

Q&A

PLENARY SESSION 1: CHARTING NEW DIRECTIONS – A LOW CARBON FUTURE

Mr Mark Schenkel

Question Asked By	Question	Answer
<p>Kwong Kok Chan kokchan.kwong@pacificlight.com.sg</p>	<p>Carbon Capture & Storage technology cost has not come down to a competitive level. Assuming policy becomes attractive enough to encourage CCS to a more commercially viable, which industry will find more such endorsers, blue hydrogen, post combustion, etc?</p>	<p>First of all, thank you for your interest in this topic and thank you for reaching out. CCS is an interesting technology from a cost perspective as it 'only' reduces CO₂ emissions and does not deliver anything else of value in the strictly commercial sense of the word. That makes it distinctly different from energy efficiency, for example. In this context, CCS on its own can never become 'competitive' with incumbent operations without CCS; CCS merely adds cost to the operation.</p> <p>Hence, policy will always be needed to level that playing field. This can be through a carbon tax, through a contract for difference or any other lever a government may have.</p> <p>To answer your question on where we may expect industries to embrace CCS first; it will increasingly happen at CO₂ point sources that are relatively cheap to capture from - all other things being equal in terms of transport and storage infrastructure, point sources with large volumes of higher CO₂ concentrations are cheaper to capture. Hence, we expect natural gas processing or hydrogen production to be point source types that are relatively early in the capture merit order; look at the Port Arthur project in the U.S., or the Porthos project announced in the Port of Rotterdam, both of which capture carbon from hydrogen production. But there are other factors of course. The type of policy incentive and the availability of infrastructure such as pipelines or legacy wells being key factors.</p>

<p>Tan Kok Poh tankp@pseraya.com.sg</p>	<p>For the feasibility of CCSU, what's the carbon concentration level in order for CCUS to be viable?</p>	<p>Thank you for your question. Technically, there is no carbon concentration threshold that limits the viability of carbon capture. Indeed, there is a strong increase in the development in the Direct Air Capture space, where concentration is of course very low. Of course, there are economic considerations too. But carbon concentration alone is not sufficient to judge economic viability of a full CCUS pathway; apart from capture, we'd need to understand how the carbon would be transported and utilized or sequestered.</p> <p>When only looking at capture cost, to evaluate the economic viability of CCUS we would need to ask ourselves what the alternative may look like. Are there other low-carbon alternatives to replace the asset? For example; can a natural-gas fired power plant be replaced by renewables and a form of demand response or storage? But also: what is the alternative for the asset? Will operating without CCS increase tax or other liabilities? In short, carbon concentration level alone will not be enough to decide on viability of a CCUS pathway.</p>
<p>VIP vip8@eenpawards2020.sg</p>	<p>There is the argument that it will be even more expensive to separate CO₂ from natural gas power plants because of the low concentration in. Can we have your views?</p>	<p>Thank you for your question. Indeed, all other things like transport and storage infrastructure being equal, key factors that determine the overall cost of CCS are scale (annual emissions) and flue gas properties. CO₂ concentration is a very important property, but definitely not the only property. If we were to compare the cost of carbon capture on gas-fired power compared to, say, a coal-fired power plant next door, the costs expressed per tonne of carbon captured might indeed be lower. Perhaps a more relevant metric however is to look at the resulting increase in the cost of power. As coal emits roughly twice the amount of CO₂ when burned for power compared to natural gas, that shifts that cost picture considerably.</p> <p>But there are much more considerations to enable me to directly answer your question. Where in the local grid merit order would these power generation assets sit and, as a result, how many full load hours do they have annually and how will that change with an increasing penetration of renewables? If that is a low or lowering number, the capital-intensive carbon capture cost can be discounted over less MWh's annually, and the cost per MWh go up considerably. The type of capture technology plays an important role in the cost picture too.</p>

Mr Ng Kian Soon

Feel free to reach out via email (kiansoon.ng@kbr.com) for a more detailed discussion.

Question Asked By	Question	Answer
Zin Kyaw Kyaw kyawkyaw.zin@engie.com	How do you calculate the efficiency of closed loop boiler? <only boiler efficiency>	By comparing the useful energy absorbed by the boiler feedwater / steam vs the fuel fired.
Lam Kar Ling karling.lam@geneco.sg	As shared, a reasonable assumption of local process boiler efficiency is > 85% and best practices is 92%, are there statistics to support these?	Boiler efficiencies of >85% is not an assumption. It is based on operating data of boilers in Singapore. Yes, there are boilers that operate very close to best practice efficiency. There are also commercial technologies that can potentially exceed 92% boiler efficiency.
Soh Soon Giap desmond.soh@samwoh.com.sg	Regarding the hot oil heater, will it be more efficient changing from diesel burner to an electrical heater as the heat source generator?	It will not be fair to compare the thermal efficiencies of a diesel heater to an electric heater. The thermal efficiency of the electric heater will most likely be better than diesel heater. You may want to compare the operating energy cost of the diesel heater vs electric heater

Breakout Session A - Implementing Low Carbon Technologies

Mr Cherif Assaf

Question Asked By	Question	Answer
Sundaram Suresh Kuamr suresh.sundaram@merck.com	How is the future of ESS (Battery Storage) in Singapore going to be?	EMA announced last Oct (SIEW 2019) that it will support large scale installation of 200MW of ESS beyond 2025, and with the target 2GWp of PV by 2030, couple with the expected drop in cost of ESS, one can expect more installation of ESS to mitigate solar intermittencies. All these spell good growth for ESS market in Singapore.
Ong Teng Ho tengho.ong@keppelom.com	How do you view ESS in the energy efficiency play? Very often, ESS are not consider as green energy sources but they are vital to chart towards effective use of renewables. Any advice to justify the savings and ROI etc on implementation of ESS?	Energy storage system will incur 2-way losses. One common usage of ESS in energy efficiency play is in load regulation which enable generator to operate at its best efficiency capacity, such as thermal storage systems are used to improved chiller plant efficiency to avoid running chiller at inefficient part load during staging in/out. In such a setting, the gain in overall system efficiency far out-weighs the two-way losses in the storage system. Another example is in district cooling system which runs their chiller system to store thermal energy at night, incurring losses from the thermal energy aspect but allowing electrical generator to run more efficiency at a higher load at night when the load is otherwise too low for the generators to run efficiently, overall system efficiency improved. Similarly battery ESS can improve overall system efficiency of PV(renewables)-grid-load-ESS integrated system. Apart from the savings, there are potential for ESS to capture value from stack-services, including but not limited to peak shaving, demand response, IL and participation in ancillary services thru' VPP.

Breakout Session B - Best Practices in Industrial Energy Efficiency

Mr Yang, Sam Ji Zheng

Question Asked By	Question	Answer
Goh Yong Tai yongtai.goh@basf.com	Why is the bypass line not already incorporated in the original process design?	The unit in question is more than 20 years old. The facility considerations at the point when the unit was installed were very different then, as are the conditions under which we operate the plant. Nevertheless the team continues to strive to develop solutions that will improve performance beyond what the existing facility would have enabled. This is a core feature of the ExxonMobil Global Energy Management System, which focuses on ongoing efforts to achieve better energy efficiency and reduce emissions in Singapore through continuous improvement and facility reviews.
Loh Men Shiang menshiang.loh@wyethnutrition.com	Do ExxonMobil consider payback for project approval? If so, what is the acceptable payback number?	Unfortunately, we will have to decline this question, due to its sensitive nature.

Ms Jessica Tan Shi Yun

Question Asked By	Question	Answer
Loh Men Shiang menshiang.loh@wyethnutrition.com	The employee who first suggested this improvement - is he/her rewarded in any way?	Yes, a token of appreciation is given to employees who give suggestions.
Yeo Yee Pang yee-pang.y.yeo@gsk.com	What is original drive to this project? Product recovery or EE?	Both product recovery and energy efficiency were the drivers for the project.
Angela Ang Wee Leng angela.wl.ang@exxonmobil.com	How do you engage your employees to keep new idea recommendations coming in?	There is a team to ensure all suggestions are evaluated, and we have a feedback loop to the originators. A token of appreciation is also given to employees who give suggestions.

Breakout Session C - Energy Efficiency Opportunities for SMEs

Mr Chen Li

Question Asked By	Question	Answer
Girish Pawar girish.pawar@ciotenergy.com	Mr Chen, Is the project able to participate in Demand Side Participation (DSM) to generate additional revenue through market participation?	Yes, it will indirectly contribute into it.

Mr Png Eng Lee

Question Asked By	Question	Answer
Choo Swee Soon css@natsteel.com.sg	Do we do Life Cycle Analysis for the solar power system?	Site survey and analysis of the solar system's performance over the contract period (20 years) was conducted. With this information we were able to confidently understand the capabilities of the solar system and project the output of solar energy generation.
Liw See Kew skliw@teknorapex.com	When short of solar energy in rainy days, do you ever face problem when switching over from solar to power grid power supply?	The switching of solar energy to grid electricity is seamless, there is no problem at all.
Foo Chee Shin energy@progress-singapore.com.sg	Do Fuisland use grid power at night?	Yes. Our solar energy can only generate power in the day. In the night, grid electricity kicks in to fill the void in generation.