Private Tour of Robert Moses Power Plant

It's time to document one of the greatest experiences of my young life. It was the Spring of 1962, when I was a 17 year old high school senior. With my Father's gift of gab and connections as a former generator operator and now responsible for all local power distribution in the region around Niagara Falls. N.Y., he arranged for a private tour of the inner parts of the Robert Moses Power Plant. This is a place that the public can not see, but a few school tour groups may be able to see. There were things that I did not see and would have liked to see. There were questions that I would have liked to ask, but was in awe and too young to think about asking.

Completed in 1961, the Robert Moses power plant features the Power Vista, an excellent free set of displays. I highly recommend going to the Power Vista. However this private tour was far greater.

Generator Access

Each of the 13 generators is housed in what appears to be a small square building. However, I assure you that these buildings are not small, but are about 2 stories high with double steel doors on the side.

As we stood just outside of a running generator, we could hear the double steel doors rattling, due to the air turbulence created by the generator's massive rotor support arms. There was also a slight hum of magnetics, most of which came from the transformer next to the generator, rather than the generator itself. Realizing that this was not a place we wanted to enter, we moved to the next generator, which was not running.

Our guide opened the double steel doors of this enclosure and turned on the lights. A small family could live inside this generator, if you didn't mind pie-shaped rooms! In fact, I have lived in smaller spaces. The “rooms” were created by the massive arms came down from the “ceiling” and supported the rotor, which was just above our heads. Near the center of the machine, the arms extended down to just above the floor, where they attached to the stainless steel shaft. They slanted upwards, making it possible for an adult to walk entirely around the outer edge of the space, without banking your head.

All around the outer edge of the space, we could look up at the generator's windings, the bottom of which were just above our heads. There was only a small gap between the rotor and stater windings. On the rotor, we could see the Direct Current (DC) field windings. On the stator, we could see the main output windings where the Alternating Current (AC) was generated.

Turbine Room

By far, entering the turbine room was the highlight of the tour. Our guide opened the door and turn on the lights. The center-piece of the room was the 5 ft diameter stainless steel shaft, with an even larger coupling between the upper and lower segments of the shaft. Around the shaft, there was a circular grate walk-way, much like a fire escape. Just below my feet, there was the top of the snail-shell like volute casing through which water enters the actual turbine. I carefully inspected the bright yellow ring and multitude of arms by which all wicket gates of the turbine are simultaneously adjusted. To one side, there was a piston arm that rotated the bright yellow ring, which then adjusted the wicket gates to control the flow of water into the turbine.

I remember a video of someone touring a shut-down hydro-electric plant in Niagara Falls in which he mentioned imagining the smell of diesel fumes and the roar of the generators. Diesel fumes in a hydro

plant? I don't think so. Roar of the generators? I spend my childhood around generators ranging from 9,000 to 70,000 Hp and there was very little sound. You could carry on a normal conversation next to a running generator with no problem.

With that in mind I remember the total peace and quiet of the turbine room and wondered what it would sound like if this turbine were running. Then I looked at the huge shaft, which was only inches away from my shoulder. It was spinning at 90 rpm! This machine was running! 100 meters above me there was all this potential energy. In the corner of the turbine room, all this kinetic energy entered via the 28 ft diameter penstock. Just below my feet, that kinetic energy was transformed into 240,000 Hp of mechanical energy. That mechanical energy was conveyed up the spinning shaft to the generator just above me, where it was transformed into 200,000,000 Watts (200 MW) of electricity. I was in the midst of all this energy conversion and it was totally and completely silent!

The silence was due to the laminar flow of water through the turbine, which is essential to reduce wear on the turbine's runners. I still wonder how much sound there would be when the machine is initially started and laminar flow has not yet been established.

What I didn't see and would have liked to ask about and see

Thrust bearing:

The thrust bearing supports the entire weight of all the rotating parts of the machine, turbine, shaft and generator armature. I have seen thrust bearings on older plants, which were bulbous chambers of water cooled oil, which lubricated bearing made of babbitt, a metal, and sometimes teak wood. Modern power plants often use high-pressure water to support the machine, thereby eliminating the leakage of oil into the environment. I wish I would have asked?

Excitation:

Most generating plants I have seen have small generators, called Exciters, that provide Direct Current (DC) to the field windings of the generator. In some cases, the exciters are synchronous rectifiers that convert a portion of the generator's output to DC for the field windings. Rankine Station used separate motor-generator sets for excitation. Modern facilities use high power, solid state silicon controlled rectifies (SCRs) for this purpose. I should have asked, although this may be part of the 15-year long upgrade.

Control Room:

I would have loved to see the control room of the facility, but would have been strictly off-limits. In 1962, it was not computerized. Modernization and digitalization is part of the 15-year long upgrade, which began in 2019.

Gantry Crane

In any photo of the facility a large, red gantry crane can be seen. It can be positioned over any of the generators and is capable of lifting the entire rotating part of the machine out for repair and/or replacement. Each generator undergoes maintenance for about one month, one per year. Due to the danger and liability involved this would also be strictly off-limits. I would have liked a peak inside.