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From: Al_Collins@oxy.com
Sent: Fri 10/6/2017 4:06:56 PM
Subject: Occidental's EOR Operations and Carbon Capture & Storage (CCS)

Ryan:

What a pleasure meeting with you on Wednesday. I am extremely grateful that you and the Administrator were able to meet with our Board and Senior Management team to lay out the President's agenda and to offer your ideas on ways that business can work more effectively with our regulators and communities to achieve even greater environmental performance. The Administrator's speech left a lasting impression on everyone.

As we said, Occidental is very proud of our enhanced oil recovery (EOR) operations and of the opportunities EOR using CO2 offers energy and environmental policy both here in the United States and abroad. We think it's American innovation at its best. It's also one of the few energy and environmental issues that most all stakeholders can support.

Below are materials that we discussed related to CCS.

1. A link to the September 14th event that was held at the Senate called "State of the Art: Innovations in CO2 Capture & Use (including Enhanced Oil Recovery)". I represent Occidental and spoke along with representatives from NRG Energy and Mitsubishi Heavy Industries America. The event was hosted by Senators Barrasso, Capito, Heitkamp and Whitehouse who are all big supports of CCS. <https://www.c2es.org/events/2017/state-art-innovations-co2-capture-use>
2. A link to the International Energy Agency's (IEA) report, "Storing CO2 through Enhanced Oil Recovery, combining EOR with CO2 storage

(EOR+) for profit," 2015 which describes the reduction of CO2 footprint from oil produced using anthropogenic CO2.

https://www.iea.org/publications/insights/insightpublications/CO2EOR_3Nov2015.pdf

3. And the Clean Air Task Force's summary of the IEA report referenced above entitled "CO2 EOR Life Cycle Analysis"
http://www.catf.us/resources/factsheets/files/CO2_EOR_Life_Cycle_Analysis.pdf
4. A Report from DOE's NETL explaining how EOR works
<https://www.netl.doe.gov/File%20Library/Research/Oil-Gas/publications/brochures/CO2-EOR-Primer-2017.pdf>

5. A report by Advanced Resources International, Inc. (ARI) on behalf of the Natural Resources Defense Council (NRDC, yes that NRDC) explaining the potential the US has to expand CO₂-EOR significantly. ARI estimates that an additional 26-61 billion barrels of oil could economically be recovered with today's EOR technologies, potentially more than doubling current U.S. proven reserves. <https://www.adv-res.com/pdf/v4ARI%20CCS-CO2-EOR%20whitepaper%20FINAL%204-2-10.pdf>
6. Moreover, "next generation" EOR technology could yield substantially greater gains, potentially increasing recoverable domestic oil from EOR to 67-137 billion barrels, and storing 20-45 billion metric tons of CO₂ that would otherwise be released into the atmosphere (ARI, 2011).
http://www.midwesterngovernors.org/documents/NETL_DOE_Report.pdf
7. Lastly, here are my broad level talking points regarding Occidental's EOR operations and the opportunity that EOR presents:

- Occidental Petroleum is an international Oil and Gas exploration and production company.
- We are one of the largest oil and gas companies in the United States [based on equity market capitalization]
- We have operations in the U.S., Middle East, and Latin America.
- Approximately 50% of our production is domestic and 50% is international.
- Occidental is the world's largest user of CO₂ and we view CO₂ as a product input and treat it as a commodity which we purchase.
- With a recent acquisition, Occidental now injects 2.5 billion cubic feet of CO₂ each day into our Permian Basin reservoirs. 2.5 billion cubic feet per day is 50 Million Tons per year.
- For context, NRG's Petra Nova Carbon Capture Plant located at the WA Parish power plant near Houston, Texas, captures about 1.6 Million Tons of CO₂ each year. So Oxy's operations handle the equivalent amount of CO₂ captured at 31 Petra Nova projects, which most of you are familiar. (50 million MT divided by the published 1.6 million MT publically shared by NRG on their website:
<http://www.nrg.com/generation/projects/petra-nova/>)
- We have 34 enhanced oil recovery (EOR) units where we inject this CO₂.
- This injection of CO₂ increases oil recovery by 10 to 25% in fields where it's employed. This is oil that could not otherwise be produced except for the injection of CO₂.
- Oxy also owns and operates close to 2500 miles of CO₂ gathering and major trunk lines.
- We employ a variety of CO₂ separation technologies including membranes, amine solutions and the Ryan Holmes process.
- In addition, we work closely with separation technology developers. We field test new and emerging technologies and offer insights into which are the most promising.
- Oxy has been transporting, injecting, and recycling CO₂ safely for 40 years.
- Sequestration is an inevitable consequence of the EOR process. These operations are "closed looped" and except for de minimus losses due to fugitive emissions, all CO₂ is

permanently stored in the geology of the reservoir.

- The United States government developed 11 criteria needed to quantify the amount of CO2 stored during EOR and Occidental was the first company to develop a plan for implementing these criteria at our Denver Unit EOR operation in west Texas. This Monitoring, Verification, and Reporting plan or MRV plan relies heavily upon the techniques Occidental already uses to operate our floods. Therefore, the implementation of the plan is require a modest amount of additional reporting and record keeping but little else.
- Occidental worked closely and in a collaborative with EPA staff to develop this plan and our recently approved MRV plan for our EOR operation in Hobbs, New Mexico. These plans provide a credible and transparent framework for reporting the amount of CO2 stored during our operations and enable those who capture their CO2 access to federal tax incentives which promote more CO2 capture.
- Oxy supports bills like the FUTURE ACT (S. 1535) and The Carbon Capture Act (H.R. 3761) that incentivize the capture and transport of CO2 emissions from coal and gas fired power plants and other industrial sources like refineries, cement kilns and ethanol plants for use in EOR and other applications like manufacturing fuels or plastics.
- These policies will increase oil recovery in existing fields where the oil would otherwise be left in place. As described by the International Energy Agency (IEA), this oil has a lower carbon footprint than conventionally produced oil due to the storage of CO2 in the process.
- And we know that there are opportunities to increase oil production using EOR all over the United States. Here's a link to the
- Better yet, these policies encourages growth in domestic energy production and the building of infrastructure both of which create good, high paying jobs, promotes energy independence and security while creating a proven opportunity for safely and securely reducing CO2 emissions.

Thank you and please let me know if you have any questions or if you'd like more information.

Sincerely,

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