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Could CSP become cost-competitive by 2020?

One of the major advantages of CSP is its ability to provide dispatchable energy through storage. But is it possible that CSP can become cost-effective and compete with traditional baseload solutions within the next six years? CSP Today speaks to José Alfonso Nebrera, Chief Executive Officer at ACS Cobra and Elisa Prieto, Strategy Director at Abengoa, to learn just how realistic this target is.

Both companies are working towards grid parity by 2020 and remain optimistic that it is achievable. In their assessments, Nebrera and Prieto include aspects such as the location of plants, natural gas prices in different markets and new agreements about CO2 emission targets, which are expected to be defined during the 2015 United Nations Climate Change Conference.

Increasing gas prices

"We would be able to compete with gas if we are talking about a place with high direct normal irradiance (DNI), where natural gas prices are around USD$10 per Million BTUs, with plant's utilization around 70% and with CO2 emissions costing around US$20 and USD$30 per tonne," Nebrera notes.

Although these prospects do not look promising given the current developments in the U.S. shale gas industry, he argues that it is unclear whether the gas prices will remain as competitive as they have been up until now. According to data published by the U.S. Energy Information Administration[1] (EIA), gas prices registered over the last two years have remained at historical lows.

Prieto agrees and points out that the prices registered in 2012, with an average of USD$3 per million BTUs, were unrealistic, which is why several gas companies decided to stop their operations and wait for an upturn in prices. "Why did that happen? Because there was a shale-gas rush, similar to that of the gold rush back in the 19th century," she says and highlights the large amount of accidents and technical problems which have occurred during fracking processes.

"Throughout Philadelphia, local authorities are beginning to regulate this activity and in some New York towns, fracking has been banned because it affects water resources.

"When these companies face a law that: a) forces them to declare what kind of chemicals they are pouring into the water during the extraction process and b) a law that obliges them to clean up their mess; then natural gas prices will rise," she notes.

In fact, the EIA forecasts an increase[2] in prices within the next few years following "the accelerated retirement of coal-fired and nuclear electricity" plants. Furthermore, it states that "the rising use of natural gas in the electric power sector will result in price increases for both natural gas and electricity in all sectors".

As a case in point, the EIA reported increased natural gas prices over the last few years. The following table shows the Henry Hub natural gas spot price[3] variations over the last four years, taking as a reference point the prices registered during the first week of January and July of each year since 2011.

The natural gas export in Egypt has been severely compromised, according to a Reuters' report. A sharp rise in gas consumption internally during the last decade, coupled with "one of the most generous gas subsidy programmes" in the region, has meant that the country's reserves have been depleted.

Table 1: Natural gas prices for the last 4 years in the U.S. (based on January and July first weeks)

Week Of	Mon	Tue	Wed	Thu	Fr
2011 Jan- 3 to Jan- 7	4.65	4.669	4.473	4.434	4.422
2011 Jul- 4 to Jul- 8		4.363	4.217	4.133	4.205
2012 Jan- 2 to Jan- 6		2.993	3.096	2.98	3.062
2012 Jul- 2 to Jul- 6	2.824	2.899		2.945	2.776
2013 Jan- 7 to Jan-11	3.266	3.218	3.113	3.193	3.327
2013 Jul- 1 to Jul- 5	3.577	3.654	3.69		3.617
2014 Jan- 6 to Jan-10	4.306	4.299	4.216	4.005	4.053
2014 Jul- 7 to Jul-11	4.225	4.204	4.17	4.12	4.146

Source: U.S. Energy Information Administration, August 2014.

How is the cost calculated?

While it registered a price of US$3.26 per Million Btu in January 2013, a year later, in January 2014, it showed US$4.30 per Million Btu, which means an increase of US$1.04 per Million BTUs within one year. Prieto emphasises the importance of the formula used to calculate CSP costs. "When we are talking about competitiveness we refer to the levelized cost of energy (LCOE). Why do we use this measure and not capital expenditure (CAPEX), for instance? Because CAPEX does not reflect the real cost of electricity generation."

She highlights that costs decrease considerably throughout the plant's lifetime as the energy source is free. "In the case of conventional energy sources, even though their CAPEX is lower, their costs are much higher due to the energy sources' prices, whether it is coal, natural gas or nuclear fuel", she notes.

The importance of storage and dispatchability

Both experts highlight CSP's storage ability in comparison to PV and, the added costs of building back-up plants for when the sun sets and the investment of building a grid network to extract energy from multiple plants.

Regarding dispatchability costs, Prieto notes that the U.S. National Renewable Energy Laboratory (NREL), through its SunShot initiative, has concluded that in between USD$0.5 and USD$0.6 per KWh can be attributed to dispatchability costs. "That is an important figure that has to be deducted when comparing CSP's LCOE to other intermittent technologies", she says.

CO2 emission targets

It is expected that an agreement regarding emissions targets will be reached during the United Nations Climate Change Conference, to be held in Paris next year. "If a price of US$50 per tonne of CO2 for developed countries is agreed together with US$20 per tonne for developing countries, then it will play in favour of renewable energies, especially CSP", Nebrera notes.

For Prieto, the consequences of this agreement will be felt most acutely by the natural gas industry. It will have to be pay two costs per KWh: extraction costs on the one hand and CO2 emission costs on the other.

Plant utilization

A factor affecting gas prices is plant utilization as there is a significant amount of gas spent to keep a natural gas plant running. The longer the plant's utilization time per year, the lower the price is. By way of example, the cost per KWh is much lower in a plant that runs 8,000hrs a year than for the same plant operating for just 2,000hrs a year.

Therefore, "in countries with a significant share of renewable energies, combined-cycle plants - which is the most common type of gas plant built nowadays-, are beginning to play a back-up role and, as a consequence, are having less working hours and are registering a higher price per KWh", Nebrera adds.

He also reminds us of the cost reduction CSP has experienced over the past few years: "When we began Andasol in 2008, we were paid around €280 per MWh. Nowadays, in South Africa our price is roughly half of that. I think that there will be further reductions in the next six years and I would dare to say that they will be around 30% of the current price".

It all depends on the location of the plants

Prieto and Nebrera explain cost competitiveness in relative terms depending on the characteristics of the market in question. Factors such as the location of the plant, local weather conditions, altitude, temperature, as well as the existence or absence of aerosols in the environment all impact project costs.

The opportunity cost: the revenue lost when burning oil to produce energy

Each market has very particular conditions. In Saudi Arabia's case, for instance, competitiveness has to do with opportunity costs. A report published by The Economist[4], dated on 2012, underlines the enormous opportunity costs incurred by Saudi Arabia, in part as a consequence of increasing internal demand during the last decade.

The report shows that the country was, at that time, the world's sixth biggest consumer of oil and that it spent a quarter of its production, 10 million barrels per day, feeding its internal consumption. The opportunity cost, considering current prices at around USD$100 p/b, is huge.

Aware of this reality, Saudi Arabia has set a goal of producing almost half of its power from renewable fuels by 2020 in order to meet domestic power needs and to free up oil and natural gas for export. In practical terms, the Kingdom has set up a goal of achieving 54.1 GW from renewable energy sources by 2032, of which 25 GW is from CSP (CSP Today Global Tracker, Markets Report 2014).

2030 is a more realistic target

Not everyone is so optimistic regarding the CSP industry's ambitious 2020 target. An industry insider, who works for an important Spanish developer, highlights current CAPEX as a major challenge: "For an investment of EUR 500 million you could build a CSP plant with a capacity of between 160 MW to 200 MW. However, for a lower cost of about EUR 300 to 400 million you could build a combined-cycle plant that has double the MW capacity."

Nonetheless, as there has been considerable investment in the optimization of CSP plants, the industry expert is of the opinion that CSP will become competitive in the longer-term and suggests 2030 as a more realistic target.

Besides, he notes that the price drop will also depend on market trends and needs. "It is not feasible to build a combined-cycle gas plant where there is no gas or where its transportation involves a very high investment, in which case a CSP plant makes more economic sense", he states.

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