



EVolution Hybrid

A Public-Private Project to build
a Hybrid Class 8 Semi Truck

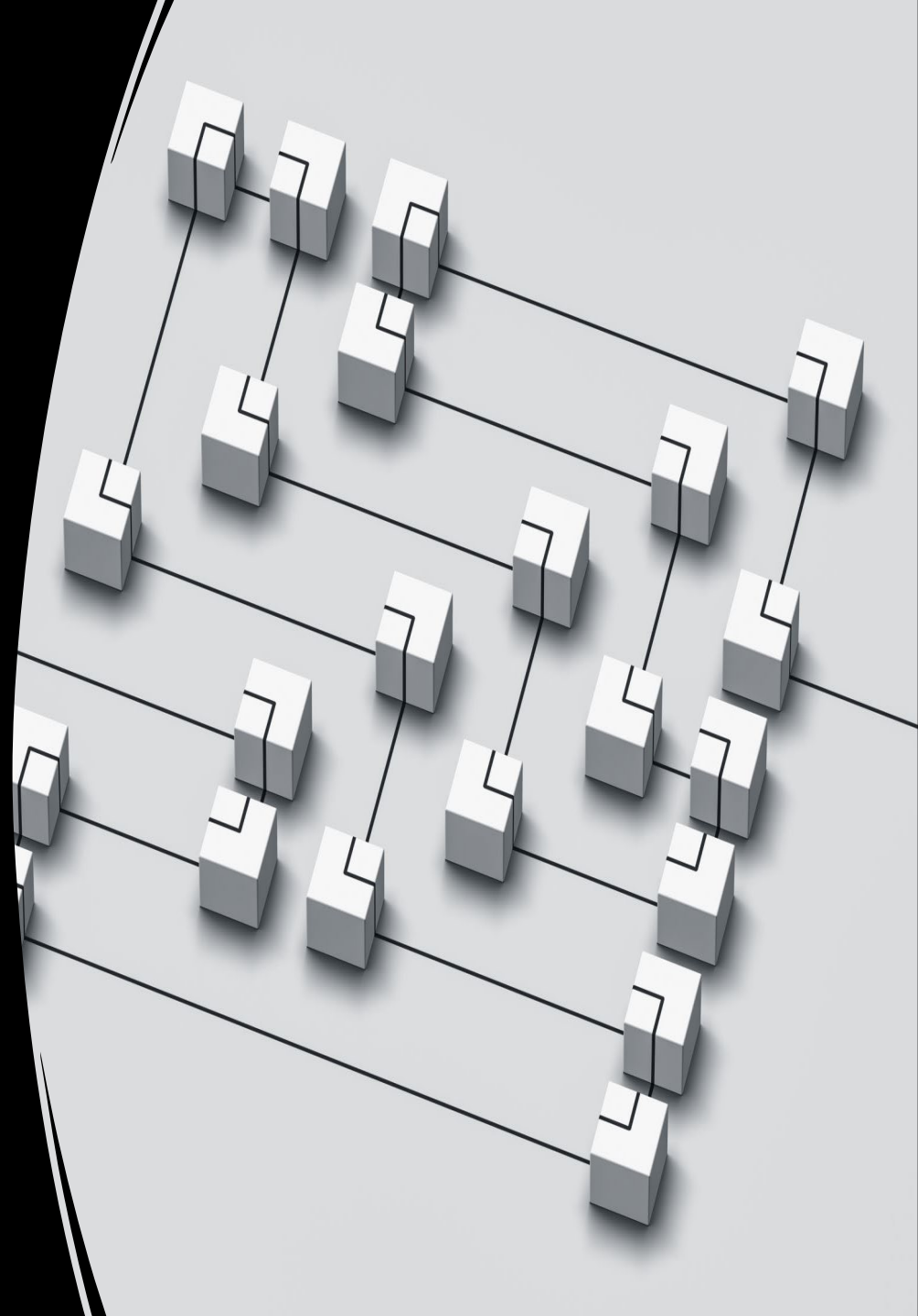


Project Rational

- Complexity of modern drivetrains
 - Diesel mechanic workforce and training shortfall
- Emissions controls lead to reliability issues
- Emissions and efficiency needs and regulations still exist within the trucking industry
- All electric (plugin) is not a viable solution for many trucking applications
- Grid infrastructure is not currently built to handle plug-in electric vehicles on a large scale

Project Goals

- Decrease complexity and increase reliability of drivetrain
- Decrease emissions and raise efficiency
 - 60% reduction in emissions
 - 80% reduction in cost/mile (plug-in only)
 - 50% reduction in cost/mile (hybrid mode)
- Run-on electricity from the grid or run-on electricity generated from range extending device
- Design a truck that will appeal to current drivers
- Bridge the gap between all or nothing approach currently seen in industry
- Marriage of technologies to make a better solution



Project Funding

- \$2.3 million EDA grant
- 20% from TrainND Northwest
- Perkins Electric Innovations





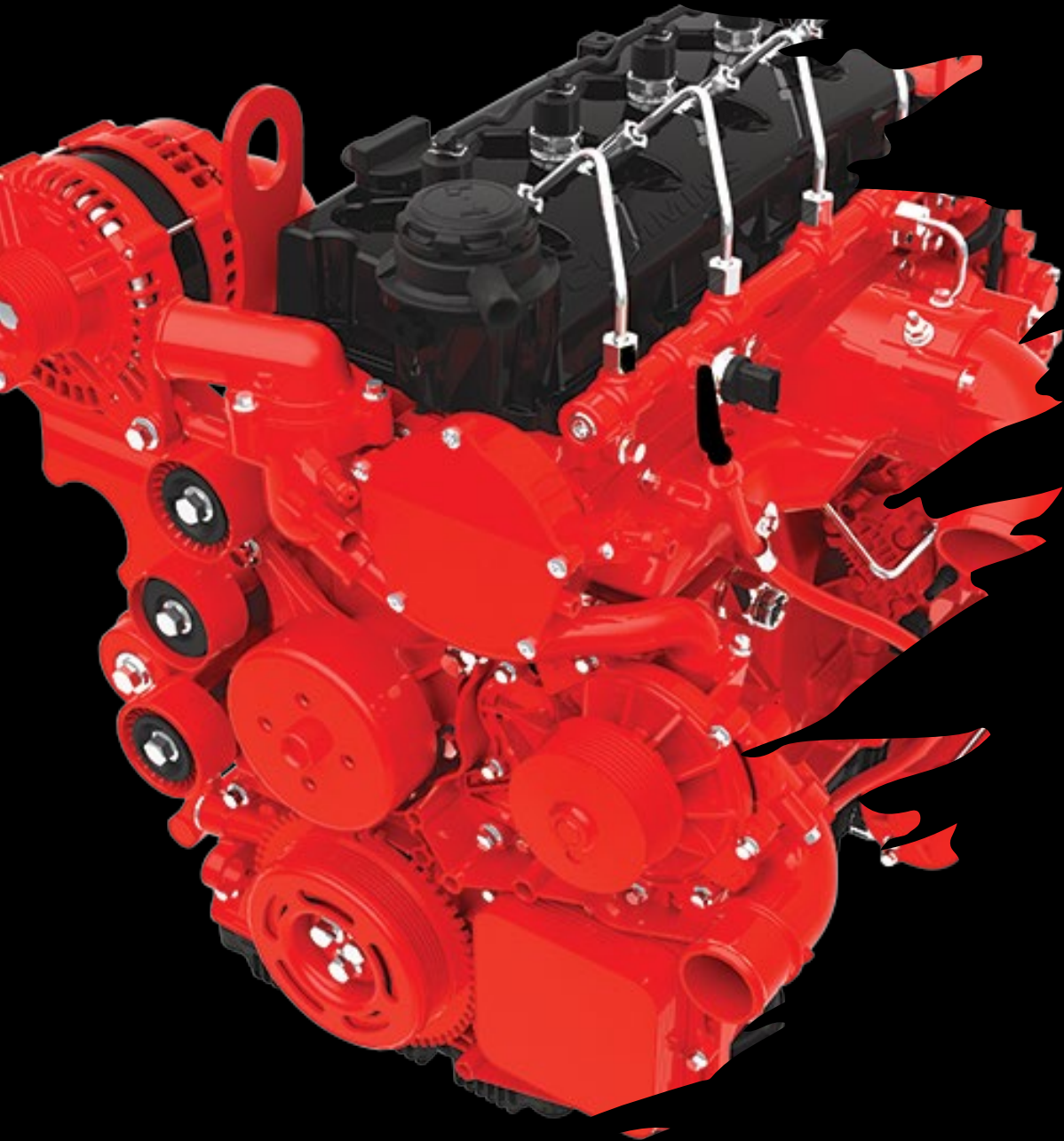
Electric Drivetrain

- Electric Motor
 - 300 KW Motor
 - 460 Horsepower
 - 1850 ft/lbs torque
 - AC Induction motor
 - Highly Intelligent Controllers (HIC)
 - 380 Volt AC output
 - Liquid cooled
 - 96% efficient
 - HMI (in cab)



Electric Drivetrain

- Transmission
 - 7 speed fully automated
 - 1st gear 8.5:1
 - 7th gear 1:1
 - PTO Function

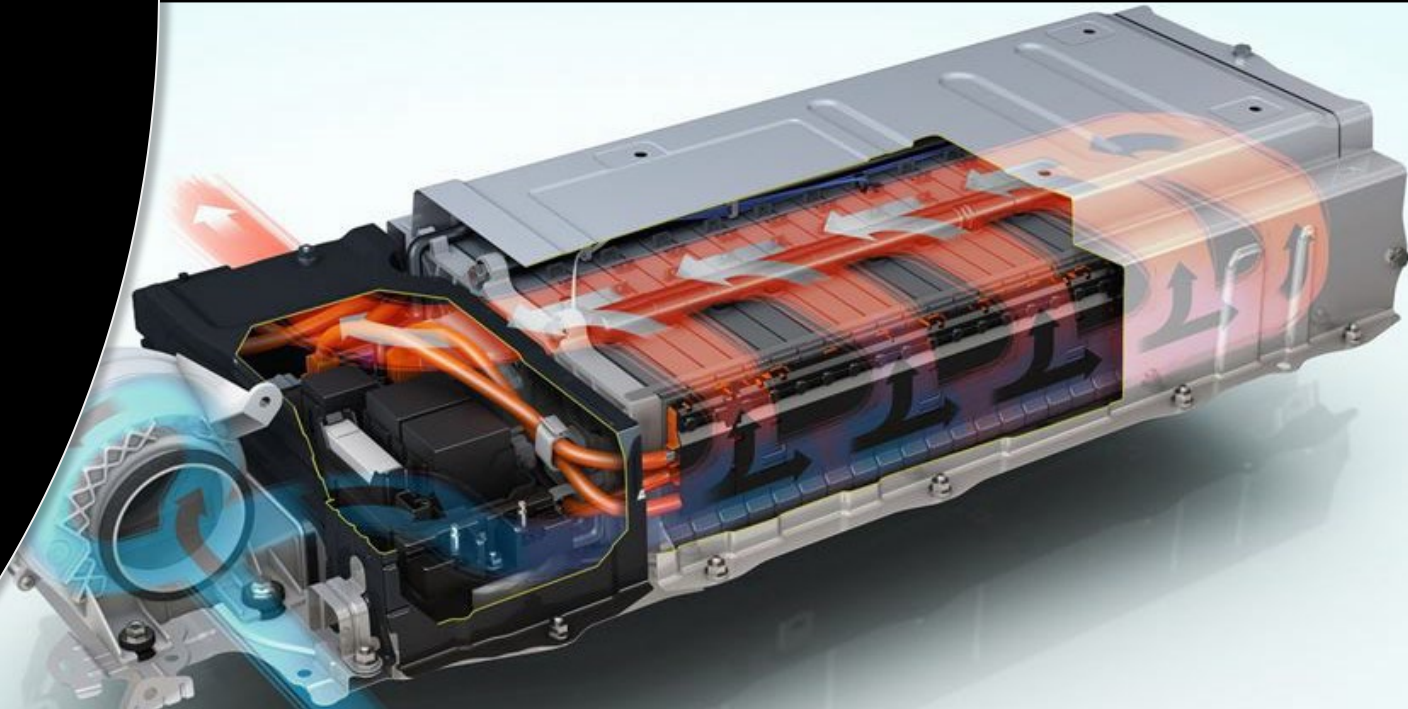
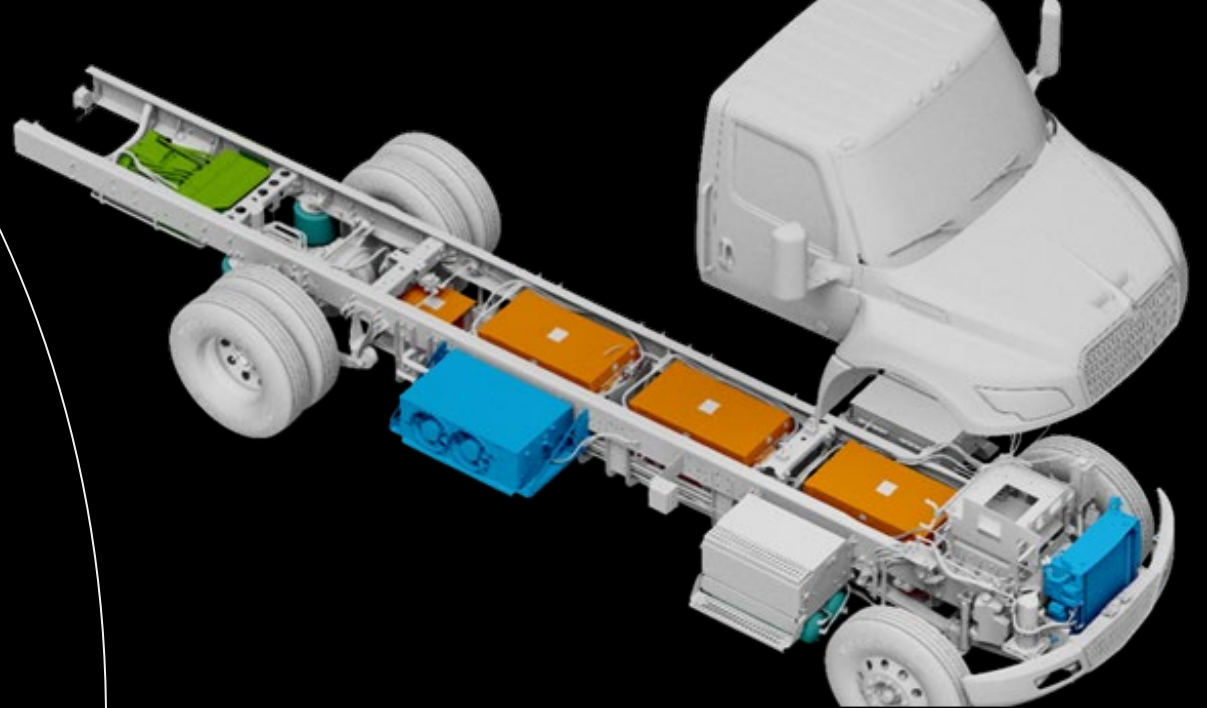


Electric Drivetrain

- Range Extending Device
 - Diesel Combustion Engine
 - Cummins 2.8 liter
 - Meets tier 4 final emissions standards
 - Direct current (DC) generator head
 - Exploring micro-turbine possibilities

Electric Drivetrain

- Battery System
 - 400-600 KW/H Battery Pack
 - In frame battery storage
 - Thermally managed



Chassis

- Kenworth W900A cab and sleeper
- Custom built frame
- Eaton 21K rear drive axels
 - 3.73:1 gear ratio
- Regenerative braking
- Air drum brakes
- Low Roll Resistance (LRR) tires
 - 30% less Drag



Plans for the Truck

- Mobile CDL simulator trailer
- Program recruiting
 - Job fairs
 - High Schools/CTE Centers
 - Truck Shows/Competitions
- Student EV/Hybrid orientation
- Next step
 - Post secondary Class 8 EV mechanic training
- Repeatability and Scalability
- Alternate fuels

