
Enhanced Vapor Recovery



Peter Mueller – Co-Founder EcoVapor Recovery Systems

Data sources – COGCC; EcoVapor Emissions Calculator*; TCEQ; Operator Data

** Factors and calculations verified by LT Environmental*

Key Points

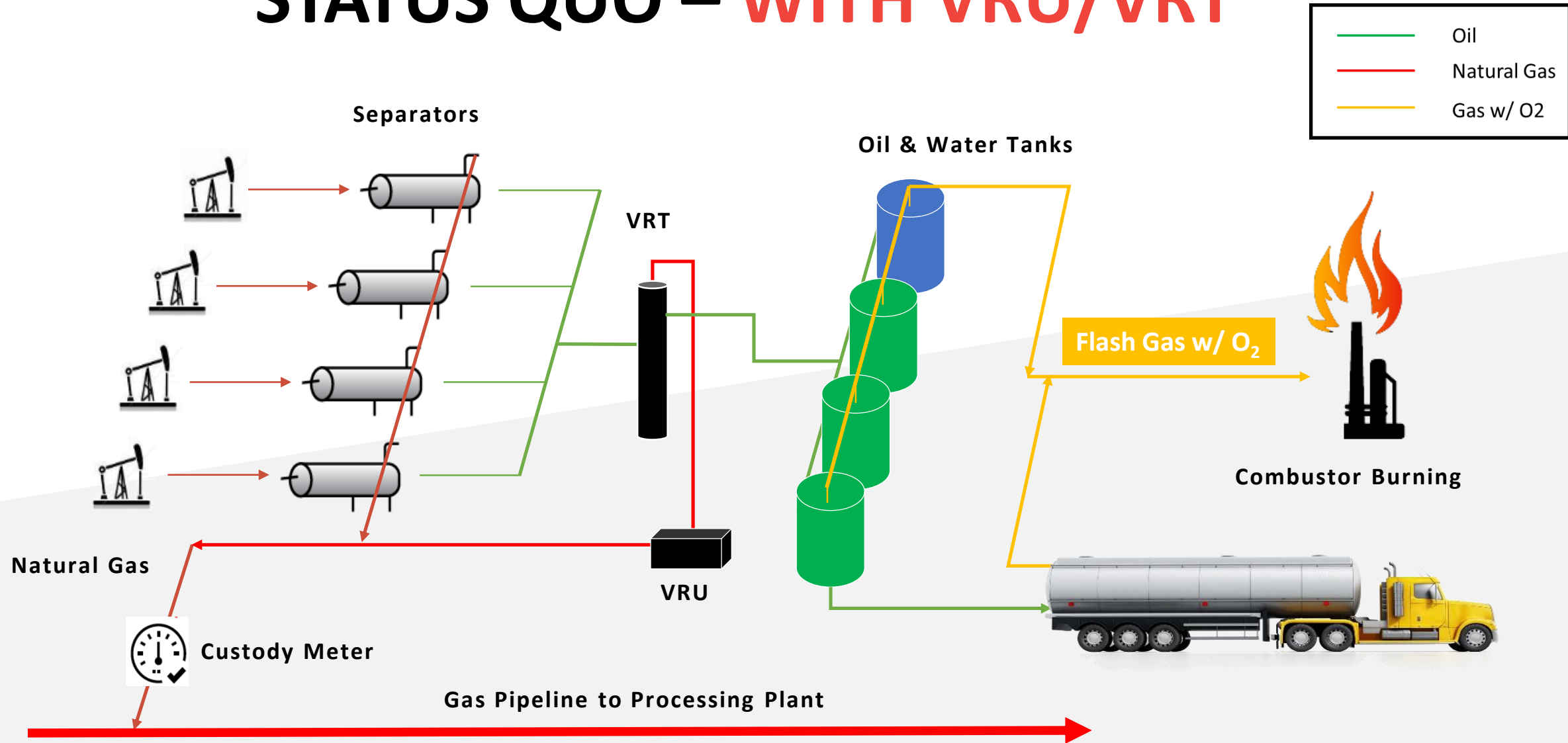
- Oil and condensate storage tanks are one of the largest sources of VOC emissions at well sites.
- Use of flares / combustors to control flash gas can be counterproductive due to waste and additional NOx emissions.
- Capturing and conditioning flash gas for sale reduces waste, VOC and NOx emissions and generates additional revenues for operators.
- Oxygen is the primary contaminant in tank flash gas. It can now be removed down to levels acceptable by all gas gatherers and pipelines.
- This oxygen removal technology is compatible with 3rd party VRUs and is significantly more effective in controlling flash gas than VRTs.
- It is now being used by majors and independent operators in most major producing basins in the US.
- Current installations are offsetting the emissions of over 2 million cars.

EcoVapor is not expecting that the MAP Team, NMED, or EMNRD endorse our technology or equipment. My goal here today is to advise what is now possible in regards to controlling and reducing emissions from flash gas from oil storage tanks.

Variables Relevant to Methane Emission Reductions

- **Volume of methane in recovered gas streams**
- **Availability of gas gathering infrastructure**
- **Proper sizing of equipment – i.e. reasonably accurate oil production and facility design/equipment information**
- **Proper operation and maintenance of interdependent equipment – i.e. VRUs**

STATUS QUO – WITH VRU/VRT



Flaring – 3.0 MMCFD



WASTE

- ~ 1200 BOPD energy equivalent
- ~ 3% to 7% of natural gas produced at site
- Fuel gas ~ 200 MCFD

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EMISSIONS

- VOC+NOx ~ 7,500 TPY
- GHGs ~ 1,090,000 TPY
- CO2e ~ 1,120,000 TPY
- Vehicle VOC equivalent ~ 560,000
- Vehicle NOx equivalents ~ 12,000

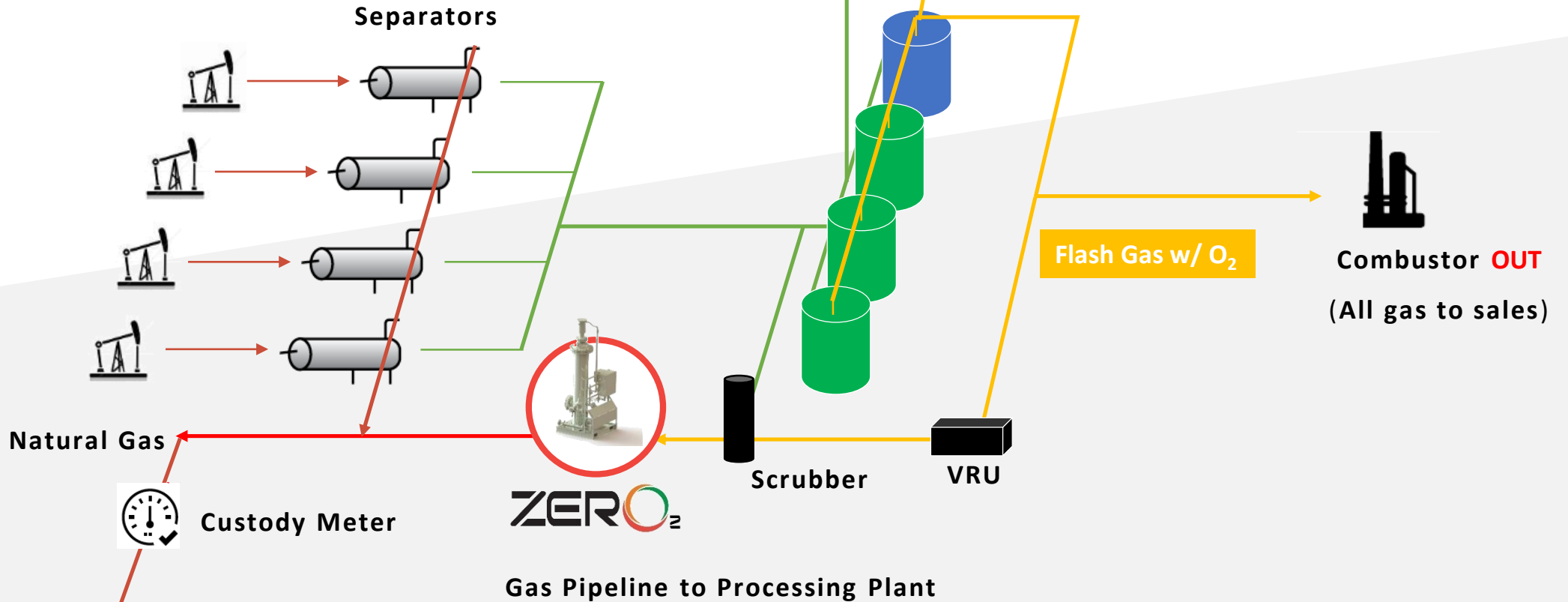
GWP/CO2e Factors	CO2:	1
	CH4:	25
	NOx:	298

Sources: Combustor vendor, EcoVapor Emissions Calculator*
NOx, VOC, and CO – API 42, Section 13, Table 13.5
GHG – CH4 and CO2 densities: 40 CFR 98 Subpart W, Section V

IDEAL SITE – Complete Vapor Capture

Zero Pad Emissions with Higher Cash Flow

Additional **CAPTURE**
(All gas to sales)



—	Oil
—	Natural Gas
—	Gas w/ O ₂

Flash Gas w/ O₂

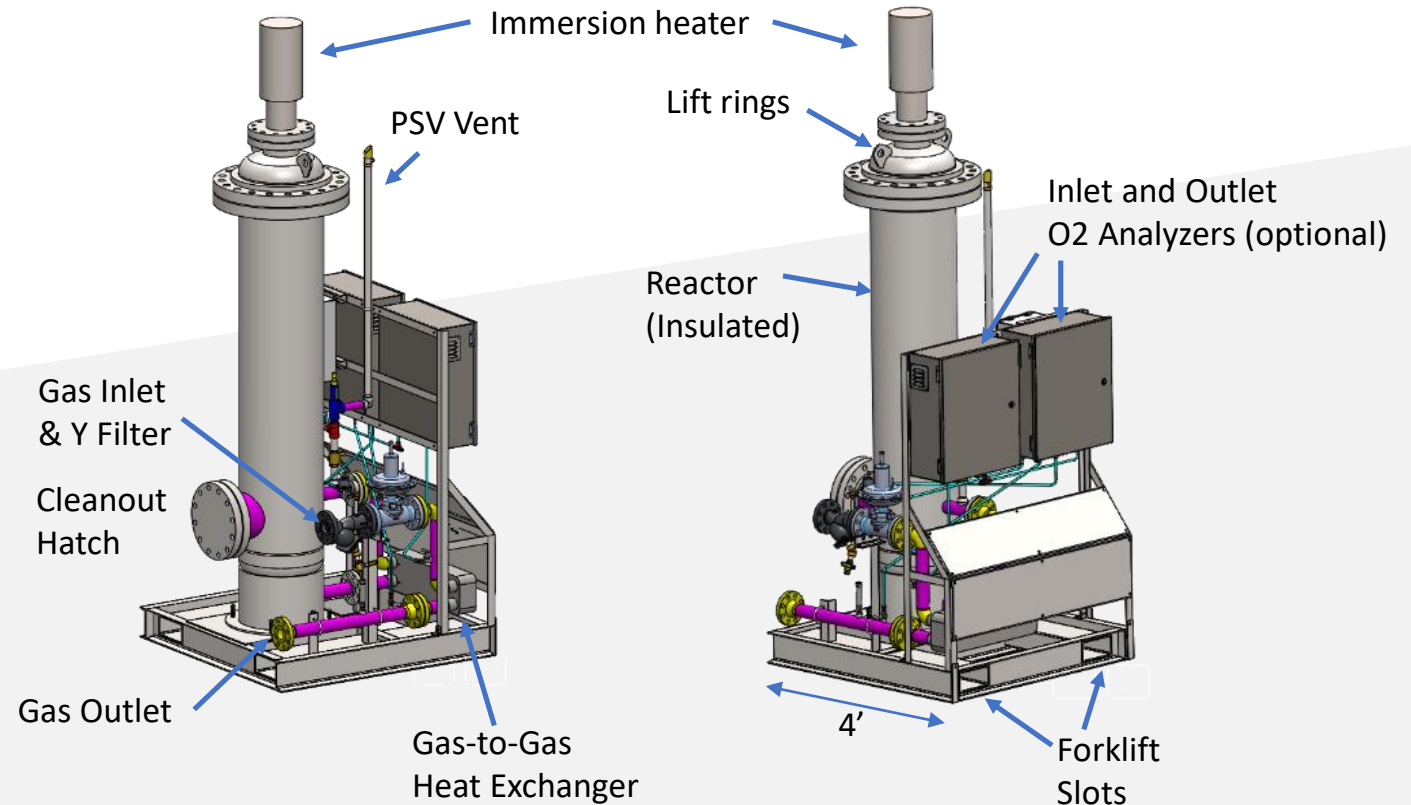
Combustor **OUT**
(All gas to sales)

ZEROO₂

Gas Pipeline to Processing Plant

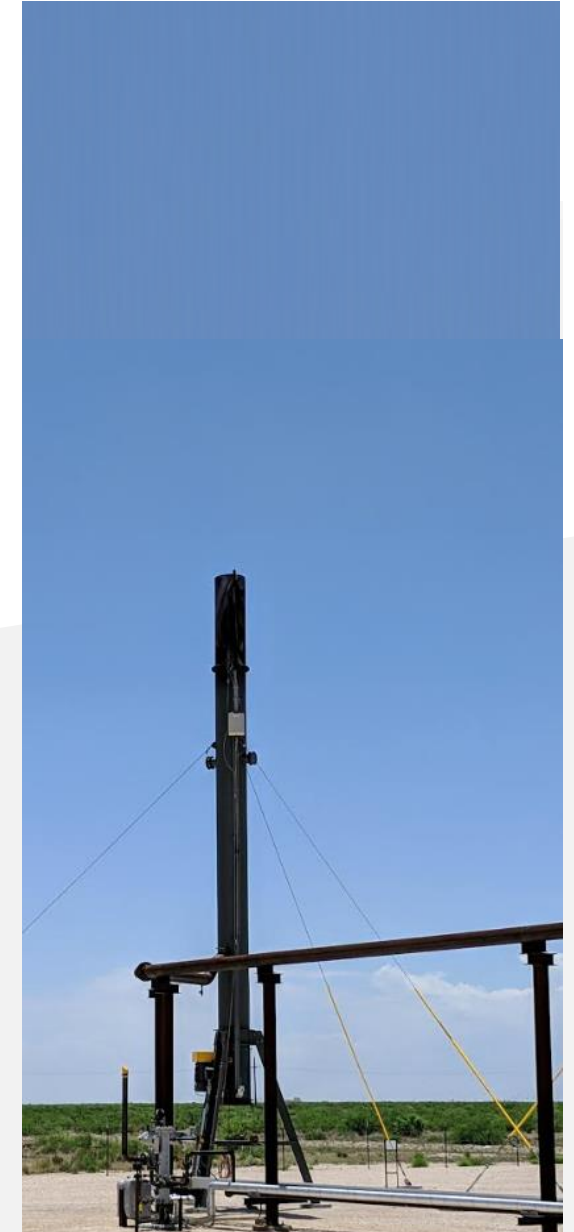
Enhanced Flash Gas Recovery System

- Patented technology removes oxygen from heated gas stream
- Straightforward installation, less than one day, **and no moving parts.**
Immediate impact
- Small footprint – 4 ft x 4 ft skid for 300 MCFD capacity system
- Minimal 480V power consumption
- Very low maintenance; **99.8% uptime**
- Remote monitoring and control included
- **300 and 1200 MCF/day** capacity sized systems available



Source: EcoVapor Machimatic System

West Texas ZerO2 E 1200s Installation 100% Gas Capture – May, 2019

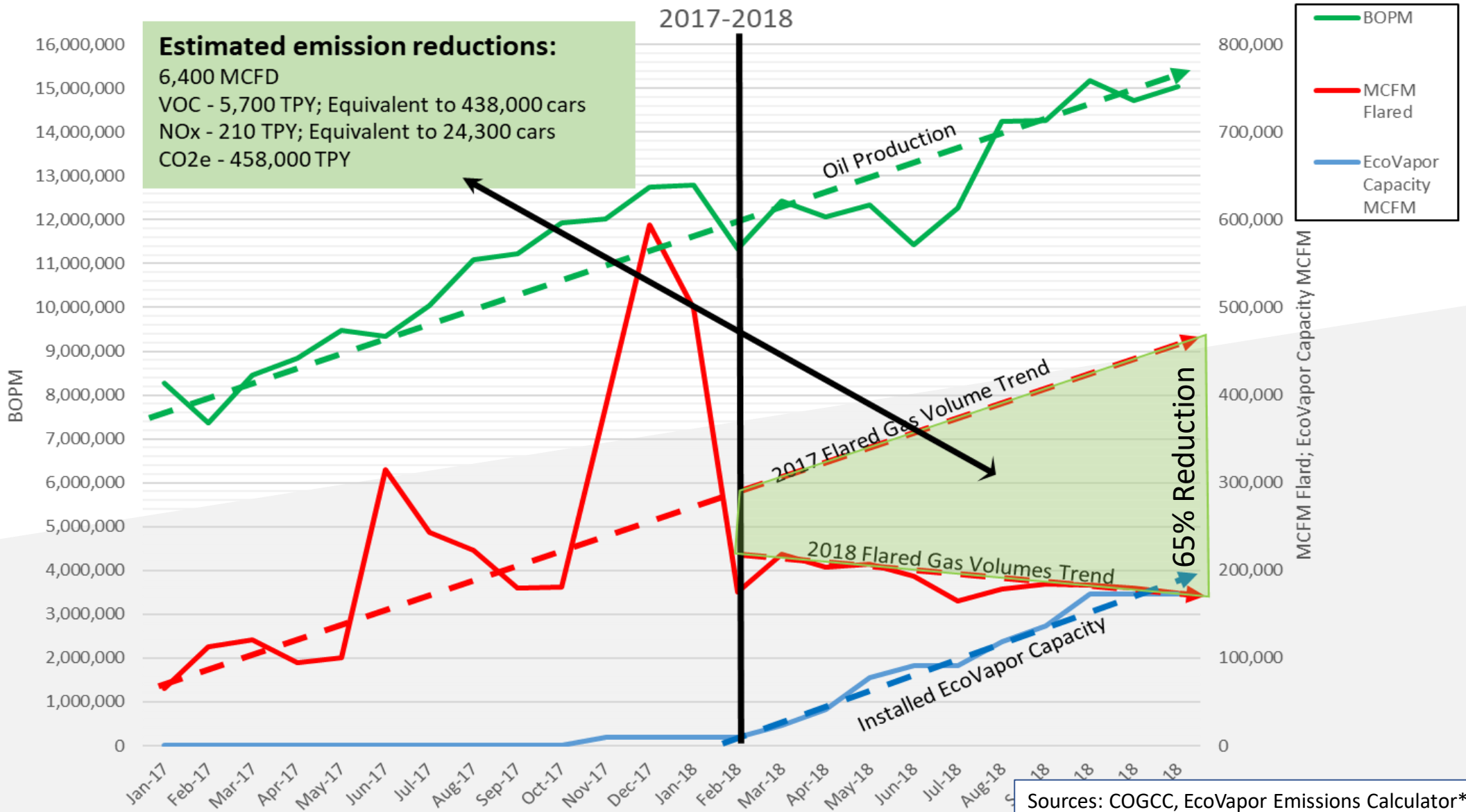


2,400 MCFD of 2500 BTU/SCF Gas
VOC Offsets = 430,000 cars
NOx Offsets = 9,100 cars

Sources: EcoVapor Emissions Calculator*
NOx, VOC, and CO – API 42, Section 13, Table 13.5
GHG – CH4 and CO2 densities: 40 CFR 98 Subpart W, Section V

DJ Basin Operator

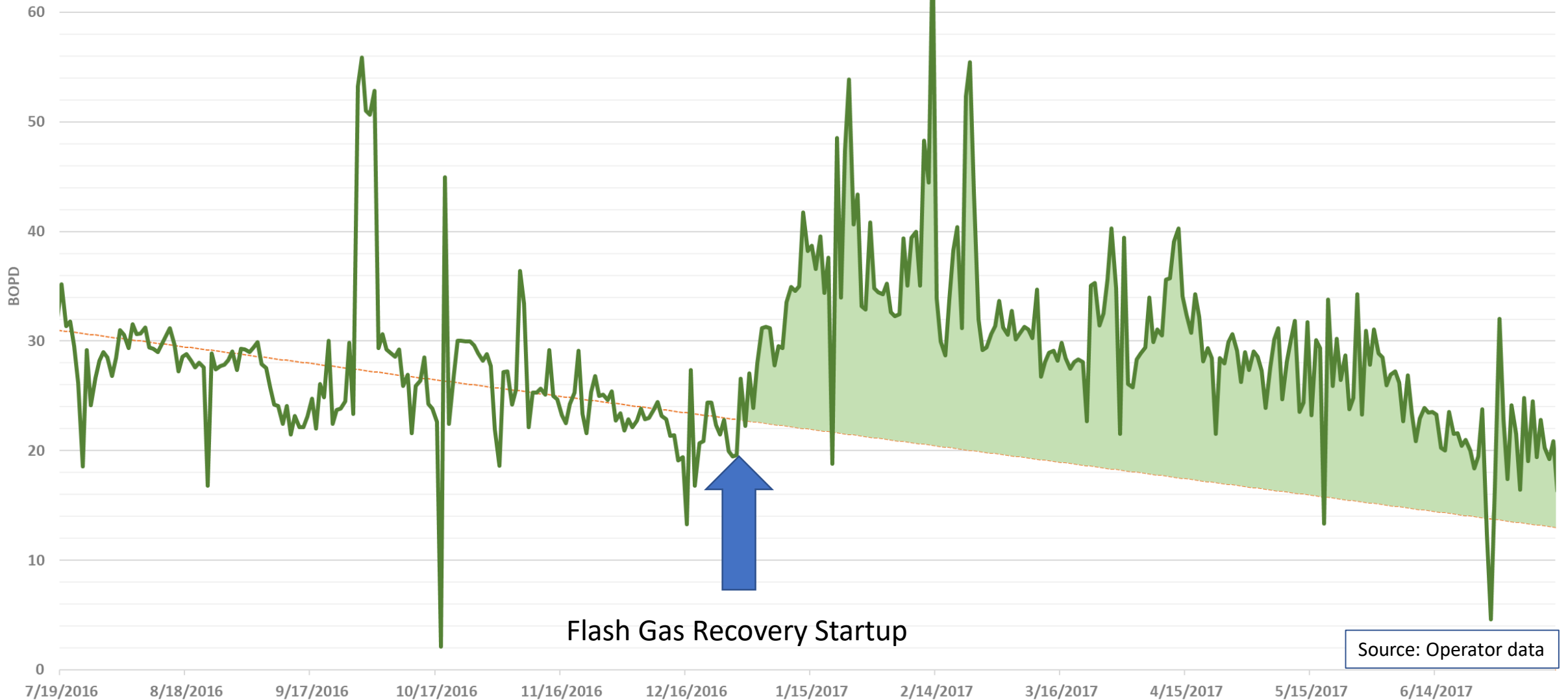
Oil Production, Flared Gas & EcoVapor Capacity Data - Weld County
2017-2018



Sources: COGCC, EcoVapor Emissions Calculator*
 NOx, VOC, and CO – API 42, Section 13, Table 13.5
 GHG – CH4 and CO2 densities: 40 CFR 98 Subpart W, Section V

Billings 2H-18H Oil Production Data

Recovery of 93 MCFD of tank flash gas yielded incremental oil sales of 12 BOPD, or 5.4 GPM.



Flash Gas Recovery Startup

Source: Operator data

Economics of Gas Capture

- 6400 MCFD of 2800 BTU/SCF Gas
- \$2/MMBTU net price
- 80% NRI

Annual revenue = \$10,465,280

Processing cost per MMBTU = \$0.30

Total processing cost = \$1,962,240

Net income = \$8,503,040

TCEQ Control Credit Applicability Table - ZerO2 Impacts

Control Credit %:	What / Why:	Provided By:	Criteria 1:	Criteria 2:
95%	Installation of a Vapor Recovery System	mVRU	Designed to capture vapor	Designed to sense pressure and capture during peak periods
1%	mVRU compressor design and controls	mVRU	The mVRU compressor is capable of handling both wet and dry gas.	The mVRU compressor is capable of changing speeds to respond to changing conditions.
1%	Additional sensing equipment	mVRU (or ancillary equipment)	Enables greater control	Enables greater efficiency
1%	Appropriately designed bypass system	mVRU (or ancillary equipment)	Operates automatically	Redirects streams as needed
1%	Oxygen ingress control **	Ancillary equipment		
1%	Continuous monitoring and recordkeeping	mVRU (or ancillary equipment)		

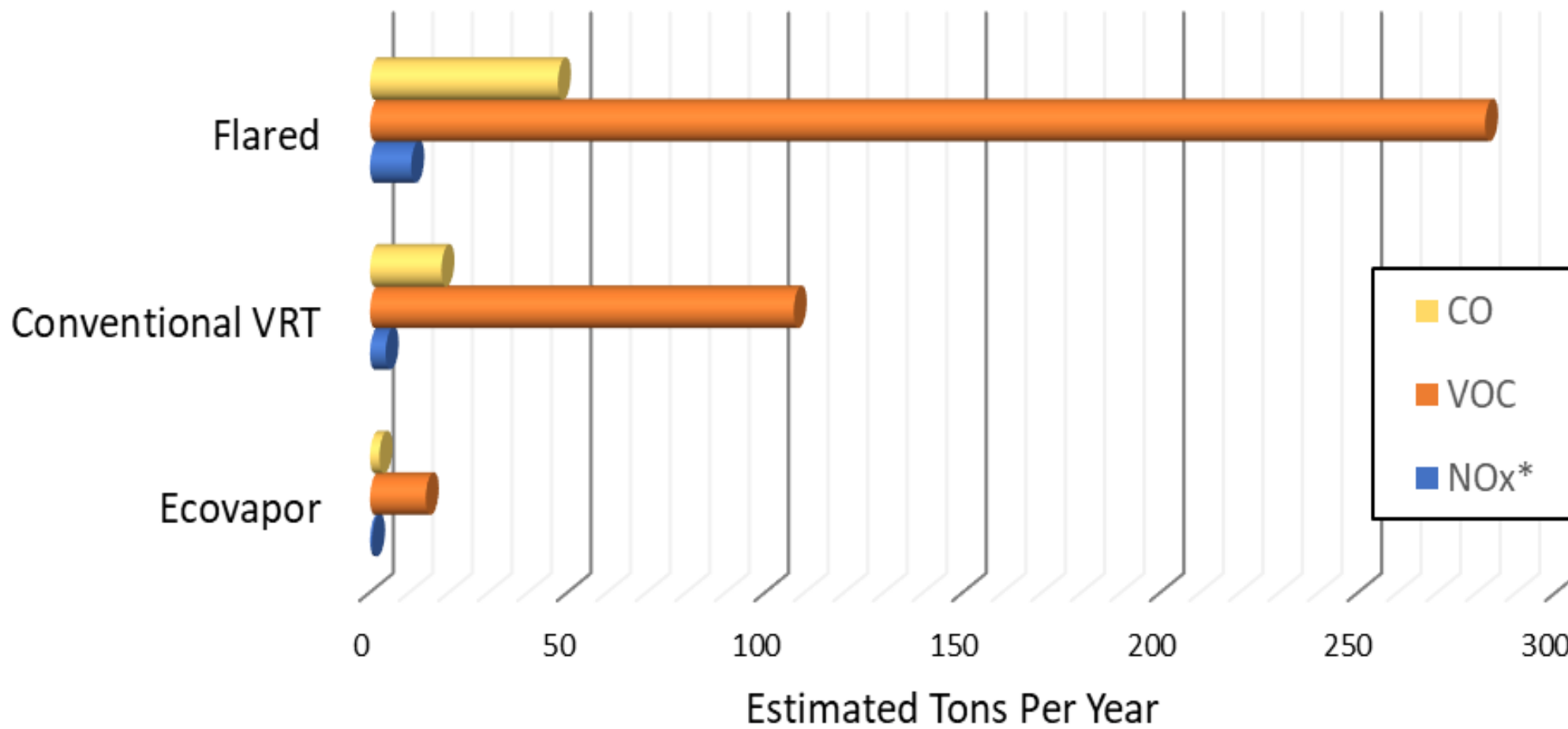
100%

Basic VRU

Enhanced System

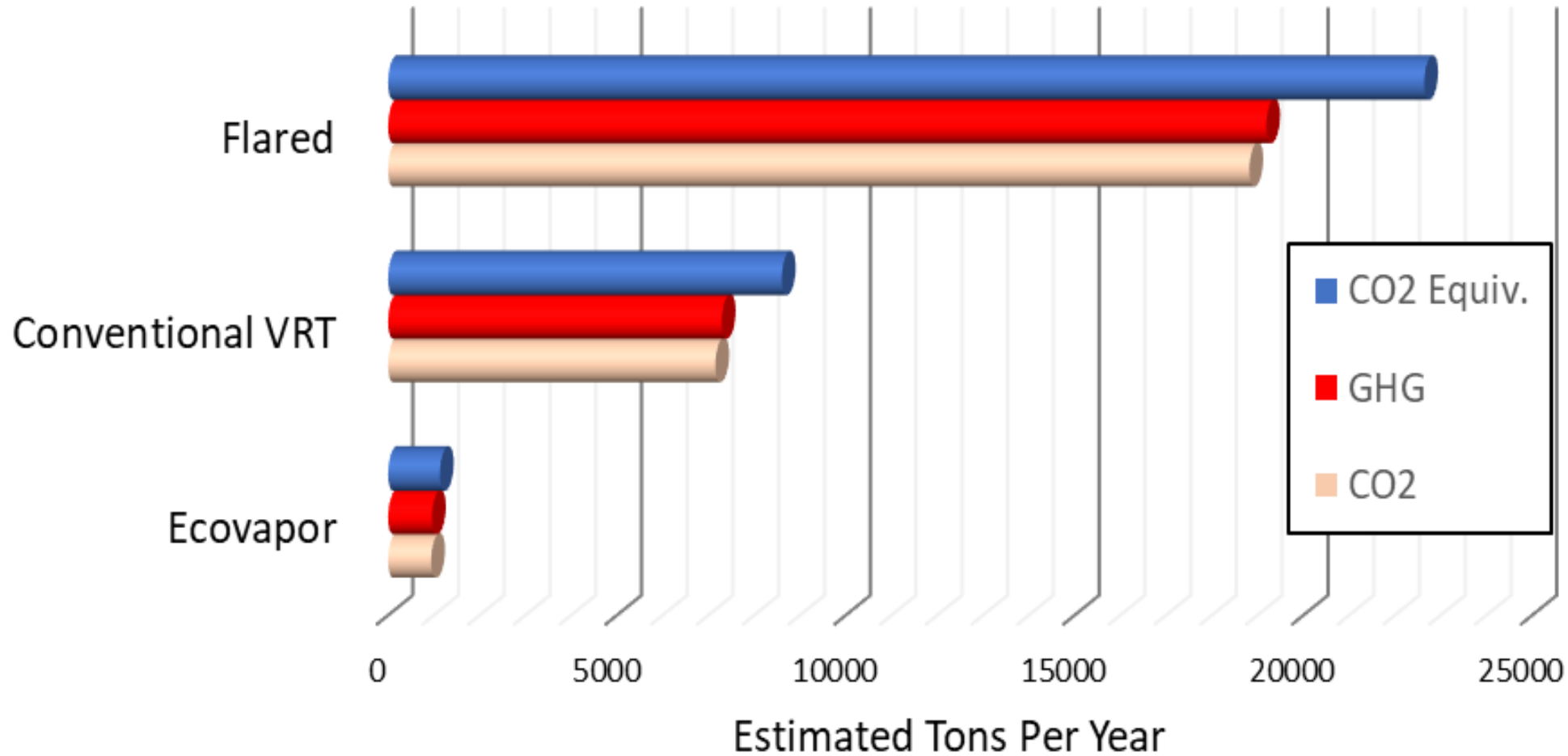
Source: TCEQ

Estimated Emissions under Three Control Methods 300 mscfd of 46 Mol Wt Vapor



Source: EcoVapor Emissions Calculator*
NOx, VOC, and CO – API 42, Section 13, Table 13.5
GHG – CH4 and CO2 densities: 40 CFR 98 Subpart V, Section V

Estimated Emissions under Three Control Methods 300 mscfd of 46 Mol Wt Vapor



Source: EcoVapor Emissions Calculator*
NOx, VOC, and CO – API 42, Section 13, Table 13.5
GHG – CH4 and CO2 densities: 40 CFR 98 Subpart W, Section V

Producing Areas w/ EcoVapor Systems

- Texas Permian
- New Mexico Permian
- Eagle Ford
- DJ Basin
- Powder River Basin
- Oklahoma STACK and SCOOP
- Bakken

Customers include international majors, large, medium, and smaller independent producers, and gas gatherers. EcoVapor equipment can be used on sweet gas and sour gas by incorporating either liquid or solid sweetening systems.

These systems can be installed at new sites as well as retrofitted at existing production facilities. Installation and time to startup is often less than 24 hours after delivery. Lead times range from one to six weeks.



A Solution for Complete Vapor Recovery

- A proven, effective and reliable process for capturing all vapor generated on a pad
- Flaring as an Emergency Practice is again possible
- Operators enjoy higher production and cash flow – sell instead of waste
- Operators have a safer and lower environmental impact site
- Tanked sites have emission profiles comparable to tankless sites
- Air permitting process is simplified and streamlined
- Production sites become a better sight to see and not hear, and a better neighbor overall

PROVEN IN OVER 150 INSTALLATIONS IN MOST MAJOR US BASINS