



"AFLEET Tool" To Analyze the Costs and Benefits of Alternative Fuel and Advanced Work Trucks

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Argonne has Supported Clean Cities for 15+ Years



- **AirCRED**
 - Estimated O₃ precursor & CO emission credits from AFVs for SIPs
- **Clean Cities AOI 4 Emissions Benefit Tool**
 - Estimated GHG & air pollutant benefits of Recovery Act grant proposals
- **REET Fleet Footprint Calculator**
 - Estimates petroleum use & GHG footprints of medium/heavy duty vehicles & off-road equipment

“AFLEET Tool” to Analyze Costs & Benefits of AFVs

- **Examines light-duty & medium/heavy-duty vehicle**
 - Petroleum use
 - GHG emissions
 - Air pollutant emissions
 - Cost of ownership
- **Contains 15 fuel/vehicle technologies**
 - Conventional: gasoline, diesel
 - Hybrid: gasoline HEV, diesel HEV, diesel hydraulic hybrid
 - Plug-in electric: PHEV, EREV, EV
 - Alternative fuel: B20, B100, E85, LPG, CNG, LNG, LNG/diesel pilot ignition
- **AFLEET Tool & its user manual available at:**
<http://greet.es.anl.gov/afleet>





AFLEET Tool's Major Data Sources



- **Argonne's GREET model**
- **EPA's MOVES model and certification data**
 - LDV = passenger car; passenger & light commercial truck
 - HDV = school & transit bus; refuse, single unit & combination trucks
- **Clean Cities Recovery Act Project data**
 - Work trucks = dump, refuse, bucket, snow plow, street sweeper, etc.
- **Clean Cities Alternative Fuel Price Report**



AFLEET Tool's Calculation Methods – Simple Payback



- **3 calculation methods**
 - Simple Payback Calculator
 - Total Cost of Ownership Calculator
 - Fleet Energy and Emissions Footprint Calculator
- **Simple Payback Calculator**
 - Simple payback of purchase of a new AFV vs. conventional counterpart
 - Uses incremental acquisition & annual operating costs
 - Operating costs = fuel, DEF & maintenance
 - Average annual petroleum use, GHGs & air pollutant emissions



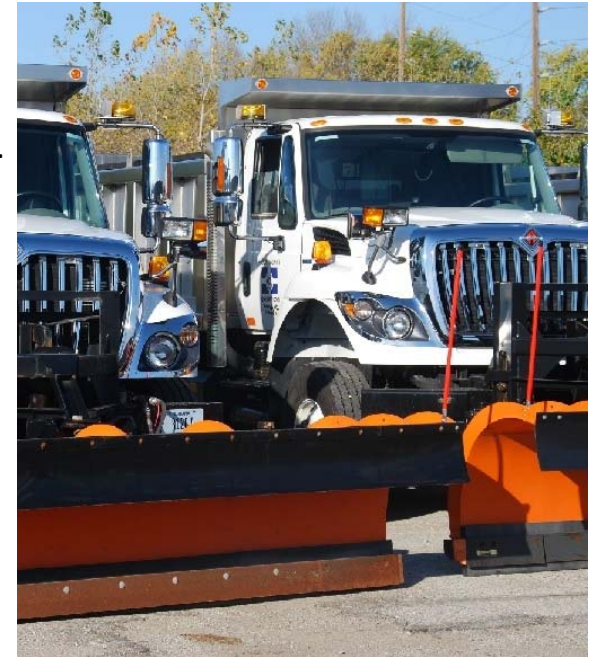
AFLEET Tool's Calculation Methods – TCO & Footprint



- **Total Cost of Ownership Calculator**
 - NPV of operating & fixed costs over years of ownership of a new vehicle
 - Discounted cash flow analysis
 - Fixed costs = financing, depreciation, insurance, license & registration
 - Operating costs = fuel, DEF & maintenance
 - Lifetime petroleum use, GHGs & air pollutant emissions
- **Fleet Energy and Emissions Footprint Calculator**
 - Annual petroleum use, GHGs & air pollutant emissions of existing & new vehicles
 - Older vehicles have higher air pollutant emission rates than newer ones

Case Study of Indy's F-550 and Refuse Trucks

- **Indianapolis has goal to reduce petroleum use from fleet**
 - Used AFLEET Tool along with fleet data and NREL testing & simulations
 - Examined AFV options for selected work trucks
- **~70 F-550 performing various duties**
 - Annual VMT ~ 12,000 miles
 - Fuel economy ~ 7.3 MPDGE (6.5 MPGGE)
- **~60 refuse trucks (side and rear loaders)**
 - Annual VMT ~ 9,500 miles
 - Fuel economy ~ 2.3 MPDGE (2.0 MPGGE)

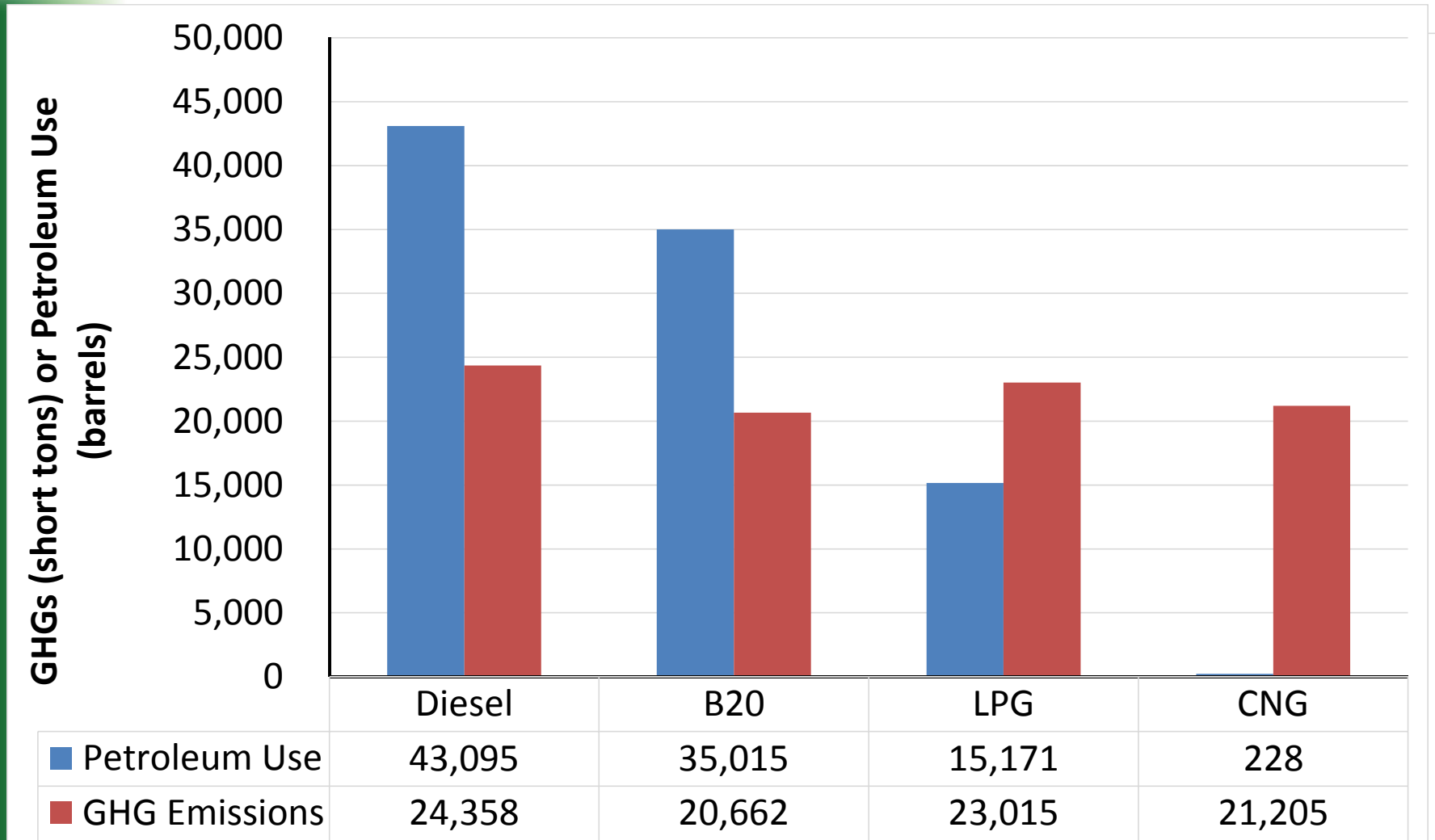


Case Study of Indy's F-550 Trucks

- **Incremental cost of AFV vs. diesel F-550**
 - B20 ~ \$0
 - LPG ~ \$8,500
 - CNG ~ \$14,500
- **Fuel price vs. diesel (DGE basis)**
 - B20 ~ same
 - LPG ~ \$1.00 lower
 - CNG ~ \$1.50 lower
- **Fuel economy of AFV vs. diesel F-550**
 - B20 ~ same
 - LPG ~ 10% lower
 - CNG ~ 10% lower



Case Study of Indy's F-550 Trucks

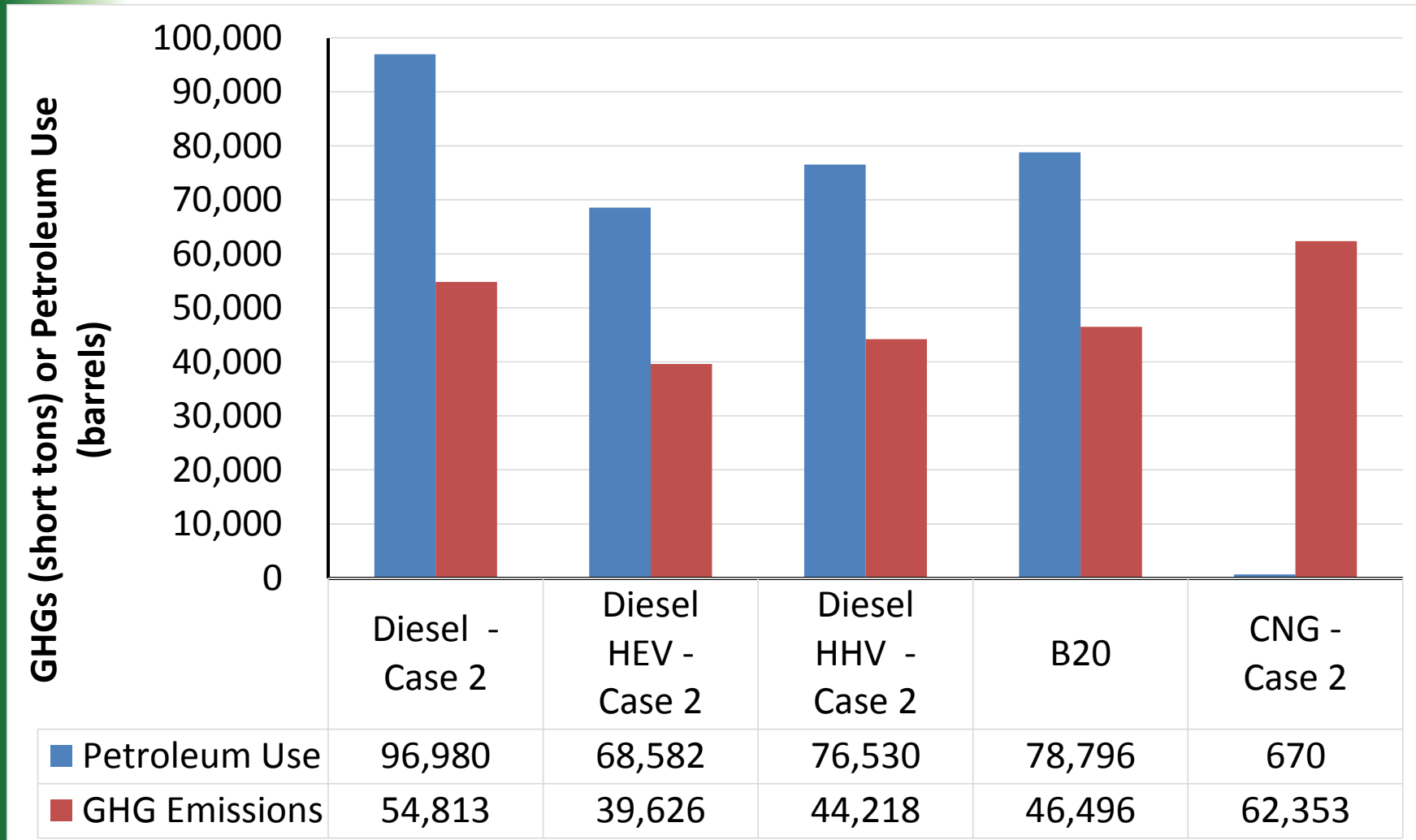


Case Study of Indy's Refuse Trucks

- **Incremental cost of AFV vs. diesel refuse**
 - B20 ~ \$0
 - Diesel HHV ~\$40,000
 - Diesel HEV ~ \$50,000
 - CNG ~ \$50,000
- **Fuel price vs. diesel (DGE basis)**
 - B20 ~ same
 - CNG ~ \$1.50 lower
- **Fuel economy of AFV vs. diesel refuse**
 - B20 ~ same
 - Diesel HHV: Case 1 (default) ~ 29% higher; Case 2 (NREL) ~ 19% higher
 - Diesel HEV: Case 1 (default) ~ 25% higher; Case 2 (NREL) ~ 33% higher
 - CNG: Case 1 (default) ~ 15% lower; Case 2 (NREL) ~ 31% lower



Case Study of Indy's Refuse Trucks



- **AFLEET can help estimate the economic and environmental costs and benefits of AFVs**
 - Inform new vehicle purchases
 - Examine energy and emissions footprint of existing vehicles
- **Default data provided for key inputs**
 - Using your own makes your analysis more meaningful
 - Case study shows impact of fuel economy
 - Info on AFV (or any vehicle) performance on specific duty-cycle is crucial
- **AFLEET future plans**
 - Include other cost/environmental data as available
 - Infrastructure costs
 - Idle reduction technologies



Thank you!!!



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