



# ARE ALTERNATIVE FUELS RIGHT FOR YOUR FLEET?

Fleets face a wide variety of choices when it comes to powering vehicles, each with pros and cons.

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## **SHELL** LUBRICANT SOLUTIONS



“ IN THE LONG RUN, ELECTRIC POWERTRAINS WILL DOMINATE. DURING THIS TRANSITION, SOME TECHNOLOGIES WILL EMERGE AS BRIDGES BETWEEN WHERE WE ARE TODAY AND WHERE WE WILL BE IN THE FUTURE. ”



**The trucking industry is in a period of significant change. Fleet owners can choose from a seemingly endless variety of powertrain technologies, including diesel-electric and fuel-cell-electric hybrid and battery-electric options.**

Fleet owners are beginning to consider alternative fuel vehicles because of their economic and environmental benefits. Some of the more promising technologies include

- commercial battery electric
- fuel cell-electric hybrid
- compressed natural gas
- renewable natural gas
- liquefied natural gas (LNG)
- propane
- diesel-electric hybrid
- renewable diesel.

At present, there are no clear winners or losers. Each powertrain option is chosen based on a variety of factors, including regional or local energy availability and fleet operational requirements. Fleets are likely to have a period of trial and error while determining which technologies work best in their real-world operating conditions.

In the long run, according to the North American Council for Freight Efficiency (NACFE), electric powertrains will dominate the market because of their efficiency when viewed from a well-to-wheels perspective. During this transition,

some technologies will emerge as bridges between where we are today and where we will be in the future.

While some manufacturers have launched alternative fuel vehicles in North America, including zero-emission options such as fuel cell- and battery-electric vehicles, the infrastructure for these trucks needs to be developed and drivers and technicians trained to operate and service vehicles with these new powertrains.

In its guidance report,\* NACFE came to the following conclusions:

- North American freight movement is becoming more predictable; e-commerce and other technologies enable dedicated routes that offer better duty cycles for alternative powertrains.
- Each alternative-fuel powertrain offers short-term benefits compared with current diesel engines and may have enough duty-cycle scale to offer total cost of ownership and emissions savings.
- Commercial battery-electric and fuel-cell trucks will be capable of lower total cost of ownership by the 2030s.

- Vehicle specifications will be optimized for the duty cycle and technology of the first user, thereby limiting equipment applicability for second or third users.
- There will be a “messy middle” until users recognize that commercial battery- and fuel-cell-electric powertrains offer significant improvements over the diesel and gasoline baselines for powering trucks.
- A future zero-emission freight world will have only electric vehicles (commercial battery-, fuel-cell- or catenary-electric vehicles) powered well-to-wheels from truly renewable sources, such as hydro, solar and wind.

In the short term, we will see a multi-fuel environment with greater specialization of vehicles for required duty cycles, where each alternative may play a part. The trucking industry will work out the details for these alternative powertrains for a future in which they will coexist with improved diesel ones. Each will specialize in, and be optimized for, specific duty cycles and regions. Each will benefit the environment compared with today’s vehicles. And fleets and OEMs will remain profitable.

## ALTERNATIVE FUELS TECHNOLOGY BRIDGES

### PRESENT 2020

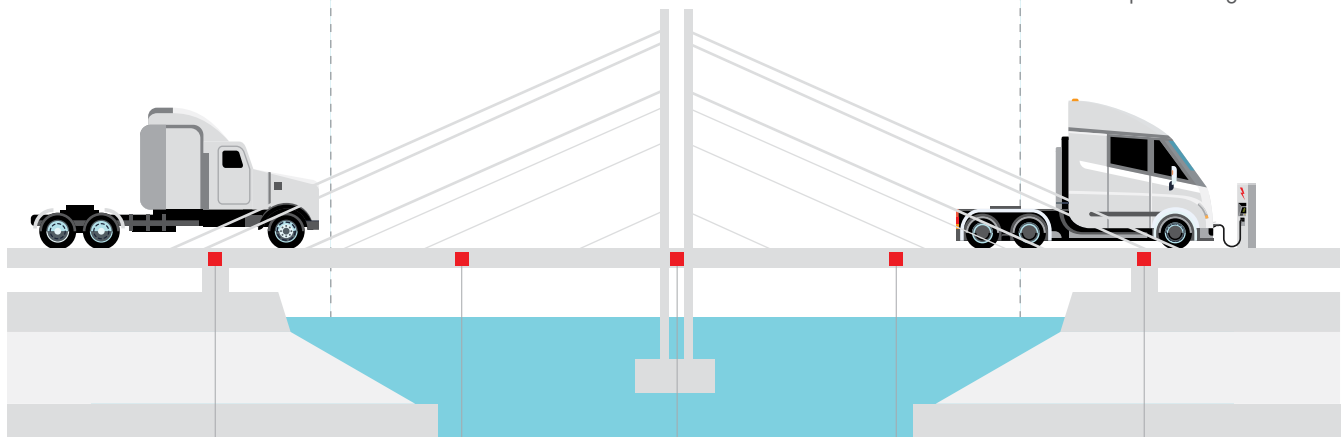
- Technology immature
- Many unknowns and challenges

### MESSY MIDDLE 2030

- Many optimized solutions
- Multi-fuel choices, growing infrastructure, learning curves, innovation and maturation, facts replace estimates

### FUTURE 2040

- Fast charging everywhere
- Long life batteries
- Low cost batteries
- Acceptable weights



- Legacy diesels dominate the market

- CNG/LNG
- Hybrid, diesel, electric
- First generation CBEV and FCEV
- Advanced diesel

- Renewable CNG/diesel
- Next generation CBEV and FCEV from all generators

- Mature CBEV and FCEV from clean energy

- CBEV from clean energy

#### KEY:

CNG: Compressed natural gas

CBEV: Commercial battery electric vehicle

FCEV: Fuel cell electric vehicle

Source: NACFE



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