2014 Crude Average CI Comment

I. Purpose:

To determine the effects of field specific carbon intensity (CI) values on multiple individual producers located within a single field.

II. Problem:

CI values for crude oil producers located in California are assigned by individual oil field; however, one particular oil field may contain multiple pools, facilities, and producers each with individual operating techniques. An individual oil field may contain some producers utilizing thermal enhanced oil recovery (TEOR) methods while other producers within the same field may not. The Oil Production Greenhouse gas Emission Estimator (OPGEE) model used for determining CI values is highly sensitive with regards to TEOR via the steam to oil ratio (SOR). Non-TEOR facilities or TEOR facilities with lower SOR ratios are being categorized with less efficient TEOR facilities with high SOR ratios.

III. Procedure:

The OPGEE v1.1 Draft D (ODD) and baseline input parameters were first obtained from the Air Resources Board (ARB). A sensitivity test was conducted to determine key variables. Identical monthly production reports utilized for determining CI values were obtained from the Department of Conservation's Division of Oil, Gas, & Geothermal Resources (DOGGR). A field (Field X) utilizing TEOR and containing 34 producers per DOGGR was selected. All ARB baseline data was entered into ODD for Field X to replicate baseline CI values for production years (PY) 2010 to 2014. TEOR Producer A was selected within Field X and modeled individually using ODD to determine CI values for PY 2010 to 2014. A comparison of Producer A and Field X was conducted and all variables were held constant except the SOR, water cut (WOR), and production (OIL).

IV. Assumptions:

- CI values were modeled using ODD
- Oil production, water production, and steam injection volumes are derived from DOGGR's monthly production reports.
- OIL, WOR, and SOR are sensitive parameters and therefor other variables can be held constant.

V. Results

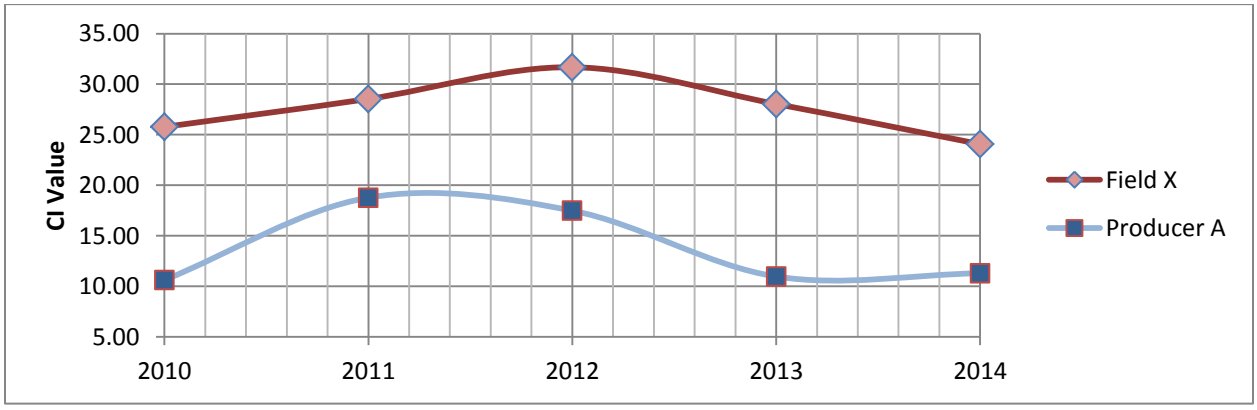
Field	Oil bbl	Oil bbl/d	Water bbl	Water bbl/d	WOR	Stm bbl	Stm bbl/d	SOR	CI Value
Field X Total 2010	2,486,338	6,812	129,366,079	354,428	52	8,435,597	23,111	3.39	25.77
Producer A 2010	1,019,880	2,794	93,232,657	255,432	91	33,376	91	0.03	10.61
Ratio	41%		72%						
Field X Total 2011	2,785,811	7,632	179,343,674	491,353	64	8,223,095	22,529	2.95	28.53
Producer A 2011	1,225,821	3,358	140,259,527	384,273	114	114,229	313	0.09	18.76
Ratio	44%		78%						
Field X Total 2012	2,735,033	7,493	180,833,093	495,433	66	9,546,295	26,154	3.49	31.68
Producer A 2012	1,247,650	3,418	137,696,290	377,250	110	-	-	-	17.47
Ratio	46%		76%						
Field X Total 2013	2,791,964	7,649	141,906,570	388,785	51	10,403,093	28,502	3.73	28.03
Producer A 2013	1,375,961	3,770	97,195,883	266,290	71	505,942	1,386	0.37	10.95
Ratio	49%		68%						
Field X Total 2014	3,606,689	9,881	125,840,321	344,768	35	12,612,997	34,556	3.50	24.06
Producer A 2014	2,121,519	5,812	82,867,332	227,034	39	2,453,735	6,723	1.16	11.28
Ratio	59%		66%						

Table 1: CI Value comparison between Producer A and Field X for PY 2010-2014.

Year	Field X	Producer A	Percent Difference
2010	25.77	10.61	-143%
2011	28.53	18.76	-52%
2012	31.68	17.47	-81%
2013	28.03	10.95	-156%
2014	24.06	11.28	-113%

Table 2: Percent difference of CI values between Producer A and Field X for PY 2010-2014.

Figure 1: CI Value comparison between Producer A and Field X for PY 2010-2014.



The sensitivity test indicated that in a TEOR field, the OIL, SOR, and WOR were the most significant factors in determining the CI value. Using the inputs from Table 1, Producer A produced 49% of the crude oil in field X for PY2010-2014 while only injecting 6% of the steam. Table 2 demonstrates that Producer A, if modeled individually from Field X, is consistently below Field X's assigned CI values by an average margin of 109% lower. Figure 1 is simply a visual representation of the data presented in Table 2.

VI. Summary

The data shows that there can be significant variance between the CI value assigned to a field and an individual producer located within the field, therefore facility specific consideration should be made in determining CI values.