



# One step at a time

**Y**ou can't run before you can walk. It seems obvious but in business we often forget. News that GE had completed testing of its H technology gas turbine at Baglan Bay and was getting ready for a further commercial demonstration period therefore came as a reminder of how things should be done – a demonstration that the industry is getting back to basics.

Over the last decade, there is probably not a single gas turbine manufacturer that could not be accused of 'running too soon'. And sure enough, most have paid the price. This time GE has taken eight years to just get to this stage. Mark Little, vice president of Energy Products, GE Power Systems, noted: "Bringing a product to market too soon was clearly at the front of our minds. Some manufacturers have had difficulties ... which have severely impacted their business."

Yet to keep things in perspective, certainly a longer development cycle was needed for the H turbine. After all, the promise is a system which can deliver a combined cycle efficiency of 60 per cent. Little explained: "We knew from the beginning that this was a big technology leap. Therefore we built our own site to contain the risks and develop the technology under our own control."

The test site at Baglan Bay represents a \$400-500 million investment by GE. Tests involved more than 7000 sensors being placed on the equipment. "We monitored every characteristic that could be important in the design and building of a gas turbine. We looked at metal temperatures of the various parts of the turbomachinery; combustion temperatures; bucket and nozzle temperatures in the gas turbine," said Little.

But there were significant new elements here. In addition to new thermal barrier coatings, firing temperatures of 1427°C (2600°F) called for steam cooling. This requires a system to draw steam, as opposed to air, into the rotor and buckets for cooling. The steam, from the HRSG and steam turbine, is introduced through tubing into the bore of the rotor and up through tubing into the rotating buckets. This requires special attention to the sealing systems inside the rotating system. There is a similar system to introduce steam to the stationary components.

A big challenge for GE will be the integrity and operation of this closed loop steam cooling system. During testing, GE looked closely at the basic technology elements of steam cooling in the H system. Little explained: "We looked closely at the fluid flows of steam and air, the way the system changes over from air to steam. One of the key things was whether the steam cooling system carried the steam where it is supposed to go and along the right path without leaking. Others have tried steam cooling with limited success but we were very pleased with our results. One of things you look for is leakage. Through our characterisation period, we ran it

though aggressive cycles to test the system. We were able to run up and down smoothly and we started up with very few issues – even fewer than you would have with a conventional gas turbine."

Having completed this characterisation period, the next step is a demonstration period which will begin in September and run for about a year. During this time GE expects to shake out any further issues that might arise.

Certainly GE has undertaken a very paced and thoughtful market introduction. Yet when it comes to actually seeing the units in widespread commercial operation, the market will present its own challenges. The gas turbine market in particular has been impacted by the US slowdown. But Little is not overly concerned: "We've returned to more of a normal market, than a crisis market. When we started the H development, we were not anticipating anything like the bubble caused by the US market. We had thought of a market much like the one we are in today and we introduced the H for the 50 Hz market first. We are confident that over time the opportunities will be there."

The first "opportunity" will come from Japan where three units will be installed at Tepco's Futtsu No. 4 power station. The first of these 109 H systems will be shipped in 2006 with the other two in 2007 and 2008, respectively. This installation will hopefully make 60 per cent efficiency a commercial reality. It is a level which has not yet been achieved but GE is confident it can deliver on its promise. "We have set ourselves a target to ensure that we have a platform to deliver 60 per cent efficiency. We are comfortable our results have established that platform. There are site specifics – for example, the type and size of HRSG, pressure levels; auxiliary systems – that set the performance of any gas turbine. Accounting for these things, we are happy that we are at the 60 per cent level."

Bringing such an advanced piece of machinery successfully to market while achieving the performance goals is a careful, painstaking operation. I had my own taste of a painstaking operation with recent surgery to fix damage caused by what some colleagues have described as a "slightly reckless" sporting endeavour. Fortunately I am now back on my feet and the goal is to bring my own advanced machinery back to 100 per cent efficiency. But like GE with the H system, it will be one careful step at a time.

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