Licella's Fibre Fuels – drop-in biofuels, in pictures

Jim Lane

What is fibre fuel, how does it displace petroleum via supercritical technology, and what does the plant look like?

A cryptic note appeared less than two weeks ago in the Bay of Plenty Times, a newspaper servicing the northern tip of New Zealand and its largest commercial port, in Tauranga.

"Z Energy and Norske Skog, which operates a paper mill at Kawerau, are seeking majority government funding for a proposed $50 million demonstration plant to turn wood waste into transport fuels," the report began — and online readers were left to guess much of the rest for a report which lay behind the online paywall.

Regular Digest readers may well recall a joint venture called Licella Fibre Fuels set up not so long ago between Norske Skog and Australia's Licella — the supercritical-based technology that, from reports floating out following completion of its small demonstration plant, could be competitive with fossil petroleum at a 200,000 tonne per year commercial scale.

In fact, it is one and the same. For those less familiar with New Zealand's energy brands, Z Energy ("pronounced "Zed") is the company that took over over the management and ownership of Shell New Zealand's downstream operations — including 300 retail outlets and a 17% stake in New Zealand's only oil refinery.

Norske Skog, in turn, is a world-class timber refiner and a major player in the pulp & paper industry — a sector hard hit by the impending sunset of the newsprint business and whose key players have for some time been casting around for opportunities in bioenergy.

Together, and using Licella's technology – they propose to make fibre fuels — drop-in biofuels that compete on price with fossil petroleum, but utilize the renewable wood basket for feedstock — cutting down on imports, emissions and helping to rescue towns and regions threatened economically by the shift to digital media that has all but killed newsprint and cost the timber industry a set of customers that have been important for them since the Gutenberg Bible.

The New Zealand project in focus is, at the end of the day, at very small commercial size — expected to produce less than 5 million gallons per year. But if approved for more than $25 million in government aid, it could be the final step in Licella's journey towards proof at commercial-scale.

What does Licella do, exactly — remind me?

Licella produces drop-in biofuels from a wide range of biomass — the JV with Norske Skog focuses on wood as a feedstock — and uses a supercritical water-based technology and catalysts to break up biomass and reform it into a drop-in fuel hydrocarbon.

The compelling features of supercritical are several:

1. It uses all of the biomass, including lignin. So, higher yields, fewer discussions on how to monetize lignin.

2. It provides all its own process heat and water. In fact, it is a net producer of water — almost unheard of for any fuel technology regardless of feedstock.

3. It produces a far more stable bio-oil than traditional pyrolysis — because the process temperature is set low enough not to break carbon double bonds and create unstable free radicals in the oil — those that continue to react long after the actual processing has finished.

4. It produces a blendable intermediate for traditional crude that works in traditional infrastructure.

5. At scale, it is expected to be competitive with fossil petroleum (using the Tapis [Malaysian] oil benchmark) — yet a scale compatible with known regional timber supplies with no need to transit biomass over long distances at great expense.

6. It has a small physical footprint compared to fermentation technologies because of the continuous flow design, and a processing time measured in minutes versus days.

One more time — exactly what is supercritical water?

For those used to the three traditional phases of water — solid, liquid and gas — add a fourth, the supercritical phase, seen under unusual conditions of pressure and temperature (think 250 atmospheres and around 373C – conditions never seen outside of a closed technology on Earth but which you might find deep in Jupiter's clouds).

Under those conditions, water can diffuse like a gas and dissolve like a liquid, and act simultaneously like an acid and a base. It can depolymerize biomass and kick off a journey for a wood chip from its usual state to hydrocarbon.

Where are the gallons?

In the case of Licella, it is just now progressing its final steps towards scale and, frankly, the investment requires the kind of "patient strategic capital" that is hard to find nowadays. For it is easy to find an old-line industry facing hard, hard times that could use a wood=to-fuels option — your friend the pulp & paper industry.

However, pulp mills have weak balance sheets themselves and struggle to provide the risk equity capital as they work hard to modernize and right-size their existing operations.

Is it a drop in?

That's a qualified yes. For sure, Licella makes straight hydrocarbons. Top date, they have only been tested in refinery conditions at up to one percent blends — more than needed for this stage of Licella's evolution. Eventually, we might see that push up towards 10 percent or more — but frankly, it would take a network of biorefineries to produce enough to fill out 10 percent of a monster refinery like, say, ExxonMobil's Baytown (TX) complex.

Business Model

Ultimately. licensing, though working in a JV with Norke Skog at present to bring the technology to commercial scale.

Commercial scale and cost

Commercial scale is expected to cost $160 million for a 200,000 tonne plant.

READ MORE: Licella (and its parent company, Ignite Energy), profiled here in "Another Wonder Down Under".

READ MORE: Licella's website is here.

Licella, in pictures

To show you more of what Licella's project looks like in real-life, this week the Digest traveled to Somersby, NSW - about 90 minutes north of Sydney, to photograph the facility.

Licella's processing line

Licella's core technology – its reactors

Licella's cascading back-end — for product cooling

Licella's original pilot scale project

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