

Fleet Procurement Plan: Alternative Fuels Update

LTD is developing a Fleet Procurement Plan that will allow the organization to meet the ambitious goals outlined in the June 2020 Board of Director's Climate Action Policy, over the next 15 years.

The Fleet Procurement Plan project will take place in two phases:

Phase 1: We'll explore our options, analyzing alternative fuels and technologies based on service considerations and a set of triple-bottom-line sustainability criteria covering financial, environmental and social factors.

Phase 2: We'll analyze adoption scenarios and develop a plan to implement the best options from Phase 1.

This project update includes a description of each fuel technology currently under review, and some of the benefits and challenges of each.

Alternative Fuels for Review

The alternative fuels to be evaluated for LTD's Fleet are:

- R99 renewable diesel (currently in use, bus fleet only)
- Renewable natural gas (bus & RideSource fleets)
- Hydrogen (Bus & RideSource fleets)
- Battery electric (bus & RideSource fleets)
- E10 gasoline (currently in use, RideSource fleet only)
- E85 ethanol (RideSource fleet only)
- Renewable propane (RideSource fleet only)

The following sections include more detail about each of these technologies for bus and RideSource fleets.

R99 Renewable Diesel — Bus Fleet

Diesel buses form the backbone of the public transit industry. Mechanics and operators are well-trained, and operations at most agencies are set up to run diesel buses efficiently. Diesel vehicles are inexpensive to purchase and operate. However, they come with some drawbacks, including their adverse effects on local air quality.

LTD currently relies on renewable (R99) diesel to fuel its fleet of 40', 60', and 60' Bus Rapid Transit (BRT) vehicles. R99, though more expensive than conventional diesel, emits less pollutants.

LTD's onsite infrastructure includes underground diesel fuel storage tanks and a fuel island with two lanes. This infrastructure is due for maintenance and upgrades. These upgrades will be required to continue fueling diesel buses for the remainder of their life. If LTD transitions away from diesel, the storage tanks will need to be removed or capped.

Battery Electric — Bus & RideSource Fleets

Battery Electric Buses (BEBs) are an emerging technology in the transit market. These buses run off electricity and carry heavy batteries to supply power to the wheels, air conditioning, and other on-board vehicle systems. Established vehicle manufacturers, as well as startup companies, currently produce transit buses. Smaller manufacturing companies have begun to build vans and shuttles for the paratransit market. Several established manufacturers have announced plans to sell vehicles for the paratransit market starting in 2022.

LTD currently operates 11 40' BEBs and is currently buying 19 additional buses to bring the onsite BEB count to 30 vehicles. These vehicles are plugged in to charge overnight at LTD's bus facility and require both time and high voltage power from the grid.

Currently, the BEBs LTD is investing in are expected to provide a range of between 150-200 miles per charge. This is sufficient for many but not all of LTD's existing routes.

Renewable Natural Gas — Bus & RideSource Fleets

Compressed natural gas (CNG) vehicles have been widely adopted by transit agencies over the last several decades due to their measurable local air quality and greenhouse gas benefits over diesel vehicles. CNG vehicles are slightly more expensive than equivalent diesel vehicles but have lower fuel costs. The range of a CNG-powered vehicle is similar to a diesel vehicle.

CNG vehicles can run on either fossil or renewable natural gas. Fossil natural gas is extracted from the Earth's crust and transported through a pipeline. Renewable natural gas (RNG) is chemically identical to fossil natural gas, but is produced from renewable sources of methane which could come from many different sources. Some of these sources include: organic waste breaking down in a landfill, organic waste being processed at a waste water treatment plant, or from animal manure from sources like dairy farms. These renewable sources have significantly lower greenhouse gas emissions compared to fossil sources. Local air quality emissions are improved over combustion of fossil diesel, but these vehicles are not considered zero-emission vehicles.

Hydrogen — Bus & RideSource Fleets

Hydrogen fuel cell vehicles are another emerging technology in the transit market. A Fuel Cell Electric Bus (FCEB), is an electric-powered bus, but instead of using electricity straight from the grid, hydrogen gas stored in tanks on the bus provides power. Hydrogen runs through a fuel cell where it reacts with oxygen, generating electricity that powers an electric motor. There are zero tailpipe emissions from this process, and the only outputs from this chemical reaction are heat and water.

In addition to having no tailpipe emissions, FCEBs report a range similar to diesel vehicles, with more than 250 miles of range. Like battery electric buses, FCEBs are expected to have relatively low maintenance costs.

Hydrogen is one of the most abundant elements on the planet. However, its chemical structure is not often found in its pure form in nature. The two most common methods of extracting pure hydrogen gas are Steam Methane Reformation (SMR) and Electrolysis. In SMR production systems, either fossil or renewable



natural gas is separated into hydrogen and carbon dioxide. In Electrolysis systems, water molecules are split into hydrogen and oxygen using electricity.

Like CNG, hydrogen is compressed and stored in an above-ground tank. Storing hydrogen onsite requires a large footprint, as does any equipment required for onsite production. Hydrogen can also be produced in one location and trucked to where it will be used.

E10 Gasoline — RideSource Fleet

LTD currently owns a fleet of 54 paratransit vehicles, including wheelchair-accessible shuttles and vans. These vehicles run 80 miles per day on average, and sometimes as high as 120 miles per day. LTD's entire fleet of paratransit vehicles runs on fossil gasoline mixed with 10% ethanol. Ethanol is a renewable fuel made from a variety of organic plant materials. All gasoline sold in Oregon must be a minimum of 10% ethanol. These vehicles are industry standard and readily available through a variety of manufacturers. LTD's vehicles currently fuel offsite at a local gas station.

Ethanol E85 — RideSource Fleet

Another liquid fuel available for LTD's paratransit fleet is a higher blend of ethanol known as E85, which means it is 85% renewable ethanol and 15% fossil gasoline. E85 is chemically similar yet not identical to fossil gasoline. It can be made from a variety of feedstocks (usually different plant materials) with lower overall greenhouse gas emissions than pure fossil gasoline. Vehicles, however, need to be equipped to run E85.

Renewable Propane — RideSource Fleet

Propane vehicles are modified versions of gasoline vehicles. Manufacturer-approved propane conversion packages may be purchased from a few different companies.

Propane molecules are a more refined form of gasoline, making them cleaner-burning, reducing both local air quality emissions and greenhouse gas emissions. Still, these vehicles are not considered zero tailpipe emission. Propane can be sourced from fossil fuels or renewable sources. Renewable propane is considered a byproduct of the renewable diesel production process. The most common feedstocks used to make this fuel are animal- and plant-based oils.

Questions or Comments?

For questions or comments, contact Kelly Hoell at Kelly.Hoell@LTD.org or 541-682-6146.