Flaring and Venting Statistics, by District

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Outline

1. Scope and Scale of emissions in New Mexico
2. Data and Assumptions
3. Flaring Data
4. Venting Data
5. Any relationships to levels and types of development that can be determined from the data?
6. What further data or analyses would be useful?

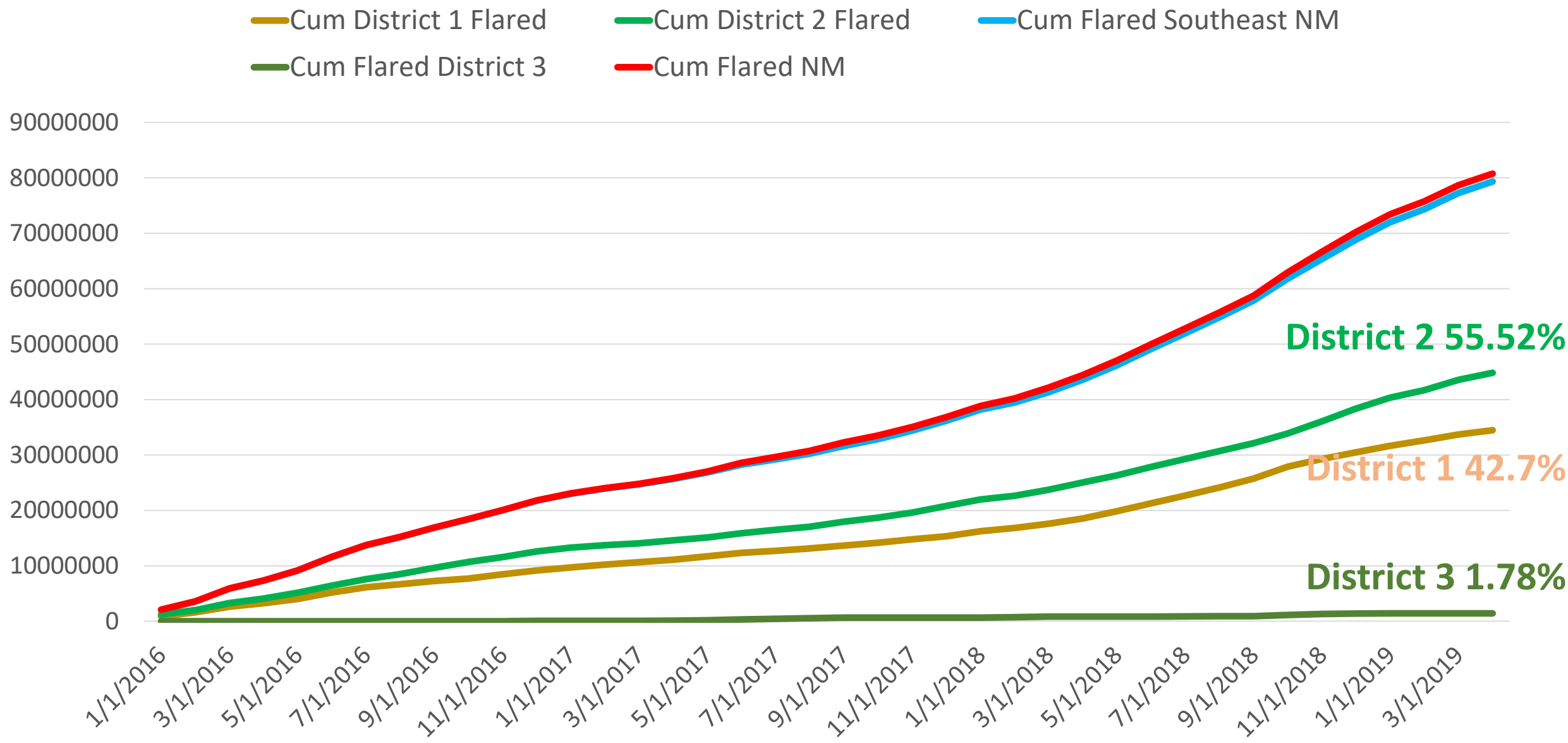
Scope and Scale

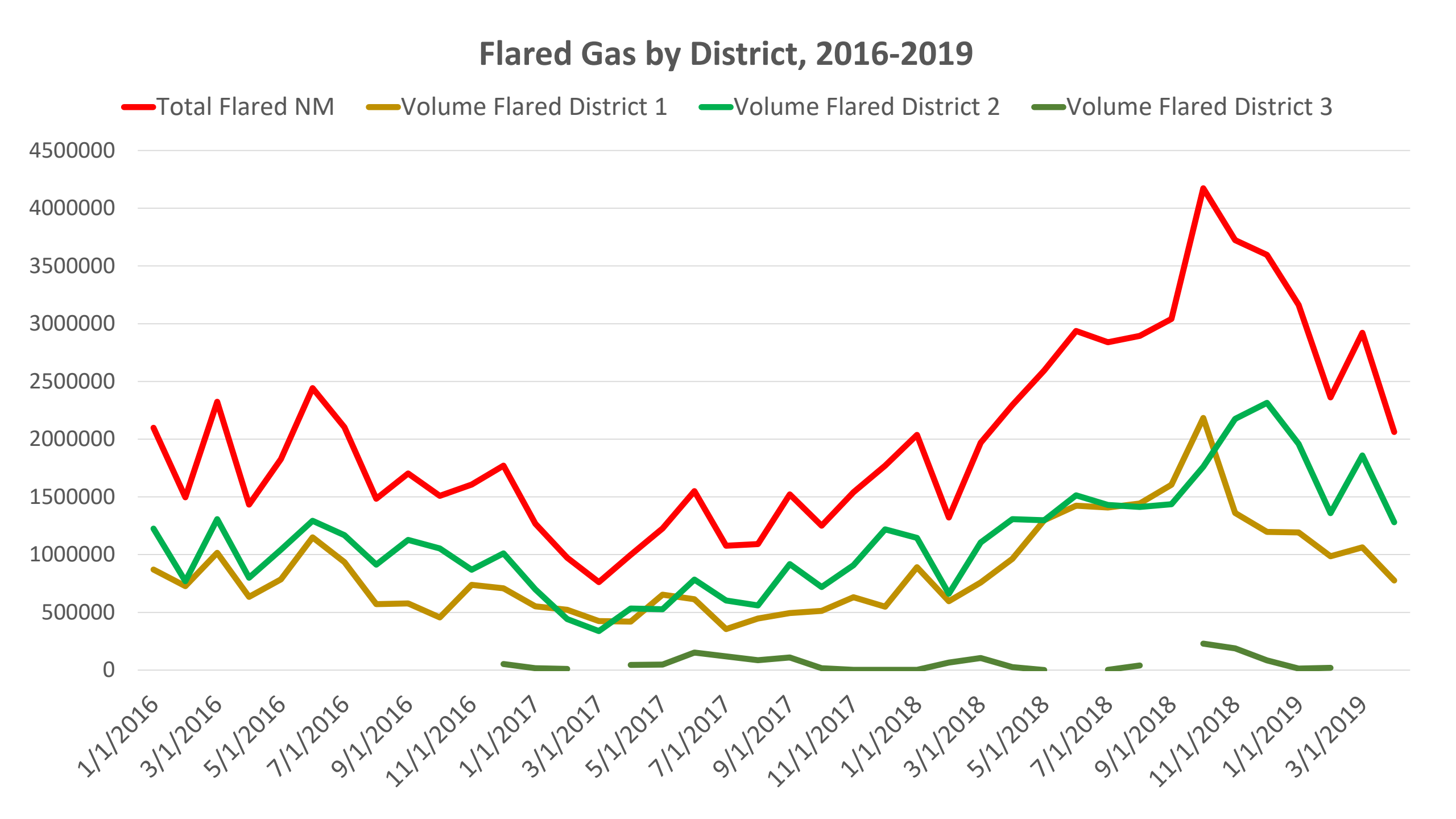
- Would like to determine within an order of magnitude the amounts of methane vented and flared over a representative time period
- Would like to measure the relative impacts of those losses
  - Economics
  - Green House Gases
- Would like to determine if there are any broad trends in the data
  - Where are the emissions occurring
  - Regional variations
  - Any relationship to activity

Data and Assumptions

- Data is from OCD website and is compiled from C-115 data
- Covers period from January 1, 2016 through April 30, 2019
- Assumption: Data is likely incomplete as it is only events requiring a C-115
- Assumption: Data is representative of current trends and order of magnitude, though likely not an exact accounting
- Gas Flared generates 53.07 Kg CO_2 per Mcf of natural gas burned (EIA)
- Methane efficiency as a green house gas is much higher than CO_2, even with a much shorter residence time in the atmosphere it is considered more impactful than CO_2
  - 28-36 times as efficient as CO_2 over a 100 year period (EPA)
  - Note methane residence time is 10 years, CO_2 around 1000 years

Cumulative Flared Gas



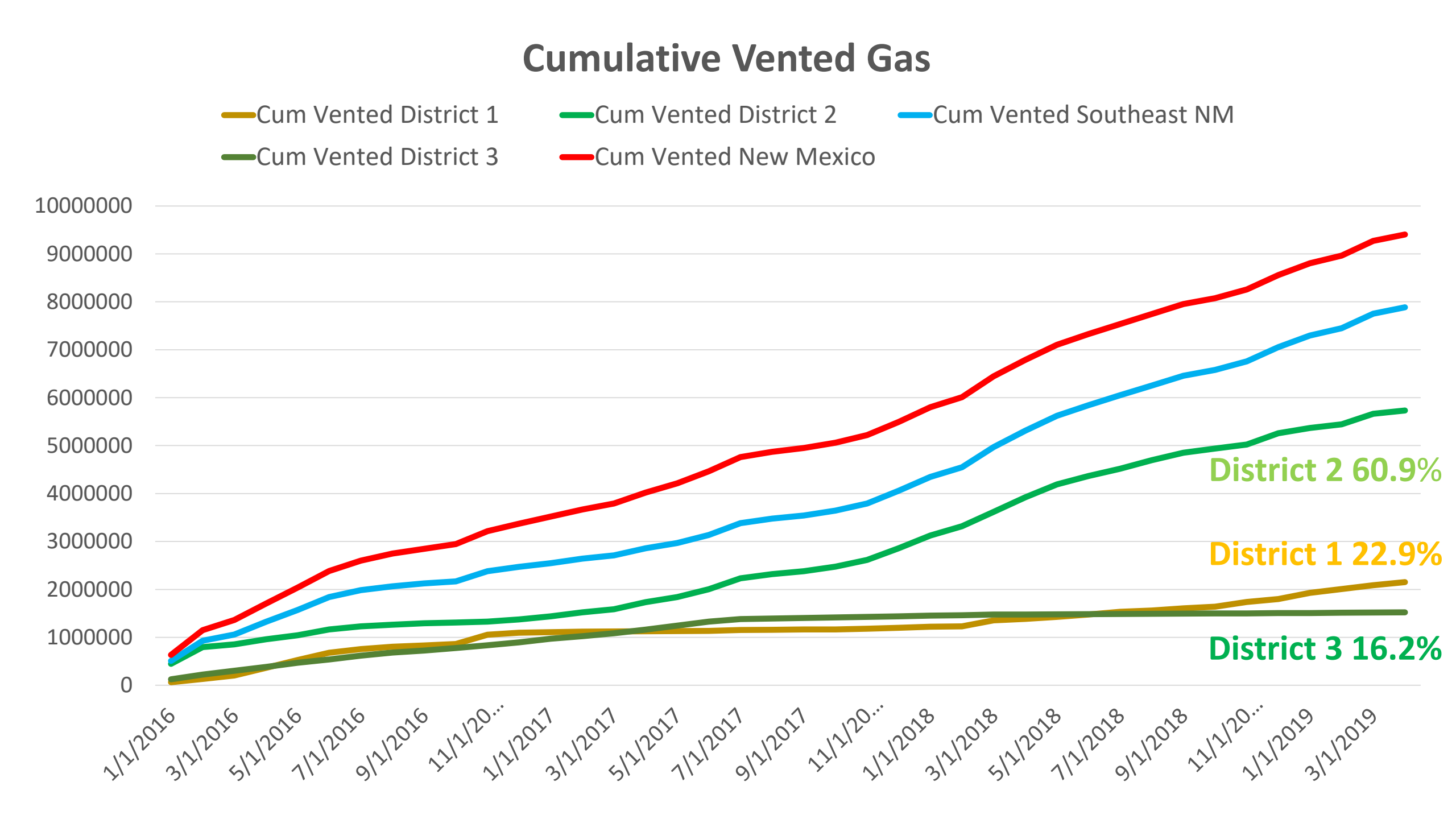

Flared Gas by District, 2016-2019
Total Flared NM
Volume Flared District 1
Volume Flared District 2
Volume Flared District 3
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
1/1/2016
3/1/2016
5/1/2016
7/1/2016
9/1/2016
11/1/2016
1/1/2017
3/1/2017
5/1/2017
7/1/2017
9/1/2017
11/1/2017
1/1/2018
3/1/2018
5/1/2018
7/1/2018
9/1/2018
11/1/2018
1/1/2019
3/1/2019

CO_2 emitted from Flared gas 2016-2019

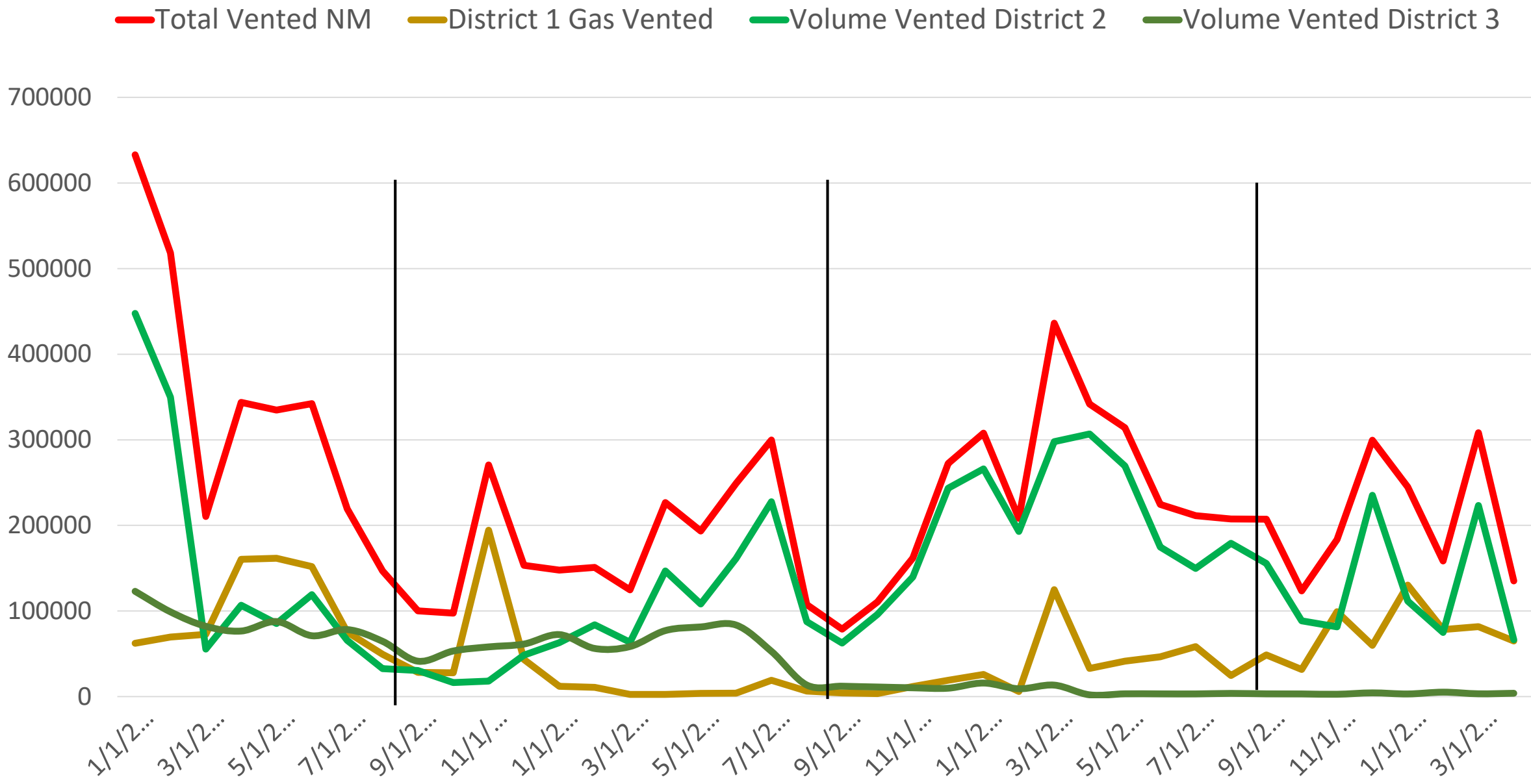
- 53.07 Kg CO_2 per 1 mcf of methane burned
- 80,757,756 mcf cumulative flared
- Cumulative CO2 generated from Flared methane:

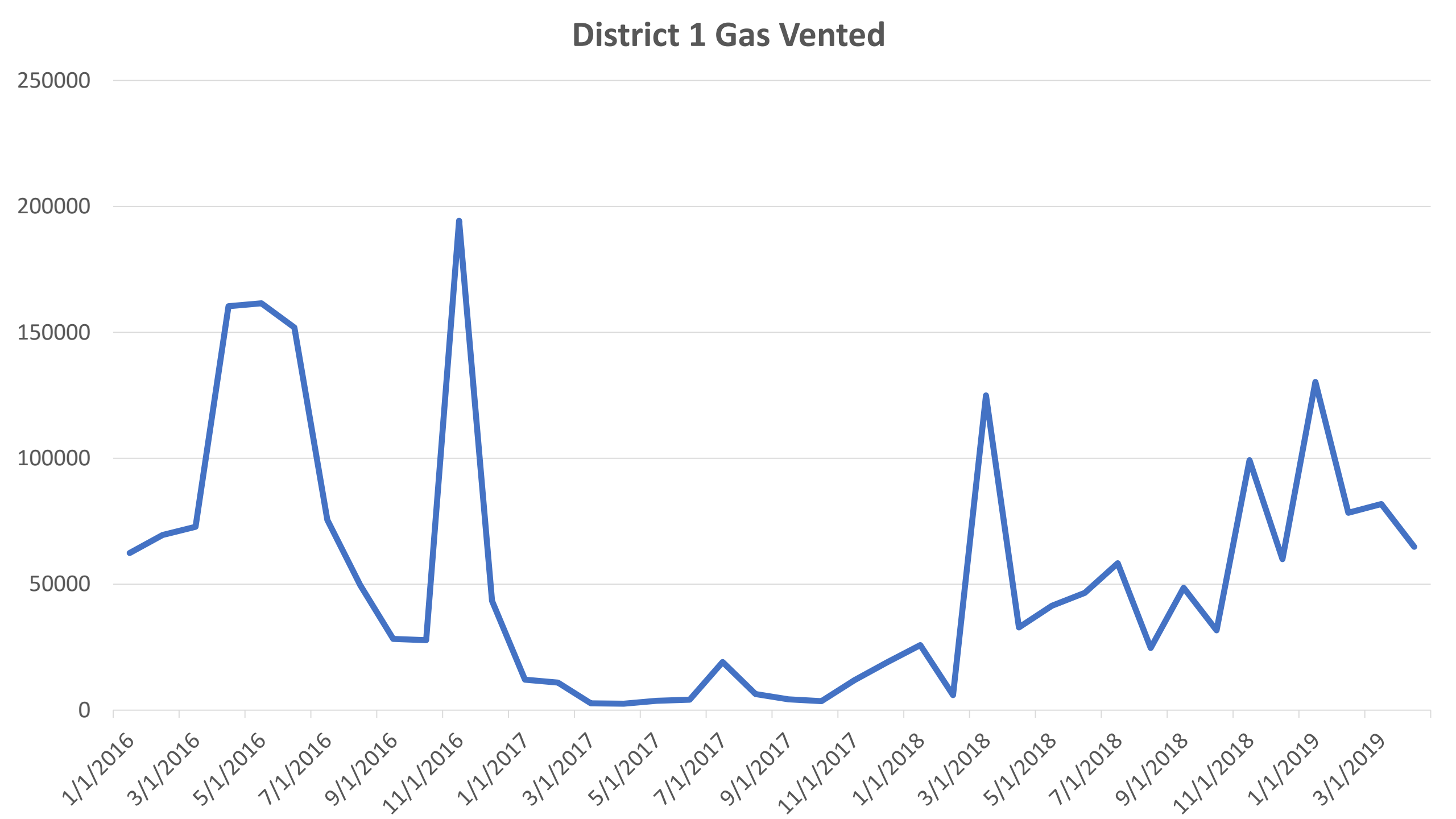
- **4,286,0 metric tonnes CO_2 generated from Flaring in 3.33 years**
- **Or 1.287 Million metric tonnes per year**

Note: 1GW of coal power plant generates about 6.3 million tonnes of CO_2 per year


Cumulative Vented Gas
Cum Vented District 1
Cum Vented District 2
Cum Vented Southeast NM
Cum Vented District 3
Cum Vented New Mexico
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
1/1/2016
3/1/2016
5/1/2016
7/1/2016
9/1/2016
11/1/20...
1/1/2017
3/1/2017
5/1/2017
7/1/2017
9/1/2017
11/1/20...
1/1/2018
3/1/2018
5/1/2018
7/1/2018
9/1/2018
11/1/20...
1/1/2019
3/1/2019
District 2 60.9%
District 1 22.9%
District 3 16.2%

Vented Gas by District, 2016-2019




District 1 Gas Vented
250000
200000
150000
100000
50000
0
1/1/2016
3/1/2016
5/1/2016
7/1/2016
9/1/2016
11/1/2016
1/1/2017
3/1/2017
5/1/2017
7/1/2017
9/1/2017
11/1/2017
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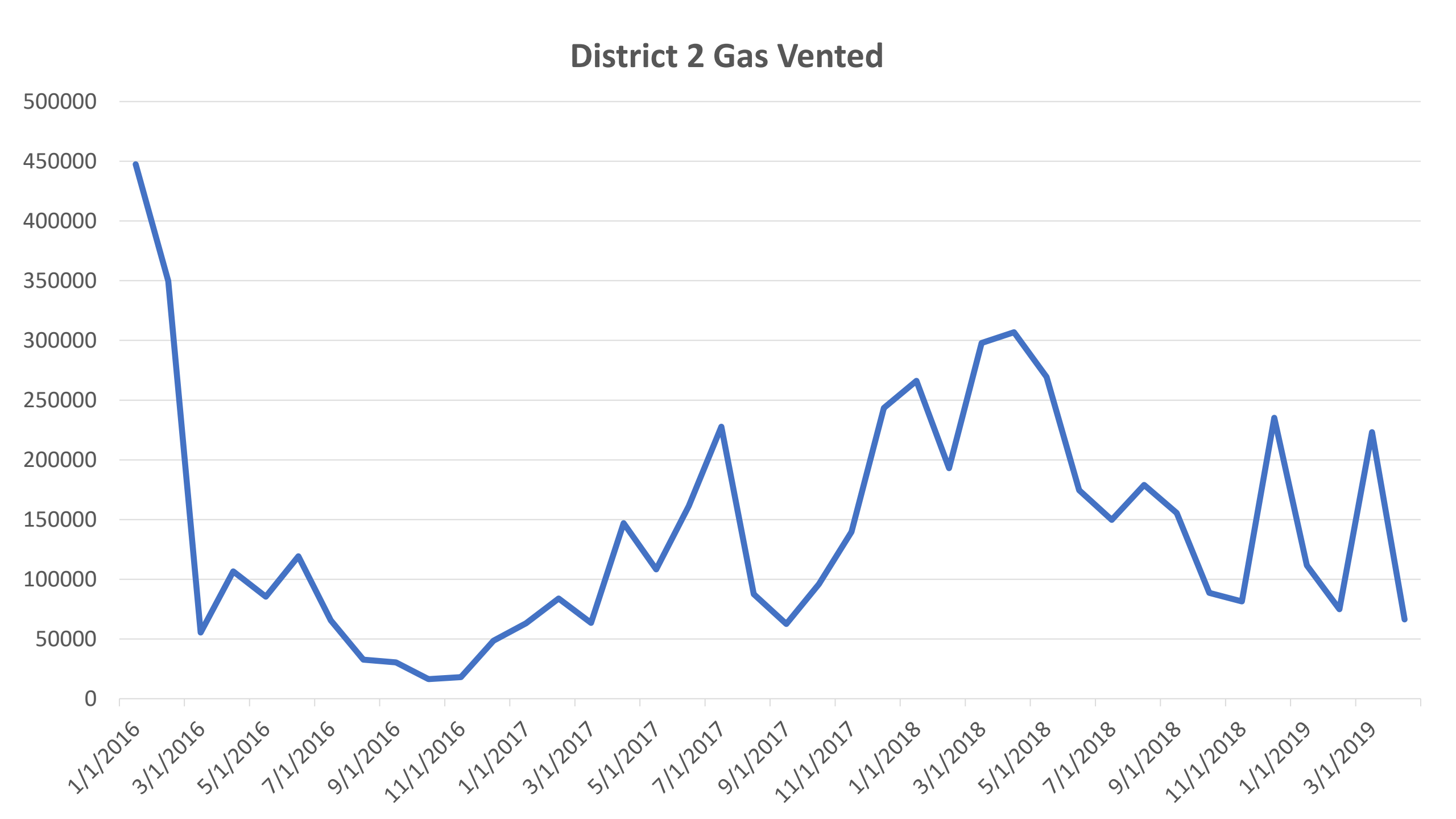
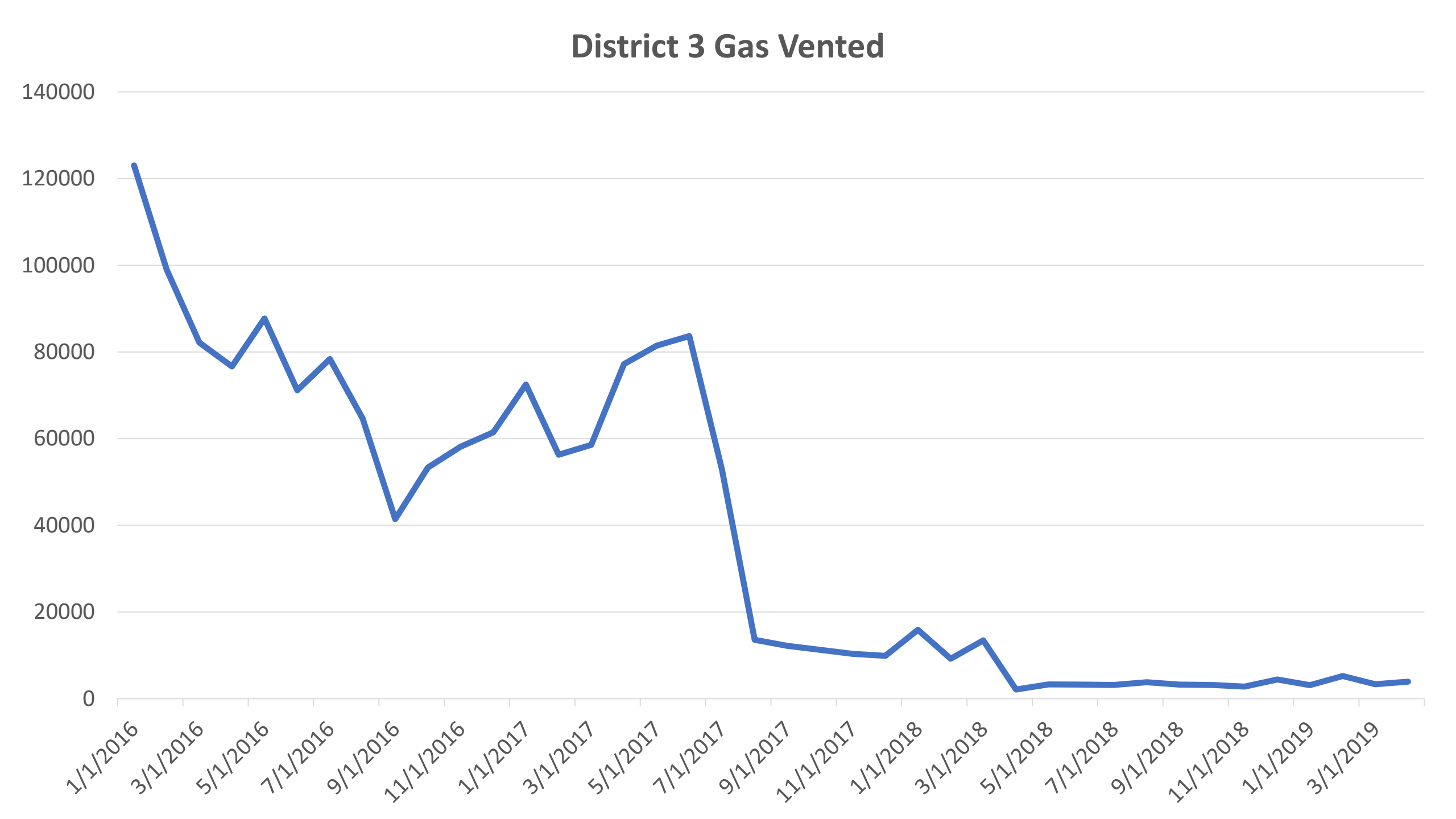
5/1/2018
7/1/2018
9/1/2018
11/1/2018
1/1/2019
3/1/2019


District 2 Gas Vented
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
1/1/2016
3/1/2016
5/1/2016
7/1/2016
9/1/2016
11/1/2016
1/1/2017
3/1/2017
5/1/2017
7/1/2017
9/1/2017
11/1/2017
1/1/2018
3/1/2018
5/1/2018
7/1/2018
9/1/2018
11/1/2018
1/1/2019
3/1/2019


District 3 Gas Vented
140000
120000
100000
80000
60000
40000
20000
0
1/1/2016
3/1/2016
5/1/2016
7/1/2016
9/1/2016
11/1/2016
1/1/2017
3/1/2017
5/1/2017
7/1/2017
9/1/2017
11/1/2017
1/1/2018
3/1/2018
5/1/2018
7/1/2018
9/1/2018
11/1/2018
1/1/2019
3/1/2019

CO_2 Equivalence of Vented Methane

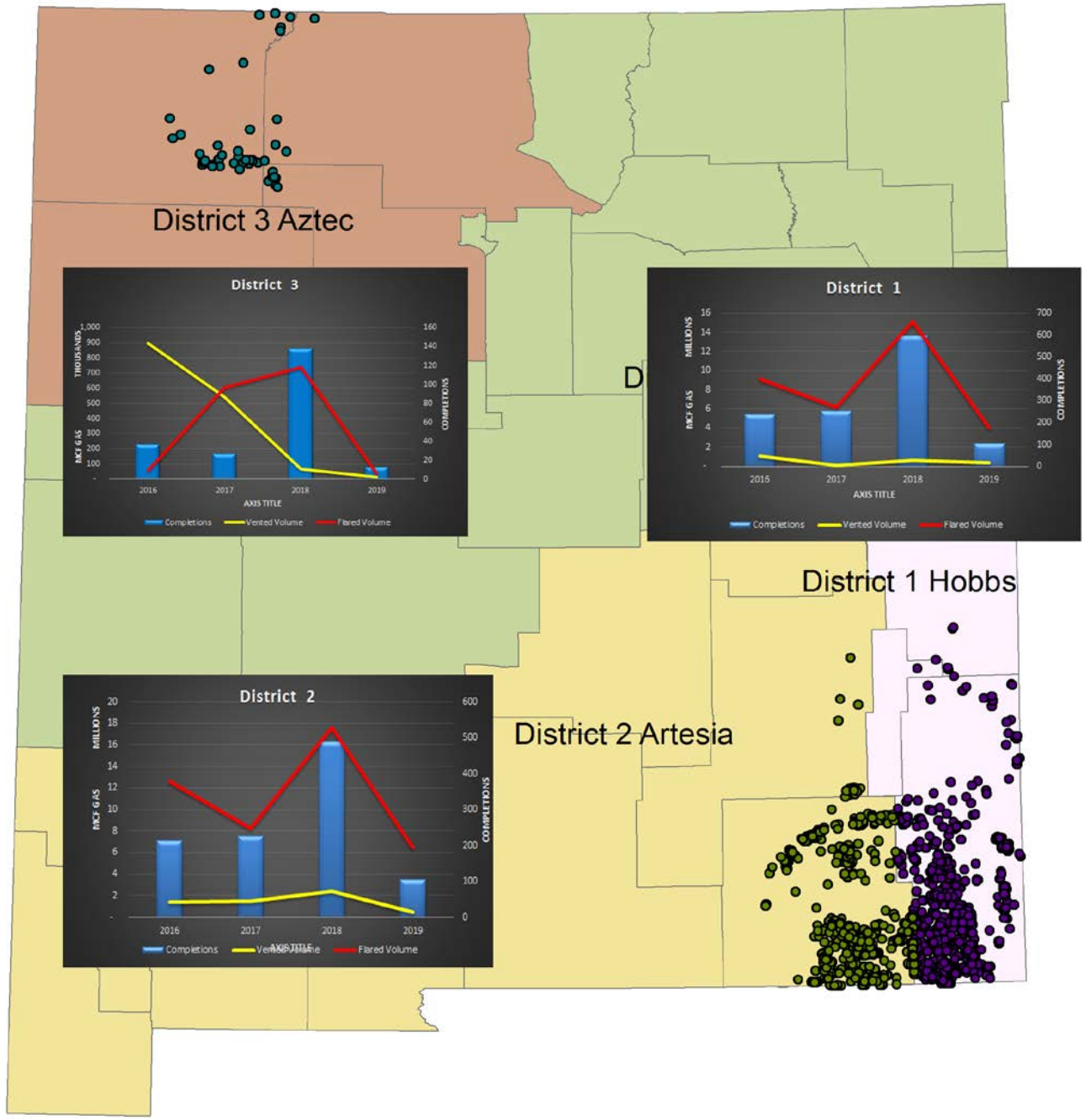
- Methane is 28-36 times more effective as a greenhouse gas than CO_2
  - Use the average value of 32 times
- ~9,405,453 mcf of vented natural gas 2016-2019 is roughly equivalent to 300,974,000 mcf of CO_2 emitted

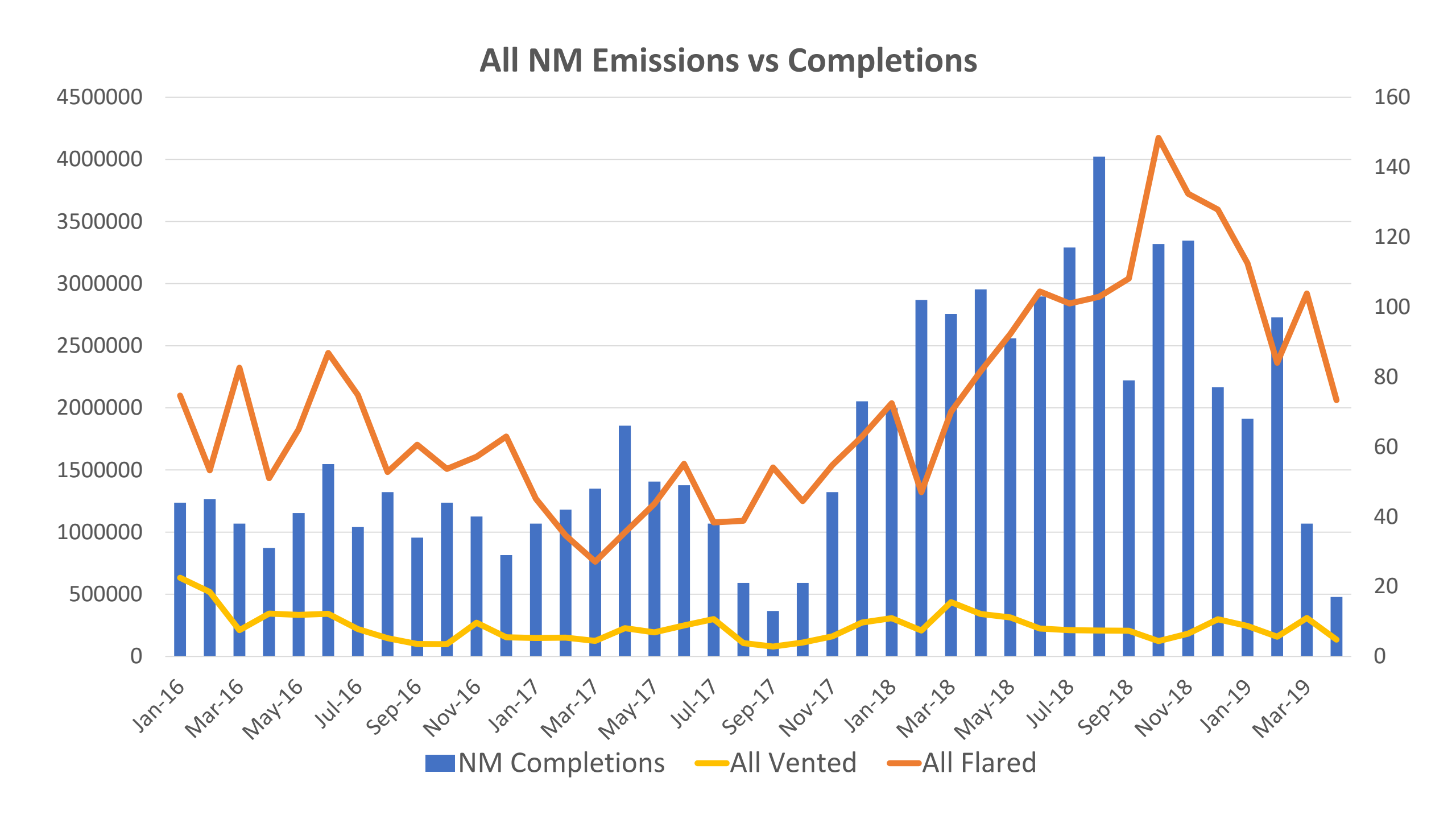
- **17.165 million metric tonnes of CO_2 equivalent generated from Venting in 3.33 years**
- **Or 5.722 Million metric tonnes per year**

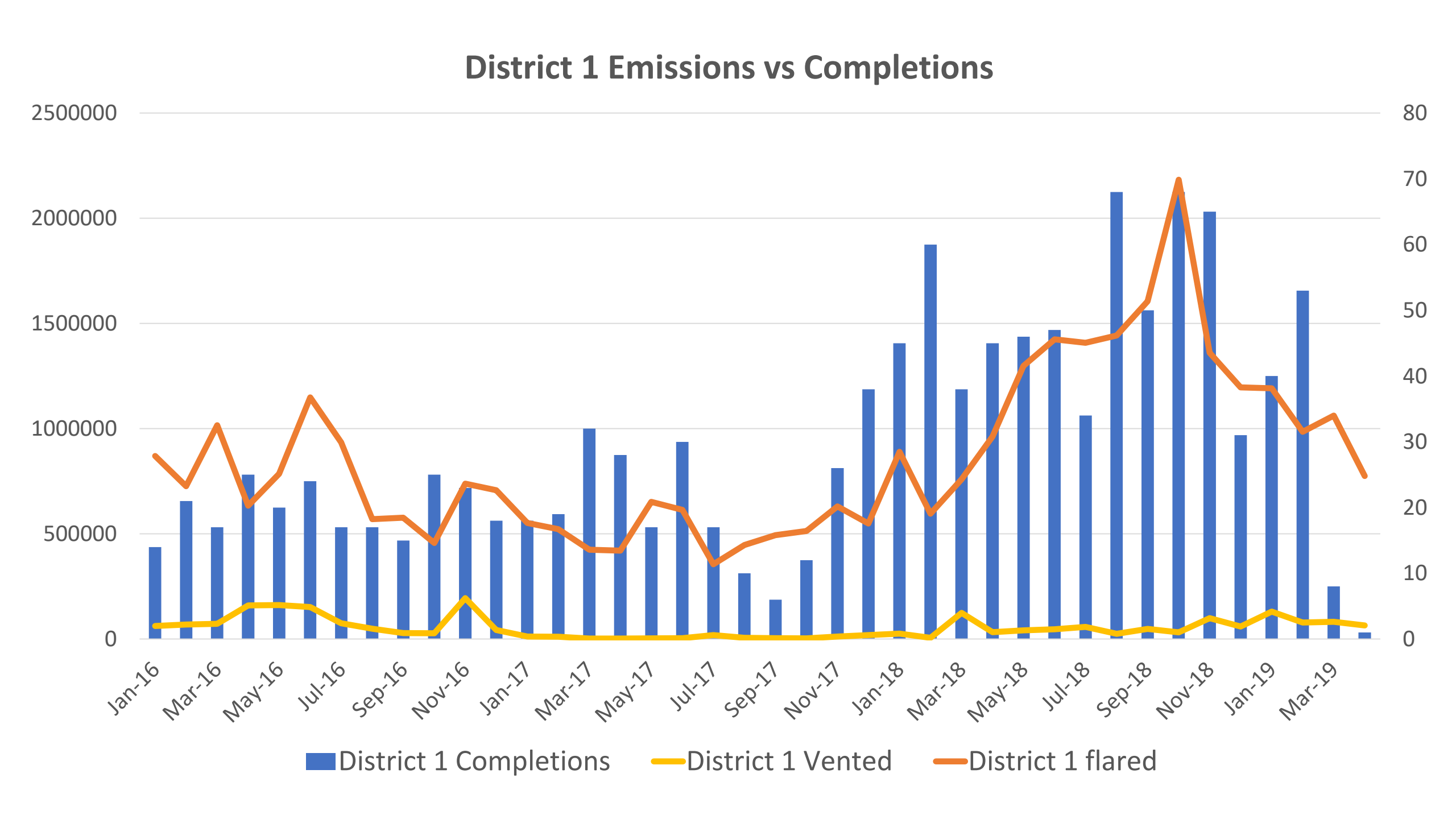
- This is about equal to a 1GW coal power plant in emissions
- Venting is a much larger source of GHG's than flared gas. If the gas were flared instead it would have generated about 150,000 tonnes of CO_2 per year

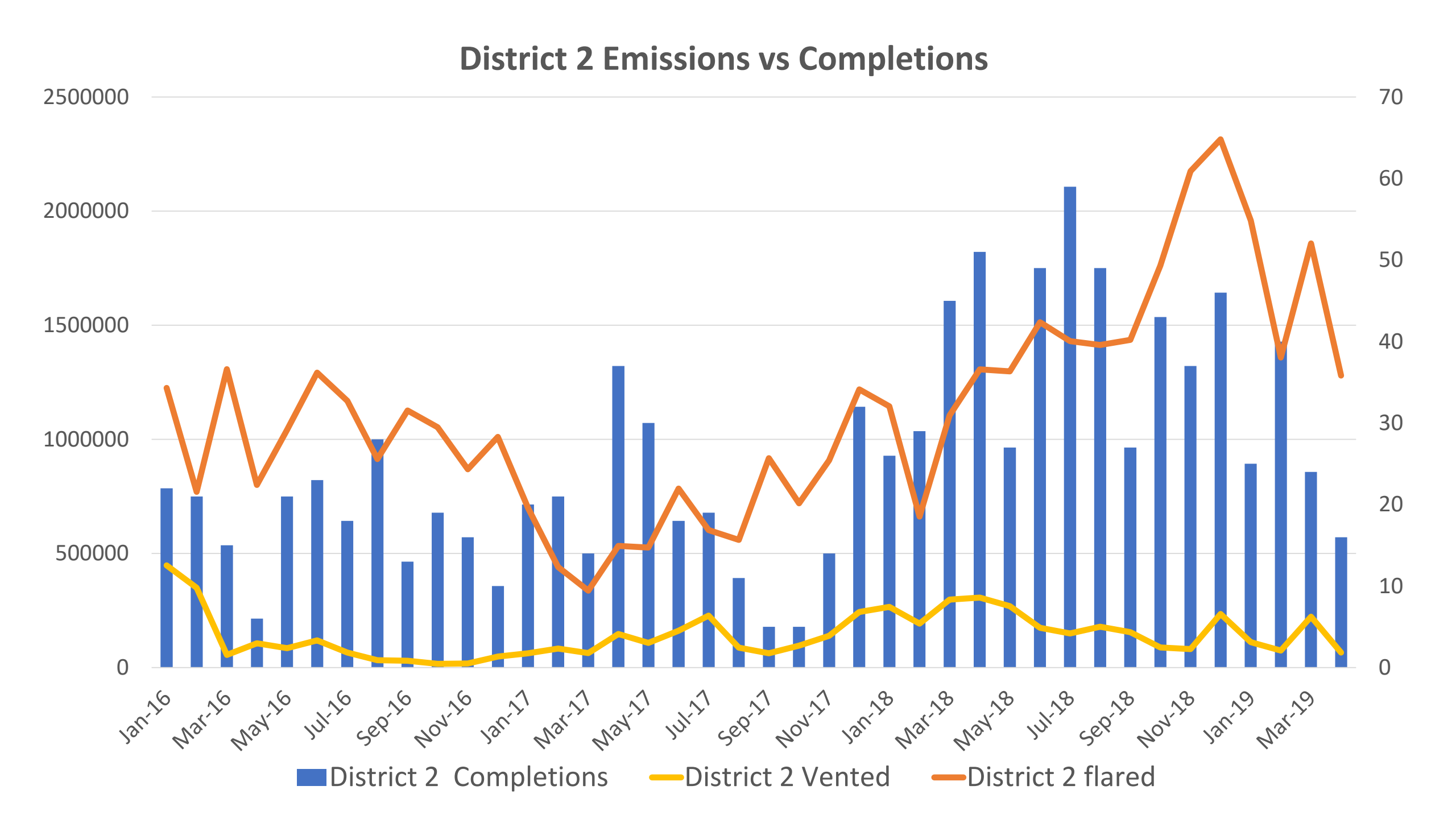
Impact of Development on Venting and Flaring

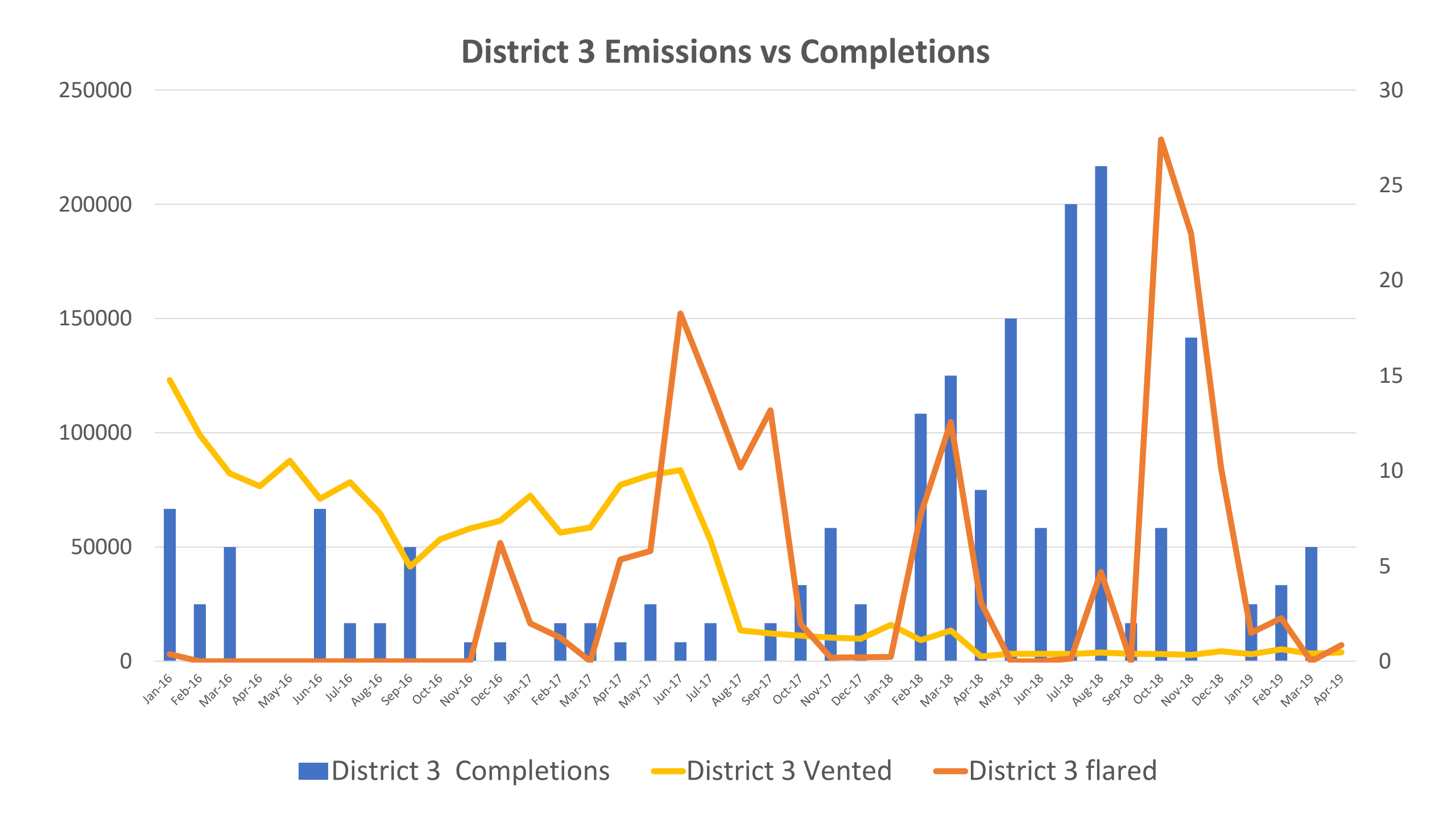
- Measured as completions by district
- Completions by month in each district plotted vs Venting and Flaring rates
- Flaring tracks development
- Venting appears unrelated




All NM Emissions vs Completions
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
160
140
120
100
80
60
40
20
0
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
NM Completions
All Vented
All Flared


District 1 Emissions vs Completions
2500000
2000000
1500000
1000000
500000
0
80
70
60
50
40
30
20
10
0
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
District 1 Completions
District 1 Vented
District 1 flared


District 2 Emissions vs Completions
2500000
2000000
1500000
1000000
500000
0
70
60
50
40
30
20
10
0
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
District 2 Completions
District 2 Vented
District 2 flared


District 3 Emissions vs Completions
250000
200000
150000
100000
50000
0
30
25
20
15
10
5
0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
District 3 Completions
District 3 Vented
District 3 flared

Observations

- This is a very high level view, so hard to draw specific conclusions, but:
- Flaring is an order of magnitude greater in gas volume than venting, but venting causes a larger greenhouse effect
- Flaring losses of value (economic impact) from gas is an order of magnitude higher than for venting
- IF GHG reduction is the goal, flaring dramatically reduces the impact of otherwise vented gas
- Venting has declined in the NW, what is different there than the SW?
- Flaring closely tied to completions in the SE, but less clearly in the NW, what is being done differently?
- There may be some seasonal variations in District 2 in venting, what could cause this?

Future Work?

- We can do more with this data set if the MAP is so inclined
- We can draw bubble maps for individual flare and venting events to determine If there are problem areas
- We could mine the C-115 data to see if particular types of processes contribute more to venting than others
- Something else?