



Hybrid Systems for Medium and Heavy Duty Trucks

## Advances in Plug-in Technology

HTUF 2009 National Conference

Joe Dalum

Odyne

October 28, 2009



## About ODYNE

- A clean technology company originally founded in 2001, develops and produces plug-in hybrid propulsion systems for trucks over 14,000 pounds.



- Focused on plug-in hybrids for the work truck sector – trucks with equipment normally powered by the engine.
- To date, 25 units produced, 30 planned by Q4 2009, testing since October, 2007.
- Utilities across country receiving units, expanding production in 2010.



## About Odyne and DUECO, Inc.

- DUECO - One of the largest final stage manufacturers of trucks for the utility industry, government and other entities with over 50 years of experience.
- January 2009, an affiliate of DUECO acquired most assets of Odyne Corp.
- Manufacturing and development of *plug-in hybrid drive systems* continues under “Odyne” name.
- Other companies, such as Terex and Posi-Plus sell the Odyne system.



**Headquartered in Waukesha, WI**



Plug-in hybrid heavy duty truck





## Applications



35 Series 4x4 Digger Derrick



35 Series Underground Utility Vehicle



## Applications



18 Series Class 7 Bucket Truck



10 Series Class 5 Bucket Truck

## Early Adopters



- PG&E, Xcel, AEP, DPL, Progress Energy, FP&L, PSE&G, Cox, Verizon, UELC and others



# *Benefits of Odyne Plug-in Hybrid*

## **Reduced fuel consumption & emissions:**

- Eliminates or reduces fuel consumption and emissions at the jobsite
- Increased efficiency when driving
- Savings of 50% per year are possible, depending upon the duty cycle. Tested at SwRI.
- **Eligible for \$12,000 tax credit** – IRS 30B Qualified Heavy Duty Hybrid Motor Vehicle Credit. Odyne system on a Navistar International DuraStar 4x2 Utility Truck

## **Quiet jobsite operation**

## **Interfaces with Allison Transmission**

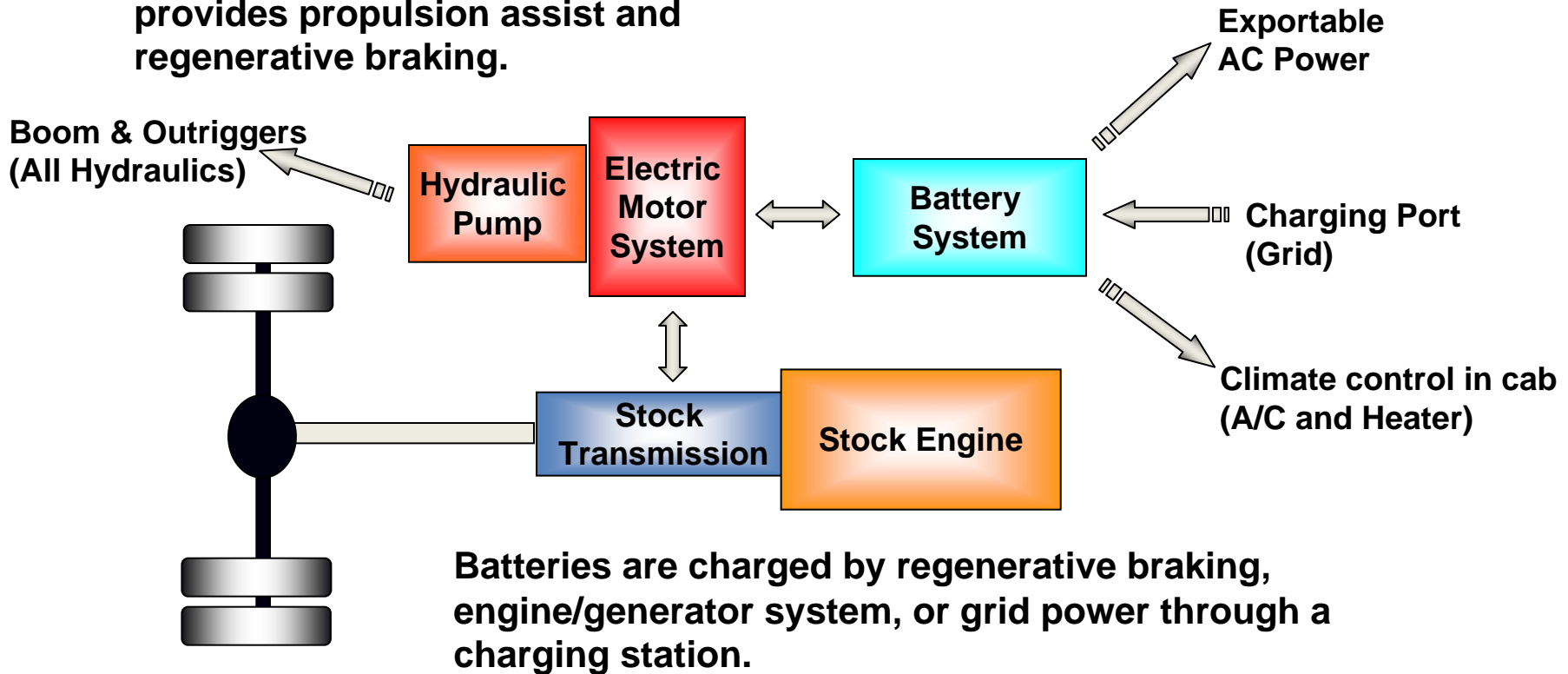
## **Larger battery system than conventional hybrid**

- 35kWh vs. 2Kwh – recharge using grid (or vehicle)
- Operates longer in all-electric mode at jobsite.
- Electric air conditioning and heat in cab, reduces idle time at jobsite.
- Exportable power, eliminates diesel generator.



# Odyne Parallel Hybrid System

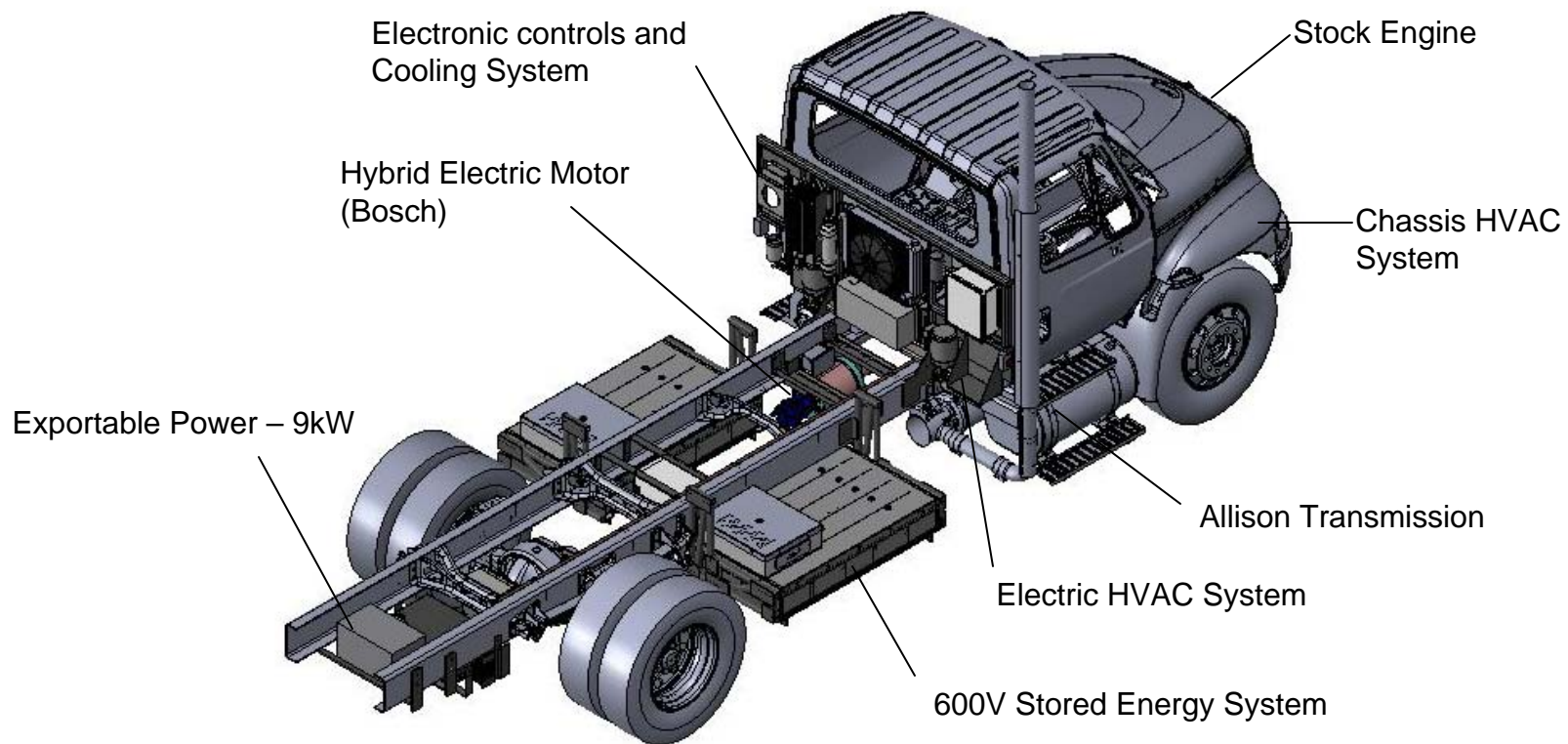
Permanent Magnet Motor/Generator provides propulsion assist and regenerative braking.



**No change to OEM Transmission or Engine parameters CARB Compliant**



# *Odyne Parallel Hybrid System*



Multiple Chassis Manufacturers, Multiple weight classes, Retro-fit capable





# *Testing results – Field and Lab*

**Data acquisition systems installed on over 15 units – started in 2007**

- Miles driven
- Idle time
- Fuel use
- ePTO – hydraulic demand time
- Recharge and Time available for recharge

## **Southwest Research Institute (SwRI)**

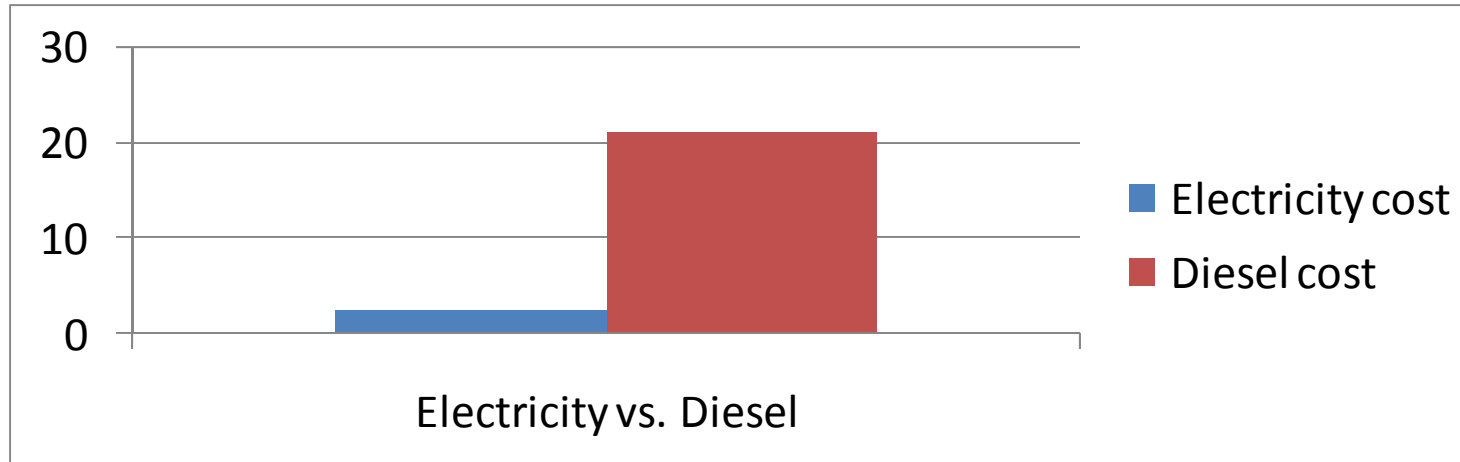
- .Duty cycle testing – urban (CILCC) and stationary testing with hydraulic loads.
- Over 50% reduction in fuel consumption for a utility duty cycle.





## Electricity cost versus Diesel fuel cost

- Electricity cost of \$2.50 (25kWhr at \$.10 per kWhr)
- Diesel cost of \$21.00 (7 gallons at \$3.00 per gallon)



## Other Cost Benefits

- Fewer trips to refill fuel tank
- May eliminate generator
- Less maintenance (fewer engine hours)
- Quiet – may be able to work different shifts

## *Current Activity*

Developing next generation plug-in hybrid system

Expanding production

- Developing lower cost, lower weight system (Li-ion).
- Leverage automotive supply chain, Scale to high volume
  - Design for multiple chassis makes and sizes
- Lower fuel consumption
- Lower emissions (2010 compliant)
- Quiet operation



Awarded DOE Congressionally Directed Project

\$1.9 million DOE funding for plug-in hybrid medium duty truck

- Develop and demonstrate next generation plug-in hybrid medium duty trucks



# Summary

- Odyne plug-in hybrid technology reduces fuel consumption and emissions - displaces petroleum
- Modular high energy system – wide variety of applications for large trucks
- Eligible for maximum \$12,000 tax credit - Odyne system on a Navistar International DuraStar 4x2 Utility Truck
- Odyne actively developing new technology, encourages support for industry –  
RD&D, extension & improvement of tax credits





# Questions?

Matt Jarmuz or Joe Dalum

**262-544-8405**

[www.odyne.com](http://www.odyne.com)

