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Today is Tuesday March 7<sup>th</sup>, 2017, and it is our second day in New Zealand. On the agenda today is visiting the Te Uku Wind Farm outside of Ragland, stopping to check out the beautiful Bridal Veil Falls, and then traveling to Taupo to visit the Waikato River and Arapuni Dam.



The topic that I am responsible for research and reporting on for this afternoon is “Cogeneration and combined heat and power uses in New Zealand”. Upon researching this topic more thoroughly, I found out some interesting facts about New Zealand’s use of this technology.

Cogeneration through combined heat and power is the simultaneous production of electricity as well as useful heat. Specifically, this process is carried out by using leftover steam from electricity generation to then produce heat as well. In the general production of electricity, some energy is rejected as waste heat, but here the thermal energy is put to good use as a second energy source.

In terms of industrial uses, in New Zealand, cogeneration plants are a relatively new technology and found in wood processing, dairy, and steel industries. It tends to be installed in places that produce or require heat. Industrial cogeneration plants can be complex to operate due to large number of turbines and operating conditions, but the production of a second energy source is a benefit to the process.

There are two types of cogeneration systems that can be used: a bottoming cycle and a topping cycle system. In a bottoming cycle system, heat is produced in the form of high pressure steam and used in industrial process. Leftover heat is then recovered and used to make steam that drives a turbine and finally a generator. The topping cycle system follows the opposite chain of events, where electricity is generated through a gas turbine, then waste heat is used to produce steam for industrial processes. Many power stations in New Zealand use a combination of the two cycles because it is most efficient way to use the two types of cycles.

Some advantages to the cogeneration process is its efficiency, due to it using the same heat twice, which in turn helps companies to save money by generating their own steam and electricity at same time. Additionally, cogeneration processed allows companies to sell back electricity to the national grid to help all of New Zealand’s energy supply. Finally, cogeneration is one of most cost effective methods of reducing carbon emissions from heating processes.

Though it is mainly used on a larger, industrial scale, some domestic uses of cogeneration include using the waste heat to produce hot water, either for domestic hot water supply or radiant floor heating systems. Most cogeneration units use gas as their fuel, and small home models can produce 7.5-14 kW of water heating energy and 1kW electricity.

