



Eaton Hybrid Power Systems

An overview of Eaton's capabilities, technologies, goals and progress





The Eaton Hybrid Power Story

- Voice of The Customer
- Eaton Hybrid Power Program Goals
- Foundational Technologies
- Value Propositions by Vocation
- Market Readiness
- Customer Vocations: Applications & Value

Hybrid Power: the next big thing?



In **1899 Dr Ferdinand Porsche**, then a young engineer at Jacob Lohner & Co, built the first hybrid-powered vehicle, with a constant speed gasoline engine powering hub-mounted electric motors.

Credits: www.hybrid-vehicle.org



Voice of the Customer

- Improved Fuel Efficiency
- Life Cycle Costs: R.O.I.
- Reliability
- Auxiliary Power
- Productivity
- Driver Ease and Safety
- Noise
- Durability
- Serviceability
- Reduced Emissions
 - Meet local, regional & EPA emissions regulations
 - Do the “right thing”
 - **Sustainability message** as a marketing tool

These attributes and benefits are valued differently by customers, depending upon their application



Eaton Hybrid Program Goals

Provide cost-effective, reliable hybrid power to targeted commercial vehicle fleets that can create the greatest benefit.

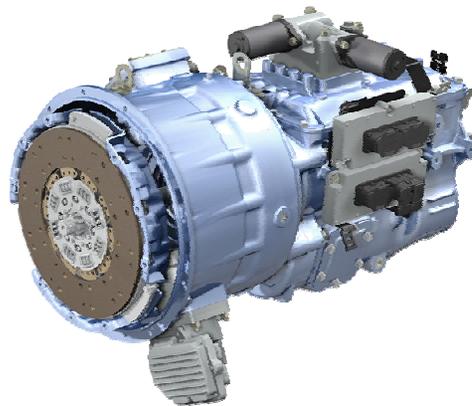
- Aim for maximum practical improvements in fuel economy
- Aim for maximum practical reductions in emissions
- Prove positive R.O.I. for hybrid power solutions

Foundational Technologies: Diesel-Electric Hybrid Power



Diesel-Electric Hybrid for Motive Power

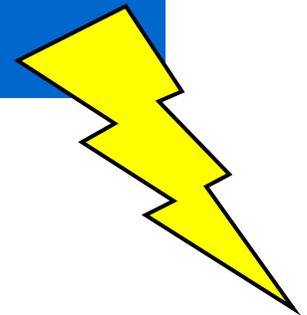
Parallel direct diesel-electric power system provides a blend of diesel & electric power as demanded by application and system design



Hybrid Drive Unit:
AMT with
Motor/Generator

Diesel-Electric Hybrid For Motive & Auxiliary Power

Parallel direct diesel-electric power system provides motive power **plus auxiliary power** for non-motive work

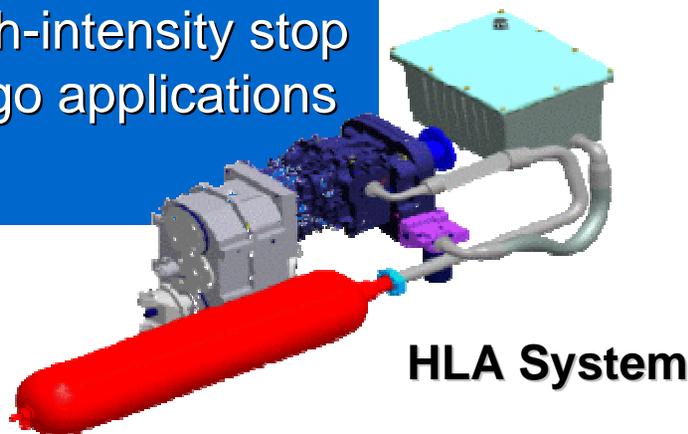


Foundational Technologies: Hydraulic Hybrid Power



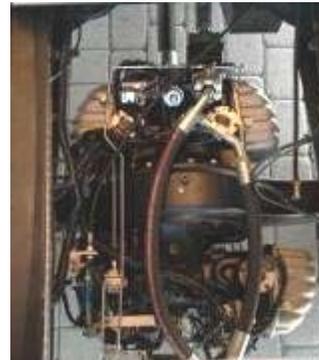
Hydraulic Launch Assist™ – HLA®

Parallel hydraulic power supplements the conventional powertrain for high-intensity stop & go applications



HLA System

Series Hydraulic Hybrid



Series Hydraulic Hybrid

Direct series hydraulic power system replaces conventional drivetrain with diesel power converted to hydraulic motive power

Hybrid Power Value Propositions: Utility & Telecomm



Utility & Telecomm

- Fuel costs
- Idle reduction
- Auxiliary power
- Noise
- R.O.I.

Save money on fuel,
generate power and reduce
work site noise & emissions



Eaton hybrid-powered vehicles delivering up to 60 percent fuel savings, cuts work site idle time up to 87 percent

Hybrid Power Value Propositions: City Delivery and Medium-Duty P&D



City Delivery



- Fuel
- Emissions
- Reliability
- R.O.I.

Save on soaring fuel costs and meet evolving local pollution and noise regulations – while maintaining reliability

Medium-Duty P&D



- Fuel
- Productivity
- Noise
- R.O.I.

Save money on fuel, improve productivity & reduce residential noise

Eaton Hybrid-equipped vehicles delivering up to 50% improvement in fuel economy & significantly reduced emissions

Hybrid Power Value Propositions: Buses & Shuttles



Buses & Shuttles

- Fuel economy
- Emissions reduction
- Noise
- R.O.I.

Save on soaring fuel costs, improve productivity and meet evolving local pollution and noise regulations.



Testing reveals 20% to 37% reduced fuel consumption

Hybrid Power Value Propositions: Class 8 Linehaul & Refuse



Class 8 Linehaul



- Fuel
- Emissions
- Idling
- R.O.I.

Improve MPG & save fuel while idling – will be impacted by EPA emissions regs & anti-idle laws

Lab and road testing indicate a \$9,800 savings per truck per year.

Refuse



- Fuel
- Productivity
- Noise
- R.O.I.

Save money on fuel, improve productivity, reduce brake service costs, reduce residential noise

Lab & road testing indicate a \$5,000 to \$10,000 increased profits per truck per year



Hybrid Power Value Propositions

- The Common Denominator:

Return On Investment!

- As “hot” as hybrid is today, the value premise and promise must outlive the hype
- Hybrid Power must prove out its savings over the life of the vehicle
- Volume production must drive per unit costs down to achieve acceptable R.O.I.
- Tax incentives and credits are needed to accelerate early customer acceptance & volume growth



Market Readiness



Customer Vocations: Applications & Value



	MD Utility			HD Refuse			HD Linehaul		MD Shuttle Bus			HD City Bus			MD Delivery			LD Delivery				
Criteria	F	P	EO	F	P	B	F	EO	F	P	B	F	P	B	F	P	B	F	P	B	EO	
Electric Hybrid	X	X	X				X	X	X	X	L				X	X	L	X	X	X	X	
HLA System				X	X	X			X	X	X	X	X	X								
Series Hydraulic Hybrid									X	X	X	X	X	X	X	X	X	X	X	X	X	L

Value Criteria: F = Fuel
P = Performance

B = Brake Life
EO = Engine Off Power
L = Limited Value

What Hybrid system is best for you?



- It's not that simple – you can't pick a hybrid power system out of a catalog
- Hybrid technologies continue to mature & improve. New technologies are being investigated and incorporated.
- It's a partnering process that begins with an in-depth investigation into a customer's needs & values.
- A combination of simulation, prototype and field trial will yield the most cost-effective, reliable solution with the highest R.O.I. for the customer.

Why should Eaton be your hybrid power system supplier?



- Eaton. We're the acknowledged global leader in hybrid power systems for commercial vehicles
- Eaton. We're focused on total customer value. We seek to create value in the most cost-effective manner.
- Eaton. We know trucks and commercial vehicle drivetrains like no one else, with almost 100 years of commercial vehicle experience.
- Eaton. Unparalleled application expertise and global after-sale support



See You at HTUF !

- **Hybrid Truck Users Forum**
- South Bend, IN
- 14-16Oct08
- <http://www.calstart.org/programs/htuf/>
- Educational Forums
- Industry Speakers
- Commercial Vehicle Ride & Drive



Eaton Hybrid Power Systems

Thank You!

Questions?

