

This is an edited transcript of a chat that occurred on Monday, August 17, 2009.

Guest chatters were ZeroGen's Chris Wheeler (Project Manager) and Howard Morrison (Emerging Technologies Manager).

The chat formed part of the 'Low Emission Technologies in Queensland' On-Line PD.

Tracey> Hi All, and welcome to the ZeroGen chat. We might get started though, so as to best utilise the time that Chris and Howard have been able to offer us. Chris, would you mind briefly outlining the ZeroGen project?

Chris> ZeroGen is a Queensland Government owned company whose mandate is to deploy an industrial-scale low emissions coal fired power project incorporating integrated gasification combined cycle (IGCC) with carbon capture and storage (CCS) in Queensland by 2015.

Tracey> Hi Howard, I was wondering if you would mind starting by giving a brief overview of the way that IGCC works, and then we will begin taking questions.

Howard Morrison> No problems - Chris is sending through a brief overview of the project. The process involves conversion of coal to a gas, stripping the CO₂ from that gas to leave predominantly hydrogen. The hydrogen is burned in a gas turbine to power a generator, and the CO₂ is piped to a location to be sequestered deep beneath the earth

Chris> To follow on from the previous comment. The key elements of the IGCC power station are an air-blown gasifier, gas treatment, CO₂ capture and combined cycle electricity generation. The gasifier converts the coal into a synthetic gas which is then converted primarily into carbon dioxide and hydrogen. The carbon dioxide is captured and stored in sandstone reservoirs, while the hydrogen is converted into electricity using a gas turbine. Hydrogen can also be used for other purposes in the longer term.

Chris> It is interesting to note that the type of gasifier we are investigating will convert the ash into a product which can be used as road base or similar. (The air emissions such as SO_x and NO_x of the IGCC is very low when compared to traditional PF plant)

dale> Hello Chris and Howard, this is Dale and I was wondering the cost of the process per megawatt produced please? Thank you

Chris> Dale, as part of our study work we will be determining the expected price for electricity. However, based on our initial investigations, we expect the technology to be competitive with other low CO₂ emissions based technologies.

Nicolle> Which locations are you looking at for Queensland Chris? Rural sites?

Chris> Hi Nicolle, The Queensland Government has a low emissions energy policy for the state and is supporting the project. In addition to this the Australian Government has a strong interest in CCS technology and ZeroGen has expressed a strong interest in being involved with the Australian Government initiative. As a point of interest ZeroGen has one of the most mature drilling exploration program for carbon storage investigations.



Howard Morrison> Nicolle: we are considering a number of potential sites for the power station, but our exploration activity for the geological storage site is centred around the Springsure and Emerald areas in central Queensland

Carly> Given the "world-first" large scale nature of the ZeroGen Project, is there any expression of interest from overseas coal/coal processing companies in the project and/or how it will proceed?

Chris> Carly, We are currently working with Mitsubishi Heavy Industries from Japan as one of the key technology providers. MHI, is interested in investing in the project. To answer your question we have overseas interest as well as local interest.

Chantel> Will these projects have any negative impact on the residents of these rural communities you are considering as potential sites? Or pose any risks to them?

Chris> Chantel, ZeroGen has been working with the local community in Central Queensland since 2006. We have had public meetings and have attempted to answer peoples questions and concerns. We see the project as having a positive impact on the community. It is the first of a kind technology and we are looking to develop this in central Queensland. There will be opportunities for employment and training in new technology. Also new industry will be developed to support this technology.

Cassie> I noticed on your website, that it is looking at costing about A\$4.3 Billion. Is this money coming from grants or mostly the government?

Howard Morrison> Cassie: The project is a commercial scale demonstration plant and will need significant funding, from governments and industry for it to proceed. At the moment there are a number of interested participants who are viewing the progress of the prefeasibility study. The answer is that both governments and industry are providing support.

Karen> When the CO2 is piped to a location to be sequestered deep beneath the earth it is under great pressure can this pressure be used eg to run a turbine?

Howard Morrison> karen: The co2 is piped at a sufficiently high pressure to keep it close to the liquid phase (for efficiency of transport and because the storage volumes are much smaller if the CO2 is not in a gaseous phase- think of your BBQ gas bottle). Expanding it through a turbine would bring it back to a gas which would not be desirable.

Rosen> will it pollute the underground water?

Howard Morrison> Rosen: we are sequestering at a depth below 800m to ensure that the CO2 stays as a supercritical (thermodynamic term) fluid. The water for farms etc comes from much shallower depths. It is interesting to note that the natural gas sourced from central Qld often has CO2 as a constituent – it's already down there!

ross> Hi Chris, compared to a normal power station which releases carbon dioxide, how costly is the ZeroGen technology to achieve low carbon emissions?

Chris> Hi Ross, at this stage of the study, it is not possible to make meaningful comparisons as we need to complete the prefeasibility study and then the feasibility study to finalise the costings. Also there will be an impact from the Emissions Trading Legislation as emitted carbon dioxide will have to be paid for. High CO2 emitters will have to pay more to operate their plant while low emissions plants will pay less. The emissions trading market needs to be installed before these costs can be calculated.



Caryn> Hi, what do you look at when trying to find a suitable storage location?

Howard Morrison> Caryn: we are looking for a secure storage site with similar geology to that which has held natural gas or oil for thousands of years. Storage below 800m, secure and proven geological seals below which we can store the CO2

Carly> Howard/Chris, Will exploration of storage sites be limited to those already near coal-fired power plants, to be more economical? Also, how many jobs are predicted to be created from the project?

Howard Morrison> Carly: The Qld Government is embarking on a process through the Geological Survey of Qld, whereby all of Qlds potential for CO2 storage will be examined. Our programme has gone to a greater level of detail (actual assessment rather than potential) We believe that the project will at its peak develop around 2000 jobs during the construction phase (power plant, pipeline, and sequestration field development).

Tracey> Howard, do you know whether the data that the GSQ came up with is public?

Howard Morrison> Tracey: The GSQ data will be in the public domain

Tracey> Hi Howard and Chris. How proven is this technology? And how important will the ZeroGen project be in terms of proving this technology?

Howard Morrison> Tracey: various components of the technology are well proven. There are a number of IGCC plants running around the world (without CO2 capture), CO2 capture or separation is as I noted required in the chemical industry and Gas industry. There are over 2000miles of CO2 pipe in the USA and Canada, and CO2 injection into the earth has been practised for decades as part of enhanced oil and gas recovery. The issue is integrating these to all happen at the one time and to have a gas turbine that runs on a high hydrogen fuel, while ensuring the CO2 stays securely stored. Our project will be a world first in this case.

alison> One of the concerns about nuclear energy in Australia is that we have no experience to set up meaningful environmental parameters for the operation of the plant. Do we have the knowledge to set up meaningful long term monitoring of this project?

Howard Morrison> Alison: I agree with the assessment of nuclears timetable for building the regulatory framework. For our technology the environmental parameters are limited to potential risks - for the power plant part of the project these are well established from the existing power and chemical industries. For the storage end the reference case is the oil and gas industry. The greenhouse gas storage act has been passed in Qld and provides the framework

Cassie> When will we see this technology working to its full extent?

Chris> Cassie, The IGCC/CCS plant is considered to be a first of a kind. If ZeroGen remains on track for its development, it will commence operation in late 2015. This plant will sent the design parameters for the next large scale IGCC/CCS generation of plants.

ross> The power station is there to produce energy but do you know how much energy is then used up to capture and sequester the carbon?



Chris> Ross, There is no doubt that there is extra energy used in capturing, compressing and storing the CO₂. We estimate the efficiency will be 32 to 35% for a new IGCC. A subcritical PF plant is about 36 to 38%. If you retrofit a capture and compression unit to an existing traditional plant, you might find the efficiency drops to mid to high 20's. The real opportunity for IGCC is the potential to improve the efficiency as technology improvements are made via the use of hydrogen fuel cells and membrane technology. Hope this helps.

Chris> Ross, Just to clarify the previous answer the PF plant is not fitted with CO₂ capture so is limited when fitted with CO₂ capture compared to the IGCC

Tracey> With regard to efficiency...That's interesting Chris. Do you know if countries that are building new power plants are looking at implementing this new technology with their new power stations?

Chris> Tracey, as a matter of interest there are five coal based IGCC powerplants operating the world at present. The longest operating one is 15 years while the most recent one is the MHI plant in Japan. This unit has achieved very good efficiency which is one of the reasons we are interested. There are several plants being investigated internationally using the IGCC fitted with carbon capture. These are in the USA, Europe and China. A USEPA report concluded that IGCC technology fitted with CCS offered a very good solution to low emissions coal technology. In short - YES there is significant interest internationally in the IGCC/CCS technology.

Caryn> In comparison to the coal technology that is available now, will this new technology be more cost effective as well?

Howard Morrison> Caryn: it's important to compare apples with apples. Any technology that captures and stores CO₂ will cost more than one that doesn't. So the question is "does an existing plant that has to buy carbon permits to cover its emissions have a better future than one that captures and sequesters the CO₂" the answer depends on the price for the carbon permits and the technology cost reductions that will come as we learn how better to design, build and operate the newer technologies.

Nicolle> Will there be much maintenance with regards to the plant itself? Or similar to current coal power stations? It sounds too good to be true, so now I'm thinking in terms of ongoing costs

Chris> Nicolle, The IGCC/CCS technology is more complex than the existing technology which emits CO₂ and will require some additional maintenance but not substantial. Quite a few of the components are similar, such as coal conveying and crushing and the electrical generation equipment. There will be an opportunity to develop new skills and experience with the technology from an Australian perspective.

peter> I imagine that if the Chinese or the Indians were to take up this sort of technology the government would be looking to "cash in" on their investment?

Howard Morrison> Peter: Any party involved in a "first of a Kind" will seek to maximise their investment. I expect suppliers, engineering firms as well as investors to leverage off their involvement.

