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## Challenges and Analytic Opportunities Associated with the Concept of Net Carbon Negative Oil

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Carbon capture and storage (CCS) with enhanced oil recovery (CO<sub>2</sub>-EOR) has grown in importance in terms of its role towards achieving deep emissions reductions (especially for 450 ppm concentrations or below). Increasingly, CO<sub>2</sub>-EOR appears to be an important early deployment action for Carbon Capture and Storage because it provides additional financing and cost reductions through deployment. In addition, carbon removal and “negative emissions” technology underpin analyses around atmospheric GHG stabilization.<sup>1</sup> This is in part because hydrocarbons and liquid fuels remain a difficult part of the system to decarbonize.

Net carbon negative oil (NCNO) is oil which has CO<sub>2</sub> emission to the atmosphere when burned or otherwise used, that is less than the amount of CO<sub>2</sub> permanently stored in the reservoir. On a simple mass-basis focused on the CO<sub>2</sub>-EOR field alone, authors have estimated that these systems are close to carbon neutral.<sup>2,3,4,5</sup> Other authors and experts have suggested that more carbon could be injected and stored during EOR, and potentially produce “negative” carbon oil.<sup>6,7,8</sup> Carbon negative oil has also been described in the context of CO<sub>2</sub>-EOR with CO<sub>2</sub> from ethanol production.<sup>9</sup> And Zeman and Keith proposed combining EOR and/or fuel synthesis from CO<sub>2</sub> with atmospheric CO<sub>2</sub> scrubbing for carbon neutral hydrocarbons.<sup>10</sup> Additional analysis and framing is needed to provide decision makers with appropriate information that could lead to investment or policy recommendations. The presentation will include a review of the context under which net carbon negative oil can be achieved, the policies under which this becomes important and recommendations for additional analysis that is required.

### References:

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