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Abstract

Carbon intensity (CI) of oil and gas production varies widely across global oil plays. Life cycle extraction from some unconventional plays (e.g. tar sands) have some of the highest CIs but even many North American shale plays have relative high carbon intensity. Flaring and venting of associated or non-associated natural gas and methane dramatically increase CI. This paper applies peer-reviewed processes across most major oil fields and compares these, discussing the particularly high and low values. Ways to lower the carbon intensity in both areas are discussed.

Applied globally, OPGEE estimates show highest values in areas with extensive flaring of natural gas and very heavy crude oils - heavy oils require large energy inputs (e.g. steam flooding) and/or the use of light hydrocarbon diluents for transportation offset. A few other major areas included for reference. Examples illustrate how OPGEE can be used to evaluate the CI of public policy actions. A sensitivity analysis to flaring volumes illustrates these impacts, and further sensitivity analyses to pad drilling and improving well performance show CI impacts associated with hydraulic fracturing.

Unconventional production, especially from light tight oil is the most significant new source of fossil fuels in the last decade. Under a wide variety of carbon constraints, oil usage will continue for many decades and increase in the near term. Operators, governments, and regulators need to be able to avoid “locking in” development of suboptimal resources and instead provide incentives for shale operators to manage resources sustainably. This approach provides quantitative measures of such actions. Oil producers must prepare by eliminating development of marginal projects, elimination of flaring and venting, optimizing hydraulic fracture treatments, using improved recovery methods (e.g. enhanced oil recovery using anthropogenic CO2), reducing energy use, and eliminating unnecessary gas waste.