

SuperTruck

VOLVO

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June 9th, 2016

Project ID: VS081



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Project Overview

Vehicle Project Goal: **50% more ton-miles per gallon** than a 'best in class' 2009 truck

Timeline



Project end date
June 2016

Cost



\$18,929,194 Funding
> \$40,000,000 Total Cost

Vehicle Project Partners



Barriers

- Concurrent development of complex technologies
- Apply knowledge gained to industrialization efforts
- Maintain operational effectiveness while making significant improvements to aerodynamic drag
- Leverage opportunities from technology integration

Approach to Freight Efficiency Improvement

2011 2012 2013 2014 2015 2016

Phase I - Concept Selection

Baseline Tests

Technology Development Refinements

Concepts Evaluation

engine bench

mule truck

Concept

Model Development

Validation

Energy Management Dev.

Virtual Optimization

Phase II - Development & Integration

Techn. Refinement

Validation

engine bench

Integration

demonstrator truck

Optimization

Demo



Approach: Technology Content

D13 485HP 1,650lb-ft	Engine idle	31,350 lb Payload
10-spd OD Manual Transmission		33,650 lb Tare
3:58 RAR		65,000 lb Total

baseline

Fuel Savings

Hotel Load Savings

Weight Savings

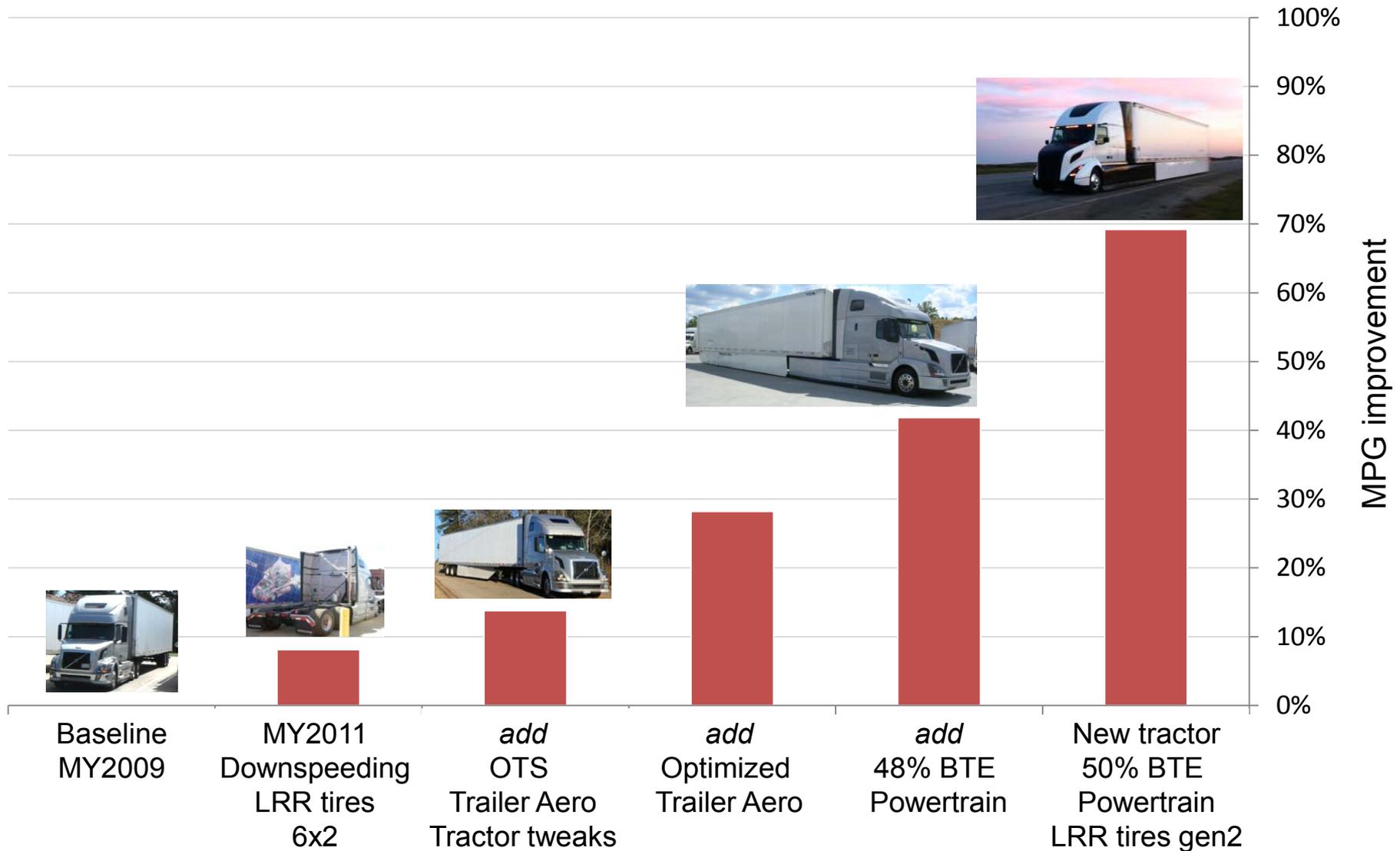
[20% lower aero drag trailer]		Lightweight trailer (MY2012)
[12% lower RR tires]		Light gauge trailer wire harness
[13L TC & WHR gen1]	LED lighting in & out	Aluminum drive shaft
400rpm downspeeding w/ AMT		Wide-base wheels & tires
6x2 axle with lube level control		6x2 axle configuration

Phase I

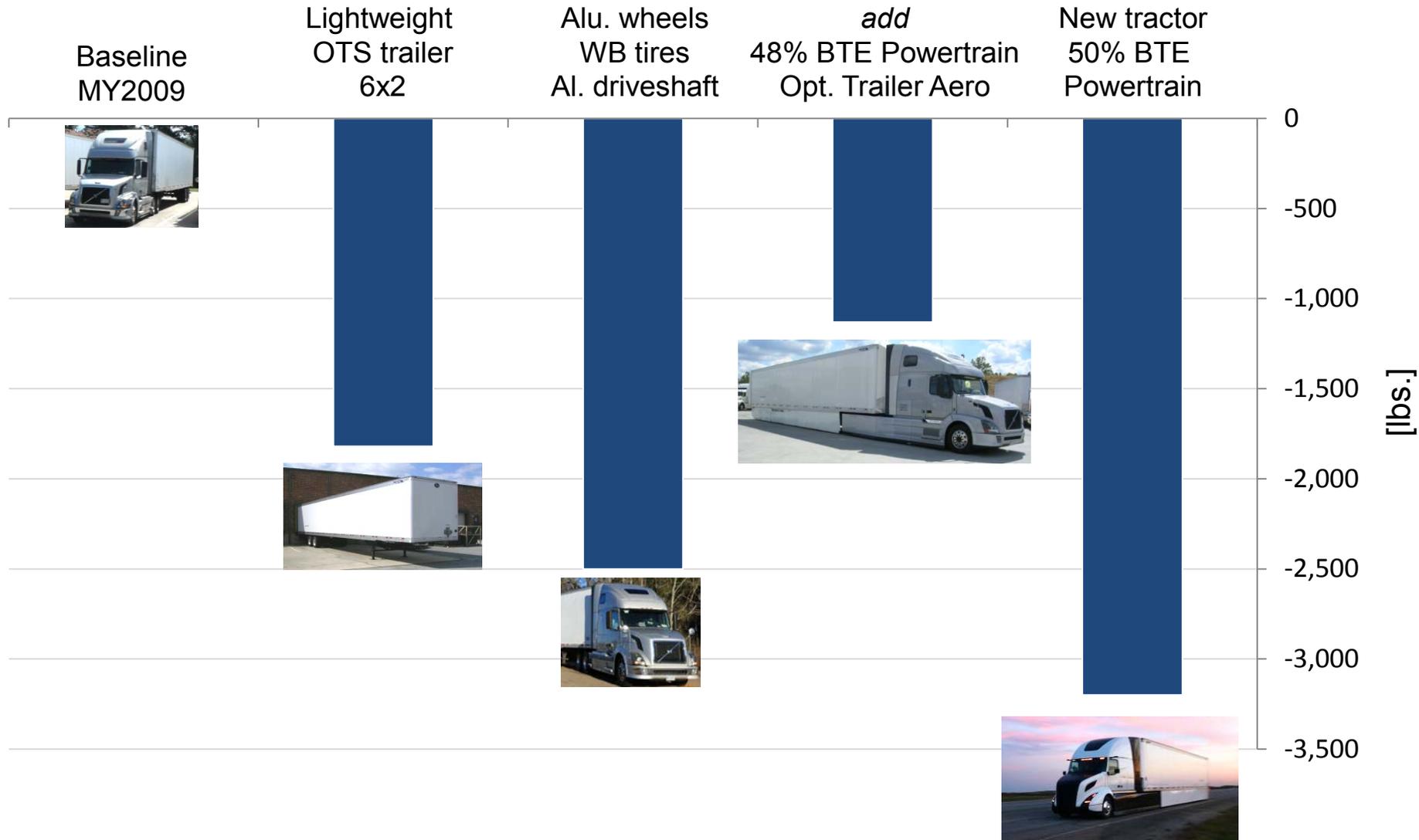
>40% aero drag reduction	Improved cab thermal insulation	>40% lighter Aluminum chassis
>20% lower RR tires	Dual-zone 24V A/C system	Engine downsizing (13 to 11L)
Predictive cruise control	15kWh energy optimized batteries	Composite trailer aero devices
Downsizing + TC + WHR gen2	Predictive kinetic energy recovery	CF tractor fairings / hood / roof
Variable oil / coolant pumps	Photovoltaics (cab ventilation + lighting + trickle charge)	Recycled CF step door
Reduced friction & oil pressure		Aluminum cab side walls

Phase II

Achievements: Fuel Economy



Achievements: Weight Savings



Achievements



88 % freight efficiency improvement



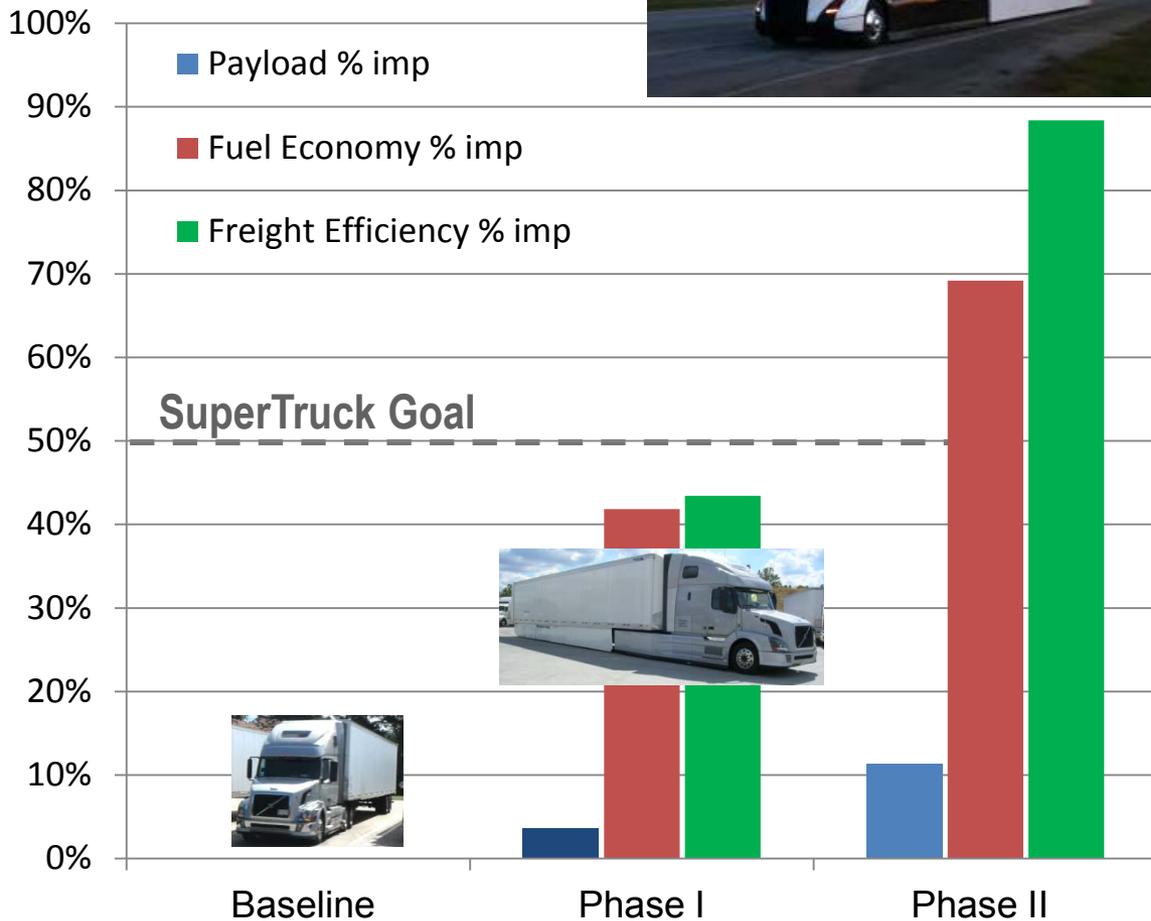
~ 188 ton-mile/gal



69 % fuel economy improvement
3,200 lbs. / 10% payload increase



Baseline ~ 100 ton-mile/gal

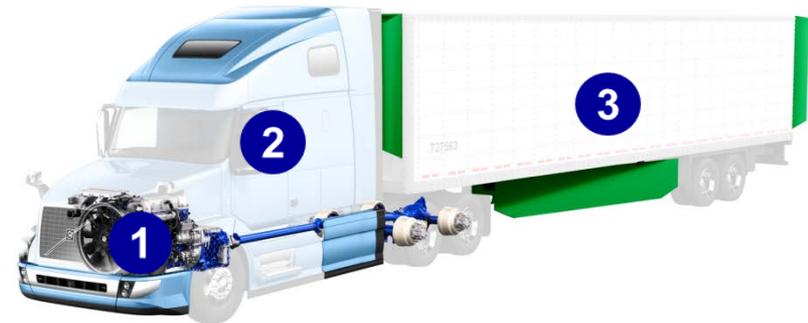


More Achievements: Technology Transfer

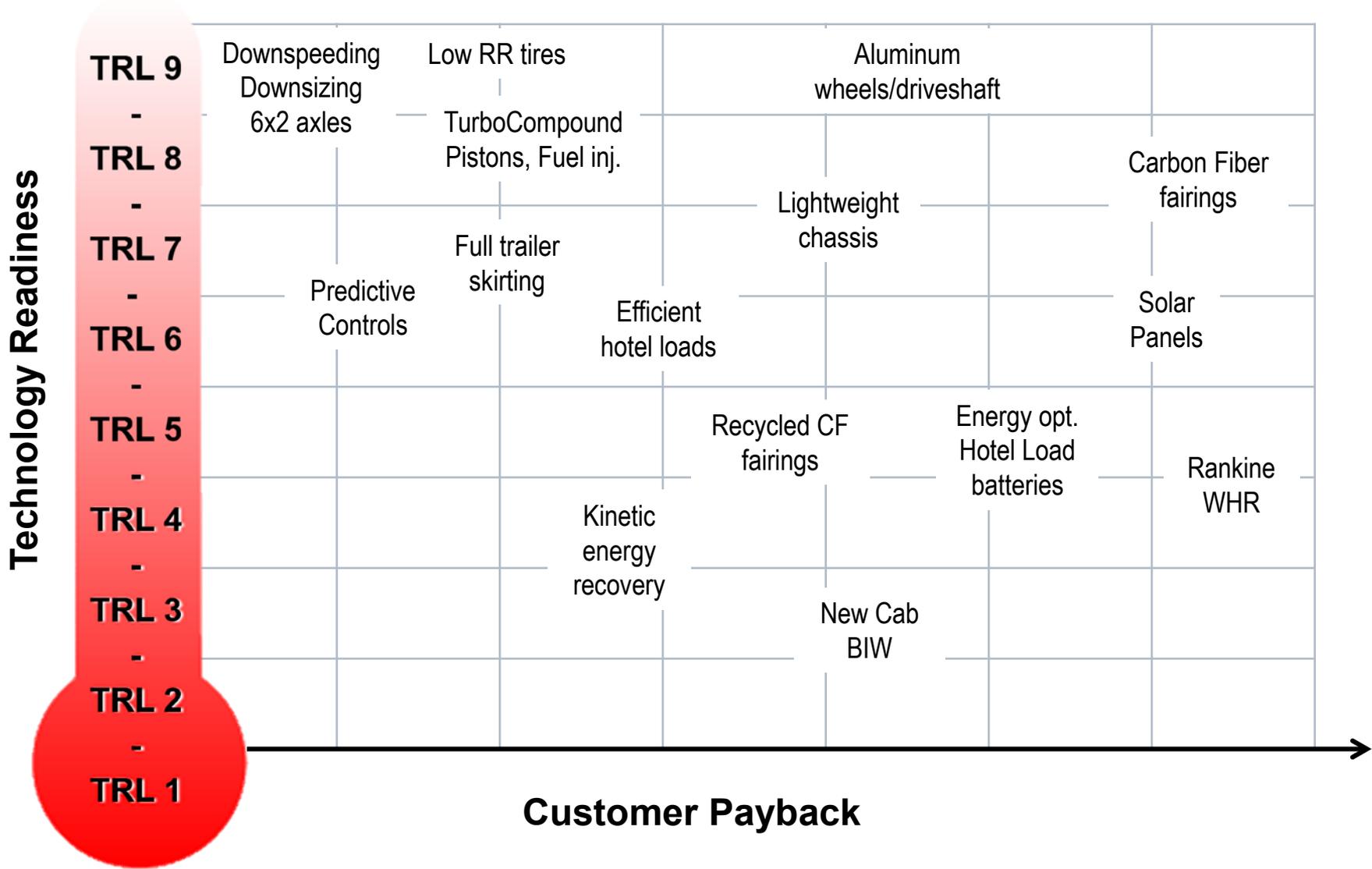


Mature technologies with acceptable customer ROI have been industrialized

- 1 Powertrain improvements - MY2017 11L & 13L engines
- 2 Tractor aero improvements - MY2016 highway tractors
- 3 Improved trailer aero devices - 2015



SuperTruck Technology Assessment



Project Summary

- **Relevance**

The goals of this project were aligned with the key barriers to higher fuel efficiency of highway transportation. All work performed helped overcome a specific technical challenge

- **Approach**

Phase I (2011-2013) allowed us to identify technologies and concepts showing most promising mid-term freight efficiency impact and ROI.

Phase II (2014-2016) saw team members further advance concepts selected in Phase I for integration into the demonstrator and commercialize the most mature technologies with acceptable ROI.

- **Milestones & Technical Accomplishments**



In this reporting period we successfully completed a 5-year project through on-road testing of a vehicle demonstrating **88% freight efficiency improvement** vs. a MY2009 baseline. Moreover several team members were able to launch new/improved products based on knowledge gained through this project, with a direct impact on fuel use by highway trucks.

- **Future Work**

Continue to evaluate the demonstrator to identify further areas of improvement and possible candidate solutions for commercialization.

Partners & key Collaborations

Organization	Key Contributions
Volvo Group North America	Project lead, simulations, advanced powertrain development, complete vehicle integration & testing
Ridge Corp.	Trailer aerodynamic devices development, manufacturing, validation and operational testing
Grote	Advanced tractor & trailer lighting systems, light gauge electrical harness
Penn State University	Advanced combustion modeling & simulation, mapping and GPS based predictive algorithms
Hendrickson	Lightweight trailer axle & suspension components
ExxonMobil	Advanced fuels & lubricants
Alcoa	Lightweight wheels & material design for new frame concept
Michelin	Advanced low-friction tires (steer, drive, tag, trailer)
Bergstrom	Efficient electrified dual-zone HVAC system w/ battery APU
Metalsa	Ultra-Light Frame Assembly

Thank you!



*The Volvo SuperTruck project has exceeded program goals
with many technologies already delivered to customers*