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NORTH AMERICAN COUNCIL FOR FREIGHT EFFICIENCY

Improving Truck Sustainability with Regional Haul Electric Trucks

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September 16, 2020

North American Council for Freight Efficiency

- Unbiased, non-profit
- Mission to double freight efficiency
- All stakeholders
- Scale available technologies, guide future change and Run on Less demonstrations.

www.NACFE.org

10 YEARS NACFE
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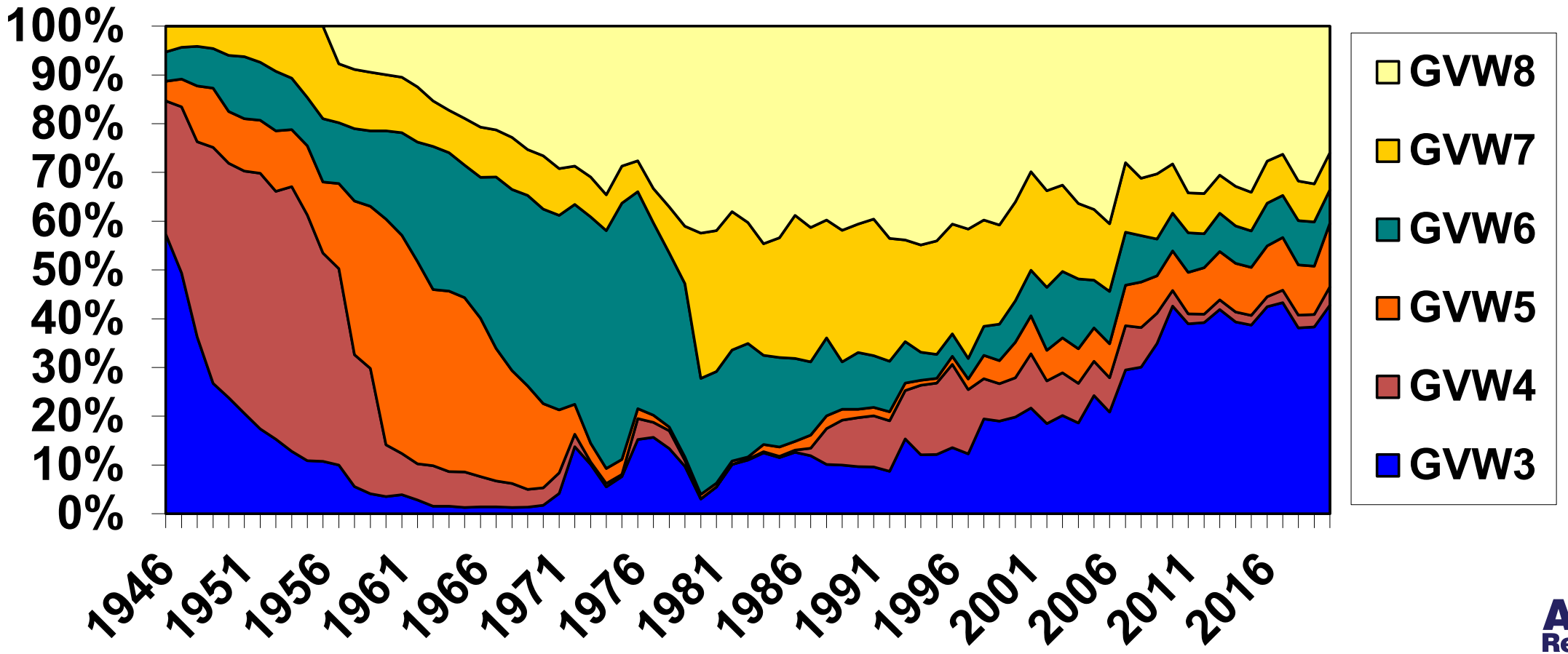
Historic Shifts In Truck Classes



ACT Research

Source: ACT Research

Percent Mix 1946 – 2020 YTD

- Class 3 growing with growth in E-commerce

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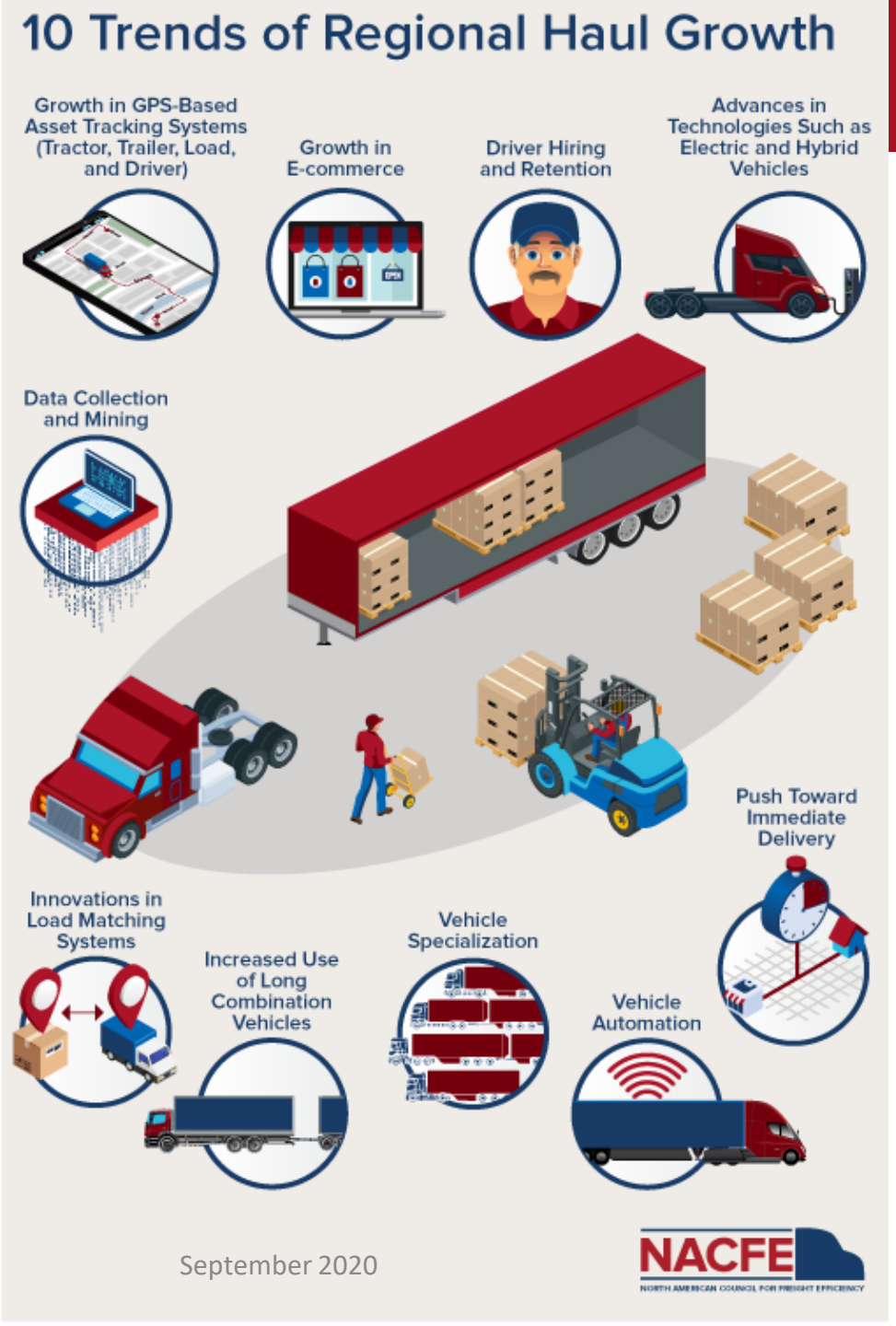


Regional Haul

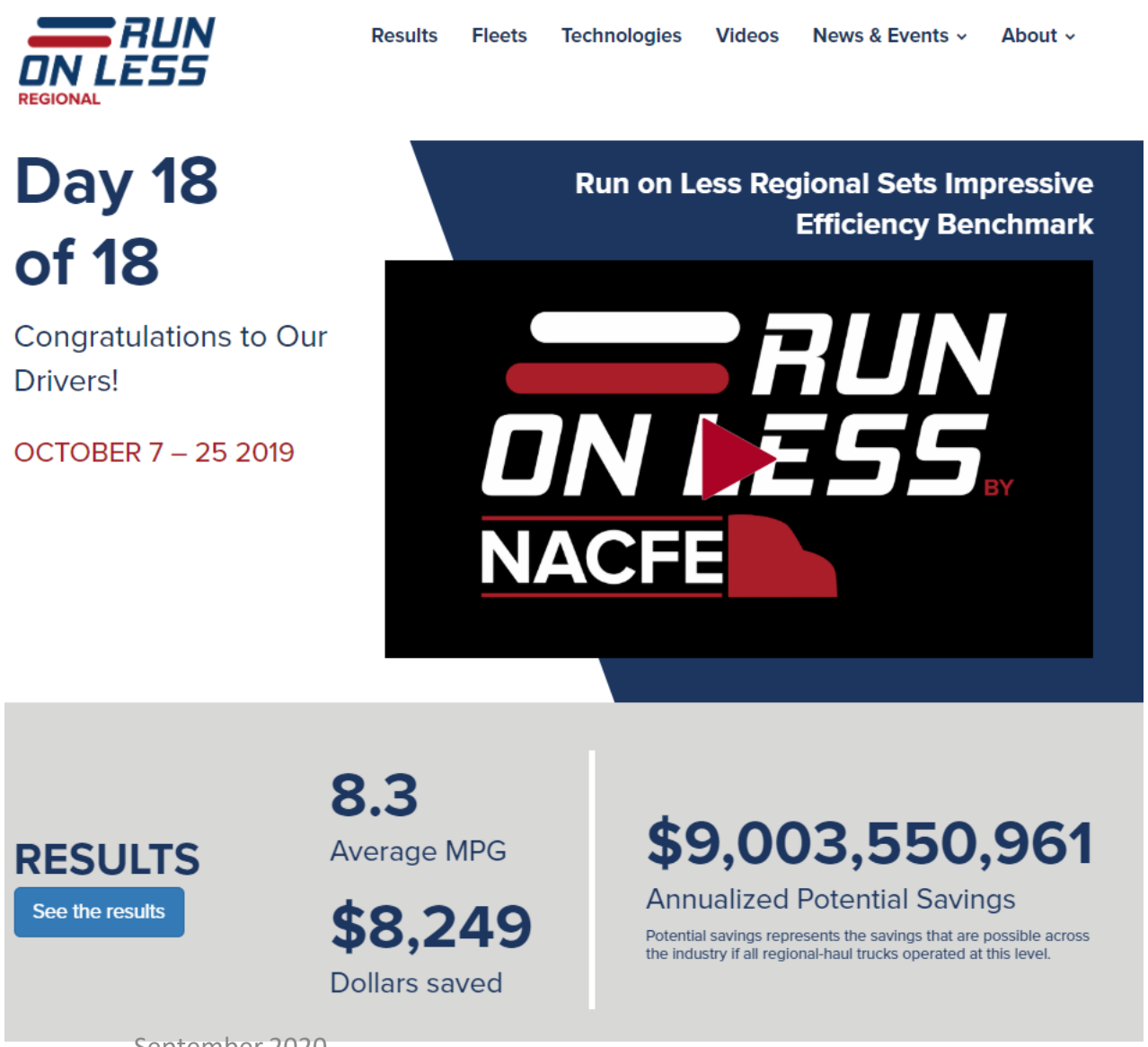
More Regional Haul: An Opportunity for Trucking?

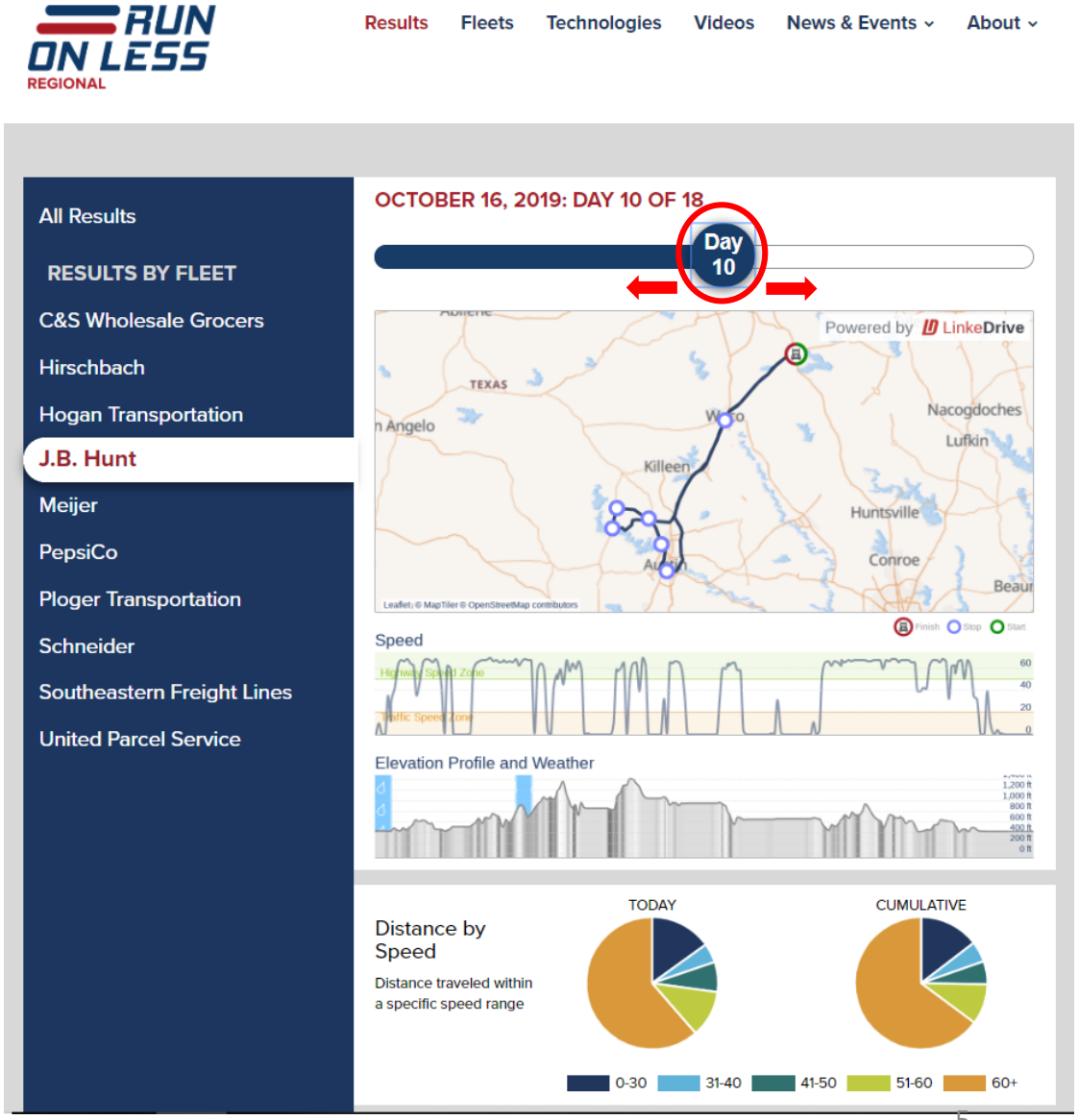
- Drop in Length of Haul
- Warehousing
- Technology Trends
- An Opportunity
  - Drivers
  - Alternative Fuels
  - Others?

Report published April 2019.

https://nacfe.org/regional-haul/

Run on Less Regional

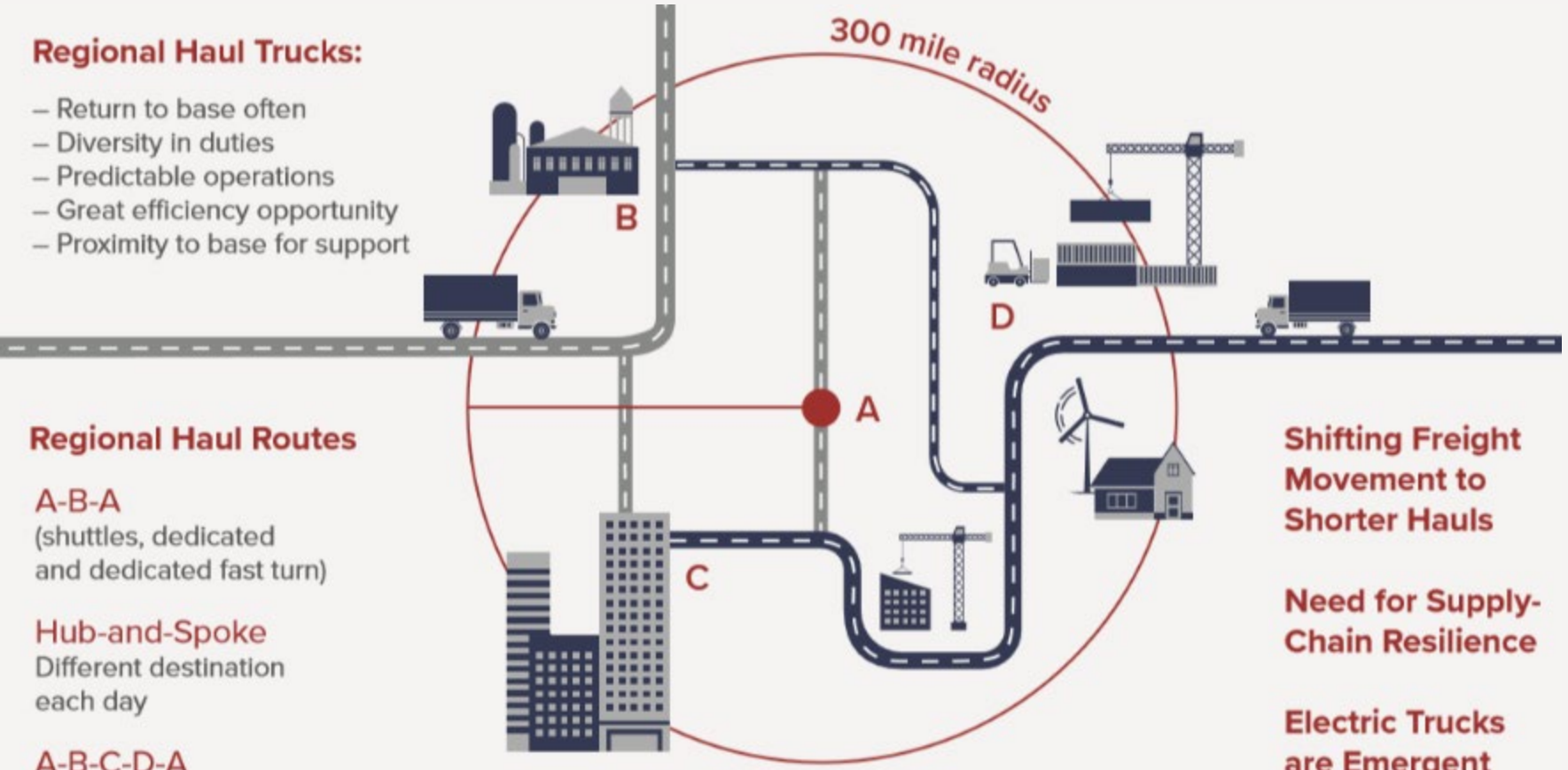




Run on Less Regional Report

Regional Haul Trucks:

- Return to base often
- Diversity in duties
- Predictable operations
- Great efficiency opportunity
- Proximity to base for support



Regional Haul Routes

A-B-A
(shuttles, dedicated and dedicated fast turn)

Hub-and-Spoke
Different destination each day

A-B-C-D-A
(city, diminishing load, and milk runs)

Shifting Freight Movement to Shorter Hauls

Need for Supply-Chain Resilience

Electric Trucks are Emergent

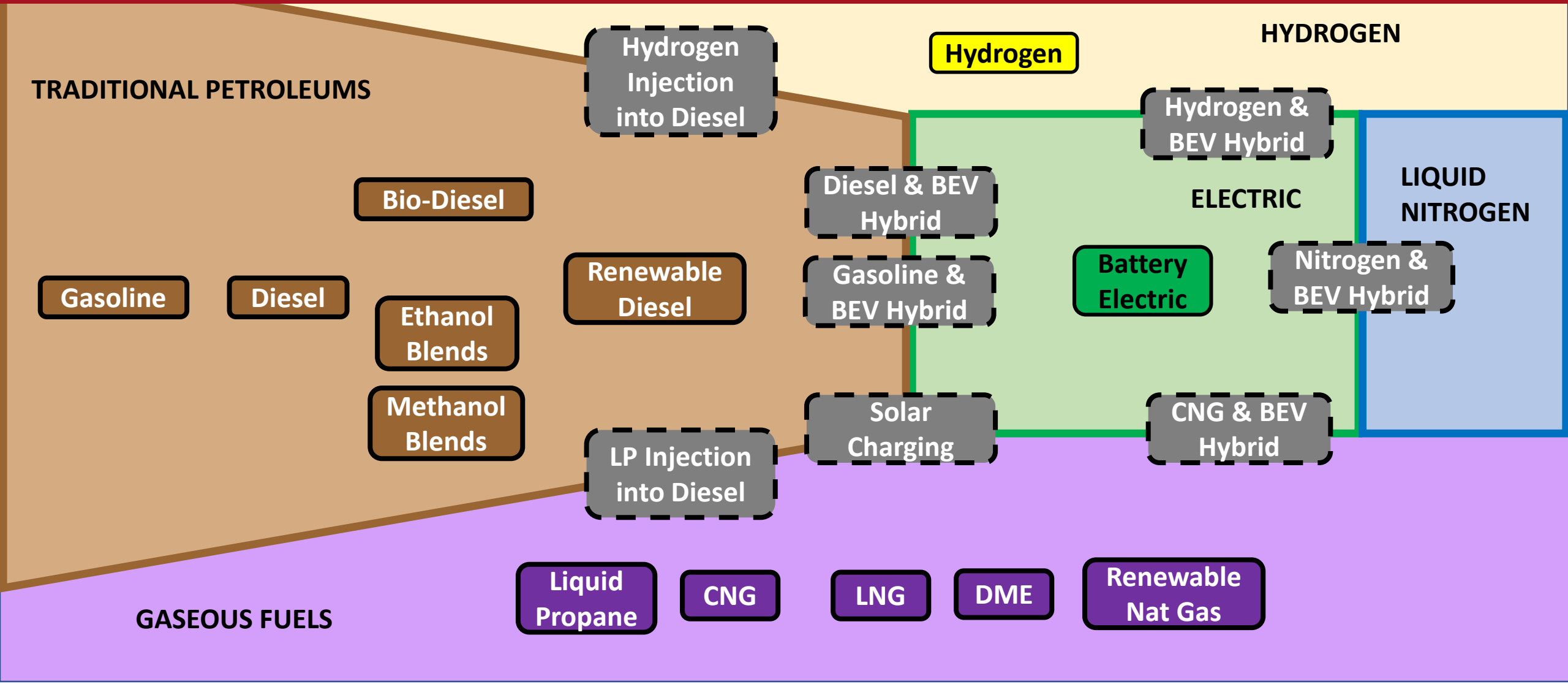
Download the report at:
https://nacfe.org/run-on-less-regional-report/

Efficiency Opportunity

Run On Less Regional confirmed that the 800k trucks in North America could use much less fuel.

*measured in billion gallons of diesel

Alternative Fuels



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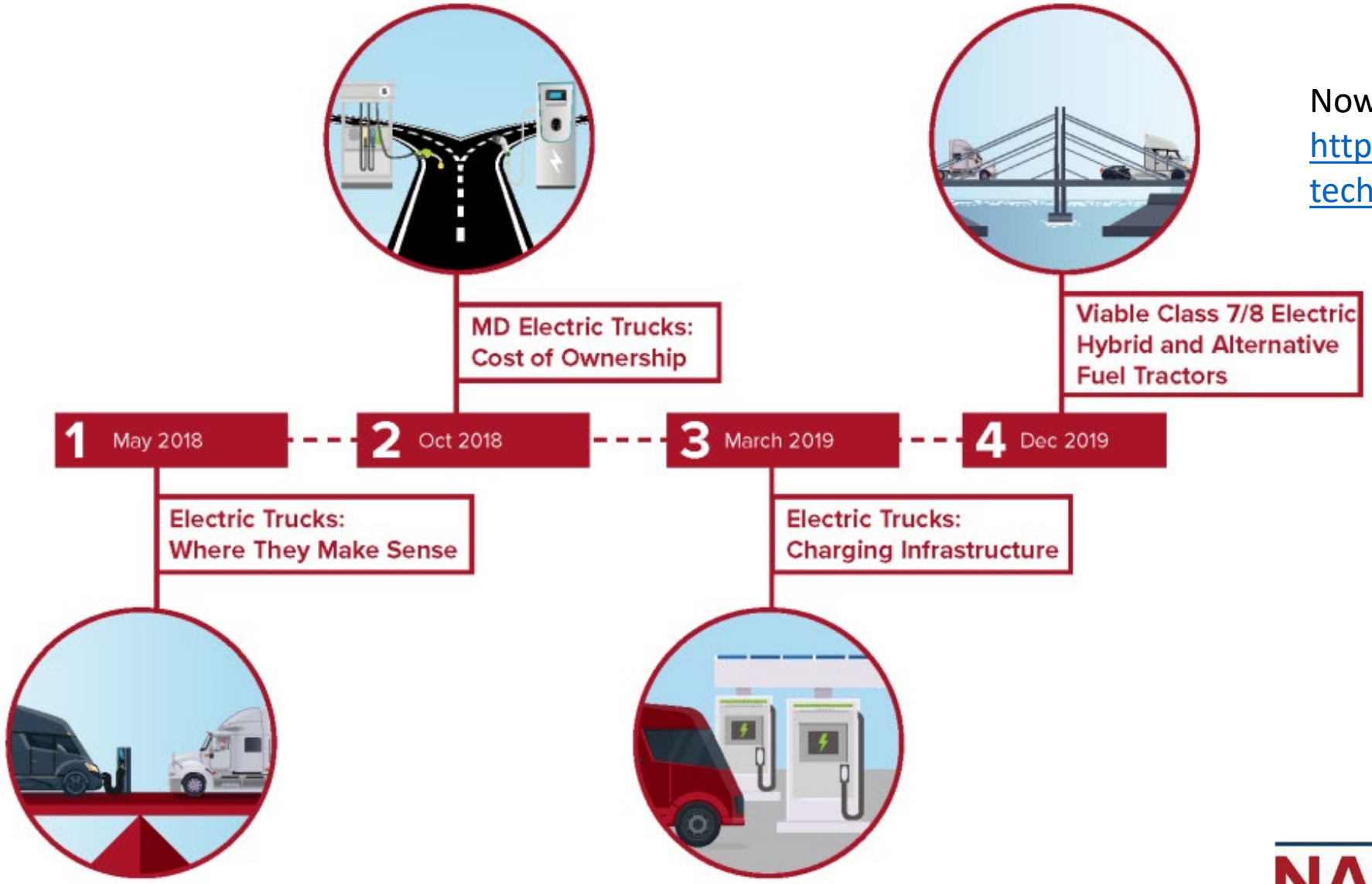
Guidance On Electric Trucks



Now Free Online at
https://nacfe.org/emerging-technology/electric-trucks-2/

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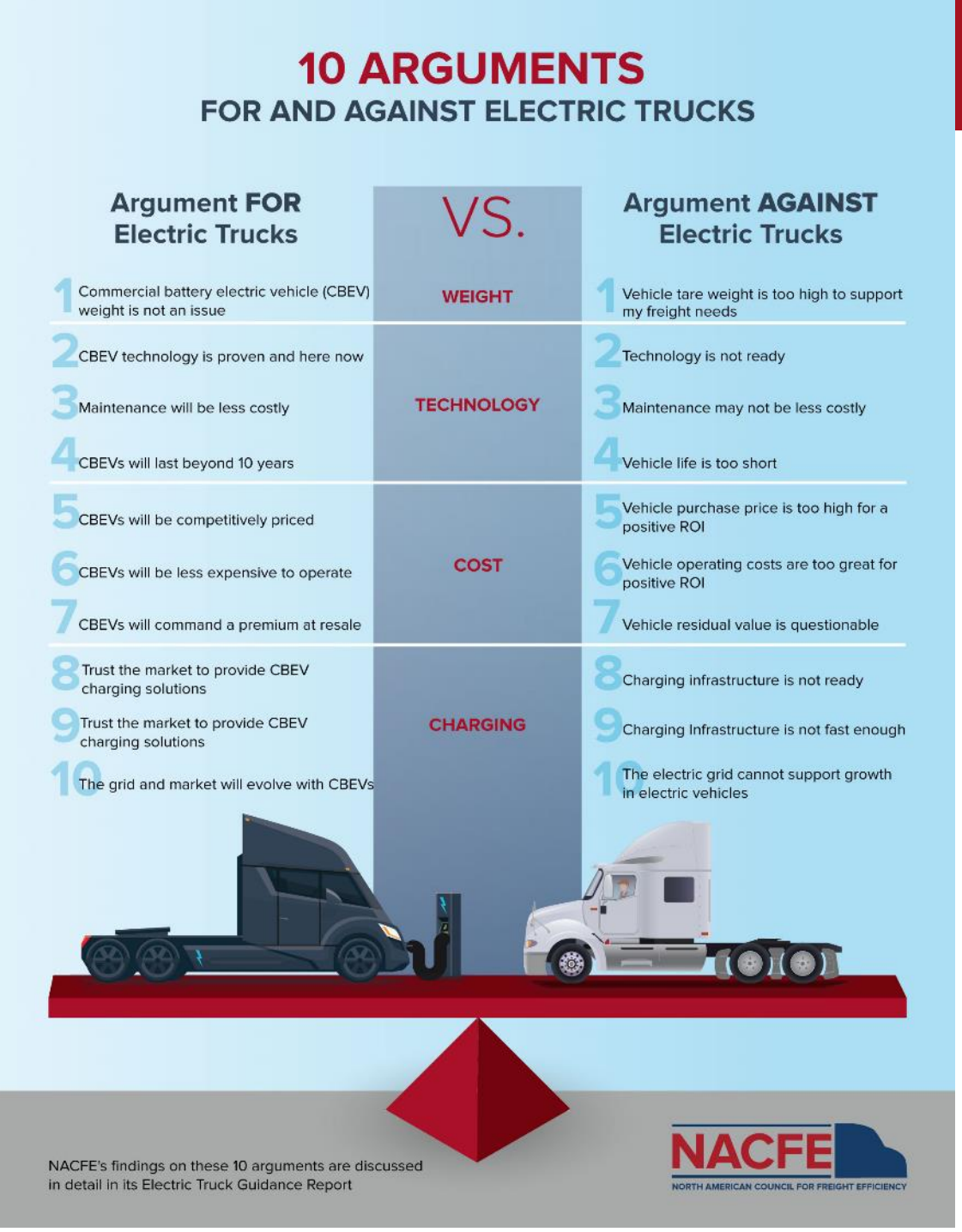
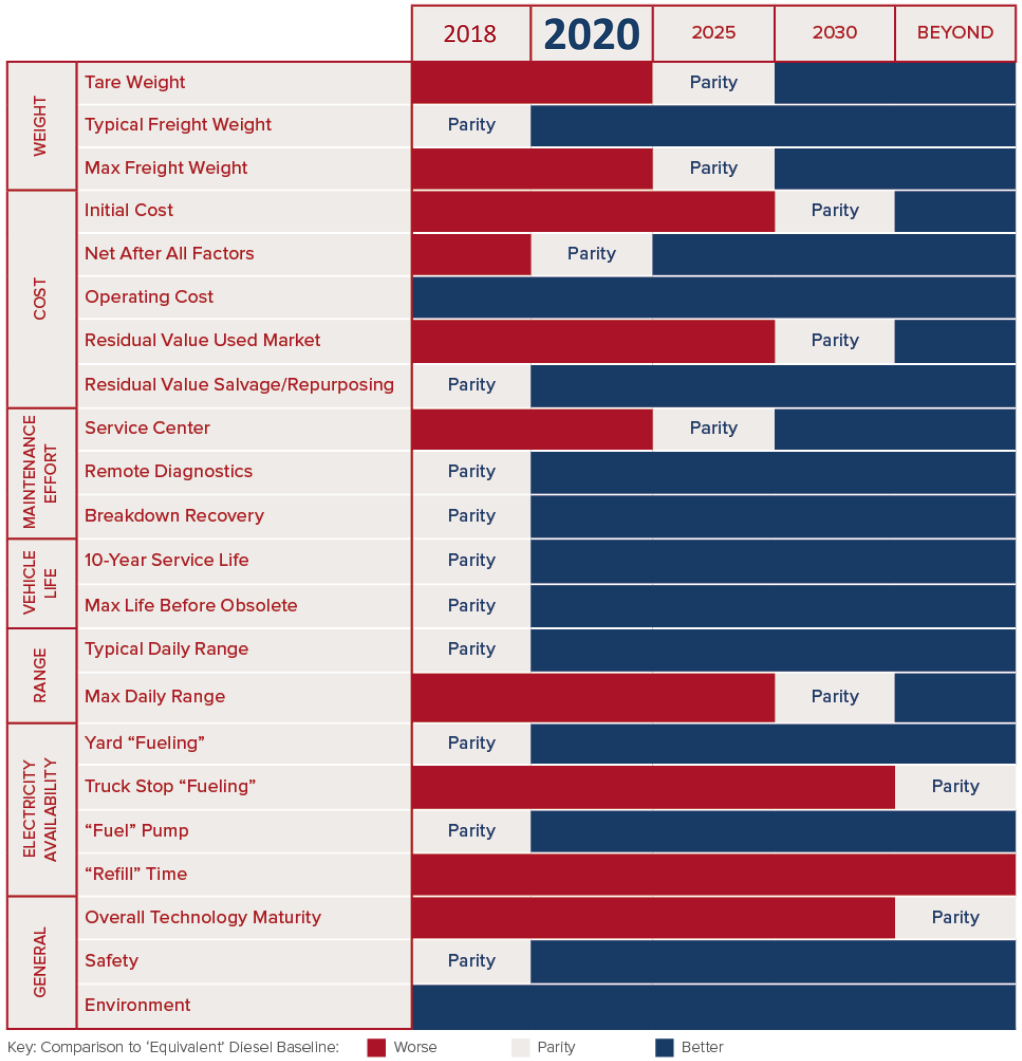
Where they make sense?

- Arguments for and against
- Weight
- Maintenance
- Cost
- Market for infrastructure

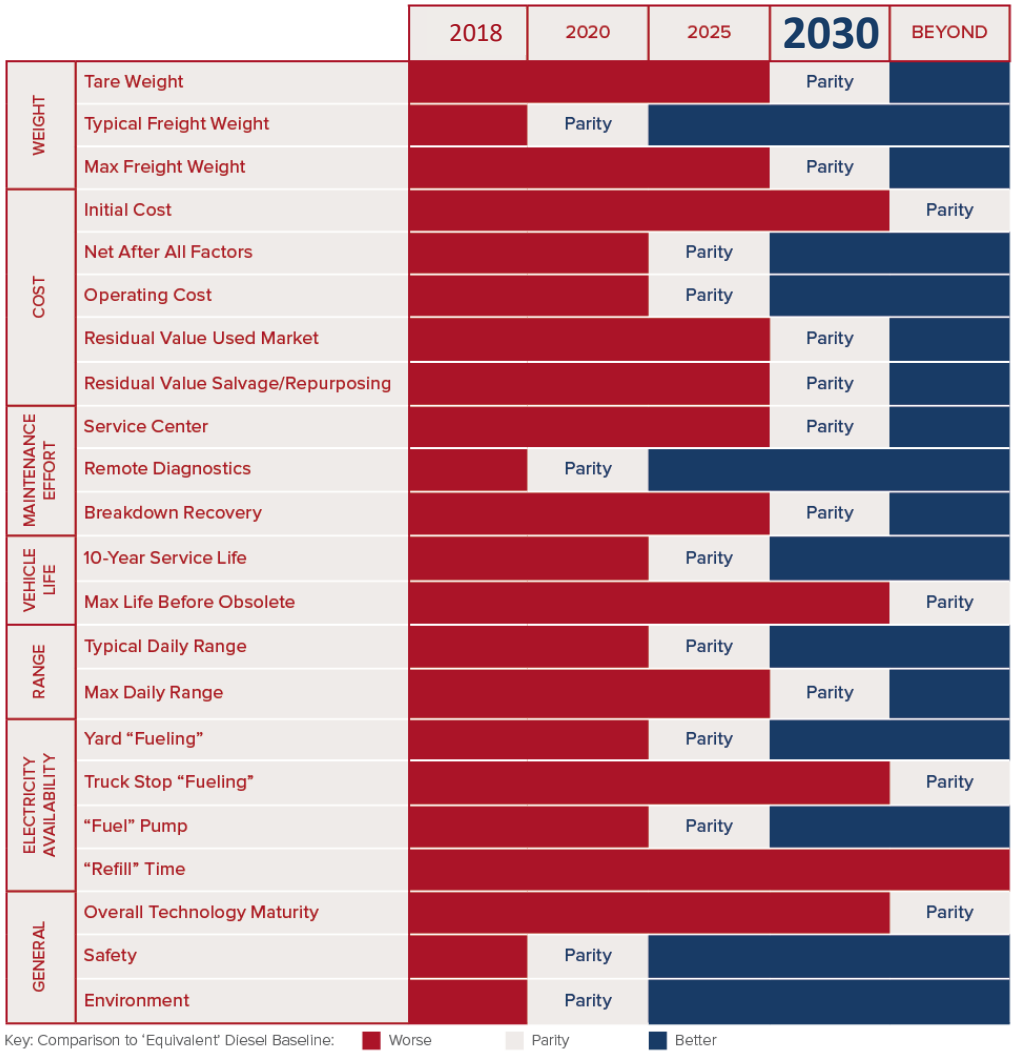


Findings: Parity To Diesel

CLASS 3 THROUGH 6 CBEV PARITY VS. DIESEL SYSTEM (NACFE)



CLASS 7 AND 8 CBEV PARITY VS. DIESEL SYSTEM (NACFE)



Class 3 - 6

Dark Blue = EV is Better

Class 7 & 8

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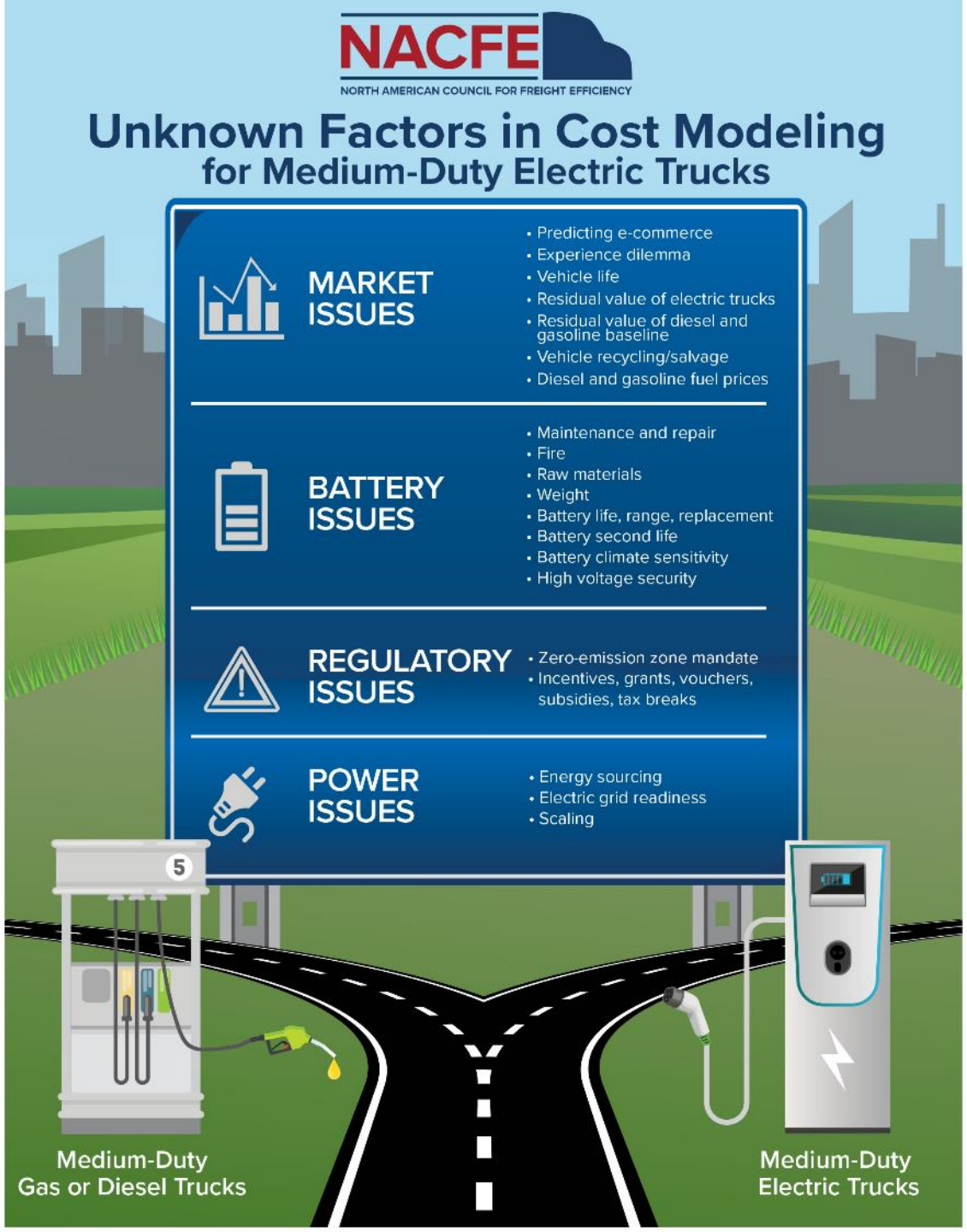
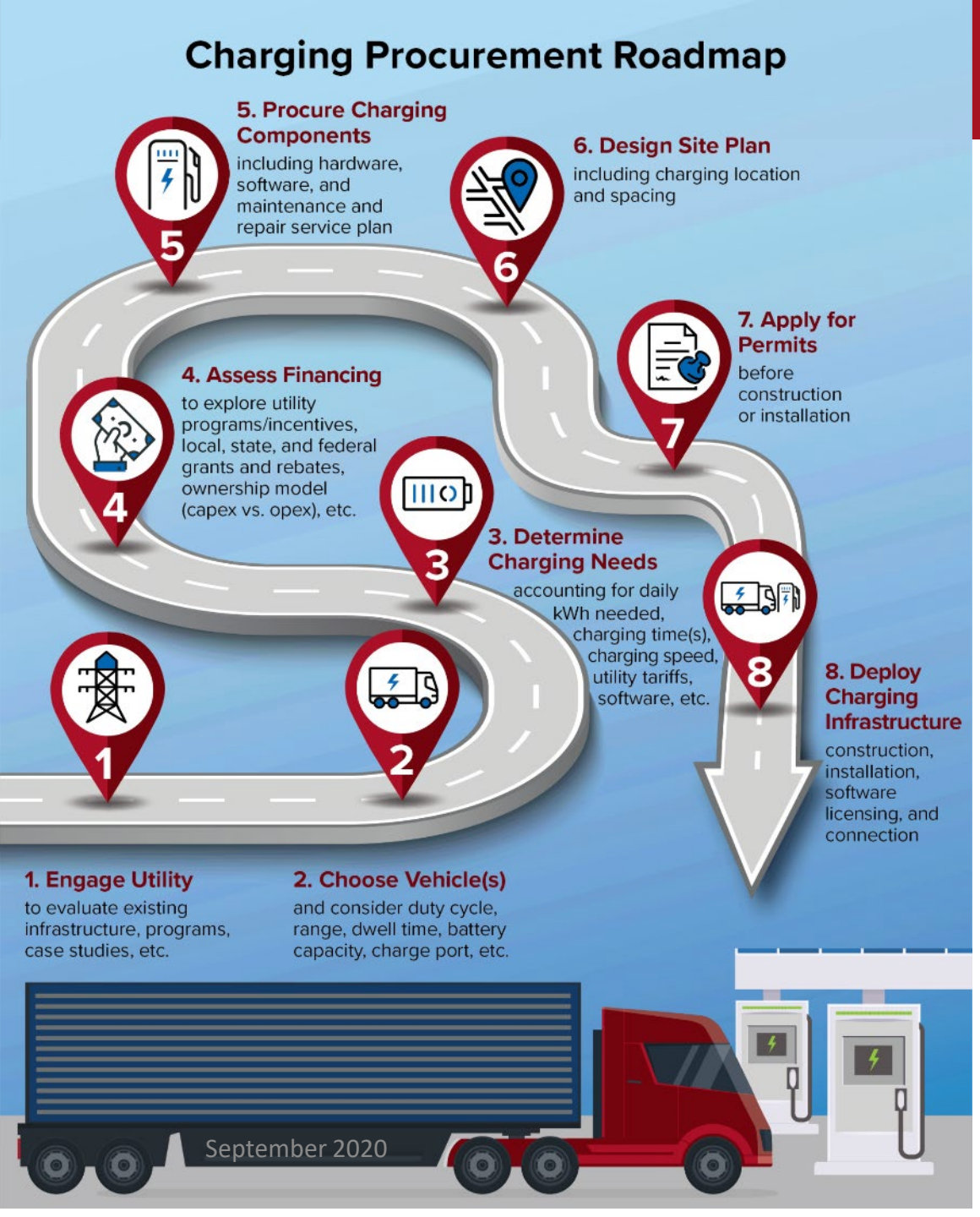
Medium Duty Trucks

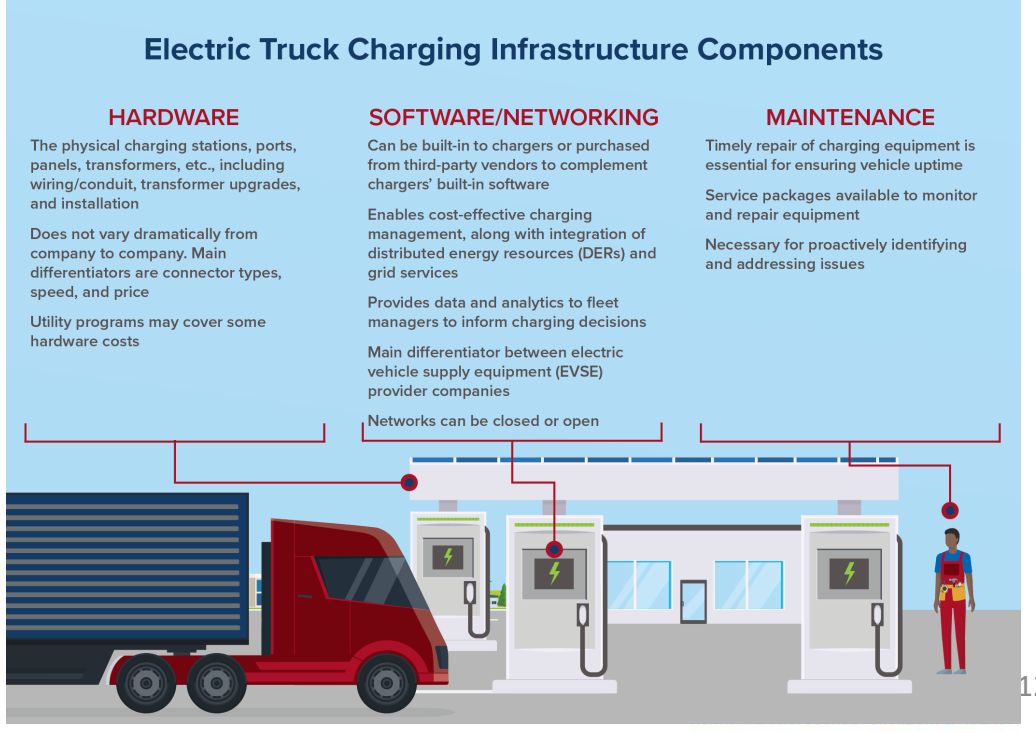
- Close to base
- Limited range
- Consistent, dedicated routes
- Total cost calculator
- “Unknown…difficult to monetize benefits”
  - Zero emissions in warehouses
  - Noise
  - Design flexibility
  - And on



Infrastructure

- Complex
- Large amount of power fast
- Involve all stakeholders early
- Time to complete
- Be flexible





HD Tractors Viable Alternatives

PRESENT: 2020

Technology immature

Many unknowns & challenges

"MESSY MIDDLE": 2030

Many optimized solutions

Growing infrastructure

Multi fuel choices

Innovation & maturation

Facts replace estimates

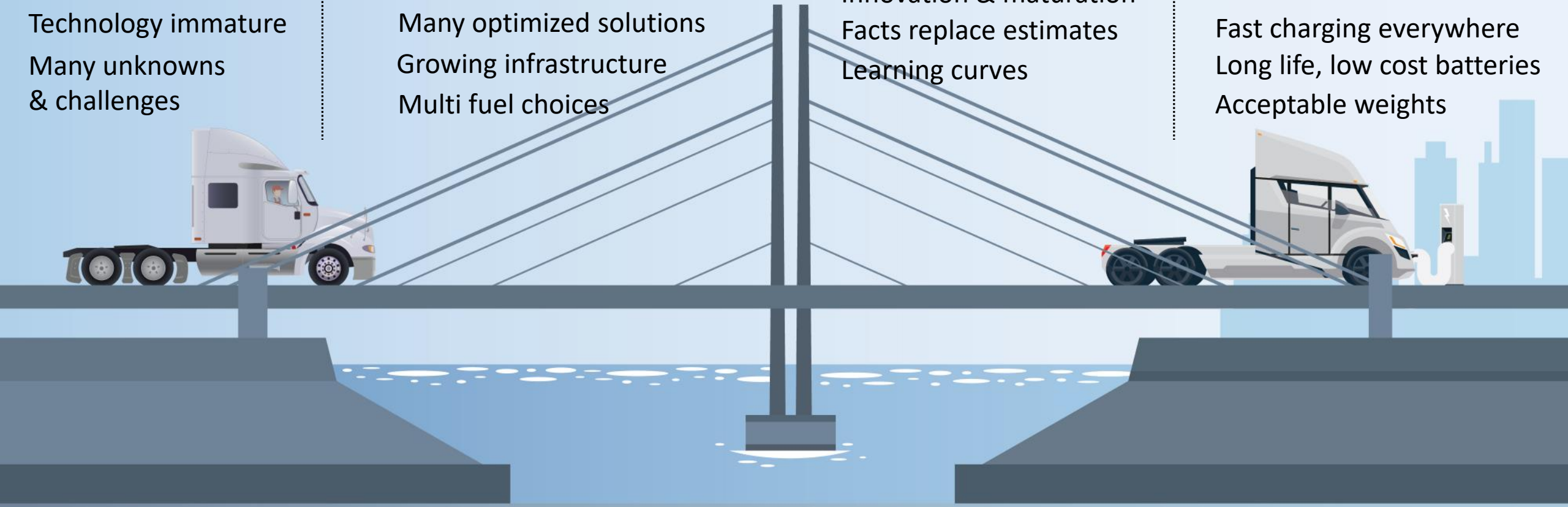
Learning curves

FUTURE: 2040

Fast charging everywhere

Long life, low cost batteries

Acceptable weights



Legacy Diesels

Natural Gas

Diesel Advancements

Natural Gas

Hybrids

Battery Electric

Hydrogen Fuel Cells

Renewable Natural Gas & Diesel

CBEV from Clean Energy

NACFE's Focus on Regional Haul Electric Trucks

PAST ACCOMPLISHMENTS

- Run on Less Regional
- Regional Haul thought leadership
- Electric truck guidance reports

NEW WORKSTREAMS

- Identify high-potential regional trucking routes
- Support implementation on first- and next-mover deployments
- Scale best practices in infrastructure deployment
- Increase confidence in the value of electrification

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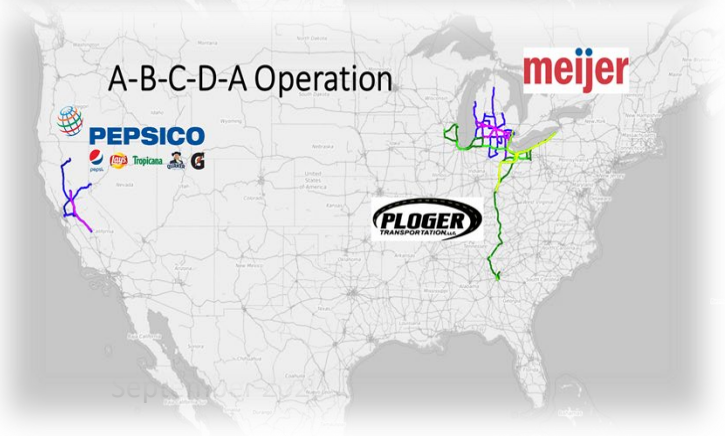
Electrifying RoLReg Routes



Battery Electric Trucks

NACFE Pre-Publication Draft Copy – EVS33 publication postponed to Fall 2020 due to COVID-19

33nd Electric Vehicle Symposium (EVS33)
Portland, Oregon, June 14 - 17, 2020

Battery Electric Powertrains for Class 8 Regional Haul Freight Based on NACFE Run-On-Less

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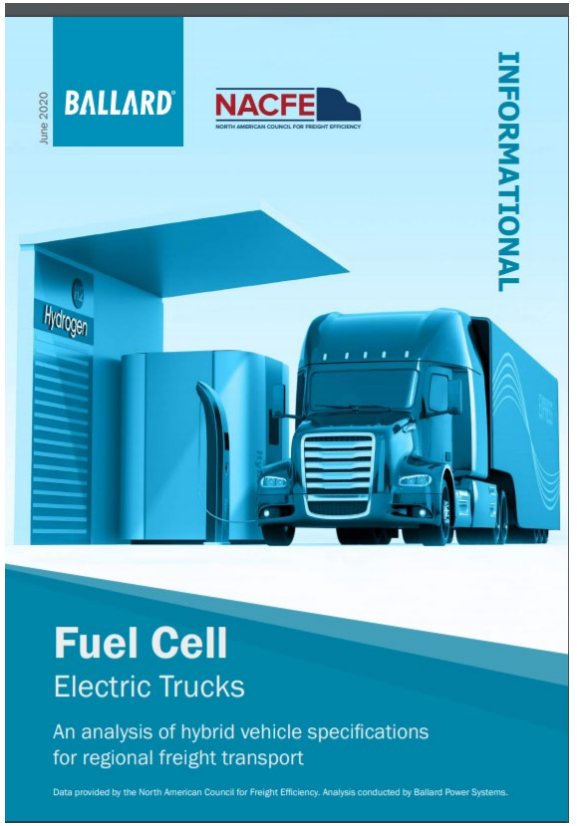
Summary

This report evaluates potential Class 8 regional haul commercial battery electric semi-truck performance requirements based on real world diesel and natural gas vehicle duty cycle data. Data was recorded over a 17-day period accumulating 58,633 miles with 10 trucks in a variety of locations as part of the North American Council for Freight Efficiency's (NACFE) Run on Less Regional (ROLR) demonstration of the effectiveness of current production diesel and natural gas tractor technologies in the hands of well-trained drivers. Data was collected with on-board data loggers in concert with the U.S. National Renewable Energy Laboratory (NREL) and Oakridge National Laboratory (ORNL), and independently through use of GEOTAB and LinkeDrive fleet tracking and management systems.

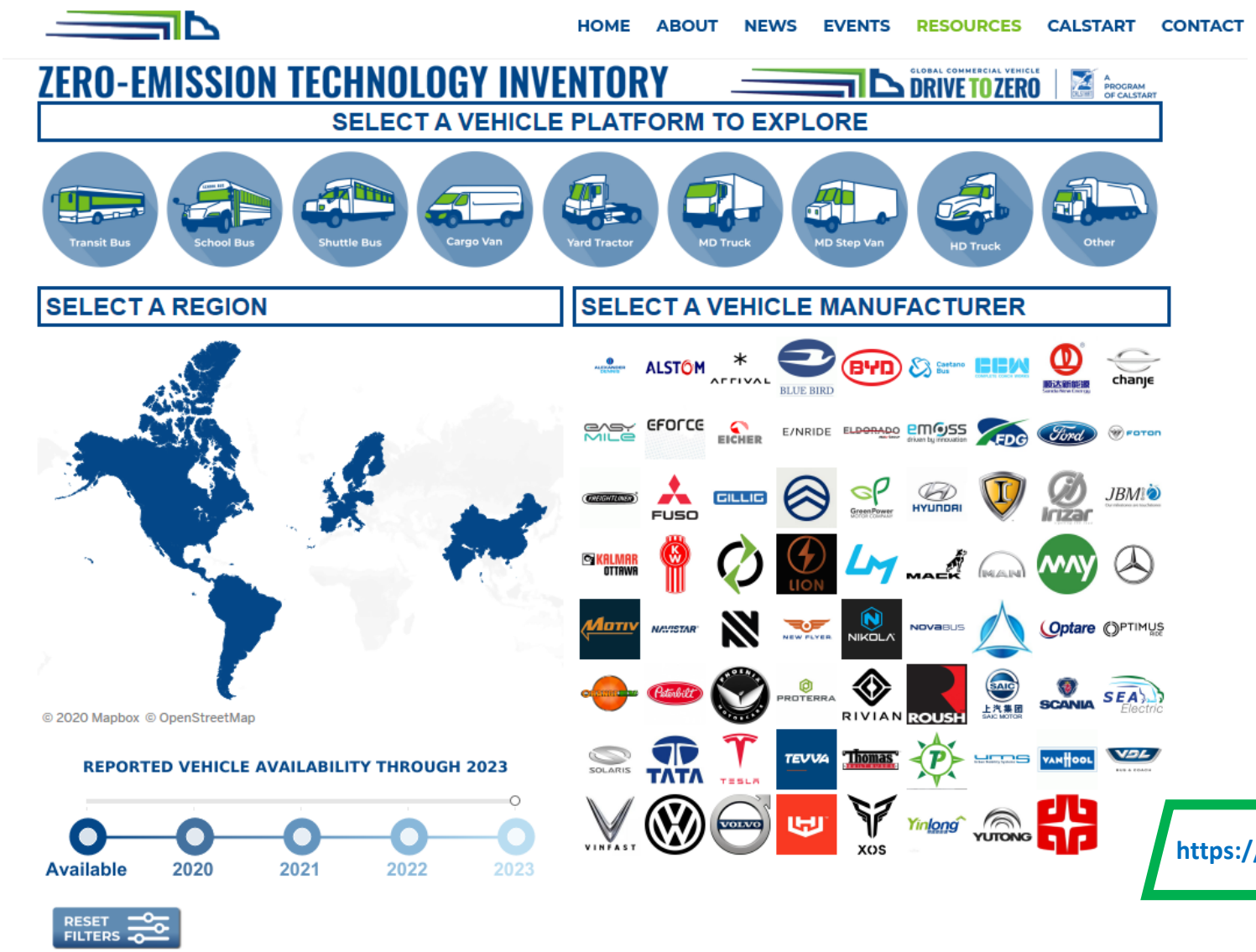
Keywords: Electric Truck, CBEV, Commercial Battery Electric Vehicle, NACFE, Regional Haul, Run On Less, NREL, ORNL, GEOTAB, LinkeDrive

Hydrogen Fuel Cell Electric Trucks



Download the reports at:
https://nacfe.org/run-on-less-regional-report/

Electric/Hybrid Trucks Catalog



- "ZETI"
- Calstart on-line tool
- Part of ***Drive to Zero*** program at Calstart
- Launched March 2020
- Current & future production models
- Links to OEM web pages

https://globaldrivetozero.org/resources/zero-emission-technology-inventory/

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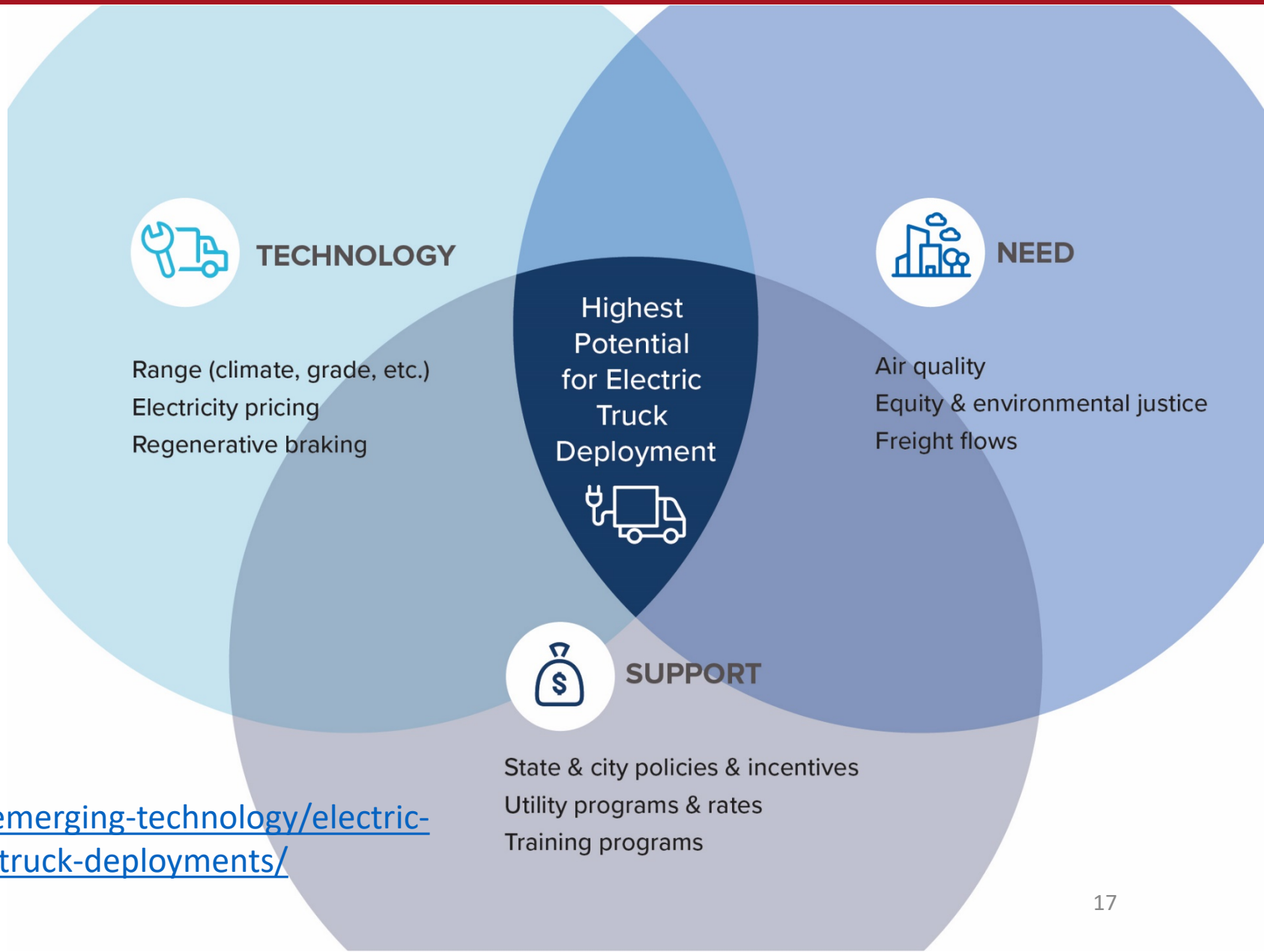
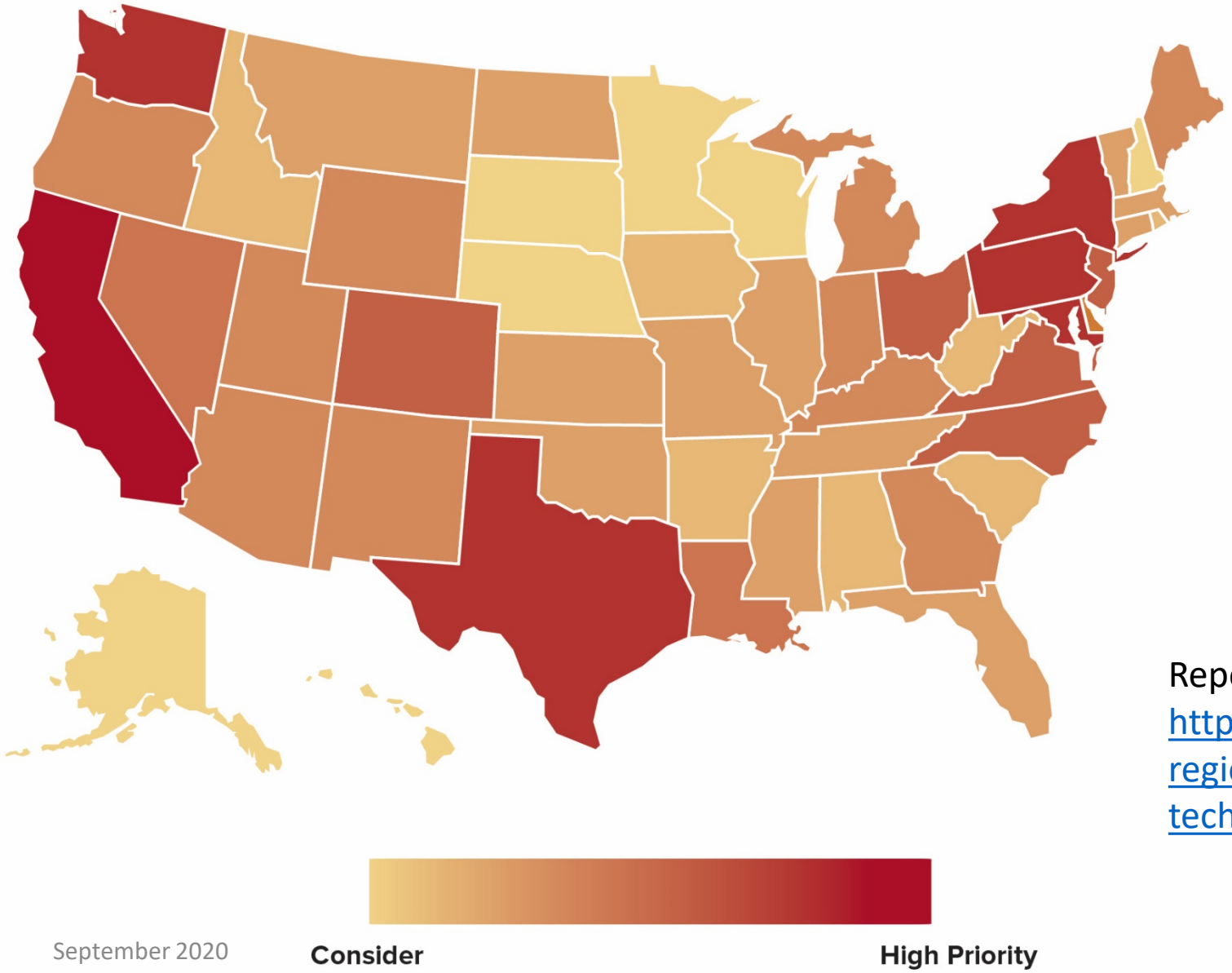
NEW High Potential Regions Report



Published August 24th, https://nacfe.org/emerging-technology/electric-trucks/high-potential-regions-for-electric-truck-deployments/

NEW High Potential Regions Report



Megaregions with particularly high potential

- Northern California
- Southern California
- Texas Triangle
- Cascadia (WA & OR)
- Front Range (CO & NM)
- Northeast

Report Link:
https://nacfe.org/downloads/high-potential-regions-for-electric-truck-deployments-technical-appendix/

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Thank You

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