U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

VTO: Strategy and Direction

Michael Berube, Director

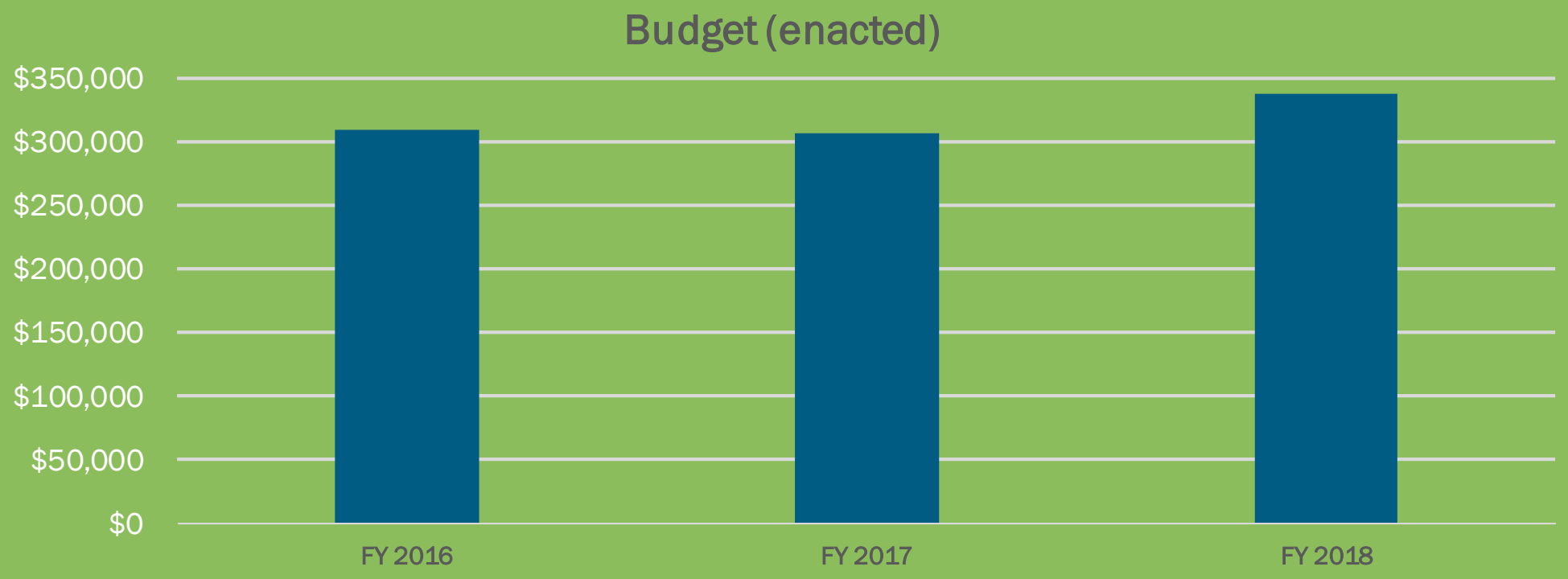
June 18, 2018

IT'S BEEN A BUSY YEAR

2018

THE NUMBERS

2018



THE NUMBERS

2018

13 New Roadmaps

$60M Lab Call

$68M FOA Announced

50+ Reports Published

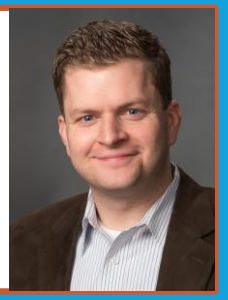
146 APM Projects

THE PEOPLE NEW ROLES

Program Managers

Batteries & Electrification

Steven Boyd



Energy Efficient Mobility Systems

David Anderson

Technology Integration

Mark Smith

Technology Managers

Batteries & Electrification

Will James

Energy Efficient Mobility Systems

Prasad Gupte

Energy Efficient Mobility Systems

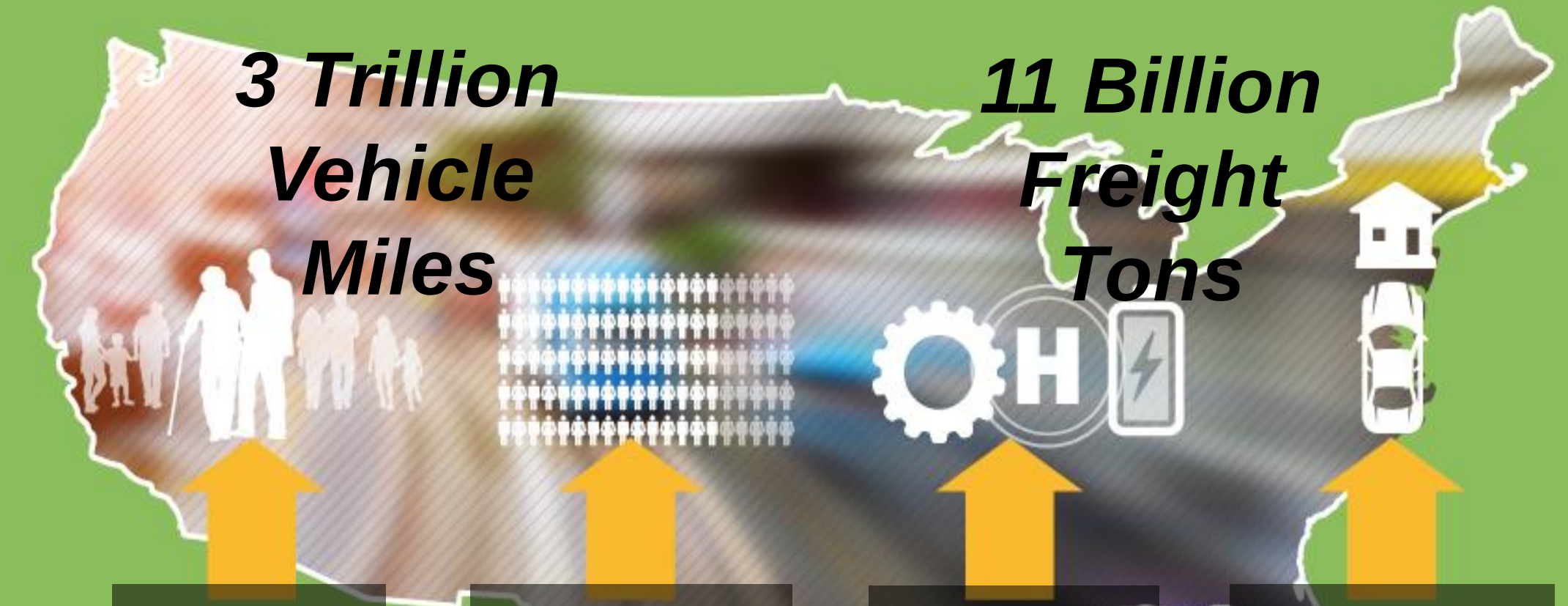
Erin Boyd

THE WORK

DRIVING DISRUPTION

DISRUPTION: BANKING

TRANSPORTATION IS FUNDAMENTAL TO OUR WAY OF LIFE



The U.S. population is growing and aging

Population density is increasing—**75% of the population** lives in urban mega-regions

Technologies and fuel choices are expanding

Transportation costs are high—second only to housing expenses

NEW TECHNOLOGIES &
BUSINESS MODELS ARE

DRIVING DISRUPTION

REQUIRING VTO TO
EXPAND ITS FOCUS

Component — Vehicle — Transportation System

THE WORK

DRIVING DISRUPTION

HPC & Big Data	EVs as a Service	Freight & Goods Movement	Partnerships

ROLE OF HIGH PERFORMANCE COMPUTING & BIG DATA

2005: Jaguar

2013: Titan

2018: Summit

2022: Frontier

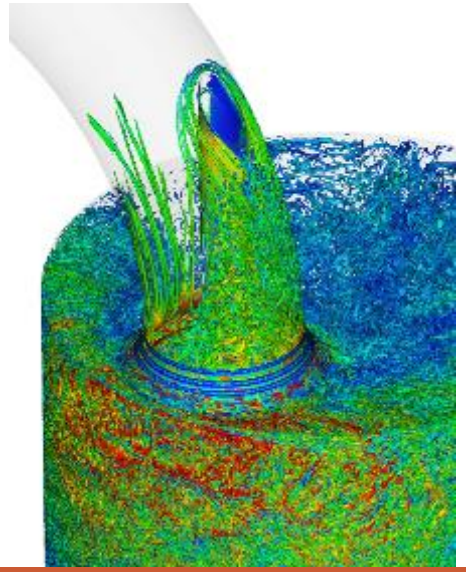
EXASCALE COMPUTING

petaFLOP **1,000x** exaFLOP

COMBUSTION

Co-Design of Engines and Fuels an EXASCALE PROBLEM

Can we simulate engine combustion completely based on 1st principles?



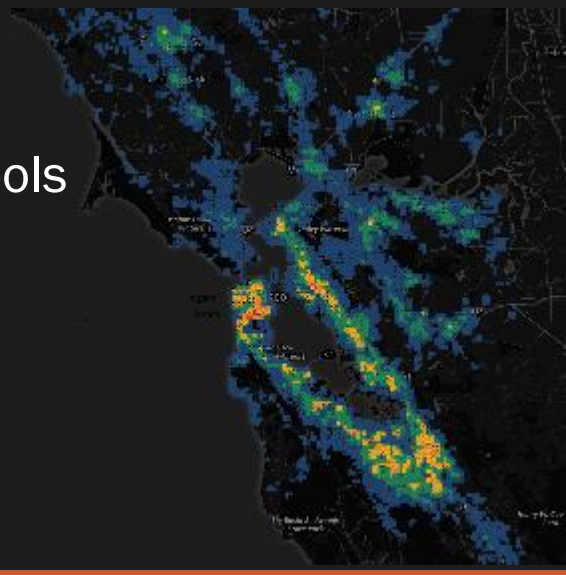
The accurate simulation of engine combustion remains one of the most challenging problems in engineering.

MOBILITY

Large-scale computing resources and big data can inform next generation transportation models

Can we predict and correct congestion before it occurs?

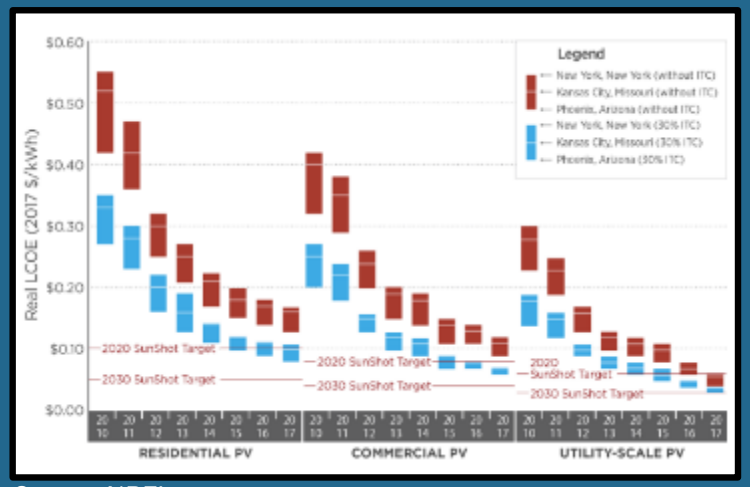
Parallelization of simulation tools is challenging and requires optimization to achieve high performance.



ELECTRIC VEHICLES AS A SERVICE

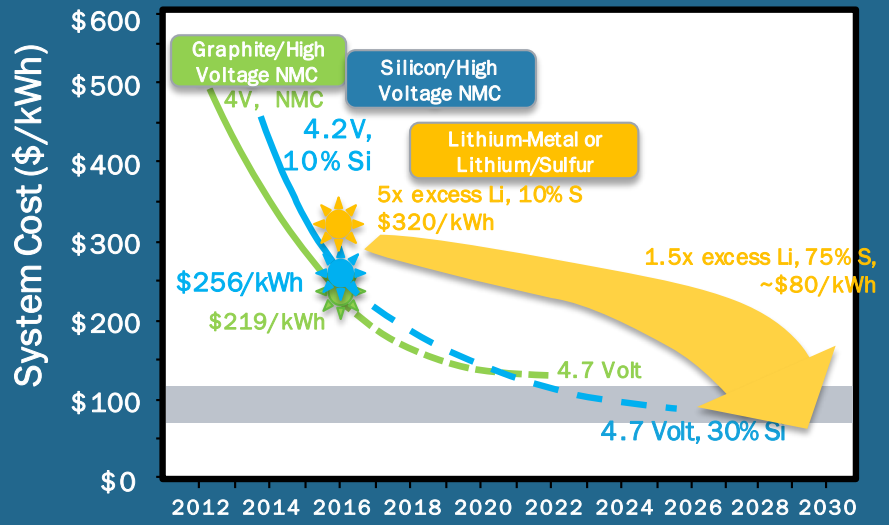
LOW COST ELECTRONS & STORAGE

PV LCOE Benchmark Summary

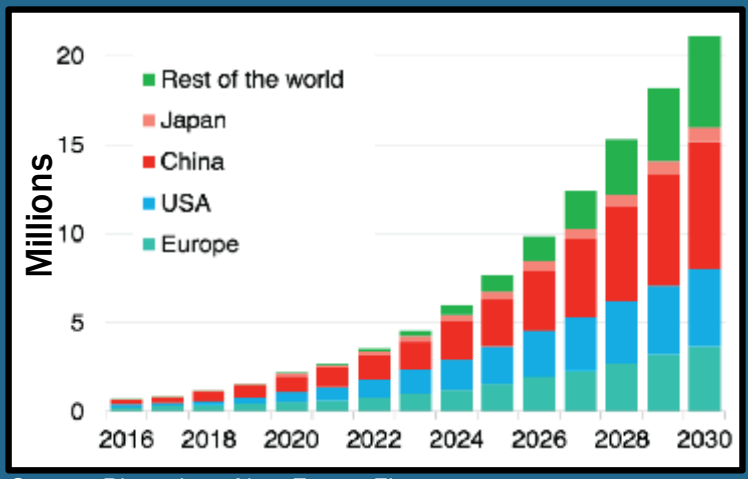


Source: NREL

Cost Trends for Lithium-based EV Batteries



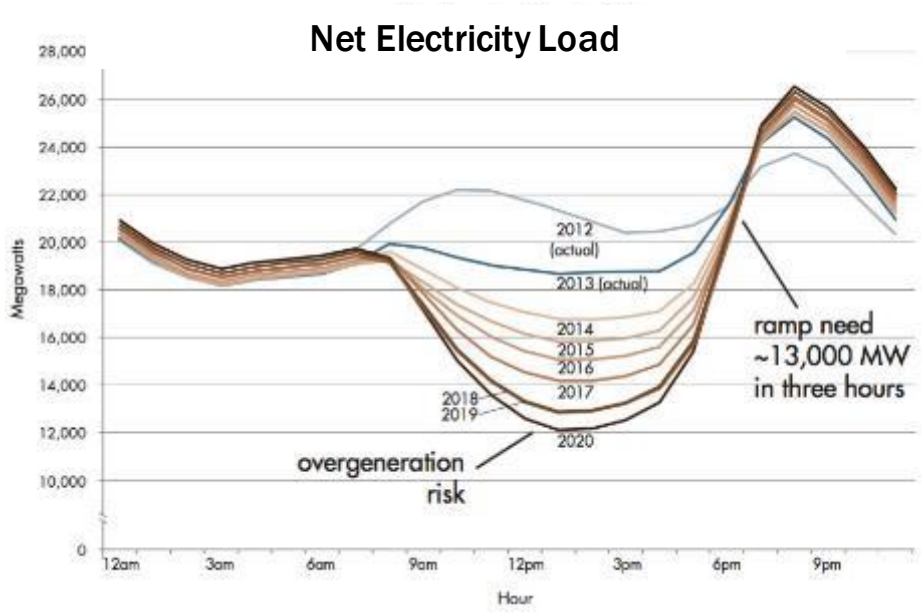
Global EV Forecast



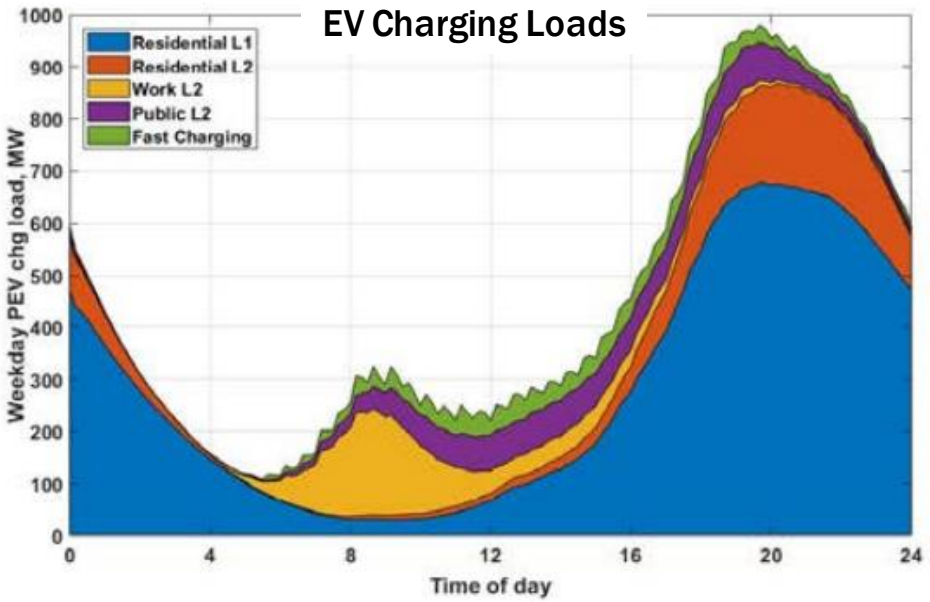
Source: Bloomberg New Energy Finance

SOLAR BATTERIES EVs

EVs IMPACT ON THE GRID



BENEFIT?



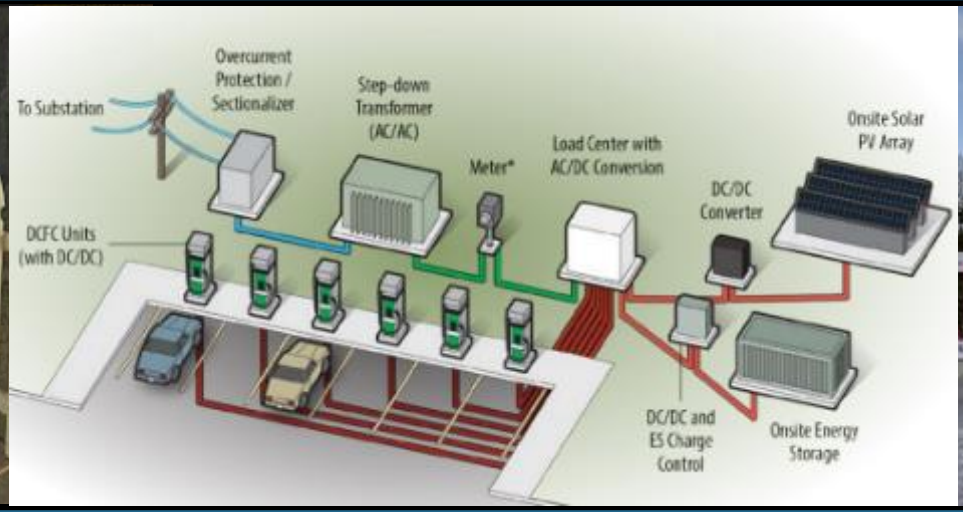
Source: California ISO

Source: California Energy Commission & NREL

DUCK CURVE

DRAGON CURVE

EV CHARGING DEMAND



MOVING GOODS

FREIGHT

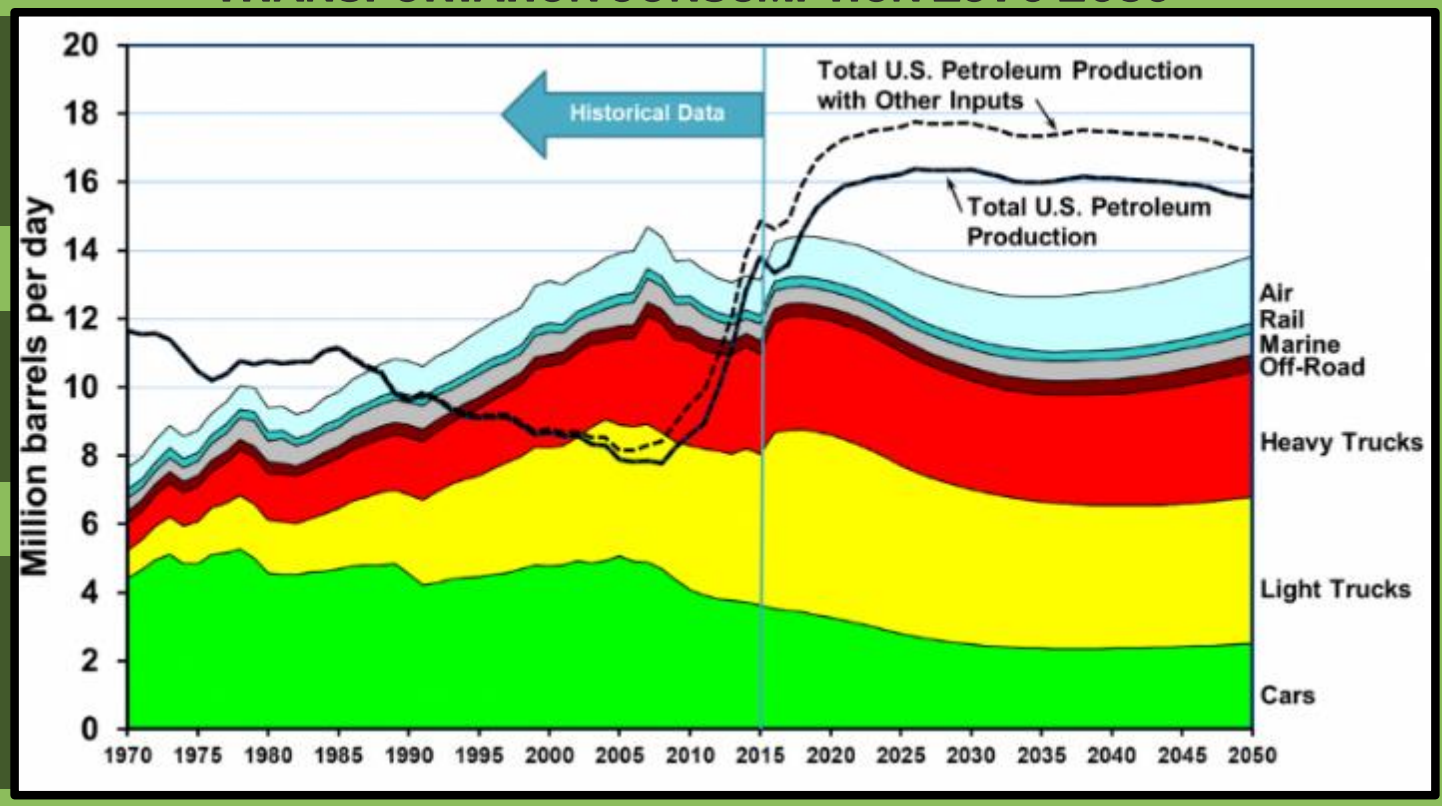
A NATION SERVED BY FREIGHT

50% of the weight and **37% of the value** of goods were **moved less than 100 miles** between origin and destination

Heavy-duty vehicle energy consumption is projected to **rise from 22% in 2015 to 27%** of transportation energy consumption in 2050

Over **$150 billion** is spent annually on fuel, maintenance, and tires for freight vehicle.

U.S. PETROLEUM PRODUCTION AND TRANSPORTATION CONSUMPTION 1970-2050



IMPROVING MOVING GOODS

Source: Getty Images

Traditional

Source: Daimler

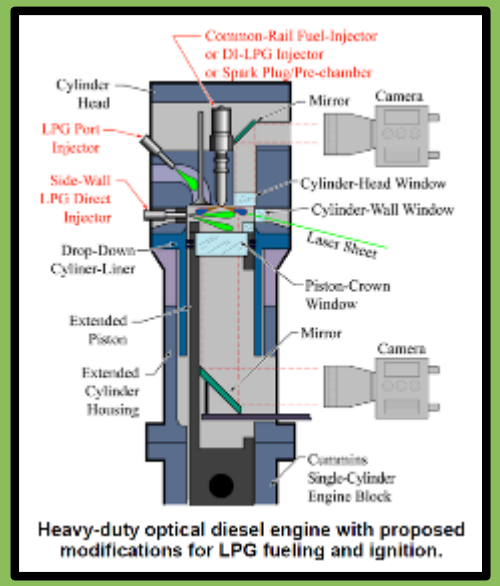
SUPERTRUCK I

Source: Volvo

SUPERTRUCK II

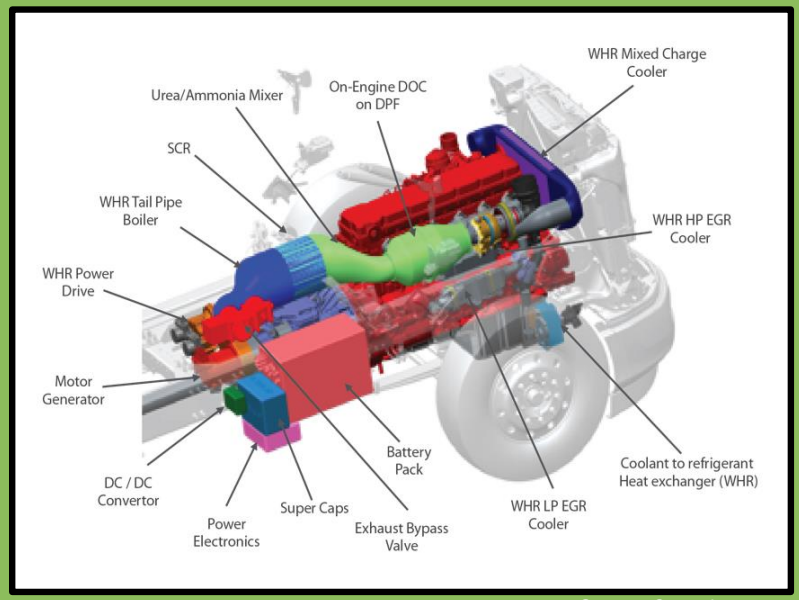
Source: Alibaba

Efficient Operation



Heavy-duty optical diesel engine with proposed modifications for LPG fueling and ignition.

Natural Gas



Source: Cummins

Electrification

Green Car Reports
The ultimate guide to greener, greener driving
News | First Drives | Guides | Electric | Car Types | Video | Follow | Google search

Electric trucks coming from Daimler, Freightliner, Volvo, and others

Eric C. Evarts 28 Comments Jun 7, 2018

Freightliner eCascadia electric semi-truck

It's not even on the road yet and the Tesla Semi is a

electrek

Automakers | Alt. Transport | Autonomous Driving | Energy

JUNE 7

Daimler unveils electric eCascadia semi truck to compete with Tesla Semi, launches electric truck group

Fred Lambert - Jun. 7th 2018 5:50 am ET

WIRED SUBSCRIBE

ALEX DAVIES TRANSPORTATION 11.16.17 11:28 PM

MEET THE TESLA SEMITRUCK, ELON MUSK'S MOST ELECTRIFYING GAMBLE YET

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Home / News / Electric Cars / Volvo introduces electric delivery/garbage truck with 186-mile range

Volvo introduces electric delivery/garbage truck with 186-mile range

Sean Szymkowski 0 Comments May 25, 2018

Volvo Truck FL electric commercial truck

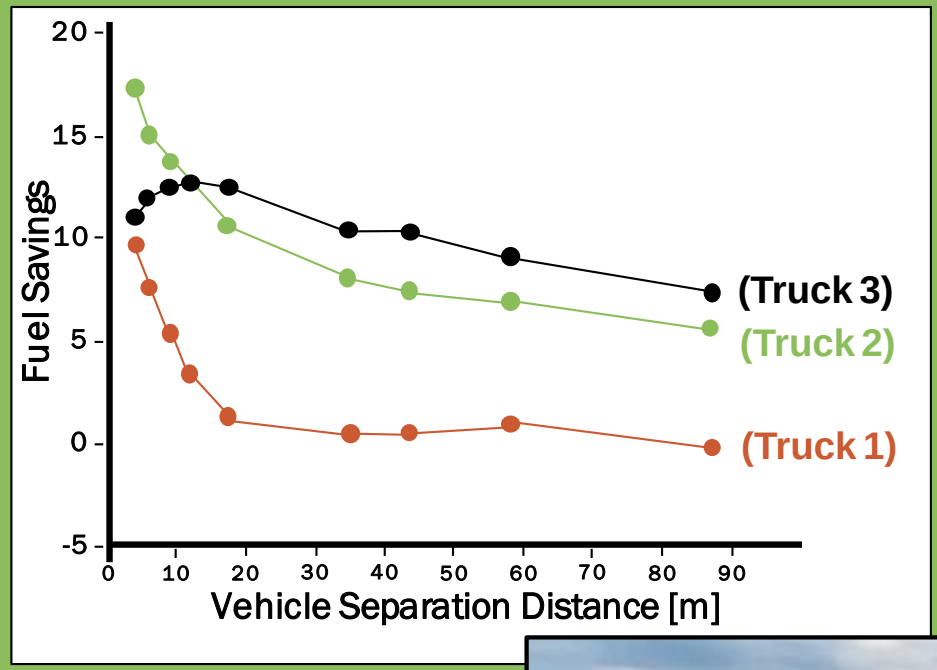
Volvo Trucks has introduced its first battery-electric truck meant for commercial duty; the FL. The company said the FL will bring the benefits of battery-electric

…ys dreamed big, and tonight he showed off his
…he fully electric Tesla Semi. Powered by a massive
…of hauling 80,000 pounds, it can ramble 500 miles
…l even drive itself—on the highway, at least.[1]

…production will start in 2019.

TOUR-BASED MODEL

TRUCK PLATOONING



INDUSTRY PARTNERSHIPS

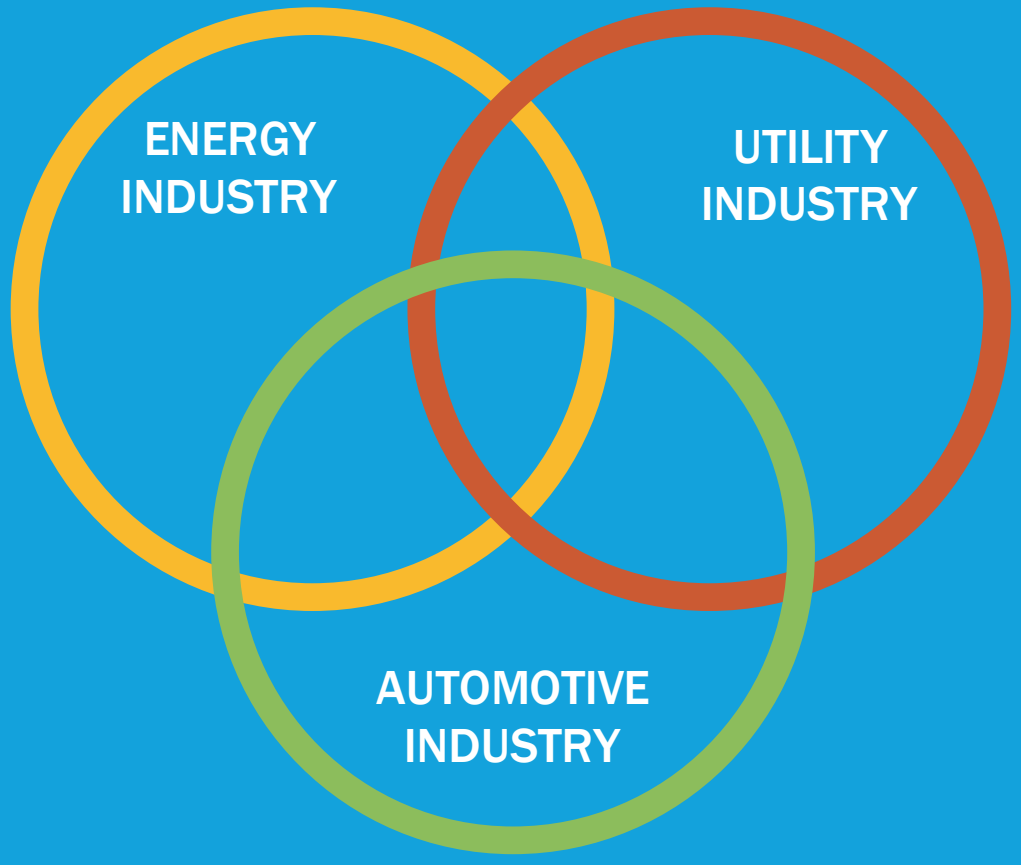
ENERGY INDUSTRY

AUTOMOTIVE INDUSTRY

UTILITY INDUSTRY

USDRIVE

DRIVING RESEARCH AND INNOVATION FOR VEHICLE EFFICIENCY AND ENERGY SUSTAINABILITY



21st CENTURY TRUCK PARTNERSHIP

LONG-STANDING

INDUSTRY / GOVERNMENT RELATIONSHIP

resulting in **TECHNICAL ADVANCEMENT** in **COMMERCIAL TRUCKS**

NEW technical **focus areas**

NEW technical **targets**

NEW operational **structure**

NEW high level **goals**

IC ENGINE POWERTRAINS

ELECTRIFIED POWERTRAINS

FREIGHT OPERATIONAL EFFICENCY

SAFETY

OUR VISION

more choices

more efficient technology

when & where it is needed

more affordable

Michael Berube, Director
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Energy.gov/eere/vehicles