FOCUS ON CCS

OPINION LEADERS SERIES

Why CCS is essential for a low-carbon future

By Lorraine Mitchelmore

November 2015

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Lorraine Mitchelmore was appointed Executive Vice President Heavy Oil effective October 2012, in addition to her role as President and Canada Country Chair.

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Focus on CCS: Opinion Leaders Series

Focus on CCS is the theme of a series of opinion pieces by world leading authorities on carbon capture and storage (CCS) and the vital role for the technology in reducing our carbon dioxide emissions. This series is published by the Global CCS Institute in its mission to accelerate the development, demonstration and deployment of CCS.

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Why CCS is essential for a low-carbon future

By Lorraine Mitchelmore

President and Country Chair, Shell Canada Limited

In late November, the world's foremost climate experts and world leaders will descend on Paris for COP21. Their goal is to arrive at a universal, legally binding agreement that will continue the fight against climate change and spark the transition towards a low-carbon future. The task will require cooperation and visionary solutions to reduce greenhouse gas (GHG) emissions. At Shell, we are investing heavily in one of those solutions.

Carbon capture and storage (CCS) is one of the best options currently available for mitigating global GHG emissions. CCS captures CO_2 from large industrial sources and stores it safely underground. The International Energy Agency has said that CCS alone has the potential to deliver 17 per cent of the world's required CO_2 mitigation by 2050, and as such, CCS must be a part of the strategy towards achieving society's goal of avoiding the worst effects of global warming.

Shell has been a leader in CCS development for the past 15 years as part of our overall commitment to curtail carbon emissions. CCS is a proven, available technology that can help combat global warming. The combination of more CCS projects worldwide, further development of renewables and improved energy efficiency are critical if we're to stay below the two-degrees celsius global temperature increase that scientists tell us we must not exceed.

Our CCS portfolio now spans the globe. We have interests in projects either planned or operational in the United Kingdom, Norway, Australia and Canada. Our Peterhead project in the U.K., now in the design stage, will (subject to approvals) be the world's first full-scale natural gas CCS project. Up to 10 million tonnes of CO_2 emissions will be captured from the Peterhead Power Station during its anticipated 10-to-15 year lifespan and transported by pipeline offshore for long-term storage deep under the North Sea.

In Canada, Shell Cansolv technology was implemented at SaskPower's CCS project at Boundary Dam Power Station. Launched in 2014, when fully operational the project will capture approximately one million tonnes of CO_2 per year and is the world's first commercial-scale post-combustion carbon capture system at a coal-fired power plant.

Shell's Quest project in Canada is a key element of that portfolio. We built Quest at our Scotford Upgrader near Edmonton, Canada, which processes heavy oil from the Canadian oil sands. I was thrilled to celebrate Canadian ingenuity and Quest's official start-up earlier this month (November 2015). As Quest comes fully online, the project will capture and store more than one million tonnes of CO_2 each year. That represents one-third of the upgrader's total emissions and is equivalent to the emissions from about 250,000 cars.

What's more, Quest provides a blueprint for the global climate community to successfully develop CCS projects. As part of the funding agreement with the government of Alberta, Shell is openly sharing details on Quest's design, processes and lessons learned to benefit future CCS projects worldwide. Additionally, the project has demonstrated the importance of cost-management and best practices, which can also be applied to other projects. Lastly, Quest shows the role that government can play to support CCS development and the importance of effectively engaging the local community.

Quest's genesis dates back to the turn of the millennium when Shell first began evaluating options to capture CO_2 from the Athabasca Oil Sands Project which involves Shell Canada Energy (Operator and

60% owner), Chevron Canada Limited (20%), and Marathon Oil Canada Corporation (20%). CCS was identified as an important carbon reduction opportunity but at the time there were few global projects and many challenges to overcome.

Early demonstration projects are not for the faint-of-heart and public dollars are critical to enable early projects. Shell was able to make Quest a reality with funding support of CAN $865 million from the governments of Alberta and Canada and significant collaboration to develop the policies to enable carbon sequestration in Alberta.

While CCS technology has been used for many years, two existing challenges limit widespread adoption. The first is the high cost of building CCS projects, which leads some to argue that industry and government should allocate funds to developing renewable energy sources instead.

Shell sees renewable energies eventually becoming the largest component of the global energy system over time. But this will only be possible in combination with cleaner and convenient hydrocarbons that can provide energy products for electricity, heating and cooling, transportation and the manufacture of materials. Hydrocarbons will be required to help address current shortcomings for renewables in volume, availability, intermittency, storage and energy density.

The reality is that we will continue to rely on fossil fuels to a certain degree for the foreseeable future, even as the transition to a lower-carbon economy continues. That reality underscores the critical need for CCS as it is the only technology that tackles the absolute level of CO_2 stock in the atmosphere. Other technologies improve efficiency and help to slow down the rate of CO_2 increase, but do not reduce the total volume of CO_2 in the atmosphere.

The Intergovernmental Panel on Climate Change (IPCC) in its fifth assessment report says that without any CCS projects the cost of achieving the warming target of 2°C increases by as much as 138 per cent[1]. Meanwhile, the cost of implementing CCS is expected to come down as new commercial facilities come online resulting in optimized designs and greater cost efficiencies.

Unfortunately we have yet to reach a tipping point on CCS adoption. As worldwide commercial-scale deployment of CCS is still in early days, government and public support for project development are essential to encourage early demonstration projects. These are necessary to achieve lower costs and greater efficiencies through economy of scale.

We also know that society will struggle to achieve its climate goals without countries each implementing a meaningful global price for carbon. A robust price on CO_2 would encourage countries to adopt CO_2 reduction technologies like CCS. The technology can be deployed across a range of sectors, including the coal, steel, chemical and cement industries, making its broader deployment critical.

Of course, governments are beholden to their citizens when it comes to the use of public funds. To that end, government and industry need to demonstrate that CCS is a cost-effective way to achieve climate change goals. Projects like Quest will be helpful in this regard as they contribute to knowledge on costs associated with various GHG reductions.

The second challenge to widespread CCS adoption is the need for more collaboration on CCS technology, public acceptance and regulation frameworks. Although CCS technology is not new, there is strong

[1] IPCC. Climate Change 2014 Synthesis Report for Policy Makers, page 25. [Online] 2014. https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

rationale for industry, government and other sectors to work together so that new CCS projects build upon the knowledge gained from previous ones in order to reduce front-end project costs for follow on projects.

Garnering public support in particular will be essential to future development. As companies around the world look to develop CCS projects, they can look to Quest as an example of how to earn social acceptance.

For the Quest project, Shell started speaking with a wide variety of stakeholders in the area very early on in project planning stages. Those first face-to-face conversations were critical to provide information, build trust and understand initial reactions. We also sought the input of external experts who could help us credibly build understanding about a technology that was familiar to us but rather foreign to most people who know little about subsurface geology.

Starting in 2008, we began a series of meetings, open houses and workshops to provide project information and respond to questions. Based on stakeholder input, we made more than 30 alterations to Quest's pipeline route, and showed community members that we took their interests to heart.

In 2012, we established a Community Advisory Panel to maintain public engagement through Quest's development stage. The panel consisted of a cross-section of stakeholders, including landowners, regulatory bodies and representatives from the academic, business and public service sectors. The panel served primarily to provide input on the measurement, monitoring and verification program to assure safe storage of CO_2. They were able to provide insight into public concerns around the project and served as valuable liaisons between Shell and the community.

A key concern heard throughout our consultative process was around safety and potential for local environmental impacts from the project. Educating the public about the CCS process and its safety record is an important step towards gaining local stakeholder acceptance. Just as developers of wind and solar projects around the world have found, environmental benefits don't always trump the concerns of locally impacted stakeholders.

With Quest, Shell worked hard to help the public understand that CCS is not an intrusive or risky process; it simply captures CO_2 emissions and stores them permanently underground. CCS has been in use without incident for over 40 years. Developing a robust measurement, monitoring and verification program that was externally verified by international risk management firm DNV also helped quell concerns.

These takeaways will be valuable to other countries exploring how to advance CCS more rapidly. We want CCS to reach its full potential, which is why we are taking an active role in sharing knowledge gained through projects like Quest and Peterhead. As an example of this commitment, Shell Canada and the U.S. Department of Energy have announced plans to collaborate on field tests to validate advanced technologies for underground storage of CO_2.

As the world grapples with combatting climate change, CCS needs to be part of a global mitigation strategy, along with the development of renewable sources, improved energy efficiency and an eventual shift in how we power our lives.

Shell believes CCS, in combination with other GHG reduction opportunities, is critical to achieving carbon reduction targets in a cost-effective way. And if leaders need a roadmap for developing and deploying CCS, they can find one in Canada's Quest project.