Life-Cycle Perspectives on Future Light-Duty CO_2 Reductions

Dr. Rasto Brezny

MECA Clean Mobility

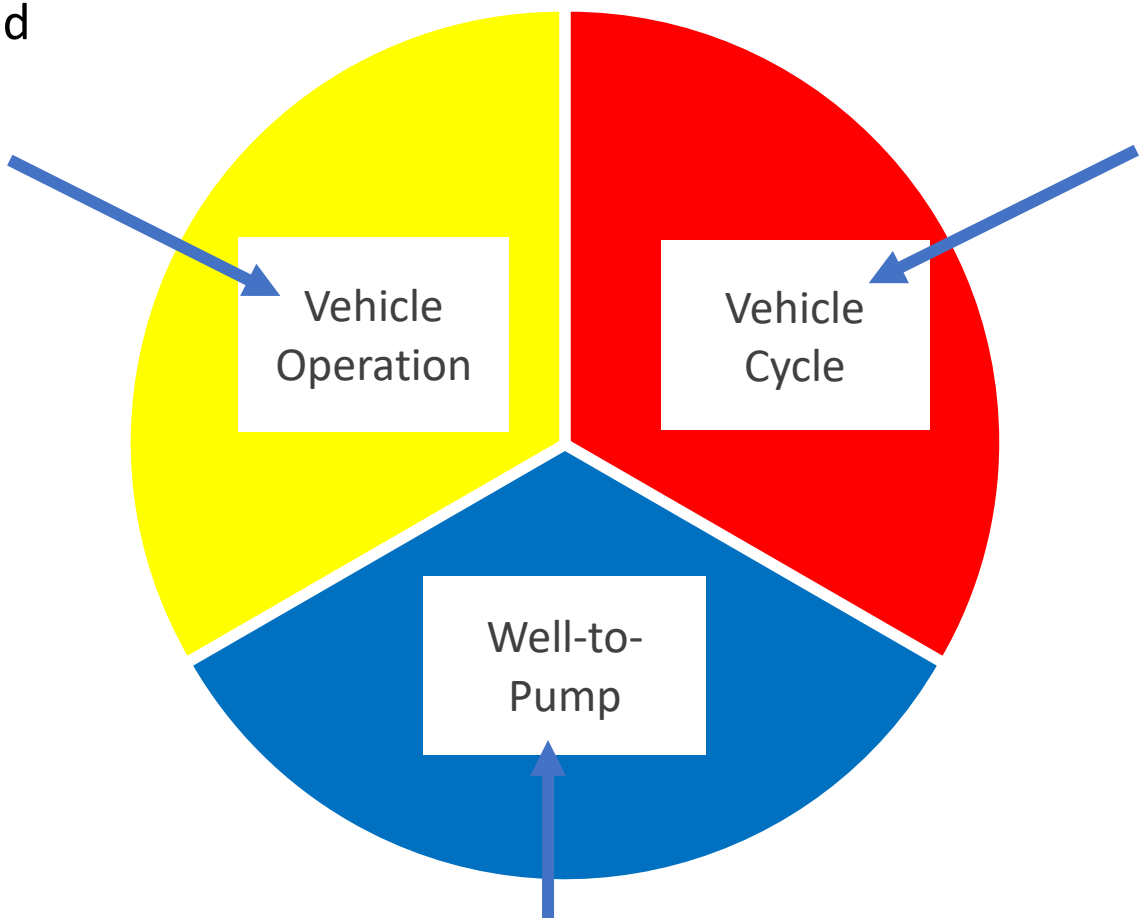
2022 Emission Control Technology Conference
November 10, 2022
New Delhi, India

SUPPLYING CLEAN MOBILITY

Vehicle Level Lifecycle Analysis Incorporates Upstream and Tailpipe

EPA sets tailpipe criteria and GHG emission standards

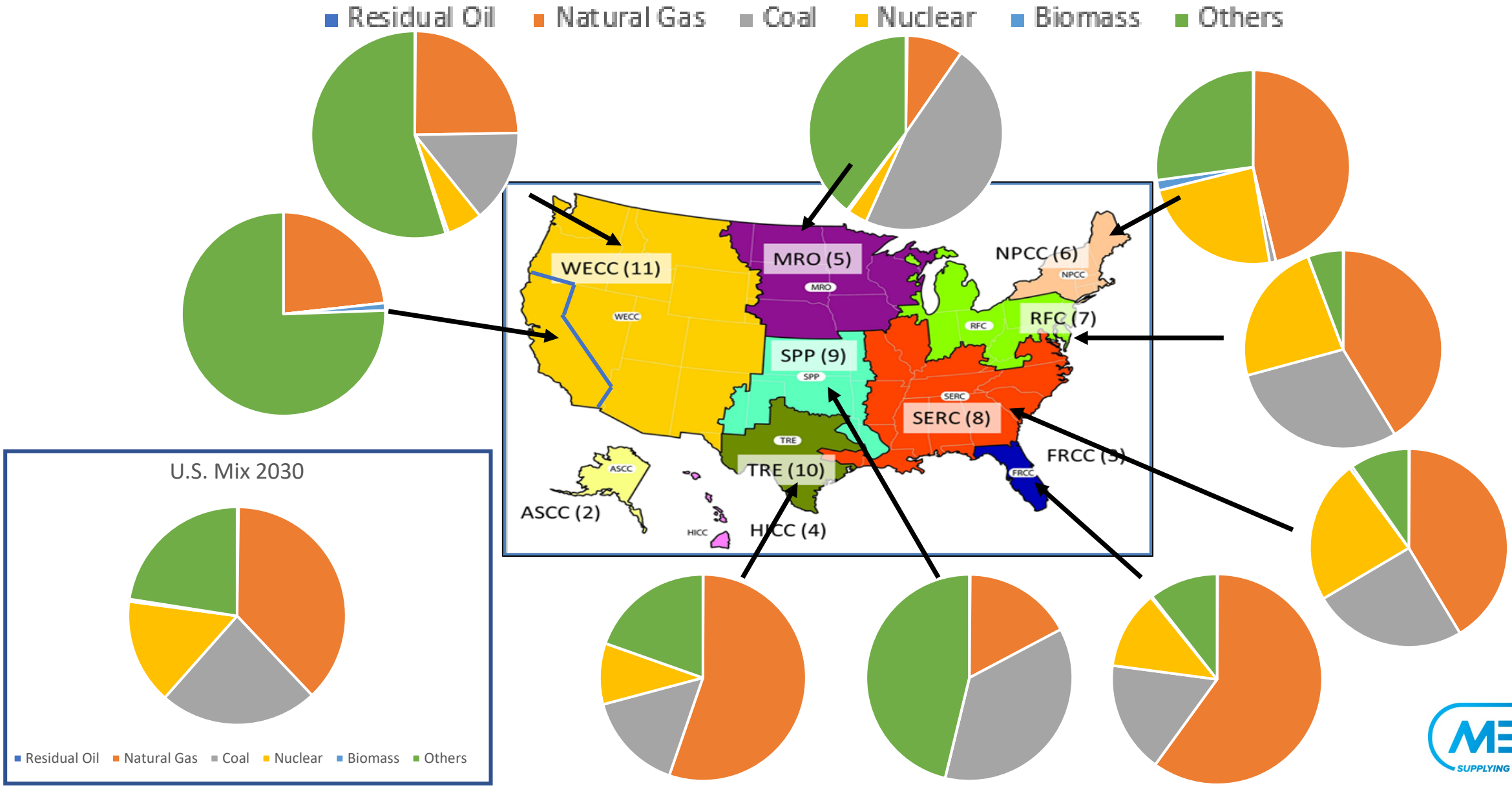
EPA does not regulate the air emissions related to vehicle production



EPA sets renewable fuel volume standards via Renewable Fuel Standard; fuel characteristics (e.g., lead and sulfur) also regulated

U.S. Electricity Mixes Projected for 2030

India uses about 70% Coal for Electricity Production

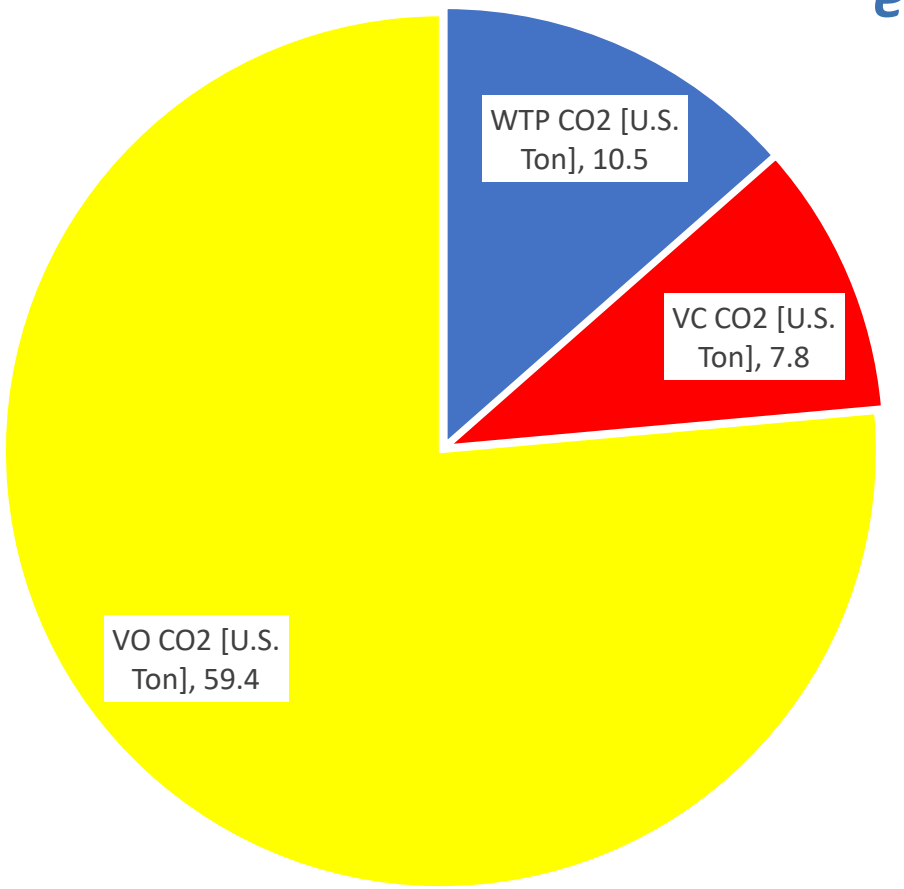


Vehicle-Fuel Combinations as a system form the basis for LCA Comparison

ICE SUV Running on E10

77.7 tons CO_2

470 g/mi



Battery Electric Vehicles, especially when charging from a renewable grid, are excellent technology choices for decarbonizing transportation.

Transportation Transition

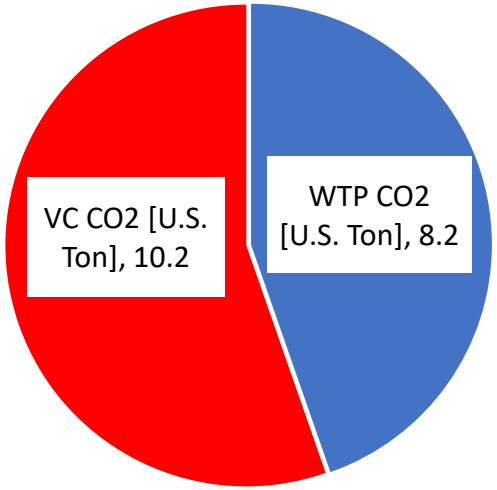
VO: Vehicle Operation
VC: Vehicle Cycle (manufacturing)
WTP: Well to Pump (fuel cycle)

BEV (300 mile range) SUV

Running on California Grid

18.5 tons CO_2

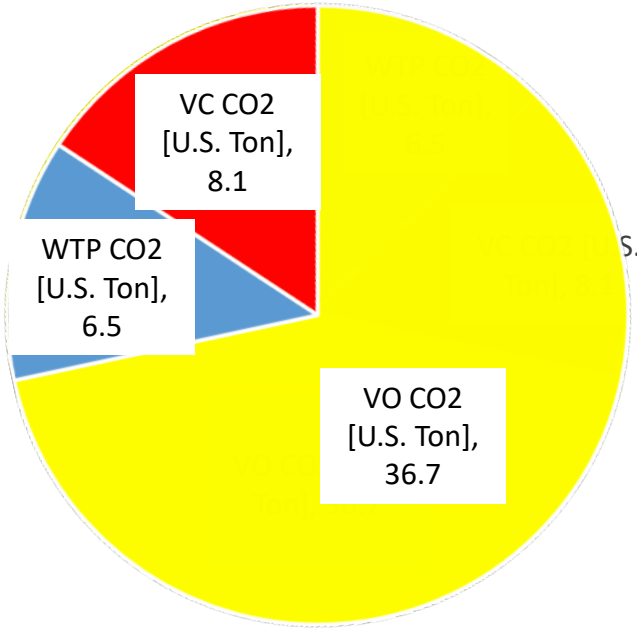
112 g/mi



Hybrids remain a cost-effective Solution where the Grid is not yet Decarbonized or Infrastructure is not fully Developed?

Hybrid Crossover Running on E10

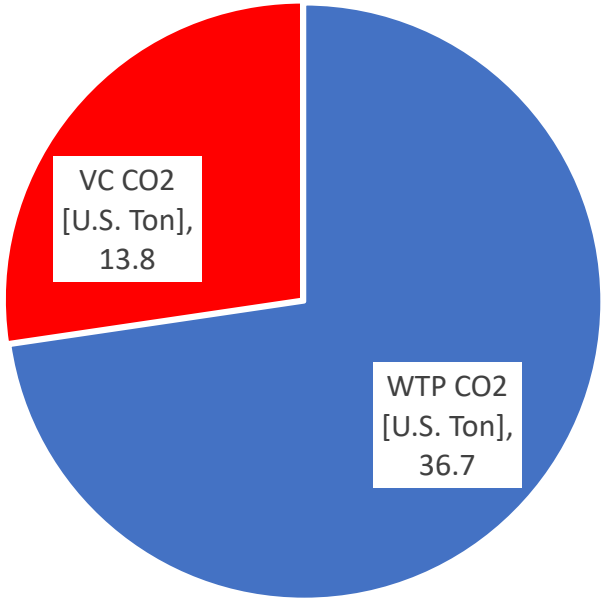
51.3 tons CO_2



BEV (300 mile range) Crossover

Running on Northeast/Midwestern Grid

50.5 tons CO_2

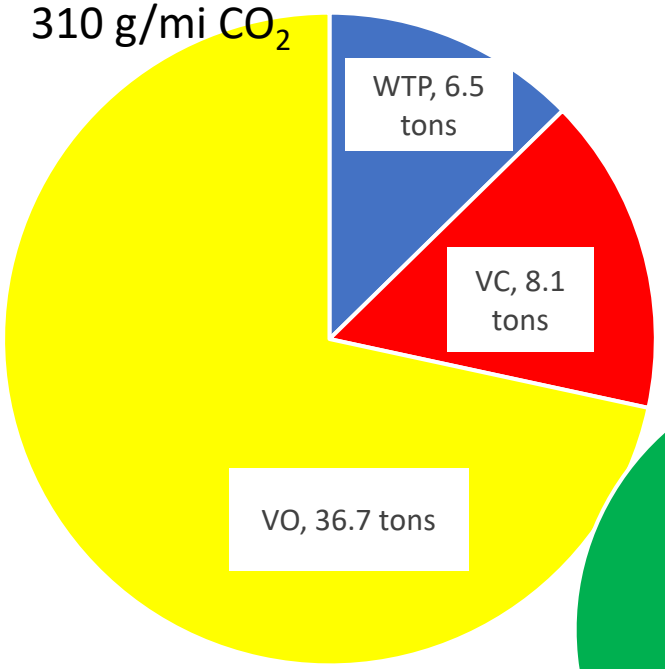


5

Electrified Vehicles operating on Low-Carbon Fuels Offer Pathways to Reduce GHGs from New and Existing Vehicles

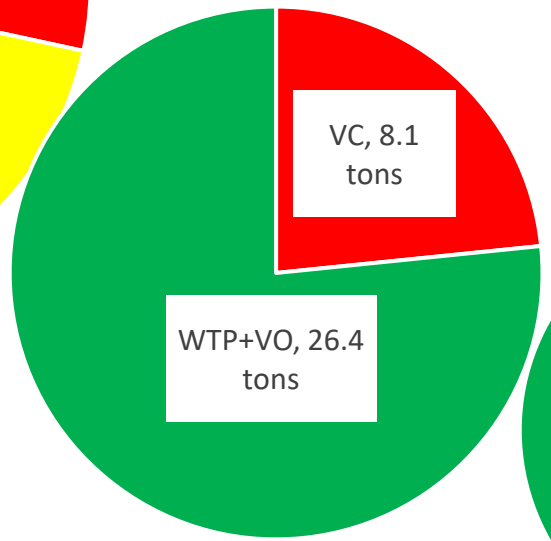
Hybrid, **E10**

310 g/mi CO_2



Hybrid, **E85**

209 g/mi CO_2



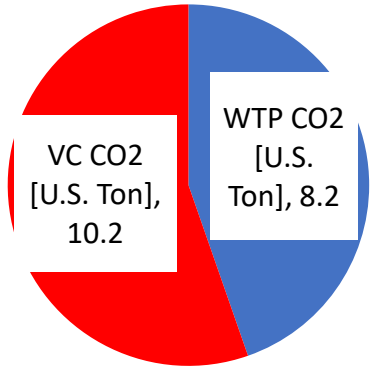
BEV SUV

300 mile range

California Grid

18.5 tons CO_2

112 g/mi

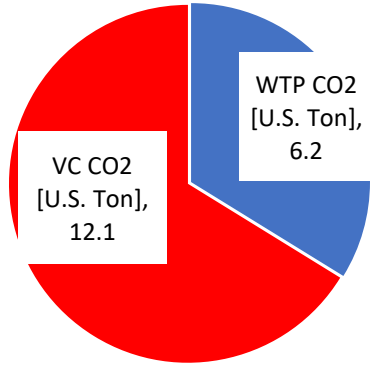


FCEV SUV

Renewable H2

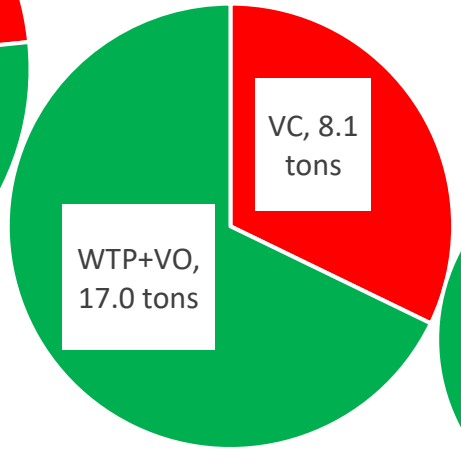
18.2 tons CO_2

110 g/mi



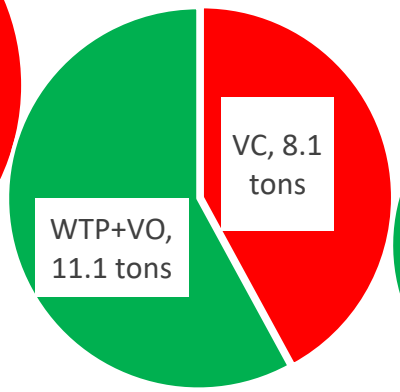
Hybrid, **E-gasoline**

152 g/mi CO_2



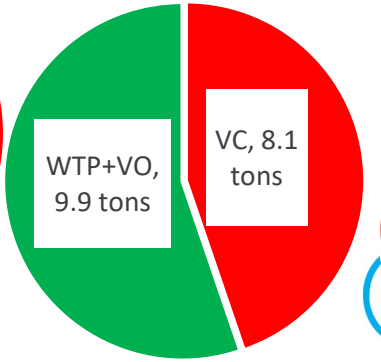
Hybrid, **Renewable gasoline**

116 g/mi CO_2



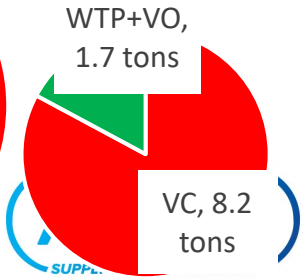
Hybrid, **E-diesel**

109 g/mi CO_2

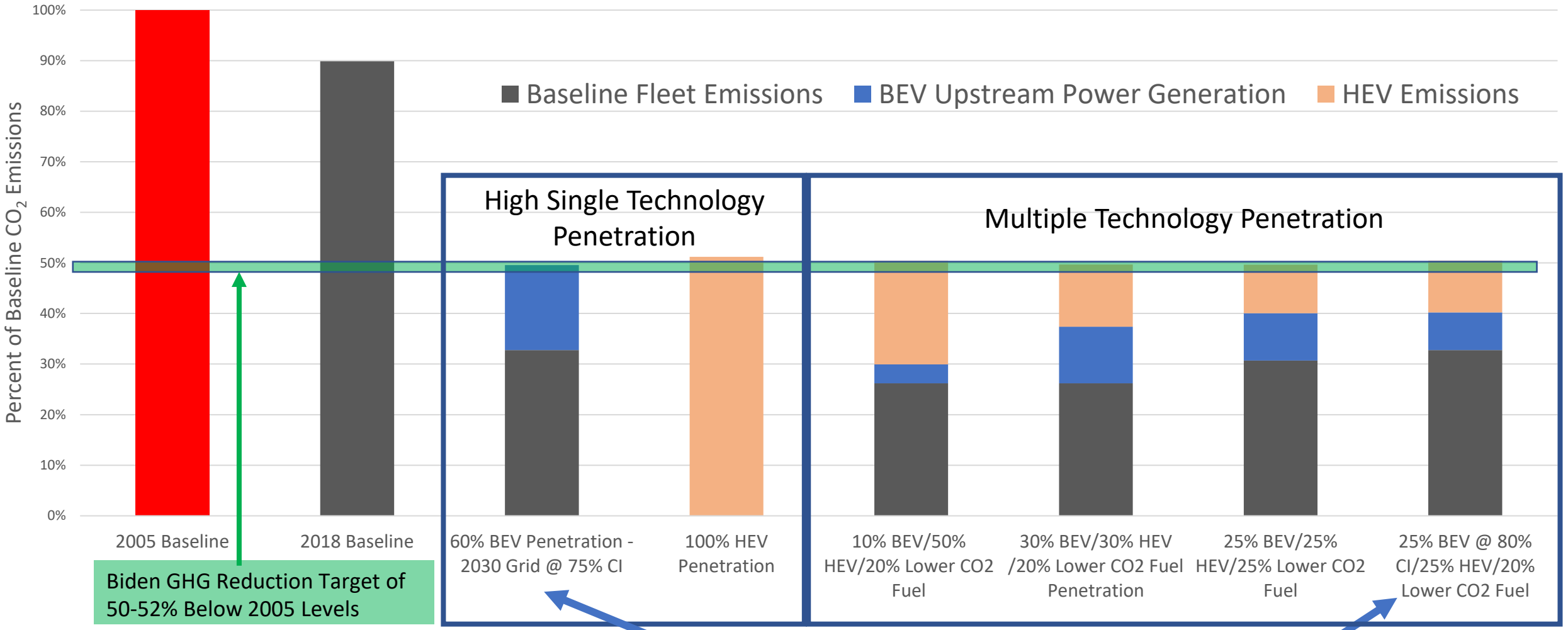


ICE, **RNG** (Northeastern Midwest)

60 g/mile CO_2



Meeting Climate Targets with Multiple Solutions in 2030



Reducing carbon intensity of BEVs via combination of grid decarbonization and higher efficiency BEVs

MECA SUPPLYING CLEAN MOBILITY

Summary

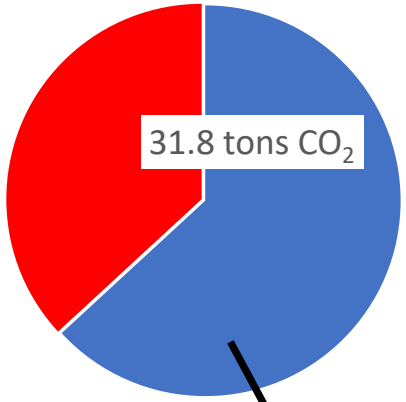
- **LCA results are sensitive to the baseline assumptions and future projections**
- **Policies that incentivize higher efficiency of all vehicles—with and without engines—leads to fastest GHG reductions**
- **Policies that incentivize low carbon fuel penetration to complement grid decarbonization can reduce GHGs from new and existing vehicles**
- **Engaging all available approaches to reducing GHGs will provide the most resilient strategy and greatest chance of success**

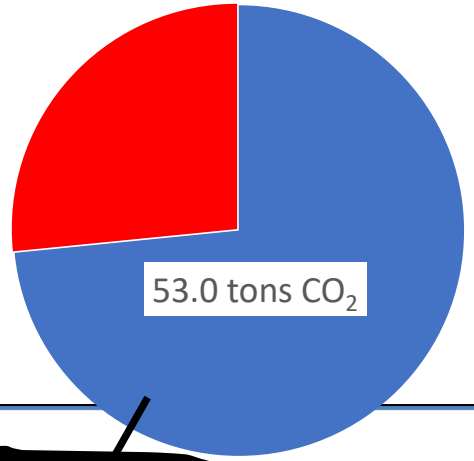
Thank You

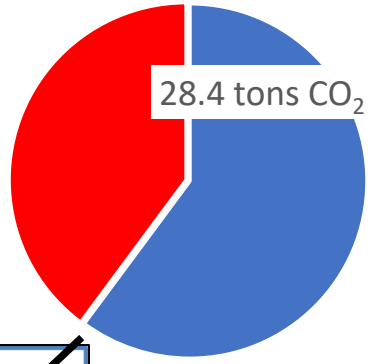
rbrezny@meca.org

Hybrids and BEVs Provide GHG Benefits in 2030 in a Large Part of the U.S.

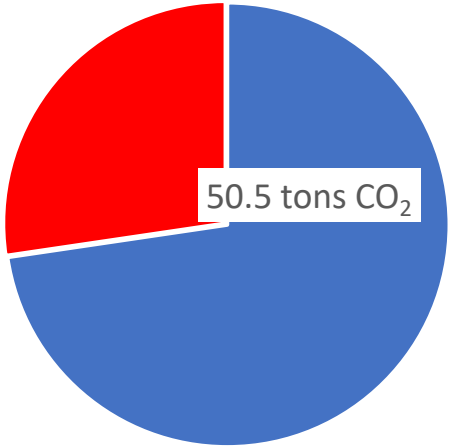
Vehicle Cycle
Well-to-Pump
Vehicle Operation

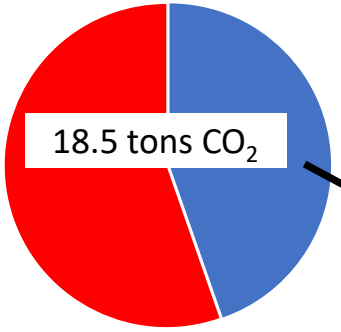


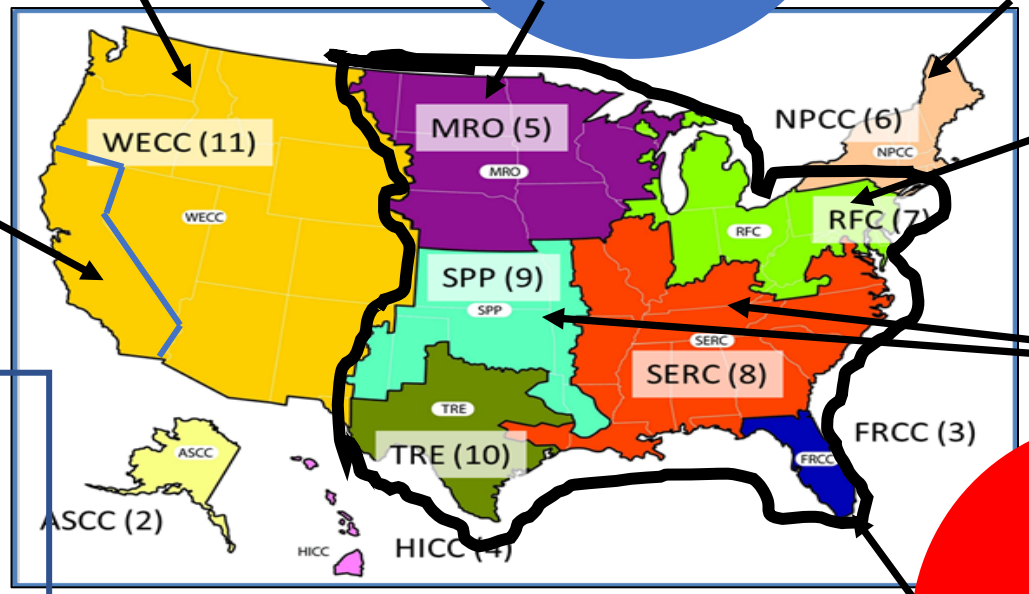


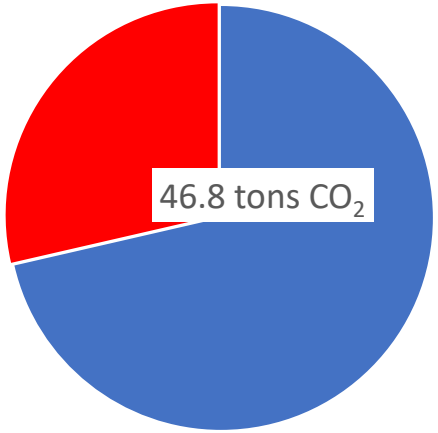


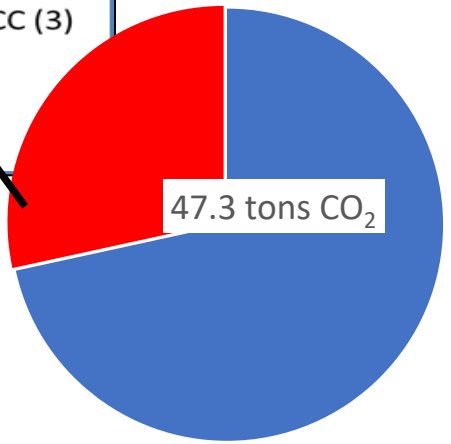
BEV (300 mile range) SUV
150,000 miles life

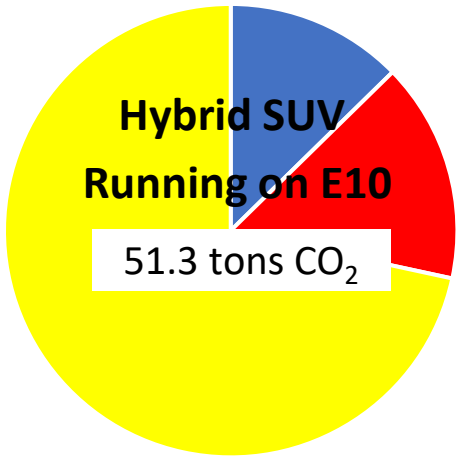












HEVs are a cost effective solution for about half of the U.S.