IEAGHG Information Paper 2018-IP36; Update on the Shand Power Station CCS Feasibility Study by the International CCS Knowledge Centre

Following the extensively informative presentations given by the International CCS Knowledge Centre in GHGT-14 the past October in Melbourne (see https://ieaghg.org/ccs-resources/blog/learnings-from-boundary-dam-applied-to-shand-power-station) , the same team has just released the *Shand CCS Feasibility Study.* As already published in such event, this facility will incorporate the learnings from the BD3 unit. Further technical information on the retrofitting of the Shand Power plant with CCS is included in the just delivered document.

As highlights:

- It is designed to capture 2Mt/year (double the captured CO_2 in BD3)
- The operation design is flexible enough to be incorporated in the energy grid together with intermittent energy suppliers such as renewables.
- The plant will operate under ZLD (zero liquid discharge). Based on the heat-rejection resign, the CCS system uses the condensed water from the fluegas.
- The operation, maintenance & consumables, and the power plant and capture capital costs are dramatically reduced compared to BD3, by 73, 92 and 67% respectively. Moreover, the International CCS Knowledge Centre ensures that further reductions can be achieved.

As we have highlighted in several occasions, the implementation of carbon capture systems is highly dependent on specific characteristics of the facility, and the International CCCS Knowledge centre confirms that in this regard, Shand facility is particularly well fitted for the installation of carbon capture equipment, as it was designed to include another unit which was never built. Consequently, Shand had space enough for the integration of a CCS system and, as it has only one unit, the carbon capture system can be installed near it, avoiding complex ineffective integration. Moreover, Shand power plant is near BD3, which is highly beneficial in regards to the transport and storage costs. However, not only the location but specifications as the age and size must be considered in any feasibility study. Age will decrease the efficiency and size, what will increase the retrofitting costs. Size by itself will impact on the economy of scale. As in the Shand power plant, the capital costs are lower as bigger the size is.

Regarding technical details, Shand power plant has been designed for optimized operation. The team carried out in-depth modelling, considering process configurations options for this specific facility. The results impacted on the equipment, operating parameters, allocation of equipment, and process design. The optimization included the details above and a detailed heat integration, where the steam is extracted from the existing facility to be used in the capture system. Further reductions are achieved through the modularized design and revenue from by-products such CO_2 for EOR and fly ash for concrete.

In addition to specifications of the facility and costs, the power plant with CCS must be considered as part of the electricity grid. As reported by IEA and other organisations, the optimum solution will be supported on a mix of measures, where energy efficiency, renewables, fuel switching, and CCS, amongst others, will be integrated to reach the B2DS. Coupled with renewables, the power plant would operate as a back-up system. However, as we saw in the GHGT panel discussion "Putting the Value of CCS in Context", traditional power plants are not designed to be flexible and, consequently, are inefficient in those conditions. Shand facility has been designed to operate as a flexible electricity supplier and the power load will vary, achieving up to 97% of capture rate at its minimum.

Finally, it is important to mention the regulatory context where BD3 and Shand facilities have been constructed. Canada is supporting the implementation of CCS through policies and incentives, but also by removing barriers to the storage and long-term security of CO_2. The International CCS Knowledge centre has highlighted that the learnings from the Canada regulations can be applied to existing oil and gas locations by amending current regulations to incorporate CCS, and shaping subsidies and incentives in various forms. Moreover, the cost has been greatly reduced from the first to the second power plant design. This cost reduction confirms that sharing knowledge and experience, and applying technical improvements, will de-risk CCS projects and decrease the CCS costs in the long term. The current CCS cost should not stop developers or regulators but catalyze the deployment of large CCS facilities.

The full report can be found here: https://ccsknowledge.com/

Mónica García
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