



Partners In

Plug-in Hybrid Medium & Heavy Duty Trucks

**AB 118 Investment Plan 2010-2011
Electric Drive Workshop – September 9, 2009**

DOCKET

09-ALT-1

DATE 9/9/2009

RECD. 9/22/2009

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9/9/2009 J. Dalum

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About Odyne & DUECO, Inc.

- Odyne designs and manufactures plug-in hybrid propulsion systems for trucks over 14,000 pounds
- Founded in 2001, Odyne developed the industry's first commercial plug-in hybrid utility truck in 2007 with DUECO, Inc.
- Odyne is owned by the parent company of:
 - DUECO, one of the largest final stage manufacturers of trucks in the U.S.; and
 - UELC, one of the largest nationwide rental and leasing companies in the utility industry, two locations in California.
- Odyne operates in partnership with affiliates DUECO & UELC and works with Terex Utilities



Odyne & DUECO Production Facility



Why Interest in Plug-in Hybrid Trucks?

- Energy security (displace petroleum with electricity)
- Reduced emissions (GHG) & other pollutants (NOx, particulates)
- Reduced fuel consumption
- Reduced noise at jobsite



Plug-in Hybrid truck with Digger Derrick

U.S. Truck Market

- Over 8 million trucks (>14,000 pounds), High fuel consumption & idle time
- Approximately 100,000 work trucks with a PTO sold per year in U.S.

Medium and heavy duty truck segment excellent fit for hybrid technology.
Odyne expects strong growth for our systems within the next 3 to 5 years.

Early Adopters

- Produced over 20 plug-in hybrid trucks to date, utilities across country receiving units, **expanding production** in 2009
- PG&E, Xcel, AEP, DPL, Progress Energy, FP&L, and others
- UELC – units available for rent



PG&E
Plug-in Hybrid
Medium Duty Truck



Applications

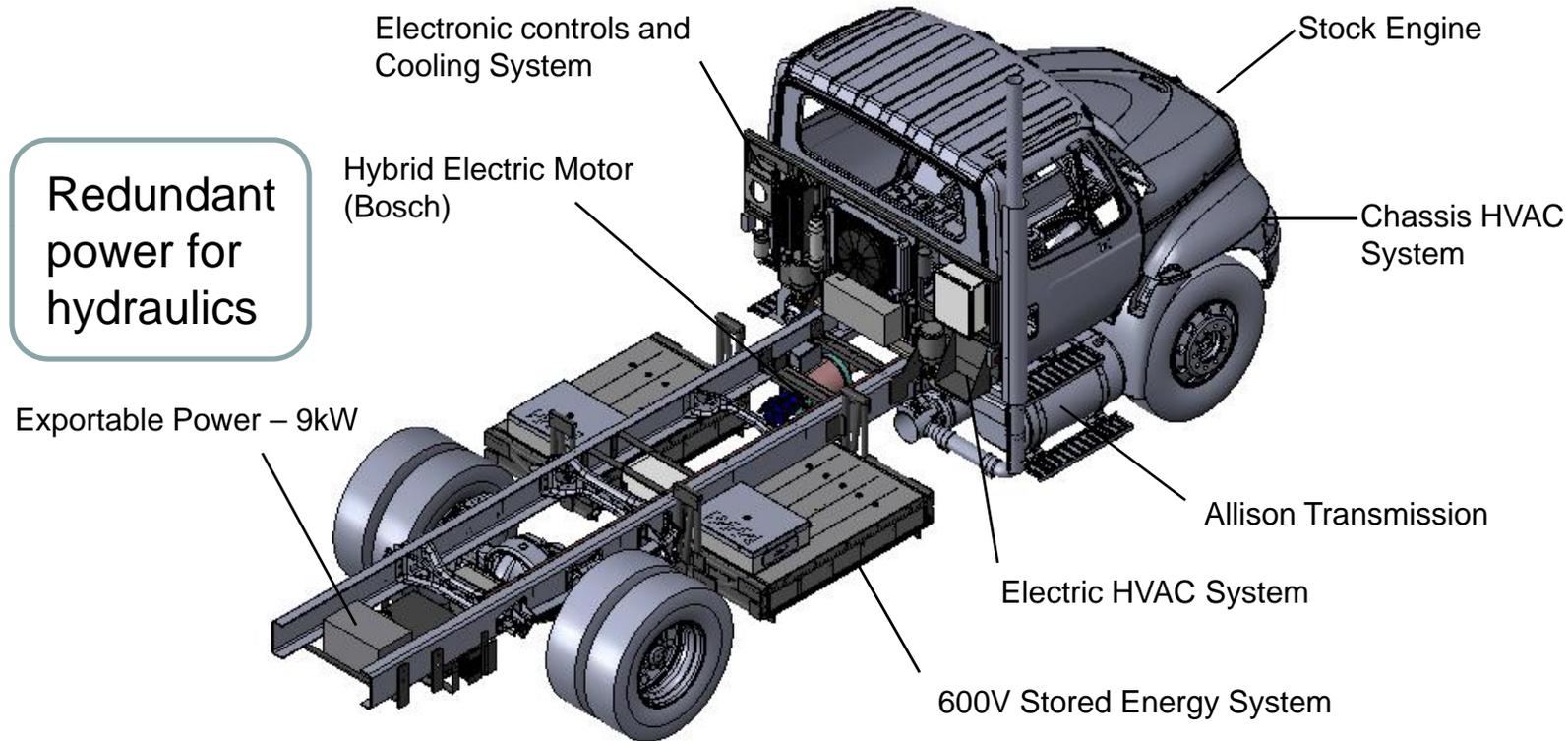
- Trucks over 14,000 pounds (examples):
 - Aerial device bucket trucks
 - Digger derricks
 - Compressor trucks
 - Refuse
- New truck market and retro-fit

Odyne is a leader in plug-in hybrids – First:

- Digger derrick
- Compressor truck
- Class 8 tandem axle truck (56,000 pounds GVWR)
- 4x4 class 8 truck (37,000 pounds GVWR)



Odyne Parallel Hybrid System



No change to OEM Transmission or Engine parameters: Emissions Compliant
Multiple Chassis Manufacturers, Multiple Weight Classes, Retro-Fit Capable



Benefits of Odyne Plug-in Hybrid

Reduced fuel consumption & emissions:

- Eliminates or reduces fuel consumption and emissions at the jobsite
- Increased efficiency when driving.
- Fuel Savings of 50% per year are possible, depending upon the duty cycle
- Testing performed at Southwest Research Institute.

Quiet jobsite operation

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.





2009 – 2010 Next Steps

Expand production of current plug-in hybrid system

Enhance system using Department of Energy Congressionally Directed Funds (\$1.9M): Use possible CEC match

Advanced battery system

Smaller, lighter weight components

Reduce cost, increase economies of scale



Expand DOE program to California

Would like CEC to expand matching eligibility to include Congressionally directed funds and other funding sources.



Demonstration Goals for 2010 - 2011

Implement large demonstration of plug-in technology for new medium and heavy duty trucks (trucks over 14,001 pounds) 100+ units

Variety of applications, especially work trucks that must operate equipment, include required charging infrastructure.

Measure duty cycle data on a wide variety of applications, this will help assess which technology is best suited for certain applications.

Plug-in hybrid Retro-fit program for medium and heavy duty trucks

Target conventional work truck applications with high fuel consumption

Use smaller components developed through DOE program

Manufacturing: California truck centers to complete retro-fit activities

Development Goals for 2010 - 2011

Continue to Develop improvements to plug-in technology for medium and heavy duty trucks – Possible CEC projects

- **Implement advanced battery technology and evaluate larger stored energy systems (e.g. 70 kWh) for larger trucks over 33,000 pounds.**
- **Develop a CNG powered plug-in hybrid.**
- **Develop retrofit kits for existing vehicles.**
- **Smart Grid Interface**
- **Other: R & D**
 - **Plug-in & hydraulic hybrid**
 - **Series / Parallel**





Summary

- Odyne plug-in hybrid technology reduces fuel consumption and emissions - displaces petroleum
- Modular high energy system – wide variety of applications for large trucks
- Seeking matching funds in California for a DOE congressionally directed project
- 2010 – 2011 Proposals:
 - Plug-in hybrid demonstration
 - Retro-fit program
 - Technology enhancements





Questions?



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