

What next for the industry's LNG dreams?

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INTERNATIONAL oil companies (IOCs) are betting big on gas, particularly on capital-intensive liquefied natural gas (LNG) schemes that they hope will find buyers in Asia, where energy demand is soaring. But the rapid rise of clean-technology energy systems and fuels could snatch away potential new markets, especially in developing economies.

For Big Oil, gas represents the future. It's the cleanest burning fossil fuel, making it more politically acceptable as climate change rises up the global agenda. It could help keep a lid on global warming, especially if it kills off coal, the most carbon intense fossil fuel. And it's affordable for power generation, especially when compared to oil, say the IOCs. Gas, they say, will be the elixir for energy hungry developing nations, lifting millions out of poverty, or so the pitch goes.

But Wal van Lierop, chief executive of Canadian-based Chrysalix Energy Venture Capital, believes "most of these LNG dreams will not happen, cannot happen. They are too costly".

Lierop once worked with major oil companies on schemes to import LNG from developing countries to high-energy developed nations, particularly, North America. "That sort of made sense," he told the Energy for Tomorrow conference in Kuala Lumpur. But, he said, if you are a developing country that needs cheap energy to push development, then LNG costing \$15 per million British thermal units (Btu) – roughly the average cost to import the super-cooled fuel into Asia – makes no sense at all.

Of course, a few LNG export projects will be built with the first movers making some money, but he told *Petroleum Economist* that he does not see the industry's high-cost business model working.

He said: "We will see many more alternative energy projects that will be built, such as solar and waste-to-energy. It's this accelerated innovation that will help this part (Asia) of the world tremendously".

Speaking on the same panel, Nicholas Parker, managing partner of Global Acceleration Partners, a venture capital company, agreed.

"We need to get away from some



Looking ahead: The energy industry mulls the future of LNG

of the big ideas about coal and LNG. And the huge investments that go with them, which I think will end in tears and are unnecessary," he said.

"LNG is a premium form of energy, instead we need to find new solutions," he told *Petroleum Economist*.

Parker cited examples in East Africa, where companies such as Kenya-based M-Kopa, that offer solar power products to consumers for less than their daily spend on kerosene, are expanding at a rapid clip, and not just in Africa. They are also starting to penetrate Asia too. M-Kopa, which uses a pay-as-you-go business model combined with cellular technology, is doubling in size every month.

Localised power generation

These start-ups, which enable consumers to leapfrog traditional, centralised power systems, to locally generated renewable energy, would not have been possible just five years ago. But thanks to rapidly falling systems costs they have been able to bring solar to these un-served low-income markets.

Solar, as well as other renewable energy technologies, should be a boon to the one-fifth of the world's population that does not have access to carbon electricity.

Still, renewable energy technologies offer small-scale affordable and flexible solutions, not just for those suffering from energy poverty, but also industrial users too.

Massimo Bergadano, founding partner of PHPower, which provides efficient off-grid renewable energy models to industrial users in Asia, believes the region will soon leapfrog the technical problems that hindered the transition to renewables in Europe. By offering competitive

off-grid solutions PHPower circumnavigates the monopolistic national utility providers, which are often adverse to implementing renewable technologies into the grid.

Within Asia, at least south of China, off-grid renewable energy models will be hugely transformative in only a matter of years, Bergadano told *Petroleum Economist*. For industrial users, renewable energy solutions offer compelling economics and allow them to mitigate the price risks associated with the gyrations of the more traditional energy supplies, like oil, coal and gas.

General sentiment at the conference suggests there is little doubt that innovation is transforming energy markets much quicker than many expect, particularly in the non-OECD countries, where energy demand is forecast to soar.

Indeed, technologies are moving faster than projections – forecasters have consistently under-estimated the rate of technological change.

In 2000, the US department of energy (DOE) predicted there would be 1 gigawatt (GW) of solar photovoltaic and thermal generation by 2020 in the US. In 2014, solar power leads the growth in renewable energy capacity and the department is estimating that it will increase from some 8GW in 2012 to more than 48GW in the US alone by 2040.

The IEA's 2014 *Energy Outlook* predicts renewables will make up some 30% of global electricity generation by 2030 – 56% more than it forecast back in 2004.

In 2010, the US DOE projected that only 2,305 electric vehicles would be on the US market by 2035. In 2014 the DOE is estimating 80,000 electric vehicles will be on the road this year

and more than 780,000 by 2035. But as technical innovation continues to accelerate these estimates could turn out to be low again.

There are other technologies too. For instance, Joule is working on industrialising its reverse combustion technique to make liquid-ready fuels, such as diesel, ethane and gasoline, directly from sunshine, carbon dioxide and saline water in a form of photosynthesis. The US-based company uses a solar process to convert carbon dioxide waste from industrial emitters directly into a carbon neutral transportation fuel, making it particularly climate friendly.

In partnership with German car-maker Audi, Joule has successfully pilot tested its demonstration plant in New Mexico and is gearing up to commercialise its technology, which it says is already competitive with fossil fuels at a cost of \$50-80 per barrel.

With 1,000 plants of 1,000 acres each, Joule predicts it could make 1.1 million barrels per day of clean, renewable, ready to use diesel. Asia offers particularly good opportunities to develop the facilities, given its abundant sunshine, said Kees van de Kerk, director of business development at Joule Fuels.

So called sustainable, or low-carbon liquid fuels, will be crucial considering combustion engines are not going away anytime soon, said Ricardo Martinez-Bottez, a professor of turbomachinery at the Imperial College in London.

If it's business as usual, the number of vehicles on the road will more than double to 2.5 billion by 2050 and at least one billion of those will still be combustion powered.

Even the shipping industry, which has been hit hard by rising oil prices in recent years, and is one of the heaviest carbon emitters in the transport sector, has been talking to Joule.

Meanwhile, the potential for fusion electricity was mooted by Howard Hornfeld of Swiss-based company Fusion Advocates. The beauty of fusion electricity, if successful, is that it could provide base load quantities of electricity, which no other non-fossil fuel system can. "It has the potential to push coal out of the energy mix", Hornfeld, who is preparing to build an \$8 billion pilot plant backed by crowd funding, told *Petroleum Economist*.

Unlike nuclear power, fusion uses low atomic weight raw materials that

are relatively cheap and abundant. It has minimal waste issues too as the fusion reaction only creates helium and a neutron, as well as massive amounts of energy, said Hornfeld.

Despite all the potential, of the big oil companies, only French major Total is seriously pursuing clean energy in the new landscape, by investing heavily in solar.

It has spent more than \$2 billion, mostly over the past two and a half years, in the sector after buying a 60% stake in panel-maker Sunpower. The French firm recognises that as innovation drives costs down, modern renewables, especially solar, will be the fastest expanding energy segment for decades. Still, that sum is dwarfed by its oil and gas investments.

Nevertheless it seems a prudent investment given large wind farms and solar plants are now cost competitive with gas-fired power in many parts of the US without subsidy.

Down to earth

According to a study by the investment bank Lazard, the cost of utility-scale solar energy is as low as 5.6 cents a kilowatt-hour, and wind is as low as 1.4 cents. In comparison, natural gas comes at 6.1 cents a kilowatt-hour on the low end and coal at 6.6 cents. Without subsidies, the bank's analysis shows, solar costs about 7.2 cents a kilowatt-hour at the low end, with wind at 3.7 cents.

"It really is quite notable, when compared to where we were just five years ago, to see the decline in the cost of these technologies," Jonathan Mir, managing director at Lazard, told the *New York Times*.

Data from the Solar Energy Industries Association, the main trade group in the US, shows the price of electricity sold to utilities under long-term contracts from large-scale solar schemes has dropped by more than 70% since 2008.

Mir noted there were hidden costs that needed to be considered for both renewable energy and fossil fuels.

Without advances in storage technology solar and wind only produce power intermittently – when the sun is shining or the wind is blowing – that means utilities need to be able to call on other sources to respond to fluctuations in demand.

Conversely, conventional power sources make pollution, like carbon

emissions, which face increasing restrictions and costs.

But in a straight comparison of the costs of generating power, Mir said that the amount of solar and wind developers needed to earn from each kilowatt-hour they sell from new projects was often "essentially competitive with what would otherwise be had from newly constructed conventional generation".

Of course, those low prices do not mean that wind and solar farms can replace conventional power plants anytime soon. But it does offer developing nations, particularly in Asia and Africa, where incremental energy demand is expected to soar over the next 30 years, the opportunity to transition to a cheaper cleaner and modern 21st Century energy system.

"Fast-developing nations are not wedded to the same old ideas and ideologies, like some industrialized nations are. We don't have the same vested interest in the Victorian economy, the same sunk capital that holds us back by constricting the ability to move forward," Malaysian prime minister, Najib Razak, told the conference.

"We don't necessarily believe that the best way to generate energy is to set fire to something," he said, while adding that developing economies like Malaysia are flexible and fast-moving, seeing new technology as an opportunity, not a threat.

Of course, there will still be value in gas-fired power, to bolster the new energy systems. But the IOCs will need to work harder to make gas more affordable. While renewable energy costs have plummeted, the cost to build LNG liquefaction plants has rocketed. Admittedly, Shell and Petronas are spending tens of billions of dollars pioneering floating LNG (FLNG), which they hope will rein in production costs, but progress has been relatively slow and it's not clear how economic the novel technology will be.

Still, it's hard not to believe that the wider energy industry is reaching an inflection point.

But one thing is for sure the oil and gas business needs to innovate much faster. That's particularly true for the gas industry. Without the cleaner-burning fossil fuel – widely seen as a bridge to a more planet friendly non-fossil fuel based-energy system – runaway global warming will be almost unstoppable. ●

