

# **The Results**

Putting Emissions Data to Work in Operations

# **Safe Harbor For Forward Looking Statements**



This presentation may contain "forward-looking statements" as defined by the Private Securities Litigation Reform Act of 1995, including statements regarding future prospects, plans, objectives, goals, projections, estimates of oil and gas quantities, strategies, future events or performance and underlying assumptions, capital structure, anticipated capital expenditures, completion of construction projects, projections for pension and other post-retirement benefit obligations, impacts of the adoption of new accounting rules, and possible outcomes of litigation or regulatory proceedings, as well as statements that are identified by the use of the words "anticipates," "estimates," "expects," "forecasts," "intends," "plans," "predicts," "projects," "believes," "seeks," "will," "may," and similar expressions. Forward-looking statements involve risks and uncertainties which could cause actual results or outcomes to differ materially from those expressed in the forward-looking statements. The Company's expectations, beliefs and projections are expressed in good faith and are believed by the Company to have a reasonable basis, but there can be no assurance that management's expectations, beliefs or projections will result or be achieved or accomplished.

In addition to other factors, the following are important factors that could cause actual results to differ materially from those discussed in the forward-looking statements: changes in laws, regulations or judicial interpretations to which the Company is subject, including those involving derivatives, taxes, safety, employment, climate change, other environmental matters, real property, and exploration and production activities such as hydraulic fracturing; governmental/regulatory actions, initiatives and proceedings, including those involving rate cases (which address, among other things, target rates of return, rate design, retained natural gas and system modernization), environmental/safety requirements, affiliate relationships, industry structure, and franchise renewal; the Company's ability to estimate accurately the time and resources necessary to meet emissions targets; governmental/regulatory actions and/or market pressures to reduce or eliminate reliance on natural gas; the length and severity of the ongoing COVID-19 pandemic, including its impacts across our businesses on demand, operations, global supply chains and liquidity; changes in economic conditions, including global, national or regional recessions, and their effect on the demand for, and customers' ability to pay for, the Company's products and services; changes in the price of natural gas or oil; the creditworthiness or performance of the Company's key suppliers, customers and counterparties; financial and economic conditions, including the availability of credit, and occurrences affecting the Company's ability to obtain financing on acceptable terms for working capital, capital expenditures and other investments, including any downgrades in the Company's credit ratings and changes in interest rates and other capital market conditions; impairments under the SEC's full cost ceiling test for natural gas and oil reserves; delays or changes in costs or plans with respect to Company projects or related projects of other companies, including disruptions due to the COVID-19 pandemic, as well as difficulties or delays in obtaining necessary governmental approvals, permits or orders or in obtaining the cooperation of interconnecting facility operators; the Company's ability to complete planned strategic transactions; the Company's ability to successfully integrate acquired assets and achieve expected cost synergies; changes in price differentials between similar quantities of natural gas or oil sold at different geographic locations, and the effect of such changes on commodity production, revenues and demand for pipeline transportation capacity to or from such locations; the impact of information technology disruptions, cybersecurity or data security breaches; factors affecting the Company's ability to successfully identify, drill for and produce economically viable natural gas and oil reserves, including among others geology, lease availability, title disputes, weather conditions, shortages, delays or unavailability of equipment and services required in drilling operations, insufficient gathering, processing and transportation capacity, the need to obtain governmental approvals and permits, and compliance with environmental laws and regulations; increasing health care costs and the resulting effect on health insurance premiums and on the obligation to provide other post-retirement benefits; other changes in price differentials between similar quantities of natural gas or oil having different quality, heating value, hydrocarbon mix or delivery date; the cost and effects of legal and administrative claims against the Company or activist shareholder campaigns to effect changes at the Company; uncertainty of oil and gas reserve estimates; significant differences between the Company's projected and actual production levels for natural gas or oil; changes in demographic patterns and weather conditions; changes in the availability, price or accounting treatment of derivative financial instruments; changes in laws, actuarial assumptions, the interest rate environment and the return on plan/trust assets related to the Company's pension and other post-retirement benefits, which can affect future funding obligations and costs and plan liabilities; economic disruptions or uninsured losses resulting from major accidents, fires, severe weather, natural disasters, terrorist activities or acts of war; significant differences between the Company's projected and actual capital expenditures and operating expenses; or increasing costs of insurance, changes in coverage and the ability to obtain insurance. Forward-looking statements include estimates of oil and gas quantities. Proved oil and gas reserves are those quantities of oil and gas which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically producible under existing economic conditions, operating methods and government regulations. Other estimates of oil and gas quantities, including estimates of probable reserves, possible reserves, and resource potential, are by their nature more speculative than estimates of proved reserves. Accordingly, estimates other than proved reserves are subject to substantially greater risk of being actually realized. Investors are urged to consider closely the disclosure in our Form 10-K available at www.nationalfuel.com. You can also obtain this form on the SEC's website at www.sec.gov.

For a discussion of the risks set forth above and other factors that could cause actual results to differ materially from results referred to in the forward-looking statements, see "Risk Factors" in the Company's Form 10-K for the fiscal year ended September 30, 2020 and the Forms 10-Q for the quarter ended December 31, 2020, March 31, 2021 and June 30, 2021. The Company disclaims any obligation to update any forward-looking statements to reflect events or circumstances after the date thereof or to reflect the occurrence of unanticipated events.



To pioneer an innovative study **evaluating the carbon emissions** generated by various types of equipment commonly used for **hydraulic fracturing**, and provide the industry with a comparative insight on the **emissions profile** of these technologies



## **Mission Statement**

Seneca's Sustainable Development Team will develop, implement and communicate innovative environmental strategies and initiatives that advance Seneca's ongoing commitment to produce oil and natural gas in a sustainable manner, taking into account Seneca's goals for reducing the environmental impact of our operations.



Recent projects include sponsoring the Well Done Foundation's first orphan well plugging in Pennsylvania and switching natural gas pneumatics over to air or electric.

# **D&C Emission Reduction Initiatives**

### Diesel displacement with Natural Gas

- Dual fuel rigs and fracs
- Natural gas water transfer pumps
- Water storage facility runs off natural gas
- Water wells run off natural gas
- Natural gas generators powering onsite lighting, offices, & camps

## Why Natural Gas?

- Lower cost fuel
- Lower carbon emissions







### **Responsible Gas Certification**



### **Equitable Origin**

 Certification focuses on five key principles: Social Impacts, Human Rights and Community Engagement, Indigenous Peoples' Rights, Occupational Health & Safety and Fair Labor Standards, and Environmental Impacts, Biodiversity, and Climate Change



### **TrustWell by Project Canary**

- Certification focuses on four key areas: Air, Water, Land, and Community
- Continuous Emissions Monitoring Technology

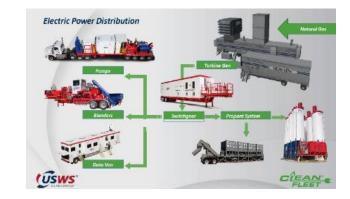
### **Completions Equipment Emissions Testing & Trial**

#### **Comprehensive Emissions Testing**

- Performed field testing of Tier 2 and Tier 4 diesel and dual fuel engines as well as natural gas-powered turbine engines and natural gas fueled reciprocating engines that powered electric frac equipment
- Emission results will be compared to original equipment manufacturer's specs and EPA factors

### **All-Electric Completion Field Trial**

- Utilized U.S. Well Services' Clean Fleet technology to complete six wells on Gamble Pad A
- Benefits include reduced emissions, fuel cost savings, and lower noise pollution



# Why Conduct an Emissions Study?

## Market

- The debate of Electric vs Dual Fuel has exploded over the past year
- White papers written in support of both sides
- Press releases from both E&Ps and Service Providers

## Questions

- What equipment is best for our job requirements?
  - Availability
  - Horsepower requirements
  - Flexibility
  - Reliability
- What are the costs?
  - Fuel savings compared to market premium of Natural gas capable fleets
- What are the emissions profile (GHG and Air Quality)
  - Idle emissions
  - Methane slip
  - Fuel additives
  - Emissions calculation methodology





## What was Tested?



### **Hydraulic Fracturing Equipment**

**Tier 2 Conventional Diesel** 

**Tier 2 Dual Fuel (Non-OEM)** 

Tier 2 DGB (CAT OEM)

Tier 2 DGB w/ FA

**Tier 4 Conventional Diesel** 

Tier 4 DGB (CAT OEM)

Tier 4 DGB w/ FA

Pratt & Whitney – 30MW Nat Gas Turbine Gen (USWS)

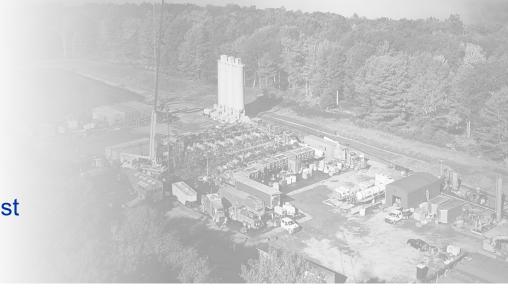
G3520 – 1.2-2MW Nat Gas Recip Gen

DD35 – Nat Gas direct drive turbine

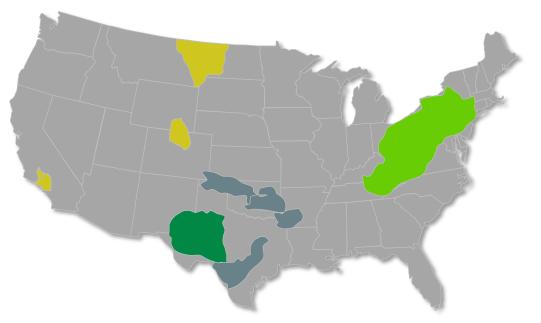


# NEXTIER

NexTier is a leading provider of **integrated completions** that employs sustainable practices and equipment that supports our customers' **ESG goals while accelerating production** in the most demanding US land basins.









<sup>1</sup>Source: Company estimates based on deployed and working fleets as of September 2021.



Providing fuel savings, emissions reductions, and operational flexibility through Low Carbon Completions Solutions

### Our Strategy **focuses on**...

- Diesel displacement
- Quality service
- Emission reductions
- Constant innovation
- Guality service
  Fuel & cost savings
  - Integrated services

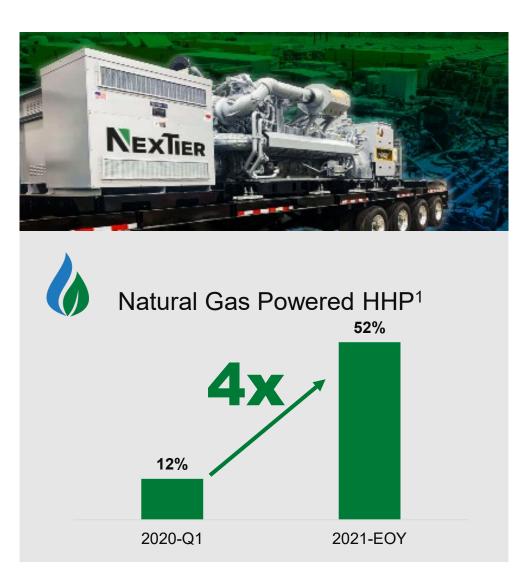
## Our Strategy delivers...

- A
- Sustainability





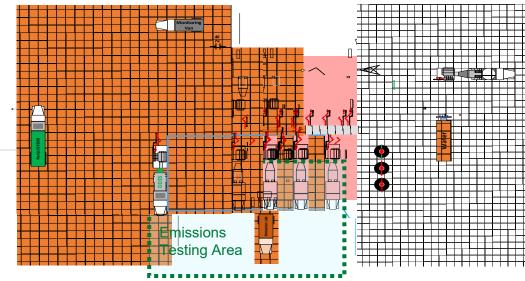
**Partnership Value** 



# **Test Partners and Methodology**



EPA Test Methods	<b>1</b> Part 60 & 63	<b>2</b> Part 1039 & 1065
Testing Partner	Air Hygiene	WVU CAFEE
Purpose	Alignment with previous studies	Alignment with EPA CFR Standards
Testing Applicability and Details	<ul> <li>Equipment stationary for &gt;12months</li> <li>1 sample / 30 Sec</li> <li>Steady Loads</li> <li>Wider range of acceptable drift</li> </ul>	<ul> <li>Transportable Equipment (stationary &lt;12months)</li> <li>10 Hertz (10x/second)</li> <li>Transient Loads</li> <li>Stricter Quality control</li> </ul>



- Equipment tested over multiple stages during pumping and idle
- Emissions collected over various engine loads
- Emissions tested include: NOx, NO, NO2, CO, VOC, THC, Methane, Ethane, N2O, HCHO, O2, CO2, PM



equipment



Temperature and humidity-controlled enclosure



### Menu of Options to optimize cost, fuel source, and emissions at the wellsite

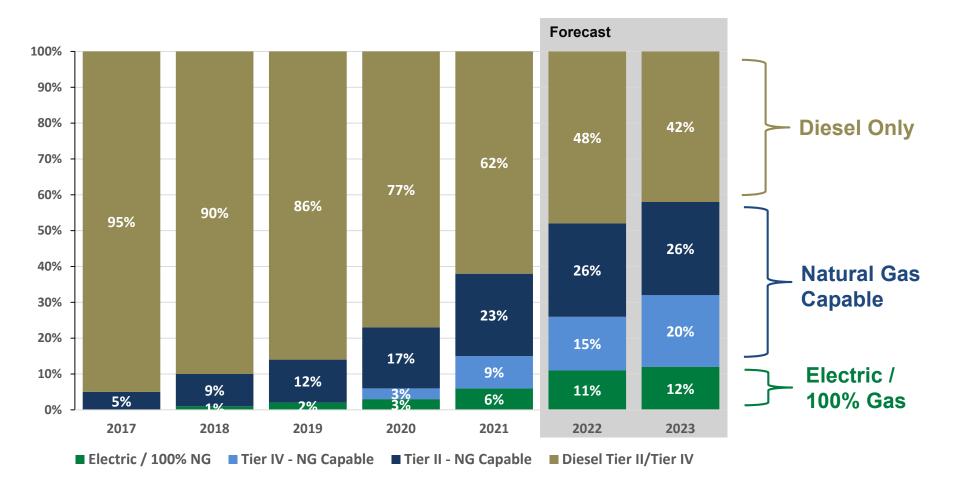
	Tier 2 Pumps			Tier 4 Pumps		Electric Pumps	
	Diesel	Dual Fuel Kits (Non-OEM)	DGB (CAT OEM)	Diesel	DGB (CAT OEM)	NG Recip Generator	NG Turbine Generator
Fuel Types	Diesel Only	Diesel & Gas	Diesel & Gas	Diesel Only	Diesel & Gas	Gas Only	Gas Only
Displacement Capability	0%	10 - 40%	20 - 60%	0%	50 - 85%	100%	100%
Gas Delivery	N/A	Low-pressure fumigation	Low-pressure fumigation	N/A	High pressure multi- port injection	Low-pressure fumigation	Direct injection into combustion chamber
Air-Fuel Ratio (AFR) Control		None		None	Compressor Bypass + O2 sensing	Wastegate + Throttle + O2 sensing	Throttle
Rating		Variable Speed 2500 bhp @ 1900 rpm			ble Speed o @ 1800 rpm	Constant Speed ~3600 bhp @ 1800 RPM	Constant Speed ~41,460 shp @ ISO
EPA Certification	Part 1039 Tier 2			Part 1039 Tier 4 Final		Part 1048	Not Regulated



### Total supply by fleet type - % Number Fleet

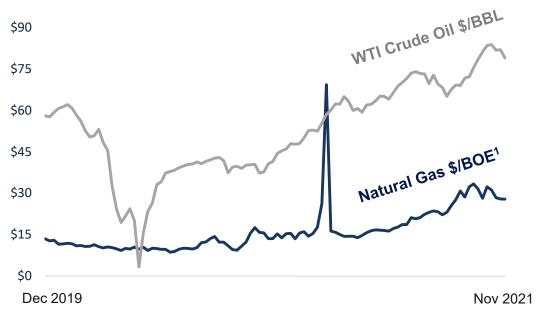
### **Increase in Gas-Fueled Fleets**

- Market interest is driving an increase in natural gas capable fleets
- Demand is highest for fleets with the highest level of diesel displacement
- Pricing premiums for fleets is generally correlated to the fuel cost savings potential





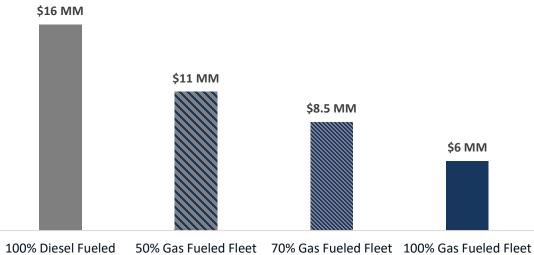
### Disproportionately advantaged vs. Diesel to lower well costs



Natural gas remains incredibly cost competitive vs. oil as an energy source

All-in Annual Frac Fuel Cost<sup>2</sup>

Estimated for 22,000 HHP avg. pumping, 4,000 pump-hrs on Field Gas

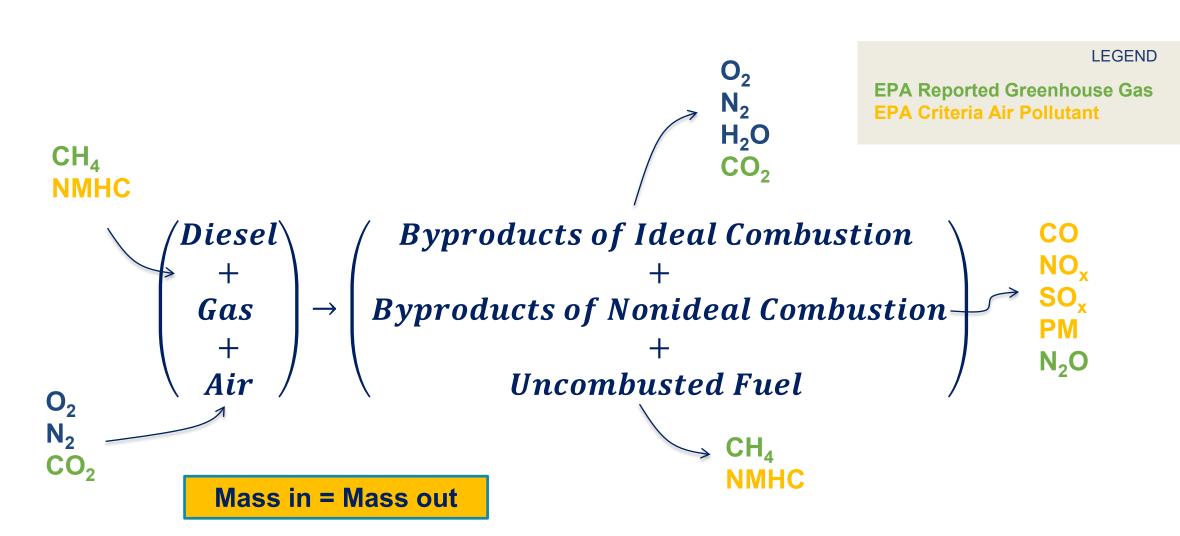


Fleet

Fuel cost advantage is created for equipment that is natural gas capable

<sup>2</sup>Assumes field gas is frac equipment compatible without treatment. Includes daily fixed costs for diesel fuel handling

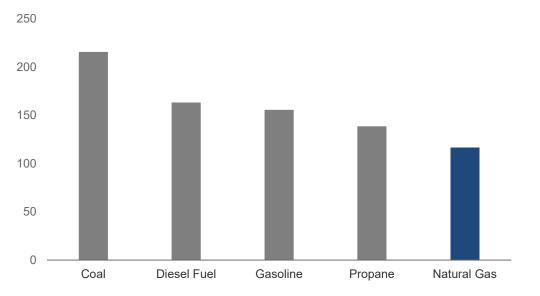




Additional constituents may exist depending on fuel quality / fuel impurities and resulting emissions from combustion

# **Reducing Carbon with Natural Gas**





### Pounds of CO<sub>2</sub> per mmBtu energy produced

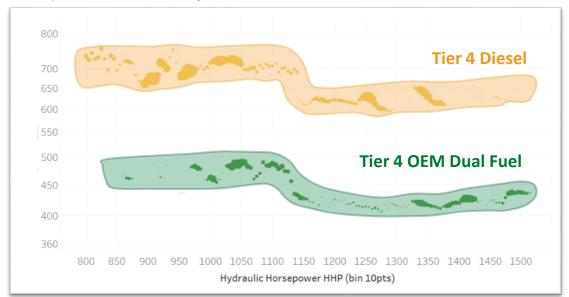
U.S. Energy Information Administration

+ Water and noncombustible elements in some fuels reduce their heating values and increase their CO<sub>2</sub>

+ Natural gas is primarily Methane  $(CH_4)$  and has lower  $CO_2$ -to-energy content

### As Tested: Avg. CO<sub>2</sub> (g) / HHP-Hr

Comparison of Diesel-only to Dual-Fuel



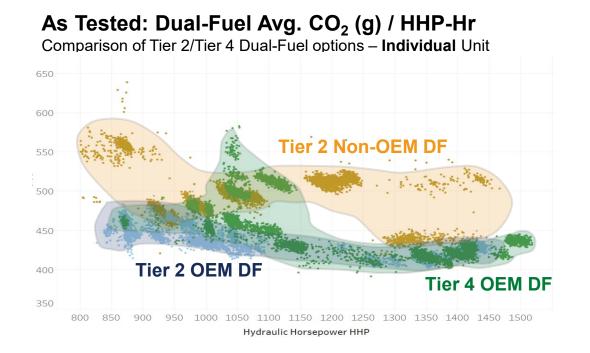
+ Dual-Fuel fleets (any kind) have **lower Carbon (CO<sub>2</sub>)** than Diesel fleets

+ Each gallon of Diesel displaced with Natural Gas reduces
 CO<sub>2</sub> by >6 lbs

*Source: U.S. Energy Information Administration: How much carbon dioxide is produced when different fuels are burned?* 

# **CO<sub>2</sub> using Natural Gas Fueled Equipment**





+ Tier 4 dual fuel consumes more total fuel but combined with its superior gas substitution, produces a similar  $CO_2$  to Tier 2 OEM dual fuel

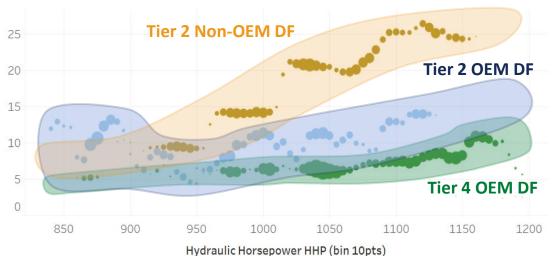
+ Tier 2 Non-OEM dual fuel utilizes the most diesel and produces more CO<sub>2</sub> than other dual fuel systems

+ Large Turbines use more fuel and therefore produces more CO<sub>2</sub> than other technologies

+ Natural Gas reciprocating engines consume the least amount of fuel of next generation technologies

## **Managing Methane using Natural Gas Fuel**

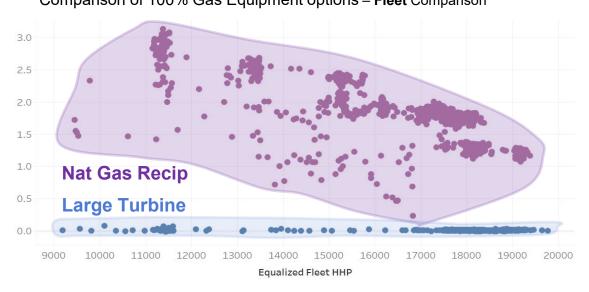




As Tested: Dual-Fuel Avg. CH<sub>4</sub> (g) / HHP-Hr

Comparison of Tier 2/Tier 4 Dual-Fuel options - Individual Unit

**As Tested: Next-Gen Avg. CH<sub>4</sub> (g) / HHP-Hr** Comparison of 100% Gas Equipment options – **Fleet** Comparison



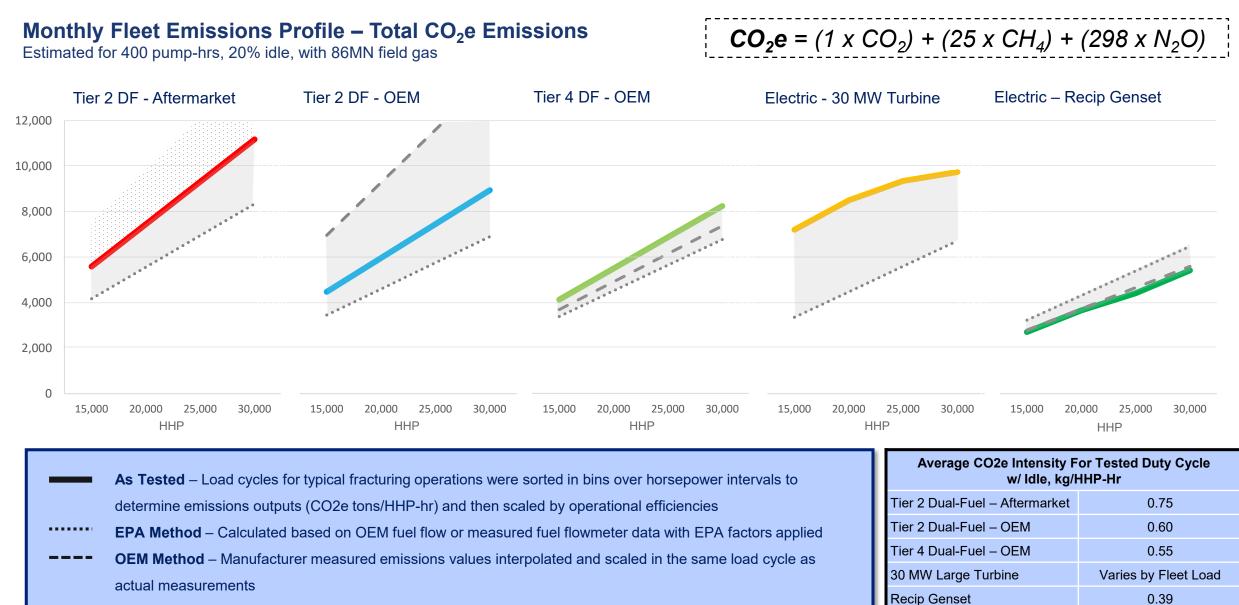
+ OEM dual fuel systems have better gas substitution and control than a Non-OEM dual fuel system resulting in less diesel consumption and less methane slip

+ Tier 4 OEM Dual Fuel has the lowest methane emissions driven by the multi-port injection at the high-pressure intake and air/fuel ratio control + Lean fuel composition contributes to methane slip. Gas-only equipment is more efficient at consuming high methane (lean) gas with the least amount of uncombusted fuel

+ Methane slip varies by engine load and rpm, with both the Turbine and Natural Gas Recip most effective at highest loads

## **Non-Regulated Emissions Results – Total CO<sub>2</sub>e**







- Emission intensity is a direct result of total fuel consumption and fuel type
- No one size fits all, an evaluation is required to determine the right solution for each E&P
- A balance of Operational Plan, Job Design, Emissions and Cost Benefit dictates solution selection
- Ongoing technology improvements provide room for emissions reduction and increased gas substitution

- SPE paper at HFTC to share further details of outcomes with industry
  - SPE-209154 The ESG Path Forward for Fracturing Equipment Making The Right Technology Selection Based On Field Emission Results