



From mega residual wood to megawatts

With rising energy prices, bioenergy has been getting a lot of attention lately. But a large stand-alone operation in B.C. has been successfully powering along since the early 1990s, and these days its fuel source includes volumes of mountain pine beetle killed fibre.

By Jim Stirling

Recent market realities have elevated interest levels in using wood residues of varying types to create new products and energy.

But the initiatives represent nothing new. Capital Power Corporation's Williams Lake power plant has been successfully flying under the radar for years. The plant in the central Cariboo region of the British Columbia interior is into its 17th year of quietly and efficiently producing power solely from wood residues. Indeed, the 66 megawatt capacity facility is said to be the largest biomass power plant in North America.

When the power plant began operating in 1993, it was seen as a solution to air quality issues in Williams Lake. A concentration of sawmilling operations and the surrounding topography combined to trap emissions from beehive burners. Creating power from material that was literally going up in smoke was a practical and sensible solution as well as a diversification into a sustainable and environmentally friendly new industry.

Capital Power estimates the plant has eliminated nine million tonnes of wood wastes in its first 15 years of operation and, in the process, reduced particulate emissions by more than 90 per cent. And, at the other end of the process, the plant produced enough carbon neutral electricity in 2007 to meet the average annual needs of 89,000 houses in B.C. The electricity produced is sold under a long term contract to BC Hydro, an agreement that is up for renewal by 2018.

The Williams Lake plant operates 24 hours a day, year 'round, with the exception of an annual maintenance shutdown. It has a complement of 28 full time staff but that figure is close to doubled with the ancillary and support people who help sustain the plant.

A number of them are involved in trucking the wood residues, primarily from the five major sawmills in Williams Lake, to the plant. The plant uses 1800 tons/day year around. The sawmill residues are mainly four inches and smaller in size.

The plant has the flexibility to accommodate some oversize material and there's an on-site hog mill for the purpose. There is no pulp mill in Williams Lake but the plant doesn't generally use bulk chips, which have a higher value elsewhere.

Up to 100 truckloads of wood residual material arrive at the plant daily, 600,000 tonnes annually. They are unloaded like conventional chip trucks by dual truck lifts that elevate the tractor-trailer units about 30 metres to release their loads.

The sawmill industry sector in Williams Lake remains fairly robust, although local mills had forced to reduce work weeks and take temporary closures. In 2009, the power plant can tempered that with beetle kill residues. And they can go after the smaller producers/suppliers so there are options to expand their draw radius with any slowdowns.



The mill site can accommodate about 100,000 tons in storage capacity, about 60 days supply. Two Cat D9s are kept busy manipulating the inventory benches and reclaiming the oldest material first.

The material, cleaned of contaminants and screened, is introduced to feeder hoppers. From there it goes into a boiler with a vibratory grate where steam is generated. A steam turbine extracts the thermal energy for conversion to electric power. The steam is converted back to water in a 100 per cent closed loop system. Further major process equipment includes a high voltage step-up transformer. The plant is also equipped with combustion and emission controls and an electrostatic precipitator. The electrostatic precipitator produces virtually no particulates in emissions from the stack, says the company.

The system is highly efficient, with only about eight per cent of the material ending up as ash. Most of the residue collected is very fine fly ash. The bottom ash—comprised of material like rock, gravel and sand particles—is collected for disposal in the regional landfill. The company says it is always looking for alternate uses but there are few options available in Williams Lake.

It's testament to the sound basic design of the plant that few major changes have been necessary over its lifetime. There have been technological changes in the system, but not in the main process or equipment.

And although most people in British Columbia are unaware of the Williams Lake plant's existence, it has attracted outside interest. The plant and company have had inquiries from other parts of North America and Europe. And that's significant as these types of plant are more common in Europe.

But that is destined to change here, too, as the potentials for wider utilization of wood residues enters the mainstream consciousness.

Lessons have been learned during the plant's 15 years-plus of operation. There have been changes in sawmills' wood handling systems and the feed mix available. It's now drier and finer. That's attributable to increasing volumes of mountain pine beetle killed fibre and improved sawmill technologies. Thinner kerf saws, the need to maximize recovery and chip production are factors. This leaves smaller pieces available, and the plant has the flexibility to deal with that, the company says.