

# Achieving Carbon Reductions

**National Association of Waterfront Employees Annual Meeting**

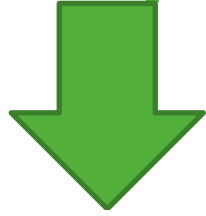
December .....



# Why Propane in the Ports?

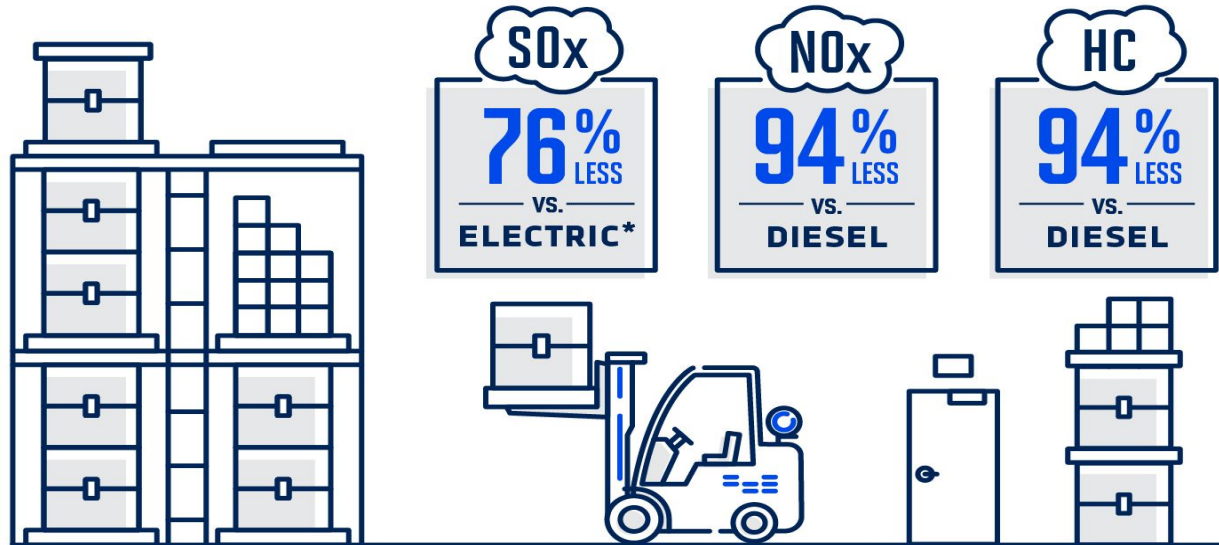


# Propane Versus Diesel



## THE EMISSIONS ADVANTAGE

Propane forklifts reduce sulfur oxide (SOx), hydrocarbon (HC), and nitrogen oxide (NOx) compared with other energy sources.

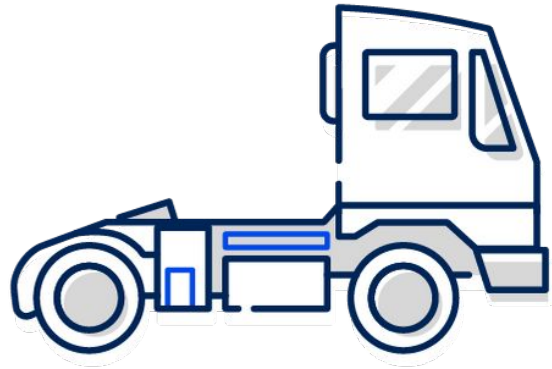


\*Fuel efficiency based on 2013 AFLEET model. Fuel use for lifting calculated based on thermal engine efficiencies in 2001 study from M. Delucchi.

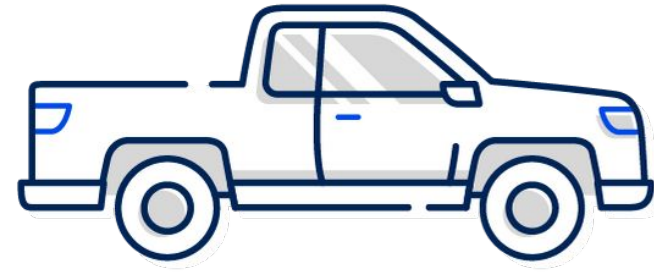
# Propane Versus Gasoline



**12% LESS**



**TERMINAL TRACTORS**



**LIGHT-DUTY VEHICLES**

# GHG FOOTPRINT OF ELECTRICITY

## CONSIDER EVERY STEP OF THE PROCESS



### 1 EXTRACTION

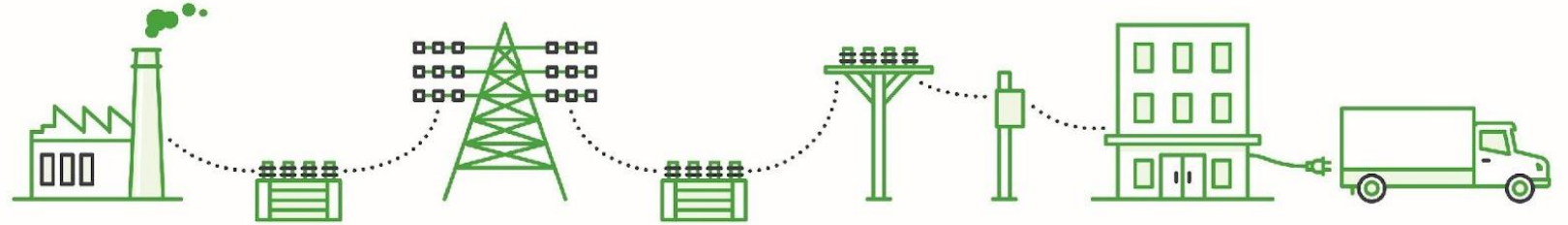
Electricity is not naturally occurring, so it must be produced using other resources.

- Gas extraction
- Coal mining
- Nuclear fission
- Wind and solar component manufacturing
- Biomass cultivation and harvesting

approximately 9.9% CO<sub>2</sub> eq emissions

**CARBON INTENSITY SCORE:**

**15.2 g/MJ**



### 2 GENERATION

Power plant generates electricity.

Transformer steps up voltage for transmission.

approximately 75.6% CO<sub>2</sub> eq emissions

**CARBON INTENSITY SCORE:**

**116.5 g/MJ**

### 3 TRANSMISSION & DISTRIBUTION

The transmission lines carry electricity to transformers, which step down voltage. Electricity is delivered to the charging location.

approximately 4.5% CO<sub>2</sub> eq emissions

**CARBON INTENSITY SCORE:**

**7 g/MJ**

### 4 EV CHARGING

Losses occur from charging electric vehicle battery.

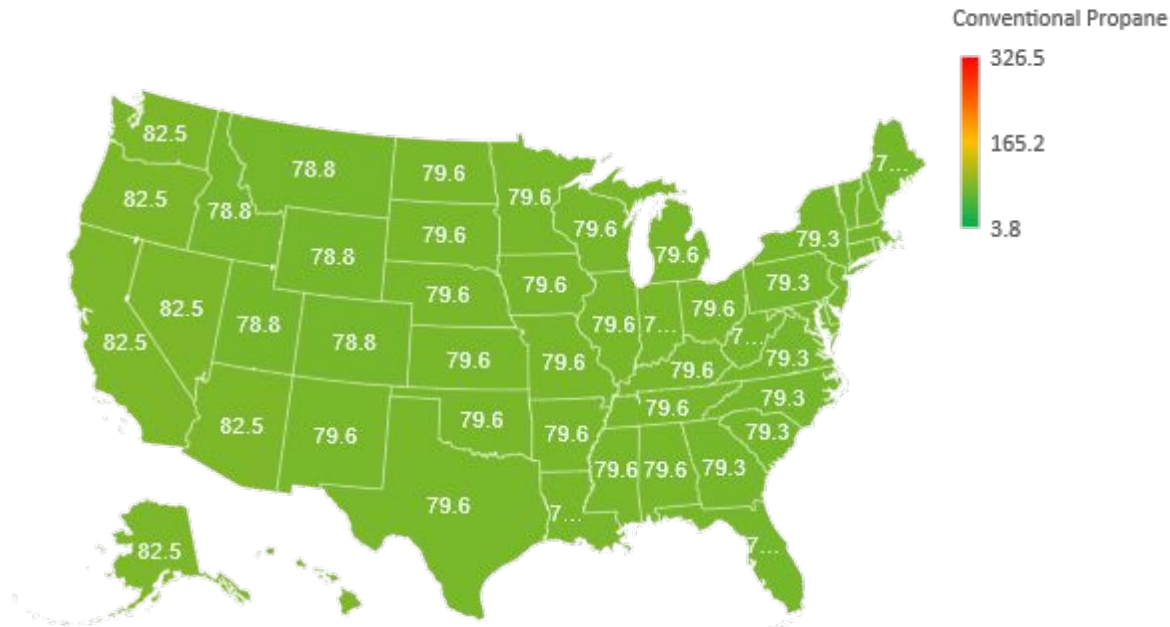
approximately 10% CO<sub>2</sub> eq emissions

**CARBON INTENSITY SCORE:**

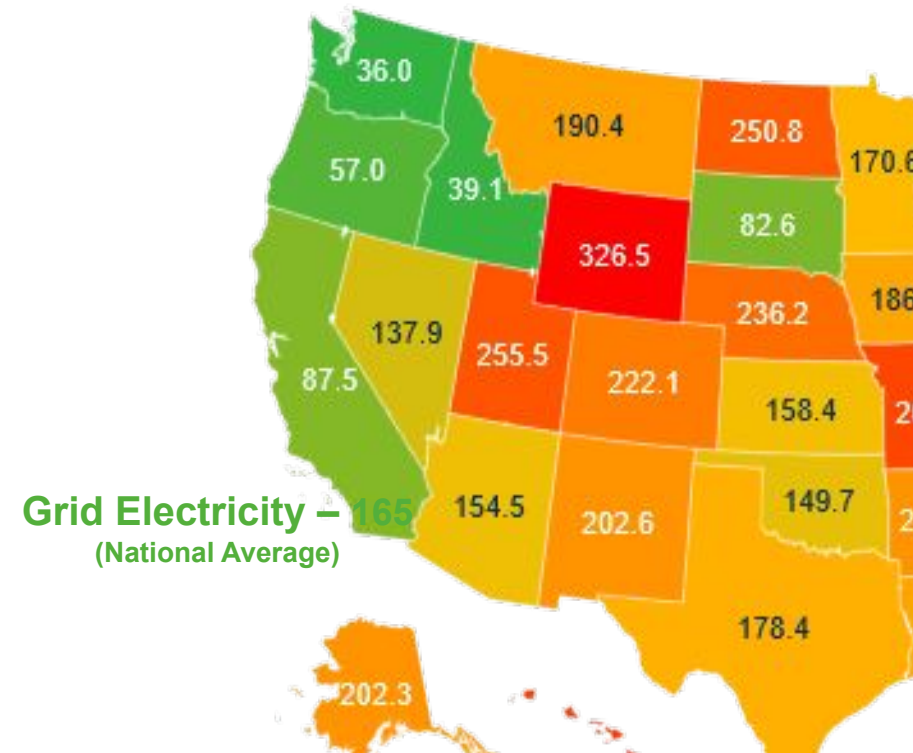
**15.4 g/MJ**

**TOTAL GHG INTENSITY = 154 g/MJ**

# Well-to-Wheels Carbon Intensity Comparisons of “Fuel” (gCO<sub>2</sub><sub>eq</sub>/MJ)



**Propane – 79**  
(National Average)

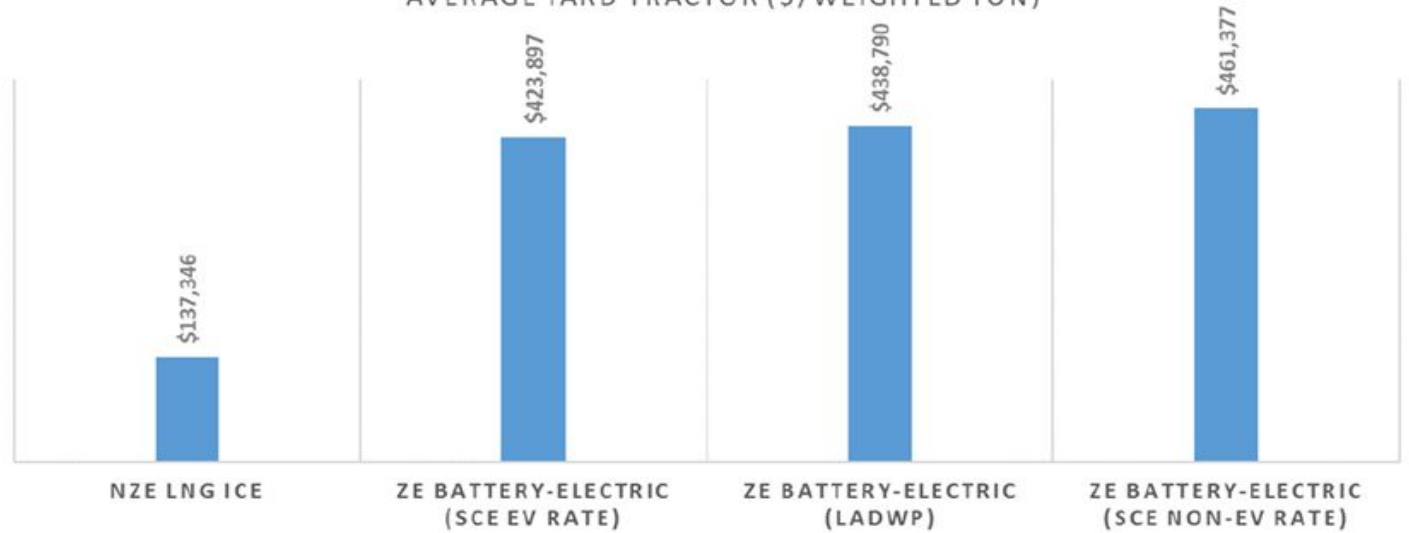


## GNA study

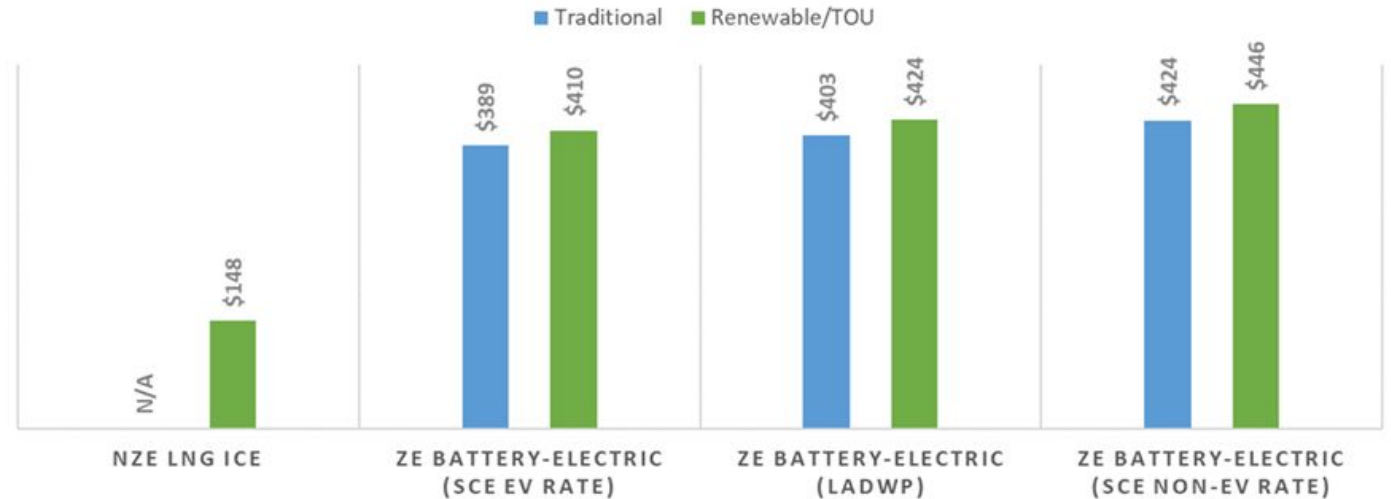
- Cost effectiveness of carbon reduction (CO<sub>2</sub>)
- \$ / Ton reduced
- Cost effectiveness of GHG reductions.
- \$ / MT

NZE, Propane delivered lowest

COST EFFECTIVENESS OF WEIGHTED EMISSIONS REDUCTIONS - AVERAGE YARD TRACTOR (\$/WEIGHTED TON)

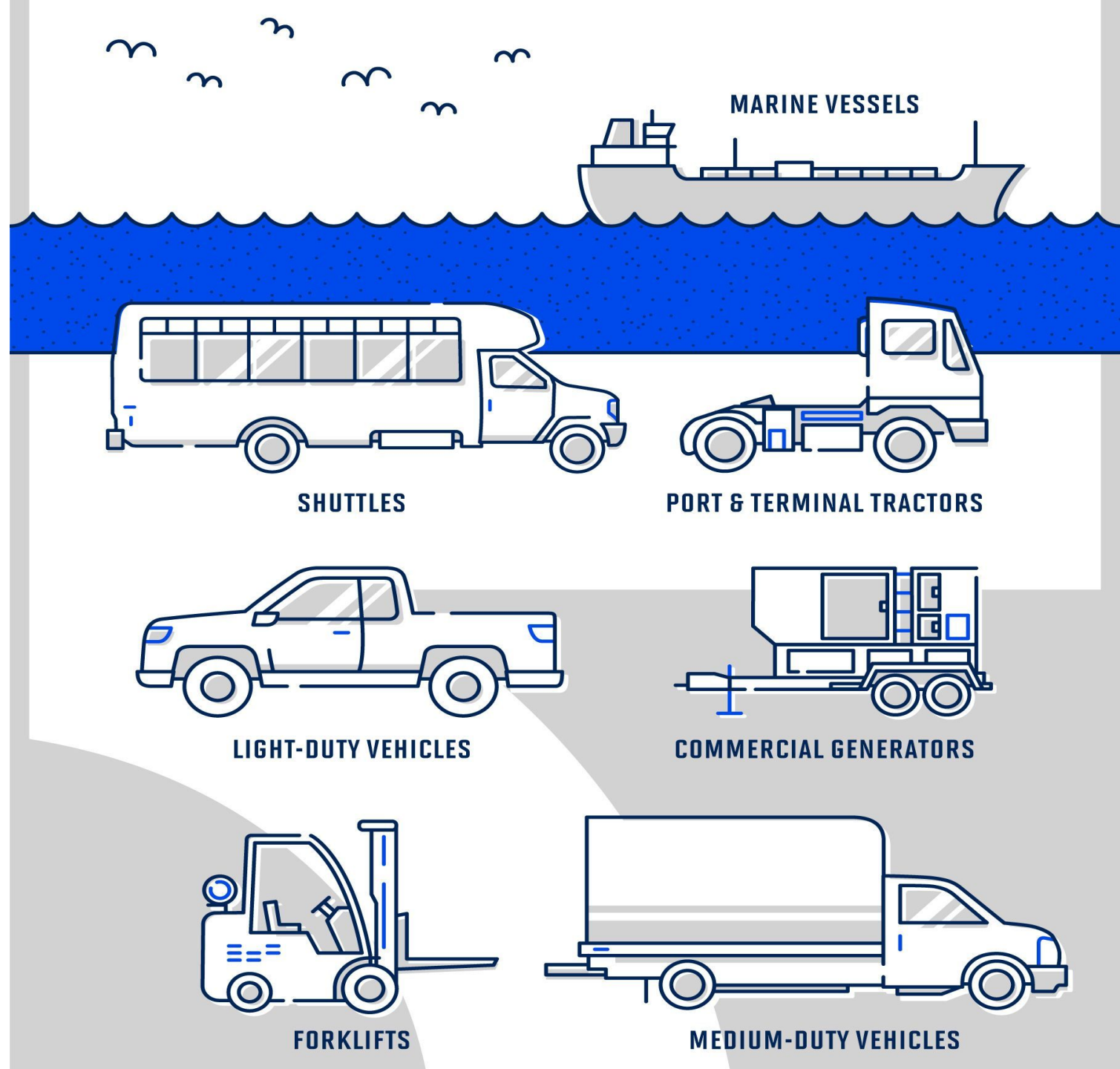


COST EFFECTIVENESS OF GHG EMISSIONS REDUCTIONS - AVERAGE YARD TRACTOR (\$/MT)



## Where Do We Find Propane Today?

- Shuttles and transit vehicles
- Port and terminal tractors
- Light duty
- Commercial power generation
- Forklifts
- Medium duty vehicles









# Thank You!

## Questions?

### Contact Information

Joe Calhoun  
Director of Business Development  
PERC  
[Joseph.Calhoun@propane.com](mailto:Joseph.Calhoun@propane.com)  
717-526-8639