

SES' ambitious Chinese syngas technology expansion strategy needs to overcome perceived high development costs

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Synthesis Energy Systems, Inc. (SES) is moving forward with its first integrated gasification combined cycle (IGCC) project in China after having completed a significant portion of the project's final feasibility report. SES recently stated that once the final feasibility report is officially approved, **Dengfeng Power Group (DFPG)** will be in a position to secure government approvals and begin construction on a 160MW facility using SES' iGAS technology.

The synthetic gas (syngas) production facility will utilize its XL3000 gasification systems, which will be supplied through its joint venture (JV) Tianwo-SES and **General Electric Company's (GE)** aero-derivative power gen-sets. It converts coal into gas, which in turn is used to generate electricity.

SES intends to use the initial project to serve as a model for approximately 600MW of additional iGAS clean power

projects in Dengfeng city and elsewhere in Henan province, as well as in other regions of China – a country that has substantial coal resources but is struggling to find a cost-effective and clean source of energy.

"Areas with nearby deposits of low cost coal, strict environmental regulations with regards to air and water, and need for additional power will be ideal locations for this technology," said Ms. DeLome Fair, recently appointed president and CEO of SES.

While suggesting that new regulations will drive the need to replace existing power plants with cleaner ones like iGAS on China's eastern coast, an area which is relatively developed, Fair considers areas such as Inner Mongolia and Xinjiang likely to be candidates for new capacity projects as new power demand will be created in the northern and western parts of China.

"We are seeing a lot of enthusiasm from investors eager to invest in clean energy projects in China," Fair said when asked about market reaction towards SES's iGAS project. "We expect the interest to continue to grow quickly as the new policies that drive cleaner energy get adopted."

IGCC projects in general are slowly progressing in China. In 2012, **China Huaneng Group** launched the first IGCC power plant in China, making it the sixth such facility worldwide.

Huaneng is not the only Chinese player that has shown interest in IGCC. A number of power generation companies in China have conducted pre-feasibility studies on IGCC projects but since failed to proceed.

Guangdong Yudean Group Co Ltd is close to becoming the second one to actually deploy this technology. The company is working on a Xinhui power project that consists traditional gas power facilities and IGCC power generation units.

"I think the main focus of development will be on the gas power plant part instead of the IGCC project," said Mr Wang, an engineer at Guangdong Yudean Group. "The latter doesn't have a clear timeline now as the cost is still too high."

The Yudean IGCC project is designed as a two phase process with the first serving as a 400MW

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Opportunity Size:

USD 1bn

Note:

Outlay for 600MW IGCC plant in Dengfeng city area

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national level IGCC experiment platform.

Cost concerns

With its low emission of sulfur dioxide (SO₂) and oxides of nitrogen (NO_x), IGCC projects are widely recognized for their environmental advantages. However often investors are held back by the high initial investment requirements.

"Historically, the development of IGCC has been focused on very large scale projects with incredible levels of complexity," explained SES's Fair. "This complexity drives up costs and lengthens the schedule in a variety of ways impacting, engineering, equipment design, project execution, and project approvals and makes it more difficult to obtain the required equity and debt financing."

"Because of the size and complexity, these previous IGCC projects have been faced with using equipment such as gasifiers, syngas coolers, compressors, and gas turbines that were unique, unproven, and larger than had ever been used before," she said. "This first-of-a-kind equipment added to the complexity and the challenges in operation."

As a result, the construction cost for an IGCC power plant is significantly higher than of traditional facilities powered by gas or coal. For the first phase of the Huaneng Tianjin IGCC project, which has a 250MW capacity, the estimated investment required was USD 384.6m (CNY 2.5bn), representing an average cost of USD 1,538.4 (CNY 10030.4) per kW. By comparison the average cost for a natural gas combined heat and power (CHP) project is approximately USD 584.6 per kW (CNY 3800/kW), according to statistics provided by the **China Electricity Council** (CEC). The CEC puts a cost of USD 769.2/kW (CNY 5000/kW) on gas-based distributed generation (DG) projects while for coal power plants, including ultra-supercritical (USC) units, the average installment cost is around USD 615.4/kW (CNY 4000/kW).

The Huaneng Tianjin IGCC facility, when it was launched in 2012, exceeded its original targeted expenditure by 30%, according to a report in the Xinhua News Agency-supervised Economy & Nation Weekly magazine.

The Huaneng project primarily adopted technology from local suppliers, including gasifiers from **Xi'an Thermal Power Research Institute** (西安热工研究院有限公司). The gas turbine was, however, provided by the joint venture formed between **Siemens AG** and **Shanghai Electric Group Company Limited** (上海电气) that has since largely unravelled.

Fair went on to say that with SES's iGAS product, a single 80MW facility will have one gasifier and two gas turbines, and all of the major equipment items are within the commercially demonstrated size range.

However, it remains to see how economically competitive the iGAS platform is.

Apart from the 160MW iGAS project mentioned earlier, DFIG also intends to site approximately 600MW of capacity in the Dengfeng city area, which represents an investment of approximately USD 1bn (CNY 6.52bn) at an average cost of USD 1666.67/kW (CNY 10833.33/kW).

In 2014, SES's then vice-president of business development, Carrie Lalou, published an article entitled "Distributed Power with Advanced Clean Coal Gasification Technology" in the World Coal Association's Cornerstone magazine. The report claimed that "initial budgetary estimates start as low as USD 1800/kW installed costs for a China construction basis and are projected to run to USD 2000-2500/kW for a significant portion of the market."

The article went on to state that "these prices can be achieved through maximizing fabrication of packaged units and major process equipment via qualified and internationally accredited Chinese fabricators."

"There are two key factors that new power generation projects in China will be evaluated on: the first is the impact on the environment; the second is the cost to produce electricity," said Ms Fair, suggesting that not only the initial investment but also cost to fuels and operation should be considered.

Traditional coal-burning plants will generally require a higher quality coal than the iGAS and "will not meet the environmental requirements that the new regulations in China are demanding", she said. As for a natural gas facility, the long term cost of electricity can be driven to a higher point by price of natural gas in China.

"Where low-cost coals or renewable fuel sources are available, iGAS economics are compelling when market power prices are USD 0.06 per kWh or higher," said Fair. "In the developing world, we see market power prices in this range all the way up to USD 0.2 and higher."

