ELECTRIC TRUCKS HAVE ARRIVED: Documenting A Real-World Electric Trucking Demonstration

This report documents the Run on Less – Electric (RoL-E) demonstration by the North American Council for Freight Efficiency (NACFE), which was conducted in September of 2021. It shares the methods used to select the participating fleets, routes, and equipment, and metrics that measured the 13 participating pairs of fleets and OEMs.

We expect that this work encourages fleets to explore the deployment of commercial battery electric vehicles (CBEVs) in their operations where they make sense, for manufacturers to improve their products for quicker return on investment, and for others to better support the efforts of the trucking industry to progress the use of CBEVs. Thanks to all of those who contributed to this important work. Run on Less by NACFE is an ongoing effort by NACFE and RMI. Run on Less – Electric is the third event in the series. The first, in 2017, focused primarily on longer haul, a second, in 2019, on regional haul and this one on CBEVs.

NACFE's mission is to double the freight efficiency of North American goods movement through the elimination of market barriers to information, demand, and supply. Run on Less is one way to do that, and the plan is to conduct a Run on Less every other year.

ACKNOWLEDGMENTS

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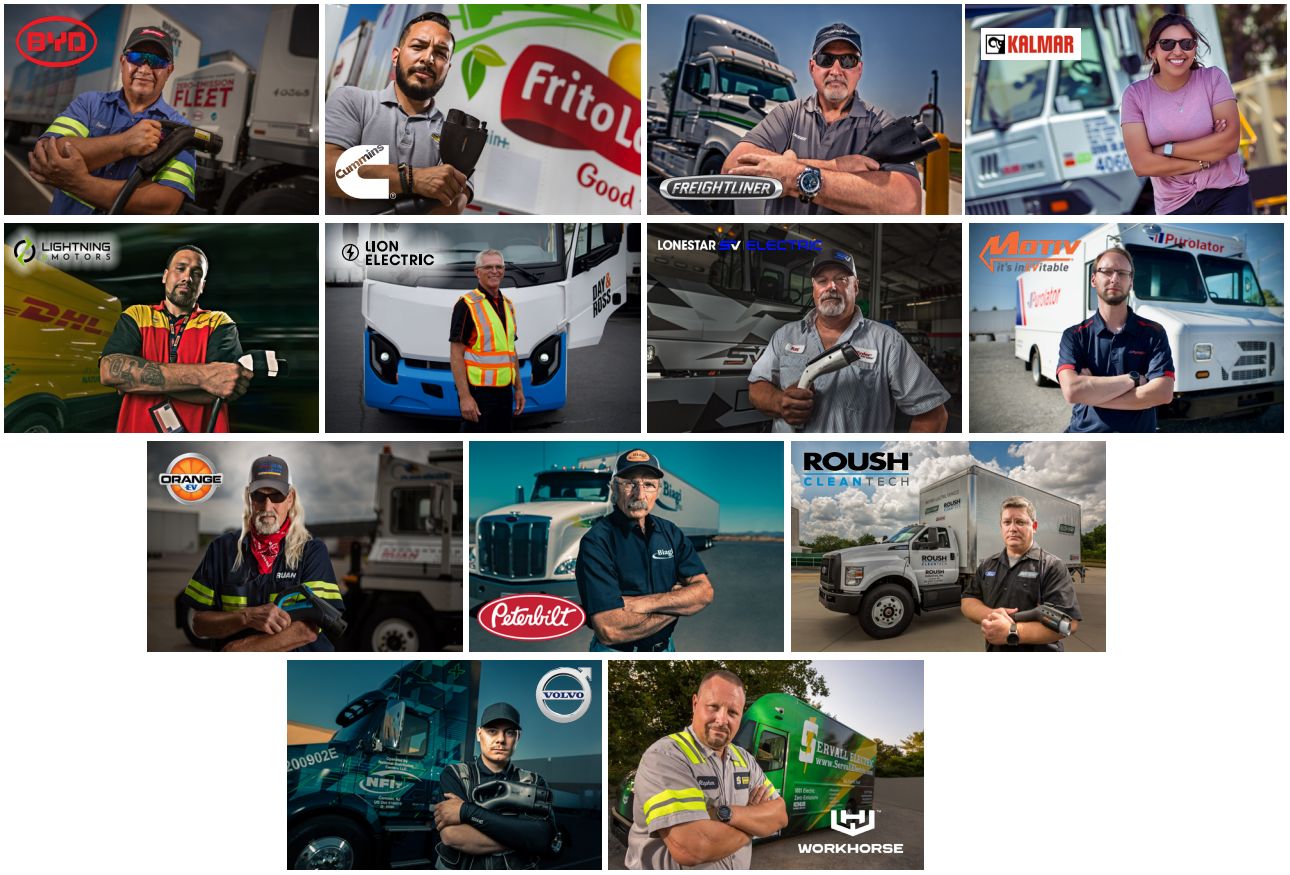
WOMEN IN TRUCKING

RUN ON LESS ELECTRIC

DRIVERS, FLEETS & OEMS

Rene Solis, Anheuser-Busch, driving a BYD tractor
Joseph Villaneuva, Frito-Lay, driving a Cummins box truck
Donald Disesa, Penske, driving a Freightliner eCascadia
Jazmin Vasquez, NFI, driving a Kalmar Ottawa electric terminal tractor
Antonio Grimila, DHL, driving a Lightning eMotors van
Francis Lajoie, Day & Ross, driving a Lion6 electric truck
Ray Hancock, Ryder System, Inc., driving a Lonestar Specialty Vehicles terminal tractor
Alexander Schaumann, Purolator, driving a Motiv-Powered step van
Conrad Hanson, Ruan, driving an Orange EV terminal tractor
Pat Brandon, Biagi Bros., driving a Peterbilt 579EV
Michael Johnson, Roush Fenway Racing, driving a Roush CleanTech truck
Jeffrey Howard, NFI, driving a Volvo electric VNR
Steve Garrett, Servall Electric, driving a Workhorse C1000



Some of the vehicle-manufacturer pairings that participated in Run on Less – Electric are part of California Climate Investments, a statewide initiative that puts billions of cap-and-trade dollars to work reducing greenhouse gas emissions, strengthening the economy, and improving public health and the environment—particularly in disadvantaged communities.

Why Battery Electric Trucks Now?

Battery electric trucks have existed for more than 100 years. Until recently, the technology made only small inroads in freight movement such as forklifts and carts and saw limited use in delivery vehicles and special purpose vehicles.

In 2010, some early entrants for the long-delayed second life of electric trucks began work on commercial battery electric vehicles (CBEVs). [1] [2] [3] [4] [5] Electric and hybrid electric buses also were being introduced in that time frame. After 2010, as electric vehicle components began evolving into commodities, several small manufacturers saw opportunities to take production chassis deliveries and upfit them with electric drivetrains.

The established large OEMs were largely silent in public on their research and development of battery electric medium- and heavy-duty trucks. However, in October 2017, Tesla's Elon Musk introduced a long-range battery electric Class 8 semi-tractor. The established truck manufacturers all started discussing electric trucks in public. Many began introducing prototype and grant vehicles laying out plans for production.

The growing focus on sustainability by companies, investors, the public and regulators spurred fleet and manufacturer interest in CBEVs.

In October 2020, NACFE determined that the trucking industry was ready to introduce production level CBEVs and concluded that the timing was right for a Run on Less demonstration featuring CBEVs. A new logo was created for the event, as shown in Figure ES1.

In September 2021, 13 trucks from across the United States and Canada participated in Run on Less – Electric, a three week, real-world battery electric truck demonstration. The event proved that four market segments — vans and step vans, medium-duty box trucks, terminal tractors, and heavy-duty regional haul tractors — are ready to go electric. And that if they did, US and Canadian fleets could eliminate about 100 million metric tons (or 1 megatonne) of CO_2 emissions.

FIGURE ES1

NEW RUN ON LESS – ELECTRIC LOGO

Prior To Run

In preparation for RoL-E from April through August 2021, The Electric Truck Bootcamp, a 10-week webinar series, was conducted involving 45 subject matter experts on a variety of critical aspects of electric trucks. It reached more than 2,500 industry stakeholders and had 3,500 attendees.

During January through April, NACFE interviewed more than 30 prospect pairings and selected 13 fleets and OEMs capable of supplying drivers, vehicles and routes for the September three-week demonstration. Vehicles crossed the spectrum from Class 3 to Class 8. A NACFE objective was to showcase not only where CBEVs were in use in California but in regions outside of California including Canada. The challenges of securing fleet and OEM participation for vehicles just entering production amid the pandemic caused NACFE to revise the RoL-E participants as the demonstration came closer to starting

Throughout the summer of 2021, NACFE staff members visited each fleet for one to two days of recording interviews and filming. The driver, fleet management, representatives from the OEMs and in some cases utility company representatives were at those site visits.

Prior to the event, each fleet was introduced on the Run on Less website with 13 short profile videos. During RoL-E, 15 daily short topic videos called Stories from the Road

"Run on Less – Electric takes the 'nervousness' out of electric trucks for fleets. They can see these trucks are out there running today and not just something you see on the trade show floor."

— Amanda Phillips, General Manager of OEM Sales, Meritor

were published from interviews with 91 subject matter experts. In total, 31 videos were produced and issued in 60 days and were viewed more than 5,000 times online with downloads exceeding 50,000.

Event Details

The emerging nature of CBEVs in 2021 provided challenges in finding production intent vehicles for RoL-E. In December 2020, NACFE identified more than 30 vehicle models to consider in planning the event.

The initial goal was to secure 10 fleets with 10 different battery electric models covering Class 3 through 8 early production unit freight-carrying vehicles. Early production units are intended to allow fleets to fully evaluate operational use of production representative vehicles. The fleets and the OEMs are working closely together for the success of emerging technology deployment. NACFE required both the fleets and the OEMs to agree to be participants for each RoL-E entry and to have their vehicles outfitted with Geotab devices in order to collect data on the vehicle's operation. Of the 13 vehicles in the Run, 12 were instrumented with a Geotab telematics device, and one had its data collected via the manufacturer's own telematics device.

Ultimately NACFE settled on 13 fleet-OEM pairs because they represented a broad mix of vehicles in four market segments — three vans and step vans, three terminal tractors, three medium-duty box trucks and four heavy-duty regional haul tractors. This cross section of vehicle types and manufacturers gave NACFE an excellent snapshot of the state of the CBEV industry.

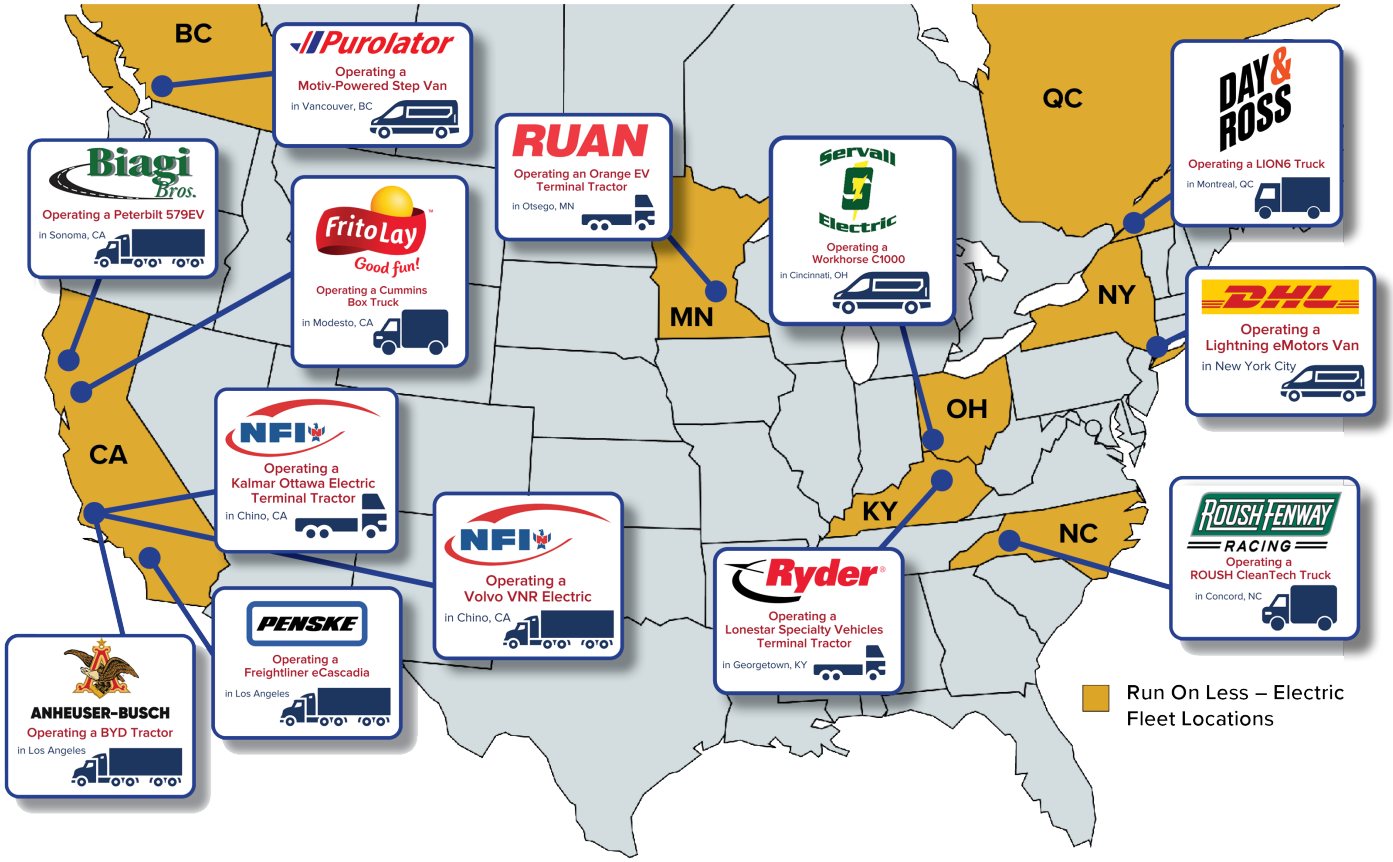
The 13 fleet-OEM pairs that participated in RoL-E are:

1. Anheuser-Busch with a BYD tractor
2. Frito-Lay with a Cummins box truck
3. Penske with a Freightliner eCascadia
4. NFI with a Kalmar Ottawa electric terminal tractor
5. DHL with a Lightning eMotors van
6. Day & Ross with a Lion6 electric truck
7. Ryder with a Lonestar Specialty Vehicles terminal tractor
8. Purolator with a Motiv-Powered step van
9. Ruan with an Orange EV terminal tractor
10. Biagi Bros. with a Peterbilt 579EV
11. Roush Fenway Racing with a Roush CleanTech truck
12. NFI with a Volvo electric VNR
13. Servall Electric with a Workhorse C1000

These vehicles made their regular deliveries over a three-week period in September 2021 in a variety of regions across the US and Canada as shown in Figure ES2.

FIGURE ES2

RUN ON LESS – ELECTRIC FLEETS, TRUCK TYPE AND LOCATIONS.



A Closer Look at Market Segments

RoL-E participants fell into four distinct market segments.

Vans and Step Vans: Urban delivery duty cycles using Class 3 to 6 vans and step vans is an ideal duty cycle for battery electric powertrains. These vehicles generally do not have issues with vehicle tare weight impacting freight weight. Range also is generally not a concern with these duty cycles which tend to be below 100 miles a day, and often below 50 miles per day. The urban traffic and street driving also permit energy recovery through regenerative braking. Charging times and electricity rates also are not that demanding as these vehicles are used in one-shift operations with long overnight dwell times making it possible to use low charging rates, more inexpensive chargers, and low-cost electricity. For a more in-depth look at this market segment read the Vans and Step Vans: Market Segment & Fleet Profile Fact Sheet.

Medium-duty Box Trucks: Urban delivery duty cycles using Class 6 box trucks also are ideal duty cycles for battery electric powertrains. These vehicles are more likely to have payload weight concerns. However, many loads carried by these vehicles tend to cube out, i.e., fill up the volume of the vehicle freight compartment, not weigh out, i.e., use the entire allowance of legal gross vehicle weight. Range also is generally not a concern with these duty cycles which tend to be below 100 miles a day, and often below 80 miles per day. The urban traffic and street driving permit energy recovery through regenerative braking systems. Charging times and electricity rates also are not that demanding as these vehicles generally are used in one-shift operations with long overnight dwell times making it possible to use low charging rates, more inexpensive chargers, and low-cost electricity. For a more in-depth look at this market segment read the MD Box Trucks: Market Segment & Fleet Profile Fact Sheet.

METHODOLOGY

This report's conclusions were generated through the data collection and calculations from Run on Less – Electric. Of the 13 vehicles in the Run, 12 were instrumented with a Geotab telematics device, and one had its data collected via the manufacturer's own telematics device. The vehicle operations were continuously digitally tracked, and their metrics updated daily via a public website with the ability to view results by day or over a span of days. Metrics such as daily range, speed profiles, state of charge, charging events, amount of regenerative braking energy recovery, weather and number of deliveries were shown in near real time. Information on weather conditions was also obtained.

Terminal Tractors: Terminal tractors are purpose-built vehicles for moving trailers around warehouses, distribution centers and other terminals. The terminal operations tend to be demanding with short dwell times when drivers take breaks and often slip-seating for multi-shift operations. The vehicles accumulate a surprising number of daily miles considering they rarely if ever leave their facilities. Several factors in the operation of a terminal tractor make CBEVs a logical fit. The vehicles always are at the depot, so always are near charging facilities. Weight is generally not an issue since the vehicles are usually 4x2 configurations with very spartan, lightweight one-person cabs. Terminal driving is very stop-and-go, which is appealing to the acceleration and regenerative braking advantages of the electric drivetrain. For a more in-depth look at this market segment read the Terminal Tractors: Market Segment & Fleet Profile Fact Sheet.

Heavy-duty Regional Haul Tractors: Heavy-duty day cab regional haul is more challenging for CBEVs because duty cycles are more sensitive to range and payload weight needs. The discussion on range splits into distinct topics of individual trip range, the driver's one-shift range, and the truck's one-day range. Vehicles may be able to easily do some number of round trips before recharging, but they may not be able to do all the multiple round trips over one driver's entire shift. In the case of slip-seat operations, the vehicle may need to do two or three driver shifts per day with little dwell time at the depot available for charging. However, where the trip distance is short, and/or operations have lengthy delivery dwell times, CBEVs can adequately handle the entirety of one-shift operations. Payload weight also factors into capability to accomplish a day's work for the truck. Lighter payloads place lower demands on power, but even heavy beverage loads may be fine if the net daily mileage is not very demanding of the batteries. For a more in-depth look at this market segment read the HD Regional Haul Tractors: Market Segment & Fleet Profile Fact Sheet.

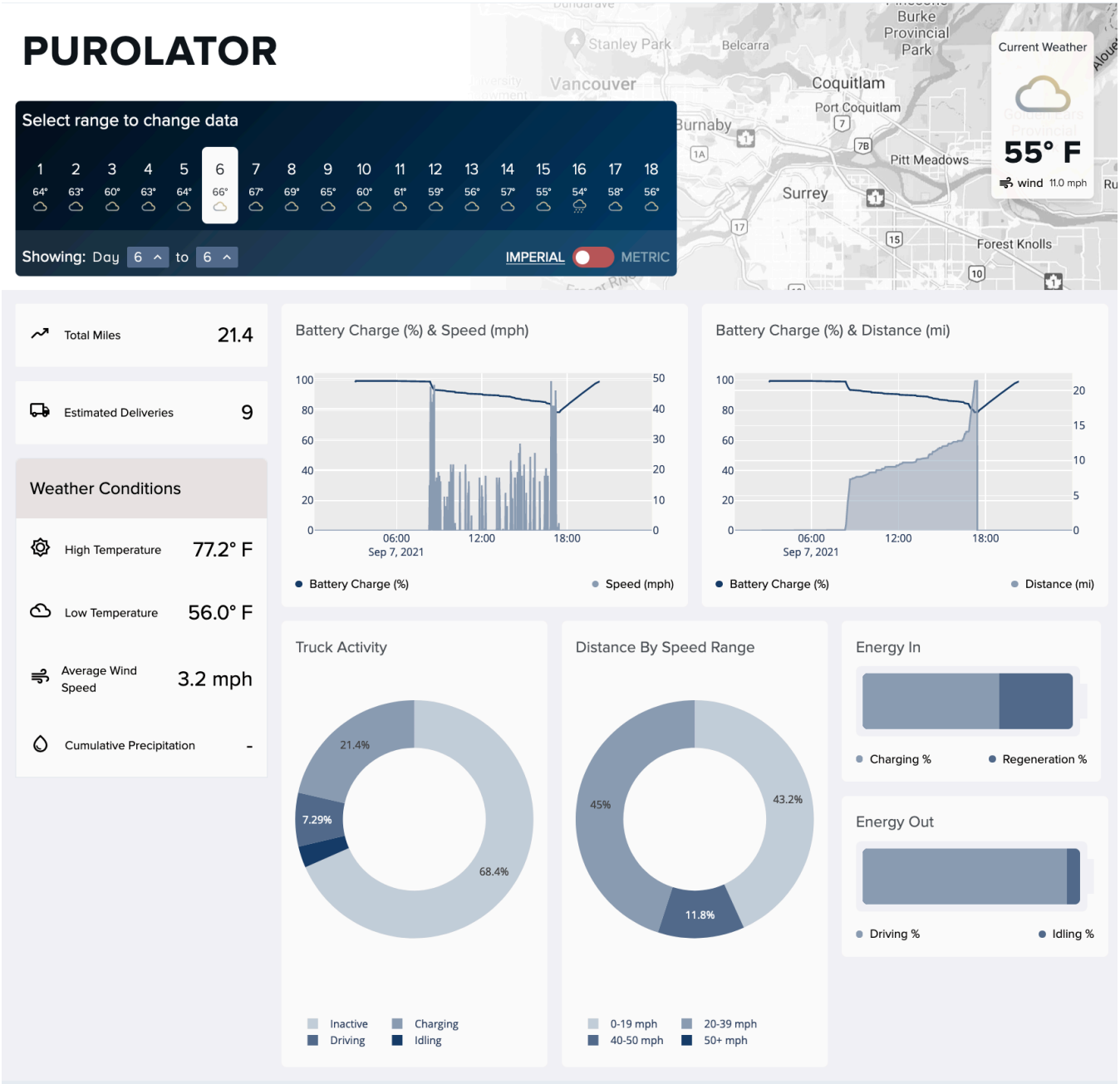
The Metrics

Throughout the run, NACFE tracked vehicle operations continuously via a digital tracking device, and updated metrics daily via a public website with the ability to view results by day or over a span of days. The website showed the metrics in near real time as illustrated in Figure ES3.

The metrics measured included the following:

FIGURE ES3

EXAMPLE OF RUN ON LESS – ELECTRIC METRICS (CLICK HERE FOR A LARGER VIEW)



State of charge: State of charge (SOC) is similar to a diesel fuel gauge. Instruments in a diesel fuel tank measure the level of fuel remaining and report that to the fuel gauge in the dashboard and on the CAN data bus of the vehicle. Battery SOC for RoL-E was measured by continuously monitoring voltage, amperage, and amp hours remaining after fully charging — essentially counting the amp-hours expended over time and subtracting that from the full charge state. [6]

Daily range: NACFE determined distance driven using GPS position because some of the vehicles did not give access to the odometer data. Total miles for the day were tabulated and reported as a number, then distances were graphed versus time along with battery SOC.

Speed profiles: NACFE used GPS position to determine speeds. First, speeds along with SOC were graphed versus time, and then speed was categorized as percent distance in speed bands. [66]

Regenerative braking energy recovery: CBEVs can recover energy by using the drive motors to slow the

vehicles. This is called regenerative braking; essentially the motors — rather than using energy — are acting as generators and putting energy back into the batteries. The amount of regenerative braking energy recovery is reported by the vehicle on the data bus.

Number of deliveries: There are no vehicle-based systems that specifically highlight a delivery instance — the act of stopping the vehicle and unloading (or loading). Deliveries also have different parameters when looking at a terminal tractor versus a box truck due to the differences in what constitutes a delivery. NACFE developed two different algorithms depending on truck type to identify a delivery event from telemetry data.

Charging rate: NACFE describes the charging rate as how fast and at what power level the vehicle is charging. Charging rate was determined from vehicle data bus signals using SOC over time when plugged into the charger. The vehicle data bus continuously reports voltage and amperage, and can integrate that over time to provide SOC. The fundamental measure is the power level (kW) over time, which equals the energy level (kWh). A 100-kWh battery pack depleted to 50% SOC during the work shift requires 50 kWh of energy to return to 100% SOC. Charging that battery can be done slowly, for example at 5 kW over 10 hours equating to 50 kWh. Or it can be done quickly, for example 50 kW in one hour again equating to 50 kWh.

Energy consumption: Consumption is the inverse of efficiency. In battery electric vehicles, the fuel efficiency metric often reported is kilowatt hours expended per mile (kWh/mi). This is not efficiency but rather consumption. NACFE did not directly report consumption through the RoL-E metrics dashboard, but it was feasible to estimate it from the data that was provided based on the specifications of the vehicles, the miles traveled per day, and the SOC data. NACFE found that there are multiple ways to measure consumption — daily charge method, net charge method, daily consumed method, and net consumed method — and they may differ in values.

Trucking activity: NACFE also tracked various types of activity for each vehicle in the Run.

- **Inactive** — Inactive time is when the vehicle is not using any significant power, the key is off, and the CBEV is not charging
- **Idling** — NACFE concluded that a CBEV was idling if the vehicle was not charging, not moving, and was expending any significant power for accessory loads like air conditioning.
- **Charging** — Charging time is when the vehicle is plugged into the charger and not moving and may or may not have accessories operating. To put this in a diesel perspective, having accessories operating during charging activity would be equivalent to idling at a fuel stop while pumping fuel into the tank — a procedure that is not advised with liquid fueling.
- **Driving** — Driving time is when the vehicle has velocity greater than zero. It also includes non-moving time at traffic stops shorter than 180 seconds.

Energy-in per day: The battery on an electric vehicle is continuously changing its SOC value based on the amount of energy that is going out and the amount of energy coming in. This can occur at the same time. Geotab engineers arrived at a method for estimating how much energy was recovered through regeneration versus how much was supplied through charging over the course of a day's operation.

Energy-out per day: Similar to energy-in, there is complexity in estimating where the energy is allocated during a day of operation

Weather: Vehicle performance always is in context of the operational environment. For RoL-E, NACFE pursued regions with diverse weather conditions. The three-week nature of the RoL-E demonstration limited the ability to observe a broad range of weather conditions, but the RoL-E fleets use these vehicles year-round. The local weather data for each day and fleet location was obtained via an Application Programming Interface from OpenWeather. For simplicity, since most trucks didn't go that far, NACFE collected weather information for the base location, not the truck's rolling location. [64]

"Three or four years ago people were saying 'we'll never electrify trucks.' Run on Less – Electric has shown that today there are some parts of that market that are ready {for electric trucks]. We've only had the theory, now Run on Less – Electric is showing the reality."

– Michael Berube, Deputy Assistant Secretary for Sustainable Transportation, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy

Other Factors

NACFE also looked at the role of the driver, regional factors in CBEV deployment, maintenance and utilities.

Drivers: The RoL-E drivers were a diverse group with a variety of experience levels, ethnicities, ages and genders. See ES4. The fleets selected their own drivers, but those drivers had to agree to the added complexity of being interviewed, photographed and videoed, and having their every working minute tracked for three weeks.

Drivers universally stated the electric vehicles provided better driving experiences versus diesels. A number of factors contributed to this conclusion including lower interior noise levels, low exterior noise levels, better acceleration, simplicity, easier charging vs fueling, no idle emissions, depot charging, no diesel smell, less fatigue, novelty factor, and positive brand image.

Regional Factors: RoL-E fleets in Minnesota, Montreal, Cincinnati, Kentucky, New York City, and the Southern California region face extremes in temperatures over the course of a year. Fleets in some of these instances like in Minnesota and New York City had been operating CBEVs through the winters and saw no performance issues that impacted their duty cycles. Other fleets had not yet gone a full year with their CBEVs so did not have first-hand experience, but all expected the vehicles to be capable of getting their specific duty cycles completed in

FIGURE ES4

THE 13 DRIVERS WHO PARTICIPATED IN RUN ON LESS – ELECTRIC

"Electric trucks are not the technology of the future. They are technology for now. Manufacturers are going into production starting now and over the next several years."

– Tim Farney, vice president, global sales, Dana Inc., Commercial Vehicle Division

their climates. The Southern California and Modesto area sites saw extreme heat during the summer on-site visits by the NACFE RoL-E teams with temperatures exceeding 100°F. Drivers and fleet managers reported no duty cycle limitations during these visits.

Maintenance: The three-week RoL-E demonstration was far too short to get any useful measured detail on maintenance. There is long-term reliability data on electric automobiles and buses showing that once vehicles are in production, their maintenance costs and failure rates trend downward versus internal combustion vehicles. This was the expectation of all the fleets in RoL-E. A few fleets that had operated their vehicles prior to RoL-E reported very high uptime and reliability. Maintenance cycles were expected to lengthen for wear items like brake systems where regenerative braking reduced the use of the wear items. Oil changes were largely no longer relevant. The significant failure modes tied to emission systems are not relevant to CBEVs. [73] [74]

Utilities: NACFE set out to engage with the utilities providing power to the RoL-E fleets. NACFE research and site visits to the RoL-E fleets showed that in some high visibility California markets utilities are actively engaged with customers to facilitate CBEV adoption. However, in other regions, the utilities are less engaged. In some cases, the fleets indicated that their utilities showed no interest in their work with CBEVs. [75] [76] [77] [78]

Clearly the utilities play a significant role in fleet electrification, but in many cases, they are not yet engaged with fleets. This is an industry challenge. Engaging a receptive utility opens up a number of alternatives for negotiating electricity pricing models. [7]

Total Cost of Ownership

Being confident in any of the cost elements in a total cost of ownership (TCO) calculation of CBEVs was not possible in the scope of the three-week RoL-E demonstration. Fleets and OEMs were reluctant to discuss much in terms of actual expenses and financial benefits. Many of the vehicles have not yet listed the manufacturer's suggested retail prices for specific models. Interviews with fleets and manufacturers surfaced their operational experiences and expectations in generic terms.

Prior to the Run, many of the fleets had not operated the vehicles for a sufficient period of time to accurately assess costs. The expectations were that the CBEVs would have lower operating expenses based on lower maintenance, less damage from moving parts, lower energy costs per mile, and many soft factors such as driver retention cost reduction, reduced environmental compliance costs, etc.

Findings

RoL-E demonstrated that for four market segments — vans and step vans, medium-duty box trucks, terminal tractors, and heavy-duty regional haul tractors — the technology is mature enough for fleets to be making investments in production CBEVs. Continuous improvement is expected to be rapid as these technologies gain market share. The environmental benefit of reduced CO_2 and particulate emissions is significant for replacing traditional diesel and gasoline-based vehicles.

Other findings include:

- Early adopters of CBEVs are validating an acceptable total cost of ownership in urban medium-duty vans and trucks, terminal tractors and short heavy-duty regional haul applications.
- CBEV adoption is occurring throughout North America, but use of longer haul heavy-duty electric semi-trucks use has been somewhat limited to California.
- There are benefits to CBEVs (quiet operation and reliability) as well as challenges (infrastructure and range).
- CBEV truck ecosystem inertia is in its early stages with many solutions emerging that will support adoption in the next several years.
- The industry needs to develop standards in the areas of charging, repair, maintenance and training.
- There is a huge demand for real-world information on electric vehicles in commercial applications and on charging infrastructure.
- The mix of startups, traditional truck OEMs, and component manufacturers is expediting the development of creative and practical solutions.

"Collaboration in the industry between energy suppliers, energy users, fleets, OEMs, government agencies and policymakers, as well as industry organizations, is crucial for developing and implementing solutions."

– Selda Gunsel, president, Shell Global Solutions and vice president, Global Lubricants and Fuels

- More thought is needed on the best way to gather and manage the necessary data for fleets and manufacturers to measure and monitor their CBEVs.
- Early adopters of CBEVs are having an influence on improving trucks and infrastructure.
- CBEVs present operational challenges, for example longer charging times than fueling, which these fleets are working to mitigate.

At the conclusion of the event, NACFE's Executive Director, Mike Roeth, said, "It's clear from the data collected during the Run that it is time for fleets to go electric in certain market segments, including the van and step van, medium-duty box truck, terminal tractor and heavy-duty regional haul tractor delivery segments." [86]

As a result of the Run, NACFE estimates that electrifying all US and Canadian medium- and heavy-duty trucks in the market segments studied in the Run would prevent about 100 million metric tons (or 1 megatonne) of CO_2 from entering the atmosphere as shown in Figure ES5. [89] [90]

FIGURE ES5

ESTIMATED NET SAVINGS FOR RUN ON LESS – ELECTRIC MARKET SEGMENTS

If all North American trucks in the four represented market segments were electric, the industry would save over a megatonne of carbon emissions each year and require approximately 169 gigawatt-hours of electricity to charge them.

MARKET SEGMENTS	POPULATION US & CANADA	CARBON AVOIDED ANNUALLY (MT CO_2e)	ELECTRICITY TO CHARGE ANNUALLY (gWh)
Class 3, 4, 5 Vans & Step Vans	4,143,406	43,476,632	89,342
Class 6 Box Trucks	385,687	7,681,707	12,475
Class 8 Terminal Tractors	25,242	929,687	726
Class 8 Regional Haul Tractors	656,294	47,940,877	66,040
Total	5,210,629	100,028,904	168,582

Figures don't add up exactly to totals due to rounding

In addition to the big overarching findings of the Run on Less – Electric demonstration which allowed us to gain better insight into battery electric vehicles in the four market segments — vans and step vans, medium-duty box trucks, terminal tractors and regional haul heavy-duty tractors — we also learned some little things.

These lessons learned were about CBEVs and their charging needs, the importance of understanding what you measure and how you measure it, the need for standards surrounding vehicle-charger interfaces and terminology, operational factors fleets need to consider in order to make the deployment of CBEVs go smoothly, and the complexity of working with utilities.

We expect all those helping to advance the use of electric vehicles in commercial applications — fleets, OEMs, suppliers, utilities, governmental agencies, legislators — will be able to leverage these lessons learned as they begin to deploy CBEVs in their operations. Figure ES6 includes these learnings categorized as charging, measurements, standards, operations and utilities.

FIGURE ES6

LESSONS LEARNED DURING RUN ON LESS – ELECTRIC (CLICK HERE FOR A LARGER VIEW)

Next Steps

Early in the second quarter of 2022, NACFE will publish market segment specific analyses of the RoL-E data. The four reports will cover vans and step vans, medium-duty box trucks, Class 8 terminal tractors, and heavy-duty regional haul tractors. A final report will take a deep dive into the data collected during RoL-E and subsequent data collected after the event.

Visit www.NACFE.org to download this and other reports

ABOUT US

ABOUT RUN ON LESS BY NACFE

Run on Less 2017 was a first-of-its-kind fuel efficiency roadshow that proved 10 MPG is possible with various combinations of commercially available technologies. Seven participating fleets hauled real freight on real routes during the three-week run across North America.

Run on Less Regional was conducted in October of 2019. Ten participating fleets demonstrated a variety of commercially available freight efficiency technologies in the three-week cross-country roadshow, proving that 8.3. MPG is possible in regional haul.

Run on Less – Electric was the first NACFE demonstration to focus on electric vehicles. Thirteen fleet-OEM pairs in the US and Canada participated in the three-week long event. If all US and Canadian medium- and heavy-duty trucks in the market segments — vans and step vans, medium-duty box trucks, terminal tractors and heavy-duty regional haul — studied in the Run became electric, about 100 million metric tons of CO_2 would be saved from entering the atmosphere. Visit runonless.com or follow us on Twitter @RunOnLess.

ABOUT NACFE

The North American Council for Freight Efficiency (NACFE) works to drive the development and adoption of efficiency enhancing, environmentally beneficial, and cost-effective technologies, services, and operational practices in the movement of goods across North America. NACFE provides independent, unbiased research, including Confidence Reports on available technologies and Guidance Reports on emerging ones, which highlight the benefits and consequences of each, and deliver decision-making tools for fleets, manufacturers, and others. NACFE partners with RMI on a variety of projects including the Run on Less demonstration series, electric trucks, emissions reductions, and low-carbon supply chains. Visit NACFE.org or follow us on Twitter @NACFE_Freight.

ABOUT RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing. More information on RMI can be found at www.rmi.org or follow them on Twitter @RockyMtnInst.

GET INVOLVED

Freight Efficiency is an exciting opportunity for fleets, manufacturers, and other trucking industry stakeholders.

Learn more at www.nacfe.org
Or contact Mike Roeth at **mike.roeth@nacfe.org**