

Pushing the 60% Efficiency Gas Turbine Barrier

07/01/2011 | Sonal Patel

Gas turbine makers GE, Siemens, and Mitsubishi Heavy Industries (MHI) in the last week of May separately profiled unprecedented results from development or testing of three innovative combined-cycle gas turbine (CCGT) technologies.

GE Launches Flexible, Efficient CCGT

GE launched its FlexEfficiency 50 Combined Cycle Power Plant—what it called “a first-of-its-kind” power plant engineered to deliver an “unprecedented combination of flexibility and efficiency.” The 510-MW power plant is said to be capable of offering a fuel efficiency of greater than 61% while featuring a one-button start in under 30 minutes.

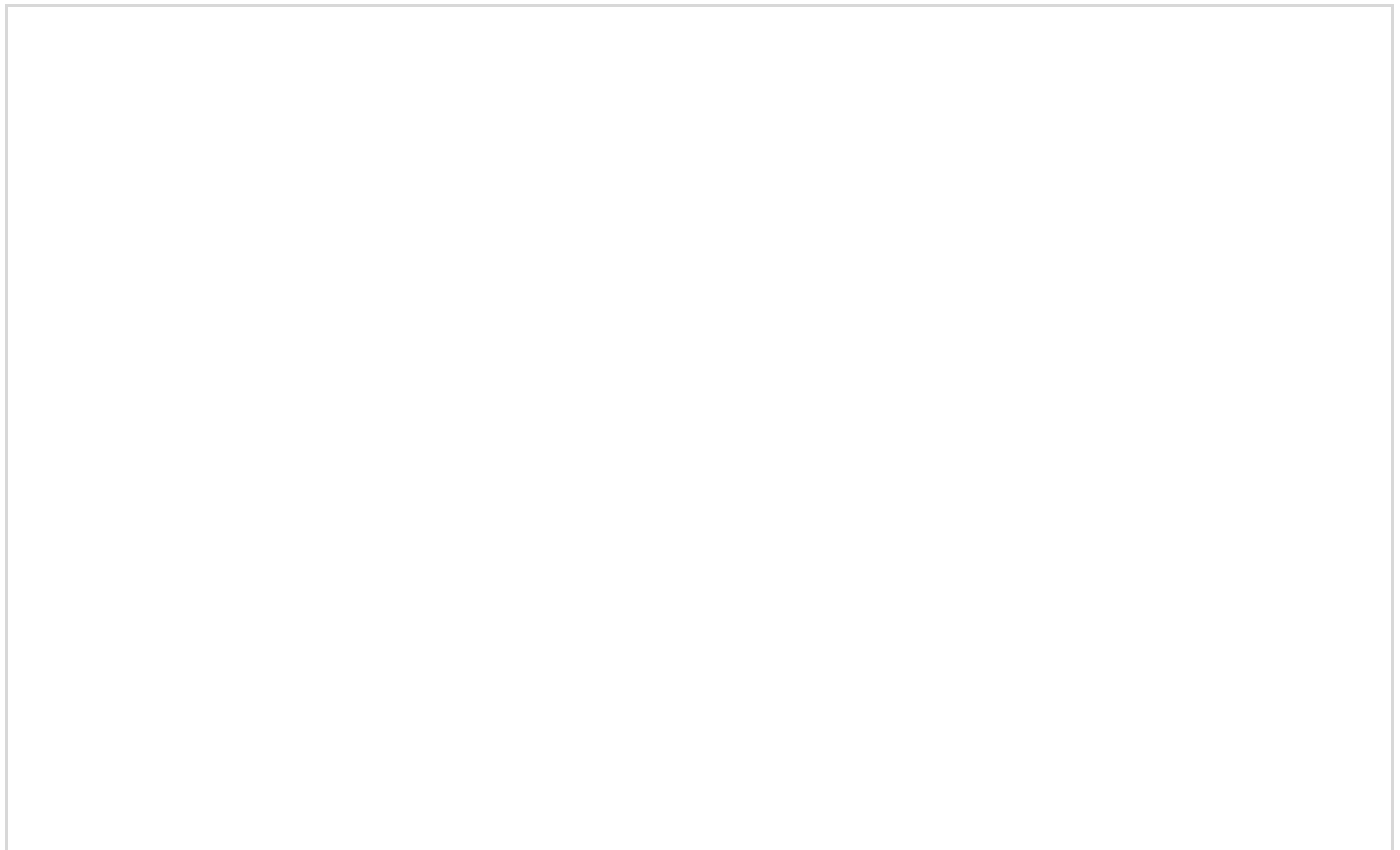
GE said at the launch of the turbine in Paris that the plant was designed to cost-effectively integrate renewables into power grids on a large scale. According to the *Financial Times*, the plant’s 50-Hz gas turbine will initially be manufactured in France and be targeted at the European Union, which has set a goal that renewable power should provide 20% of all energy by 2020. GE has announced no plans for a 60-Hz U.S. model at present.

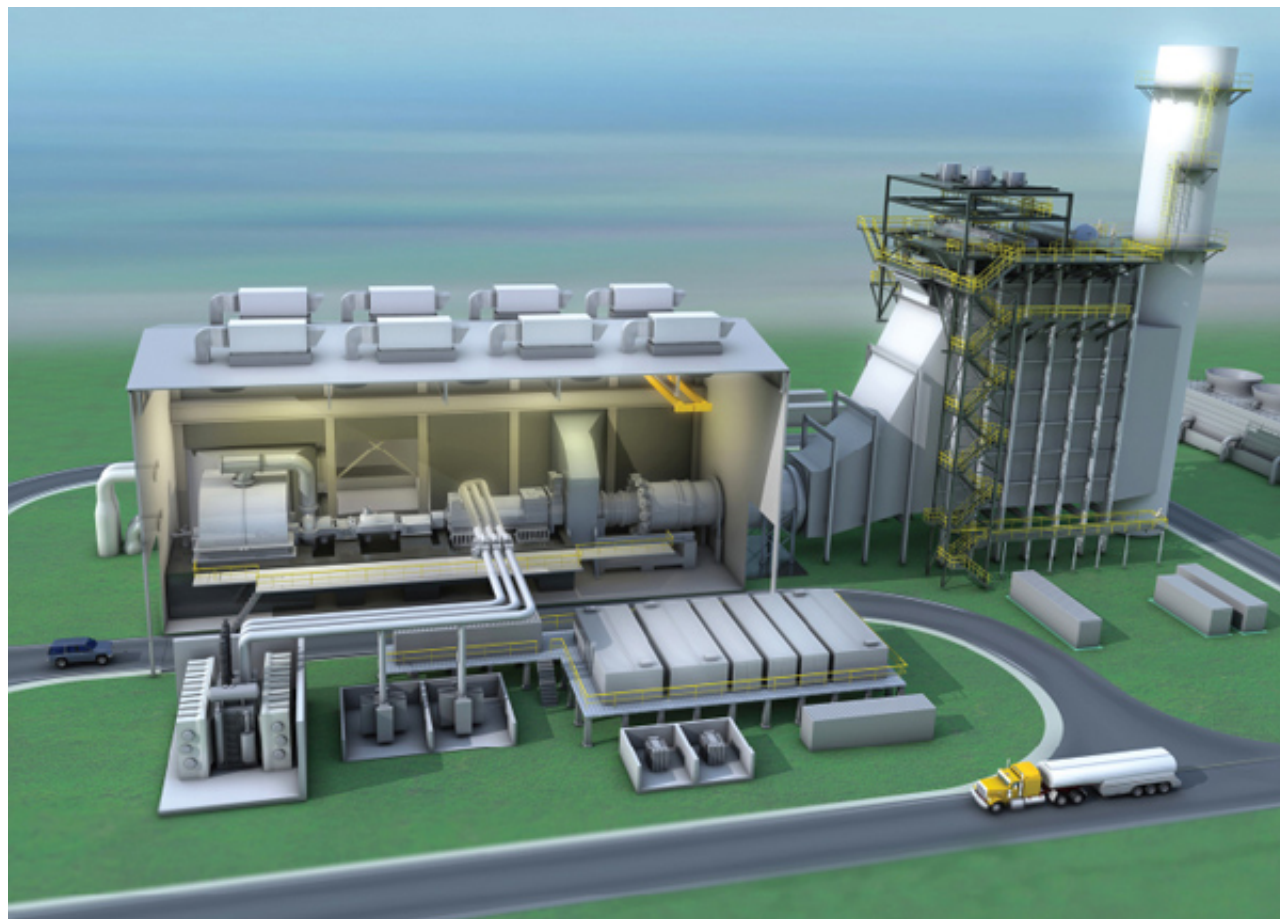
The new CCGT, which cost more than \$500 million in research and development, draws from the company’s jet engine expertise “to engineer a plant that will ramp up at a rate of more than 50 megawatts per minute, twice the rate of today’s industry benchmarks,” GE said.

Development of the turbine began in 2004 after studies about how to best

integrate intermittent renewable technologies into the grid showed that power systems of the future would characteristically see “more variability and uncertainty in the net load.” These systems could be managed with favorable “policies, power market structures, operating strategies, and investment incentives”—and advanced gas turbine technologies with flexible attributes would play a key role, GE said.

The company said GE engineers were able to avoid the “typical tradeoffs between flexibility and efficiency by approaching the plant design from a total equipment and control systems perspective.” Essentially, the FlexEfficiency 50 integrates a next-generation 9FB gas turbine that operates at 50 Hz (the power frequency that is most used in countries around the world); a 109D-14 steam turbine, which runs on steam produced from the waste heat from by the gas turbine; GE’s advanced W28 generator; a Mark VI integrated control system that links all of the technologies; and a heat-recovery steam generator (Figure 1).





1. Model of efficiency. GE launched its FlexEfficiency 50 Combined Cycle Power Plant in May—a 510-MW power plant capable of offering a fuel efficiency of 61% and more. *Courtesy: GE*

The gas turbine will now be tested in GE's full-loading \$170 million testing facility in Greenville, S.C., at full capacity in a variety of real-world power plant conditions, beginning in 2014. Commercial operation and first achievement of 61% is expected in 2015.

GE already has a couple of buyers. In June, China's Harbin Electric Co. signed a memorandum of understanding for the purchase of four 9FB gas turbines before 2013, including two that incorporate FlexEfficiency technology. And in June, the plant was selected by MetCap Energy Investments, a Turkish project developer, for what GE says is the world's first integrated renewables combined-cycle power plant. That plant, to be located

in Karaman, Turkey, will be rated at 530 MW and is scheduled to enter commercial service in 2015. (For more on integrating renewables and fossil fuels, see this issue's [cover story](#).)