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| **WRAP Regional Haze Planning Workgroup** |  |
| **Emissions Inventory & Modeling Protocol Subcommittee** |
| **2014 Shakeout Modeling Revisions (v2)** |
| DRAFT – 8/29/2019 |

The Regional Haze Planning Work Group Emissions Inventory and Modeling Protocol (RHPWG EI & MP) Subcommittee worked with States & Locals to update the 2014 emissions, which will be used in the final base case modeling simulations (Shakeout v2). The WRAP RHPWG EI & MP Subcommittee will also use 2014 emissions (as characterized in v2 of the base-case modeling inventory) as the “representative baseline” for point sources unless state/locals provide an update.

The [plan](http://www.wrapair2.org/pdf/WesternModelingPlan%20update%20March27_2019.pdf) for photochemical modeling includes the base case v1 and v2 (actual 2014 emissions with iterative changes/corrections), which used the 2014 NEI as the starting point. Several updates to the 2014 NEI were made for v1 shakeout modeling, as described [here](http://views.cira.colostate.edu/wiki/Attachments/2014v2_Review/WRAP%20Regional%20Haze%20SIP%20Emissions%20Inventory%20Review%20Documentation_Docket.docx). Additional changes to the 2014 base case that were made for shakeout v2 modeling are summarized below.

***2014 Base Case v1 to v2 changes:***

* California submitted a complete replacement of 2014 emissions for all anthropogenic sources.
* O&G source emissions were adjusted for selected relevant states, based on the work of the O&G workgroup (see Table 1)
* Pima County (Arizona) submitted emissions changes (see Table 2) due to incomplete data submission in shakeout v1
  + 5 non-EGU facilities to be added (87 tons NOx, 1517 tons PM10, 267 tons PM2.5, 7 tons SO2, 45 tons VOC, 203 tons CO)
  + 1 O&G facility to be added (5 tons NOx, 1 ton PM, 90 tons VOC, 17 tons CO)
  + 3 non-EGU facility datasets to be replaced
  + 1 EGU facility dataset to be replaced
* North Dakota identified 1 facility to be switched from O&G sector to non-EGU sector
* model boundary conditions changes (international anthropogenic emissions vs international natural emissions) were adjusted to account for over-predictions of sulfur and ozone
* Several updates to Montana point sources were made due to incorrectly formatted pollutant names for PM and NOx in the shakeout v1 simulations, causing 1084 tons of NOx, 2335 tons of PM10, and 438 tons of PM2.5 to be dropped from the simulations. These are fixed for v2.

See Figure 1 for the total emissions changes and Table 2 for a summary of emissions changes by sector. California emissions are excluded because they are not directly comparable to the first shakeout version.

Figure 1: Total Changes in Emissions from WRAP Shakeout v1 to v2, in tons, by state.

Table 1. Upstream Oil & Gas Emissions changes: WRAP 2014 Shakeout v1 to v2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **State** | **WRAP Shake-out Modeling v1**  **(basis is 2014 NEIv2)** | | | | | | | **WRAP O&G Working Group Emission Inventory v2 for Shake-out Modeling v2** | | | | | | **Percent Increase or Decrease (v2 from v1)** | | | | | | | | | | |
| **NOx** | **VOC** | **CO** | **SO2** | **PM10** | **PM2.5** | **NOx** | | **VOC** | **CO** | **SO2** | **PM10** | **PM2.5** | **NOx** | **VOC** | | **CO** | **SO2** | | | **PM10** | | **PM2.5** | |
| CO | 58,031 | 107,231 | 48,784 | 522 | 1,889 | 1,846 | 65,985 | | 189,113 | 56,710 | 710 | 1,929 | 1,929 | 14% | 76% | | 16% | 36% | | | 2% | | 4% | |
| MT | 5,828 | 50,965 | 5,255 | 293 | 233 | 178 | 5,933 | | 50,995 | 5,448 | 288 | 175 | 175 | 2% | 0% | | 4% | -2% | | | -25% | | -2% | |
| NM | 54,253 | 178,156 | 58,683 | 7,355 | 1,014 | 1,004 | 76,288 | | 210,988 | 100,303 | 12,665 | 2,130 | 2,130 | 41% | 18% | | 71% | 72% | | | 110% | | 112% | |
| ND\* | 40,947 | 475,624 | 30,253 | 7,660 | 2,234 | 2,100 | 39,365 | | 478,167 | 32,000 | 3,847 | 1,325 | 1,325 | -4% | 1% | | 6% | -50% | | | -41% | | -37% | |
| SD | 652 | 2,914 | 362 | 13 | 75 | 75 | 693 | | 3,090 | 496 | 13 | 77 | 77 | 6% | 6% | | 37% | 0% | | | 2% | | 2% | |
| UT | 17,598 | 112,280 | 14,245 | 595 | 780 | 759 | 16,379 | | 112,485 | 14,145 | 586 | 706 | 706 | -7% | 0% | | -1% | -2% | | | -10% | | -7% | |
| WY | 32,632 | 216,127 | 19,432 | 7,542 | 1,343 | 1,204 | 46,171 | | 264,821 | 21,384 | 6,888 | 1,276 | 1,276 | 41% | 23% | | 10% | -9% | | | -5% | | 6% | |
| \* The Great Plains Synfuels Plant (coal gasification facility in North Dakota) will be moved from the O&G point source emission inventory to the point non-EGU emission inventory in WRAP Shakeout v2 modeling because it was incorrectly included in the WRAP v1 modeling as an O&G emission inventory source. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | Highlighted states have indicated that the WRAP O&G Working Group Emission Inventory v2 should be used in the Shakeout Modeling v2. Other upstream O&G emissions will be the same v1 to v2, except California. | | | | | | | | | | | | | | |  | | |  |  | |  | |  |

Table 2. Emissions changes by sector in tons: WRAP 2014 Shakeout v1 to v2 (California not included)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sector | State | CO | NH3 | NOX | PM2.5 | PMC | SO2 | VOC |
| ptegu | Montana | 0 | 0 | 5 | 1 | 0 | 0 | 0 |
| ptegu | Arizona | 206 | 0 | 1,332 | 90 | 0 | 1,092 | 24 |
| ptnonipm | Montana | 0 | 0 | 2,524 | 428 | 1,909 | 0 | 0 |
| ptnonipm | Arizona | 554 | 0 | 186 | 474 | 1,876 | 42 | 110 |
| ptnonipm | North Dakota | 2,231 | 971 | 3,235 | 830 | 106 | 3,818 | 862 |
| np\_oilgas | Montana | 220 | 0 | -94 | -3 | -2 | 0 | 158 |
| np\_oilgas | New Mexico | 27,578 | 0 | 8,238 | 804 | -5 | 3,056 | 19,886 |
| np\_oilgas | North Dakota | 3,743 | 0 | 1,056 | 43 | -29 | 0 | 2,765 |
| np\_oilgas | Utah | -11,937 | 0 | -13,497 | -567 | -20 | -49 | -84,128 |
| np\_oilgas | Wyoming | -6 | 0 | 10,689 | -106 | -93 | -674 | 40,034 |
| pt\_oilgas | Montana | -27 | 0 | 195 | 0 | -52 | -4 | -127 |
| pt\_oilgas | New Mexico | 14,042 | 0 | 13,797 | 323 | -5 | 2,254 | 12,946 |
| pt\_oilgas | North Dakota | -1,996 | -971 | -2,647 | -819 | -106 | -3,812 | -227 |
| pt\_oilgas | Utah | 11,836 | -9 | 12,276 | 513 | -2 | 40 | 84,332 |
| pt\_oilgas | Wyoming | 1,958 | -17 | 2,846 | 179 | -45 | 20 | 8,661 |