

DOCKETED

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Free trucks and buses from fossil fuel

Partnering with OEMs on All-Electric Vocational Vehicles



Presented to



CALIFORNIA
ENERGY COMMISSION





Electrify any Truck

4 Motiv-Powered electric vehicles



Motiv's Electric Powertrain



ARFVTP Objectives

Have changed slightly over the years

ARFVTP Objectives

Alternative/ Renewable Fuels

- ↑ Use
- Make in CA
- (↓ Carbon Footprint)
- (Optimize for engines)

Vehicle Technology

- ↑ Efficiency
- ↑ Performance
- ↑ Mkt Viability
- Retrofit MD/HD

Fuel Infrastructure

- More Stations
- Corridors
- Existing Fleets
- Public Transit

Training/ Outreach

- Train Workforce
- Public outreach
- (Promotion)
- (Tech Centers)

Motiv's Focus

Motiv's Vision

Focus on tackling one of the ARFVTP Objectives

Improve the efficiency, performance and market viability of [one type of] alternative MD/HD vehicle technologies:

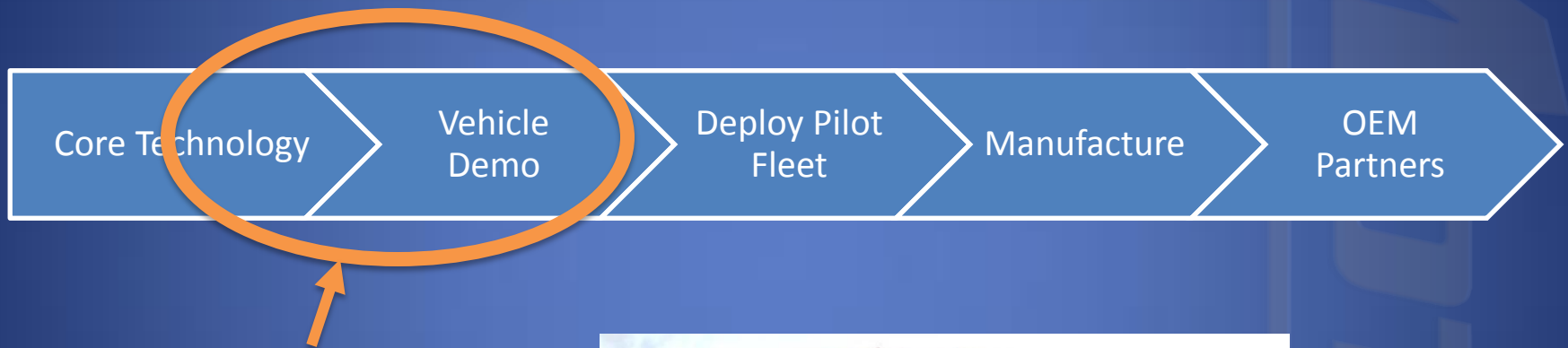
electric drive

(Corollary: promote it, train people)

How? Become the “Cummins of Electric”



“Cummins of Electric”



ARV-09-015
Prototype Shuttle



ARV-09-015: Prototype Shuttle

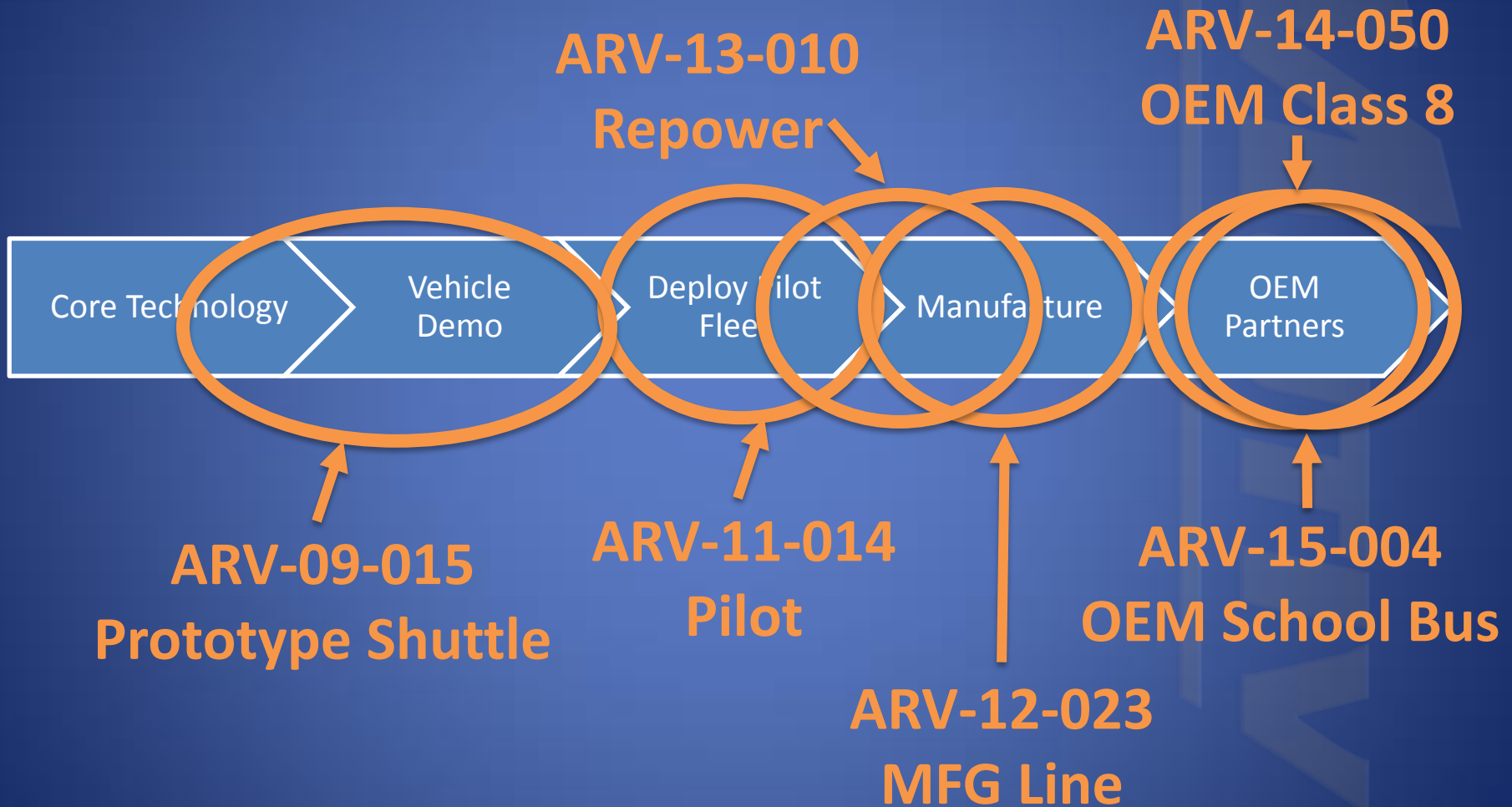
Key ingredients for success

- Very good alignment between project and business strategy
- Business strategy and project which are:
 - Focused (powertrain-only)
 - Flexible (battery agnostic)
 - Capital-efficient (robust to market projection error)

Lessons learned

- Timelines were too optimistic
 - E.g. Motiv has 41 people in 2015, not 108
- Underestimated the work between “snowflake” and commercial production (i.e. OEM-caliber)
- Supply chain lacks depth in key accessories

“Cummins of Electric”



CEC Grant Projects

Completed: ARV-09-015

In Progress:

1. ARV-11-014 for the build and demonstration of 4 more new medium-duty all-electric trucks and buses - 3 Shuttles and 1 Work Truck
2. ARV-12-032 for bring-up of Motiv's manufacturing line in Hayward, CA
3. ARV-13-010 for repowering 6 Walk-In Vans for AmeriPride in Vernon, CA
4. ARV-14-050 for building 3 All-Electric Refuse Trucks in Sacramento, CA
5. ARV-14-004 for building 5 All-Electric Class C School Buses



From Pilot to Commercial

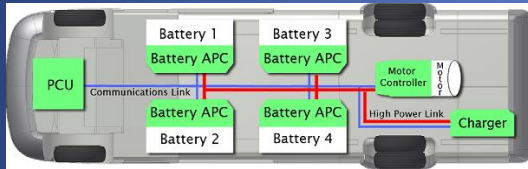
Two of Motiv's projects have successfully transitioned to commercial all-electric vehicles purchased through CARB's HVIP program:

- ARV-11-014 – Ameritrans ECO-CHARGE Shuttle
- ARV-13-010 – Morgan Olson Electric Walk-in Van

An accomplishment for Motiv, the CEC and CARB



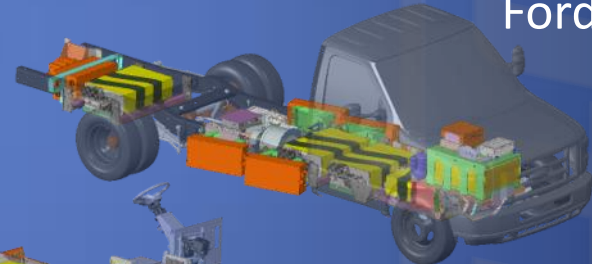
Then



NOW



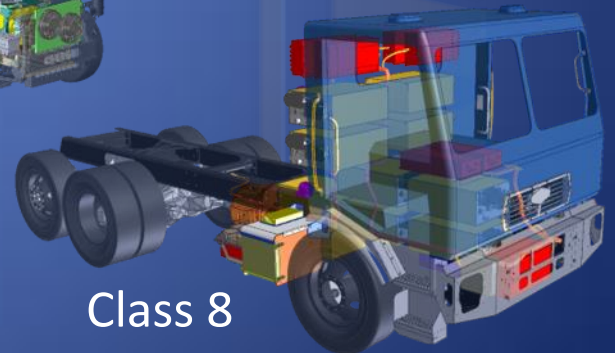
Ford E450



Ford F59



Class 8

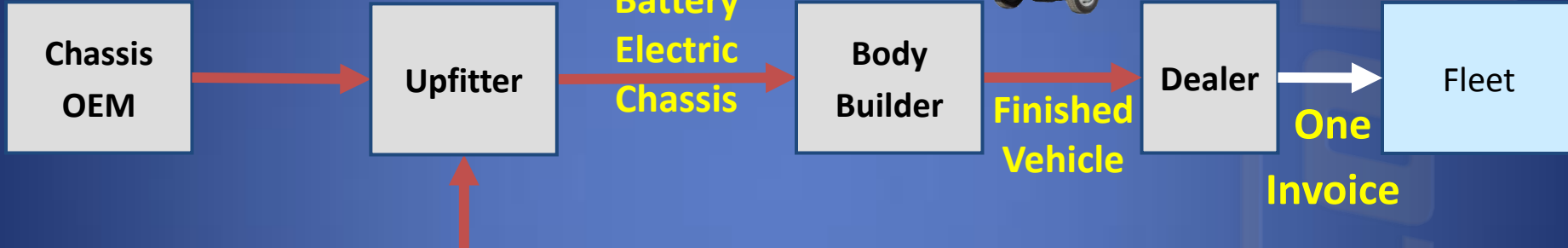


Product Line-up



Ford E450	Ford F59	Class 8
Class 4 – 14,500 GVWR	Class 6 – 22,000 GVWR	Class 8 – 66,000 GVWR
80 – 120 miles range	70 – 110 miles range	40 – 80 miles range
8 hr charge time	8 hr charge time	8 hr charge time
School Bus (Trans Tech) Shuttle (Ameritrans) Parcel (Rockport) Flatbed (CTEC)	Parcel (Morgan Olson) Linen (Morgan Olson)	Refuse (Loadmaster) Drayage

Motiv Value Chain



Motiv Electric Powertrain



Ameritrans ECO-CHARGE



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Proprietary and Confidential

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Trans Tech Bus SST-e



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Proprietary and Confidential

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Cargoport-e (Rockport)



Electric Flatbed (CTEC)



Morgan Olson Electric WIV



Cumberland/Motiv ERV



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Proprietary and Confidential

Growth Since 2012

- #240 on Inc's *500 Fastest Growing Private Companies in America*
- Awarded over \$13.5M in grants
- From 17 employees to 40 employees
- Over \$12M in private investment
- From 3000 ft² to 7500 ft² at 1165 Chess Drive
- New manufacturing facility in Hayward
- 3 chassis types
- Vehicle applications:
 - School bus
 - Shuttle bus
 - Refuse truck
 - Walk-in van
 - Delivery van
 - Work truck
- From 1,500 miles traveled to 70,000+



Most Recent Launch

Vehicle #1 in ARV-13-010: Repowered Linen Truck

Quotes from Fleet Manager

- *I've heard nothing but good things about how the truck has been running and about the responsiveness of, and interaction with, the Motiv team!*
- *We really appreciate all the extra efforts/testing Motiv did to ensure the truck worked well when it got to us.*
- *We're going to get rid of our spare truck that we thought we'd keep around....just in case the EV truck wasn't working*



Conclusion

- Project/Business Strategy Alignment
- Focused and Flexible
- Capital efficiency

“This electric refuse truck has changed my life”
– Driver, Dept. of Sanitation, City of Chicago

Thank You!

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