

1888 WIND ENERGY TECHNOLOGY

CHARLES BRUSH'S WINDMILL GENERATOR 120 YEARS AGO!

Capturing the power of the wind is trumpeted around the world as a renewable energy source that can provide more and more of our electric power. Way back at the beginning of the electrical industry an engineering pioneer was already capturing the wind's energy.

Charles Francis Brush's "Colossal Windmill" was set with a 56 ft. diameter sail area and stood in the back yard of his Cleveland family mansion. As Mr. Brush was also working and patenting plate compounds which became the standard for storage batteries, the generator power was stored in 408 batteries in the house's basement.

After being started up in 1888, all of the Brush mansion's energy needs were taken care of including an extensive laboratory, 350 incandescent lights, 2 arc lamps, and 3 electric motors.

The main wheel was mounted on 20 ft. long, 6½ inch diameter shaft set in two 26 inch long self oiling bearing boxes at the top of the 60 ft. tall rectangular tower. Gear ratio from the 144 blade sail to dynamo was 1:50 with 32 inch wide belt/pulleys connecting the main shaft to the double ended dynamo. The Brush dynamo used to create the battery charging power was of the design already being supplied for lighting around the world.

What was probably the world's first "automatic voltage regulator", maintained the field controls to ensure the voltage never exceeded 90 volts. On start up dynamo output was automatically switched to charge the batteries above 75 volts plus or minus 5 volts, and limit no load voltage to below 90 volts. Generator power output was measured at 12 kW at 500 rpm and was fed to the mansion via underground conductors.

Scientific American wrote in December 1890, "The reader must not suppose that electric lighting by means of power supplied in this way is cheap, because wind costs nothing. On the contrary, the cost of the plant is so great as to more than offset the cheapness of the motive power. However, there is a great satisfaction in making use of one of nature's most unruly motive agents. . . . It has been in continuous operation more than two years and has proved in every respect a complete success."

The windmill was improved in successive years but eventually more modern equipment became available, including the connection of the Brush property to the local electric utility. The windmill fell into disuse and was eventually dismantled around 1925.

Derek King – 10/11/2010

Post Script: This is the same Charles Brush (Born Ohio 1849: died 1929) who founded the Brush Electric Company (Cleveland) and Anglo American Brush Electric Company (London) in 1879. He also was a founder (1905) of the Linde Air Products Co which became part of Union Carbide in 1917, and with his son Charles Brush II the Brush Laboratories in Cleveland which became Brush Wellman the specialized manufacturer of beryllium metal products. The Brush name also lives on in the Brush Electric companies (large motors, turbogenerators, switchgear & transformers and railway loco) based in Loughborough UK.