

projects in receipt of government stimulus funds are under pressure to “Buy American” or that the legal GE battle could result in a ban on importing MHI wind turbines into the US.

The Japanese yen recently strengthened to about 89 yen to the dollar, 5% higher than its average 2009 level. Local manufacture would help MHI cut foreign-exchange risk and transportation costs. About 80-90% of MHI’s wind turbine production, which is worth about \$1 billion annually, is sold to the US market. MHI plans to continue with wind turbine manufacture in Japan, with a view to growing its sales into high-growth markets in Asia.

GE filed a patent infringement complaint against MHI in a district court in Texas in February despite a ruling from the US International Trade Commission the previous month that MHI’s turbine design does not infringe GE’s patents. But GE has said it has grounds on which to appeal the commission’s decision, signalling that MHI’s troubles with GE are far from over.

See feature, page 77

SOFTWARE

Project cranks up turbine capacity

Jesse Broehl

At a time when wind turbine vendors are logging fewer new orders, some are creating innovative upgrade services to bring in new business from their existing operational fleet.

GE Energy has rolled out a software upgrade to sell to the owners of the thousands of its GE 1.5MW operating turbines. WindBoost promises to run the wind turbine faster in certain conditions to squeeze an extra 100kW out of the machine, effectively turning existing 1.5MW units into 1.6MW units.

When developers choose a wind turbine for a certain location, they do so after a close analysis of specific site conditions. This goes beyond just average wind speed to include wind shear and terrain effects, air density, air temperatures and so on. Every wind turbine has a certain range of environmental and site factors that are considered within its so called design envelope.

For example, some units are better for lower-wind-speed sites and others for high-wind-speed sites. All tend to operate in the middle range of their design envelope, says Jeff Wiener, global sales and commercial manager for GE Wind Services.

“We designed this software package that looks at those factors,” he says. “If you have the right environmental conditions, it will have

the generator run faster and generate an extra one hundred kilowatts.”

Installation takes less than a day, and then the system can operate by itself. It monitors for the right conditions and turns the extra generation on and off automatically, or can be triggered from a remote operations centre. “It’s just using the existing design envelope more efficiently,” says Wiener. “This translates to \$6000-\$12,000 per unit per year of added revenue and does not impact normal operations and maintenance, turbine lifecycle or warranty provisions.”

It is like upgrading a vehicle’s computer chip to one designed to squeeze out higher performance. But like a car that is run at higher performance levels, WindBoost may run down the turbine’s overall lifecycle quicker, says one of GE’s competitors, Lawrence Willey, operations and maintenance vice-president for Clipper Windpower.

GE kicked off the launch of its WindBoost with a big first order. NextEra Energy has agreed to upgrade its fleet of approximately 800 GE 1.5MW wind turbines. Theoretically, this is like NextEra adding an 80MW wind plant to its assets. WindBoost is designed only for GE’s 77-metre rotor SLE model and not its lower-wind-speed 82.5-metre XLE model. There are approximately 13,500 GE 1.5MW units installed worldwide, the majority being SLE models. GE will not reveal the price of its WindBoost package.

INNOVATION

Changing blades without a tall crane

Mark Anderson

American turbine manufacturer Clipper has developed a simple, inexpensive new way to change blades. The idea, from Clipper’s project managers in the field, eliminates the need for \$200,000 cranes by using a pair of ordinary industrial trucks — and could forever solve one very expensive wind industry headache.

A hydraulic bucket truck, a flatbed with a winch and a specialised toolkit worth \$15,000 is all it takes, says Clipper vice-president Craig Christenson, an engineer with 15 years’ wind experience. “You can go down to your local industrial equipment rental place and rent the trucks,” Christenson says. “This took very little modification to meet our needs.”

Christenson traces the idea back to 2008, when Clipper faced a fleet-wide remediation programme to correct blade problems on hundreds of its 2.5MW turbines and began calling out traditional construction cranes.

“Some of these cranes in the US, the lattice-style cranes, come in on 25 or 30 trucks,” Christenson says. “To bring in a large crane just for one blade, you add \$200,000 for that replacement to what is typically about \$100,000 a blade. You’ve now tripled the cost.”

Last year, partway through remediation, the Clipper field technicians proposed the idea. “My initial gut reaction was, it’s impossible. The machine wasn’t designed for that,” says Christenson. “But they came back and showed us; we just couldn’t take no for an answer.”

Winch, bucket truck and more

A group of Clipper engineers worked with a crane company to perfect the method: winch on one side, bucket truck on the other, point the blade downward, connect the cables, unbolt and lower (see picture, below).

“The basic instruction is very specific: you can’t drop it,” Christenson says. “But we had to put very detailed procedures in place, and safety conditions, so that, number one, no blade was dropped — and, number two, no one was hurt. Now it’s standard procedure for us.”

Clipper used the new method to finish off the final third of the system-wide blade retrofit project, completed in January. And the company sees ongoing savings because of the small-scale trucks involved. Many of Clipper’s turbines, planted in Midwestern farmland, are built with nine-metre-wide construction roads that are subsequently narrowed to three metres for the 20-year operation cycle.

“It’s a huge deal to bring in these large cranes afterwards on some of these projects,” Christenson says. “You have to pay the farmer for the damaged crops, you have to pay for the road to be rebuilt. In some cases, rebuilding the



Cheap blade repair Clipper’s new method uses a winch and two industrial trucks

road can be as expensive as the crane costs.”

Clipper’s toolkits can be shipped to project owners. “These machines do get hit by lightning,” Christenson says. “Typically, there are reasons that you’d want to take a blade off over a 20-year period, so it might be justified by an owner to have their own set of the tools.”

Meanwhile, Christenson realises that other companies are working on related methods and a lucrative new market is up for grabs. GE Energy, he believes, is working on a system that uses a giant sock to lower blades. Vestas has a system where a small crane is winched up to the hub and bolted to the top of the tower (*Windpower Monthly*, September 2009). While Clipper knows its method will be hard to beat in simplicity or cost, Christenson says the company is hesitant to let others use it before a patent is secured — a process that could take up to two years.

“We want to own the intellectual property, the exact tooling that’s used up in the turbine to execute the blade change-out safely,” he says. “So what we have is a solution and a patent application in place on it. But I wouldn’t be surprised if GE has this alternative and they’re trying to protect it as well. We’re all racing to find ways to change the game.”

RESEARCH

Turbines face cold-weather tests

Diane Bailey

Turbines designed to withstand ice and extreme cold will be tested in a moist winter environment in an effort to develop machines that can open up harsher climates to wind development.

Repower Systems has installed 2.05MW turbines in Quebec as part of a plan to test the German manufacturer’s machines in Canada’s cold climate prior to the installation of as many as 477 units in the province from 2011 until 2015.

The two turbines were expected to come online in March at the Site Nordique Expérimental en Éolien Corus (SNEEC), located near Rivière-au-Renard at the tip of Gaspé Peninsula (see map). They are a special cold-climate version of the MM92 model designed to operate on Canada’s 60 Hertz grid.

Repower has tested its technology in cold climates before, says chief technology officer Matthias Schubert. The company operates a test facility in Inner Mongolia where its turbines are exposed to extreme temperature fluctuations, with dips as low as -40°C.

The key difference between China and



Quebec, particularly on the Gulf of St Lawrence where the turbines will operate, is humidity, which makes ice build-up a problem. “We want to ensure that our turbines can prove their value, even in moist Canadian weather conditions with lots of ice and snow,” says Schubert. A Repower team will monitor the turbines intensively over the coming months.

Although Repower will use the installation to test the cold weather capabilities of its technology, the turbines are owned by Quebec’s TechnoCentre Éolien. It plans to use the wind farm for a broader platform of research and development into the impact of the northern climate on wind turbines and their components. “The acquisition of this wind farm is a key element in the Wind Energy TechnoCentre’s strategic plan, the goal being to acquire major research infrastructure,” says general manager Frédéric Côté. The turbines will also be available to universities, colleges and companies for their own research.

The acquisition of the turbines is part of C\$20.5 million investment that includes the establishment of a test facility in the Gaspésie community of Murdochville that will couple a small wind system with diesel generation, and fit both this system and the Repower turbines with measurement instruments. Aside from the two Quebec test turbines, there are no other Repower turbines installed in Canada.

GRIDS

Forecaster hired to boost integration

Jesse Broehl

California’s electricity grid operator has selected New York-based meteorological consultancy AWS Truewind to provide its weather forecasting services following a year-long competition. The California Independent

System Operator (CAISO) hopes the appointment will improve the state’s ability to efficiently integrate the increasing amounts of renewables expected in the next few years.

In the forecasting competition, AWS Truewind showed it could provide a 20% improvement in forecasting wind energy production over a standard system last year. “With wind resources expected to double over the next five years or so, accurate forecasting is imperative to maximise the usage of these new green resources,” says Debi Le Vine, CAISO’s director of operations.

Considering capacity factor, California sees an average of 1GW of wind from the 2.8GW of installed projects connected to the grid, says Jim Blatchford, CAISO’s senior policy issues representative. If the state were to reach its goal of deriving 33% of its energy from renewables by 2025, that represents another 26GW of renewables resources, with wind playing a large role.

Managing a mismatch

All this new variable electricity capacity will need to be accommodated to maximise the efficient balance of all electricity generation resources. The challenge with wind, says Blatchford, is that the California wind resource tends to be strongest at night, when electricity demand is low.

“We’re concerned about electricity demand going up in the morning as wind comes off from its night cycle,” says Blatchford. “So we have a little mismatch here, and we have to find out what’s happening with wind so we can dispatch conventional generation.”

Conventional generation power plants, usually gas plants in California, can take four to five hours to warm up to their operational levels and once there it is most efficient to keep them running. The state would like a more precise view of how much wind generation can be expected in the hours and days ahead so the grid operators can more efficiently balance resources.

Mismatches can be wasteful and Blatchford says that the spring months may provide an example. The winter in California has been a particularly wet and snowy one. In the spring a heavy snow pack will melt, putting hydroelectric dams into full service, and conventional generation will back off to accommodate the increased hydropower. But if wind generation picks up during this time of high demand, the power could be wasted.

“Then we have too much energy,” Blatchford says. “This can be a problem where we’re effectively giving energy away, or giving money to people to take power.” During electricity oversupply, CAISO has market mechanisms to offload the power to heavy energy users.