

Why are we discussing HEV?

- History behind the movement
- Sensitive to economic and environmental issues.
- Hybrid propulsion is making an impression in the automotive market and the transit bus industry. It has the potential to do the same for school bus operators.
- Potential savings and safety benefits.



HYBRID
TECHNOLOGY

✓ **What is a Hybrid:** Internal combustion engine + electric motor

✓ **Propulsion:**

- Parallel: Either engine or motor can turn wheels
- Safety: Diesel drive can operate independently of HEV
- Electric Assist: Mostly during acceleration—0 to 30 mph
- Regeneration: Batteries recharged during braking

✓ **System Type:**

- Plug in: Charge depleting; greater reliance on battery
- Battery Tech: Split Lithium Ion Battery Packs

Operation of plug in Hybrid

When brakes applied or vehicle is going down hill, the electric motor goes into re-generation mode to recharge the batteries.

Besides savings in fuel costs, will see savings in brake and tire replacement costs.

- ✓ **Fuel Economy Improvement**
- ✓ **Reduced Emissions**
- ✓ **Factory-Installed, Turn-Key System**
- ✓ **Reduced Maintenance**
- ✓ **Improved Acceleration**
- ✓ **Uses existing fueling infrastructure; need access to 220v power.**

KEY Operational Points

Fuel Savings is Route Dependent and Driver Behavior Plays a Role

- ✓ Lots of start-stop is optimal, non-rural routes
- ✓ Max of 50-55 miles on a single charge
- ✓ After 50-55 Miles the bus operates on diesel
- ✓ Normal charging cycle is 5 to 6 hours; 220 volt

Anticipated Benefits

- 20% to 40% increase in fuel economy
- 90% reduction in particulate matter
- 60% reduction in NOx
- Increased engine, transmission and brake life





Summary

- Hybrid vehicles address societal concerns and provide operational benefits
 - Reducing consumption of fuel
 - Reducing output of harmful emission
- Hurdles for users
 - Funding for acquisition
 - Next steps



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