small local electricity companies that connected to the trunk lines, but many had to wait for the Rural Electrification Act of 1936, part of FDR's New Deal, to get electricity for the rural areas, farms and small towns and villages. Usually, farmers would do all the necessary wiring on their farms in preparations so that when the trunk line finally came into their area, they could hook up and have electricity immediately. Some rural areas did not get electricity until after World War II, when there was a big industrial boom to provide housing, home appliances, automobiles, and farm machinery to soldiers returning from the war eager to begin their pursuit of the American Dream.

The nation's first commercial power plant opened in Appleton in 1882. Henry J. Rogers moved to Wisconsin in 1873. He wanted to introduce electric power to his factory and home. He built his plant with hardware from the Edison Company. The plant started transmitting power to local paper mills, the water company and several wealthy families in the summer of 1882. More power plants soon followed.

Electric railroads made suburban living possible. The city soon transformed into a center of business. Employees rode streetcars from residential neighborhoods into the city for work. Investors promoted interurban trolleys to connect adjacent cities. The former manager of Milwaukee's railways John I. Beggs envisioned an interurban system from Chicago to Green Bay. Unfortunately, automobiles soon beat out light rail.

After engineers harnessed Niagara Falls to generate electricity in 1896, Wisconsin investors looked into using the state's many rivers for hydroelectric power. They actually established one at Prairie du Sac But hydroelectric power stations were extremely expensive. Wisconsin had over 400 dams by 1935. But steam continued to supply most of Wisconsin's power. The cost of building electric power made it difficult for small electric companies to stake a claim to the market. A few large corporations gained control over the electricity market.

Following early electricity experimentation in 1879 in Dodgeville, N.Y (supplied power for industrial purposes) and 1881 in Niagara Falls (a small dynamo supplied electricity for lights for a few stores in Niagara Falls), Wisconsin quickly did prove itself a leader in the development of electricity.

- 1882 Appleton, Wis. DC Power 12.5 kw, the first Edison hydroelectric station in the U.S., powered electric trolleys.
- 1883 A small gas company in Oshkosh was formed.
- 1885 Oshkosh Gas Light Company obtained a franchise to begin electric service. It was the first combined gas and electric company.
- 1890s “The railroad track that runs east and west thru town features a small museum with a train and army tank on display, adjacent to the park and bandstand pavilion. The museum curator said that the railroad was being wooed by two different towns and decided to split the difference and created Brodhead. A nearby branch of the Sugar River was diverted along a canal to a small hydroelectric generator supplied by a small holding pond. This supposedly gave Brodhead the distinction of having electrical service before other larger cities such as Chicago, and perhaps the first electrical service in Wisconsin.”
- 1902 New Glarus, the southwestern Wisconsin dairy center, begins development of a municipal water system, which prompts the organization of the New Glarus Fire Department. An electrical production plant is developed and plans begin for telephone wiring. New Glarus is about 26 miles from Brodhead and 75 miles east of Bloomington.
- 1910 The first true long-distance transmission in what would become Wisconsin Public Service territory was a 69,000-volt line strung on steel towers between the High Falls hydro plant and Green Bay.
- 1913 Manufactured natural gas service had been expanded from Green Bay through Allouez and into De Pere.
- 1913 The Railroad Commission of Wisconsin oversees regulation of water and sewer rates and power leases.
- 1913 Kaukauna Gas, Electric Light and Power Co. has electric plant. City of Kaukauna trying to buy their plant.
- 1913 There is a Chicago and Milwaukee Electric Railway Co.
- 1914 The Chicago, Milwaukee and St. Paul Railway Company went through La Crosse.

- 1917 The first really large steam generating plant was built in Wisconsin Public Service's territory. It was built in Manitowoc by Wisconsin Securities. A second plant of the same size was added in 1920. These were the direct result of war-related industrial needs.

Here is a recorded timeline of electrification in the village of Bloomington, gleaned from the *Bloomington Record* newspaper. It is believed that electricity came to the village around the turn of the century.

January 17, 1912 While hauling his gasoline engine for the mill from Glen Haven, Fred Welsh was going through a snowdrift when the sled tipped over and the big fly wheel tumbled off and broke into several pieces.

October 21, 1914 Everett Kavanaugh has rented H. M. Hickok's building, next to Ludden's Store, and will move his restaurant into it as soon as the building is repaired and painted. Everett and Lester Pritchett will handle electrical supplies in the building the Kavanaughs vacate.

November 18, 1914 Construction of a waterworks plant can hopefully begin in the spring.

January 20, 1915 Work on the waterworks plant in the village is to begin when the frost is out.

October 6, 1915 A franchise is being given to the "Bloomington Electric Light and Power Company." The generating plant was located in the tile building which is now owned by Pete Sturmer. **Note:** would the new power plant be available only to in-towners or to farms that could pay for the service?

1916 The municipal waterworks system is completed, including installation of fire hydrants. The village set up its first organized fire department. Prior to that, fires were fought by volunteers using a tanker wagon, hose carts, and citizens manning "bucket brigades."

1916 Mailing envelope: Bloomington has \$15,000 waterworks system and \$12,000 electric light plant.

November 7, 1917 The village will purchase a windmill tower from John Lord and place it in the school park and put the fire alarm on it. It will be connected to the telephone central so the signal can be telephoned to the alarm.

August 6, 1924 The Bloomington Electric Light and Power Company last week completed a deal for the sale of its property to the Interstate Light and Power Company.

Sometimes villagers did not agree on the need for electricity, as we see in this excerpt from the Glen Haven, Wisconsin history: "In 1926 the installation of electricity proved a controversial issue. At that time the majority of the townspeople were content with their present mode of living without the added luxury of electricity. However, a group of men including Howard F. Booth, Ben Walz, and John Thiessa, favoring its installation, each donated \$100, which was later repaid by the other residents who finally came to realize the benefits of electricity."

What was the cost of this early electricity per kw hour? (Prices are quoted in 2013 dollars, when this study was completed.) What is immediately apparent is how the cost of electricity went down.

- 1902 - \$4.45
- 1907 - \$2.30
- 1912 - \$1.75
- 1917 to 1930 - \$1.00

As we have seen, before the 1880s, no one had access to electrical power. Until the 1930s very few Wisconsin farms had electricity. Constructing power lines and generating the energy that flowed over them were costly investments that few farmers could afford. Power companies were reluctant to subsidize rural electrification because it was more profitable to provide service to cities. The Depression only emphasized the large disparity between urban and rural life in Wisconsin. Recognizing the needs of rural Americans and the benefits that the rest of the country could realize, President Franklin Roosevelt signed an executive order creating the Rural Electrification Administration on May 11, 1935.

As was the case with many Depression-era government programs, the Rural Electrification Administration (REA), was begun as part of a general program of unemployment relief. Just three months after its creation, REA was more closely defined as a lending agency. Created was an orderly program of low-interest government loans, which made rural electrification a national business investment. Given existing experience with the cooperative form of business, the idea of using nonprofit, cooperative organizations to encourage rural electrification caught on quickly. Rural electrification officially came to Wisconsin on May 7, 1937, when Richland Electric Cooperative went into service. By 1945, the last of Wisconsin's electric cooperatives had been organized (not counting six subsequent mergers). Nationwide, there are now about 930 rural electric cooperative systems.

Local leaders worked with the REA to collect fees and enroll customers in rural electric programs. The REA gave farmers low-interest loans to build their own lines and provide them with electricity. Wisconsin's first electricity cooperative named Richland Electric Cooperative opened on May 7, 1937. Within fifteen years, 90% of American farms had electricity.

Rural electric systems serve more than 520,000 people in Wisconsin today and over 34 million across the United States. Wisconsin created the nation's first statewide association for rural electric cooperatives, printed the first publication for members and founded the insurance company that provides coverage to the more rural electrical cooperatives than any other in the country.

By the time Johnnie and I got to Wisconsin, there was already electricity in the town and on our farm road because we were on the fairgrounds road trunk line. The fairgrounds are about two miles north of the village, and our farm was another two miles beyond that.