Jaunt

WHERE CAN WE TAKE YOU?

Feasibility Study of Alternative Fueled Buses

May 25, 2023

Kimley»Horn

OVERVIEW

- Purpose
- Project Goals
- Technology Options and Evaluation
- Recommendations

PURPOSE OF A FEASIBILITY STUDY OF ALTERNATIVE FUELS

- Evaluate the technical and economic feasibility of alternative fuel vehicles based on commercially-available technology.

- Focus for Jaunt: vans and cutaway style buses, possible conversion of demand-response and ADA fleets

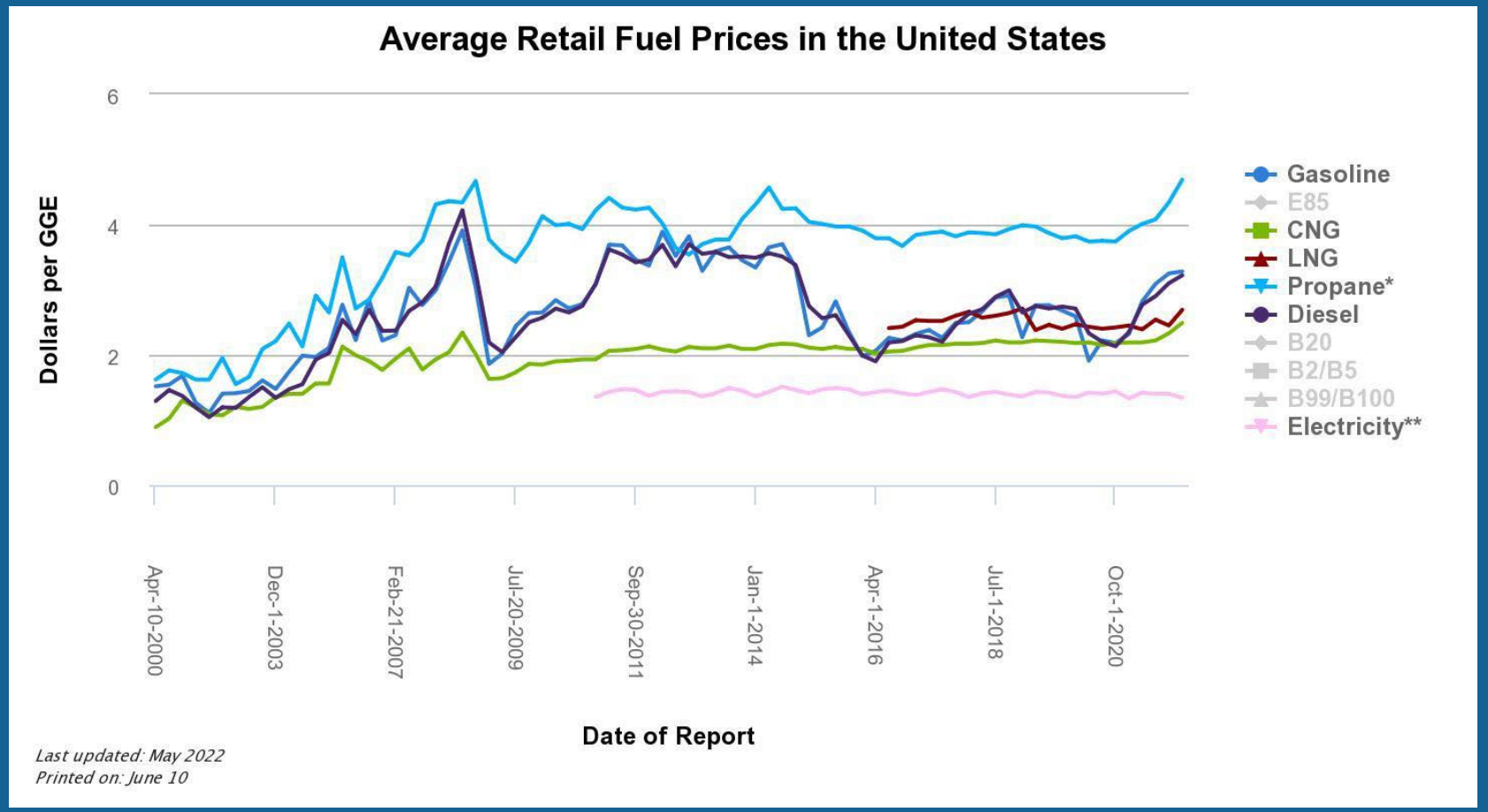
PROJECT GOALS

- Achieve 45% GHG reduction by 2030
  - Net zero GHG by 2050
- Determine a preferred cleaner fuel type for Jaunt
  - ✓ Consider trade-offs including operating and capital cost, emissions impact, and operational viability
  - ✓ Balance the current level of service with practicality of low or no emissions vehicles (minimize impact to operations)
  - ✓ Consider well-to-wheel impact of propulsion technology on emissions
- Determine high level implementation strategy and timeline of the preferred fuel type

TECHNOLOGY EVALUATION

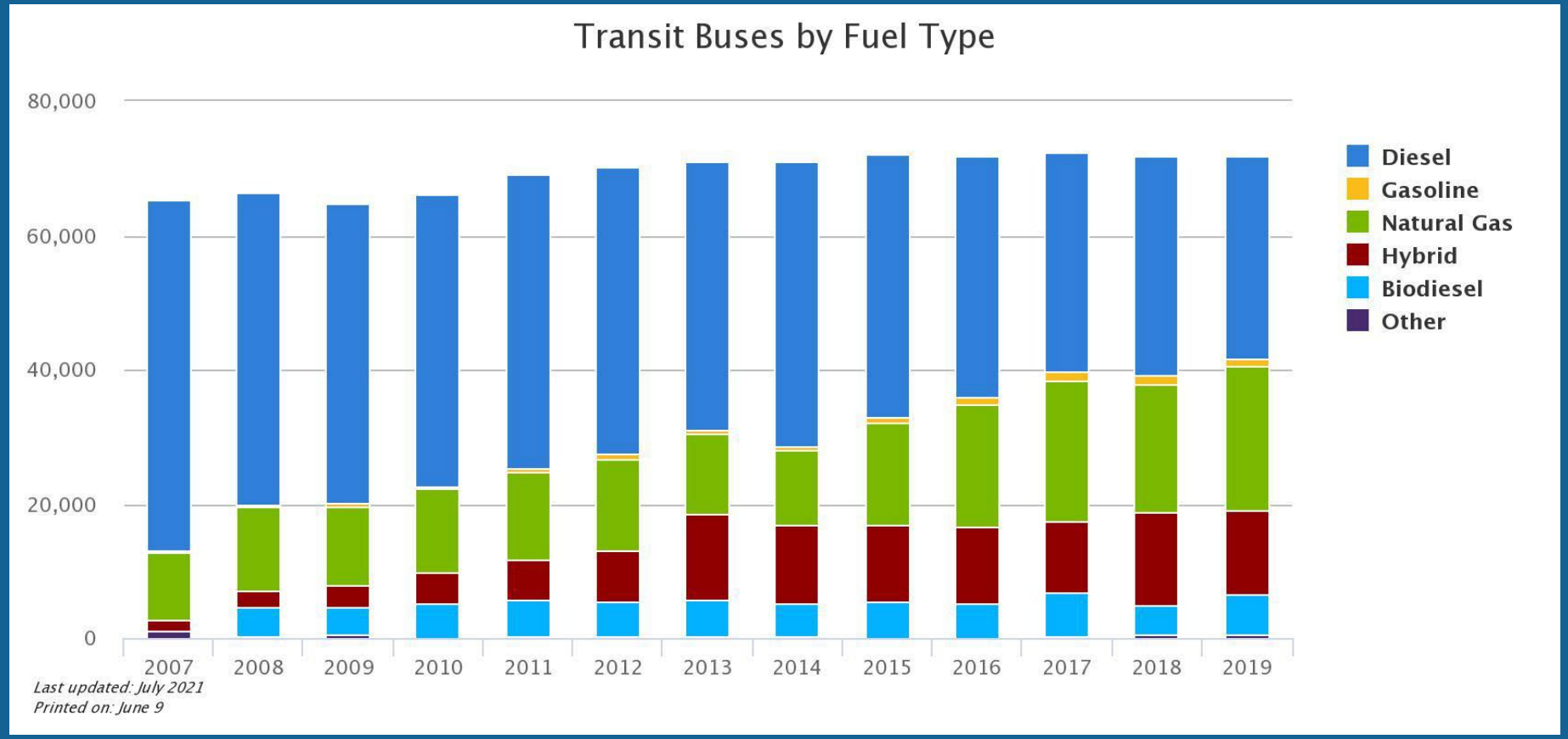
- 'Traditional' Diesel or Gasoline Fossil Fuel
- Compressed Natural Gas (CNG)- *Natural or Renewable*
- Battery Electric- *Depot and fast charging*
- Hydrogen Fuel Cell Electric
- Other types:
  - Hybrid Electric
  - Propane
  - Biodiesel

TECHNOLOGY EVALUATION:
COST OF FUEL PER GASOLINE GALLON EQUIVALENT (GGE)



Source: Clean Cities Alternative Fuel Price Reports | Electricity prices are from EIA's Real Prices Viewer.
Notes: Fuel volumes are measured in gasoline gallon equivalents (GGEs).

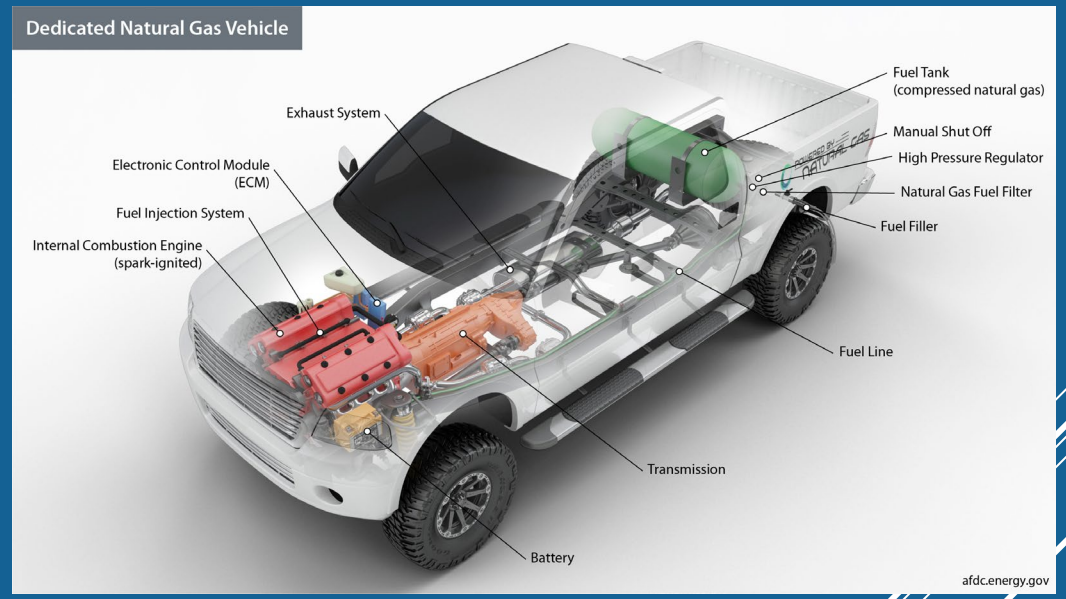
TECHNOLOGY EVALUATION: CURRENT SHARE OF TRANSIT BUS FUEL TYPES



Source: Derived from Tables 21 and 34 in Appendix A of the 2020Public Transportation Fact Book from the American Public Transportation Association
Notes: "Natural Gas" includes compressed and liquefied forms. "Other" up to 2007 included propane, bio/soy fuel, and biodiesel. After 2007, "Other" included battery-electric, hydrogen, and propane.

TECHNOLOGY EVALUATION: COMPRESSED NATURAL GAS AND PROPANE AUTOGAS

- Combustion-based fuel
- Like conventional gasoline or diesel vehicles
- Similar vehicle range
- Emissions are dependent on fuel sourcing



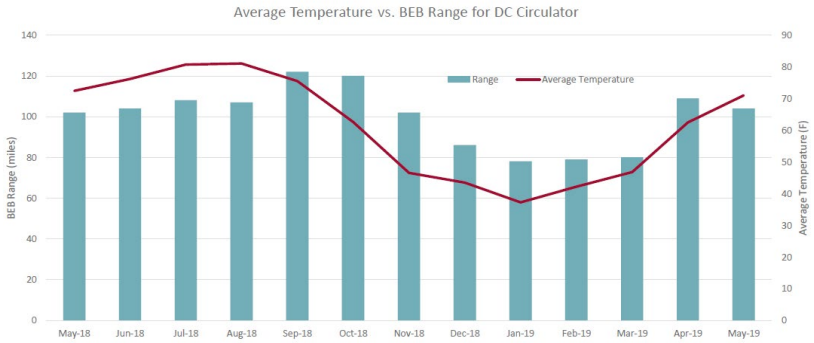
TECHNOLOGY EVALUATION: CNG AND RENEWABLE NATURAL GAS PROS AND CONS

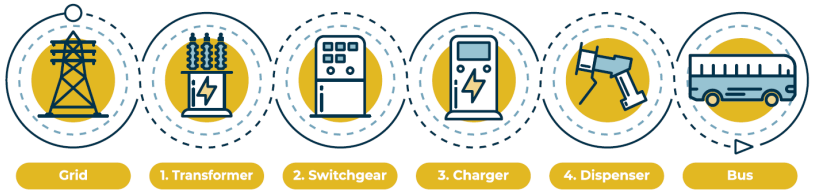
Opportunities

- Fixed-route and demand-response services can be accommodated
- CNG technology is widely adopted
- Some renewable sources may have *negative* carbon emissions

Barriers

- CNG is *not* net zero emissions
- Most renewable natural; gas is mixed into the distribution network

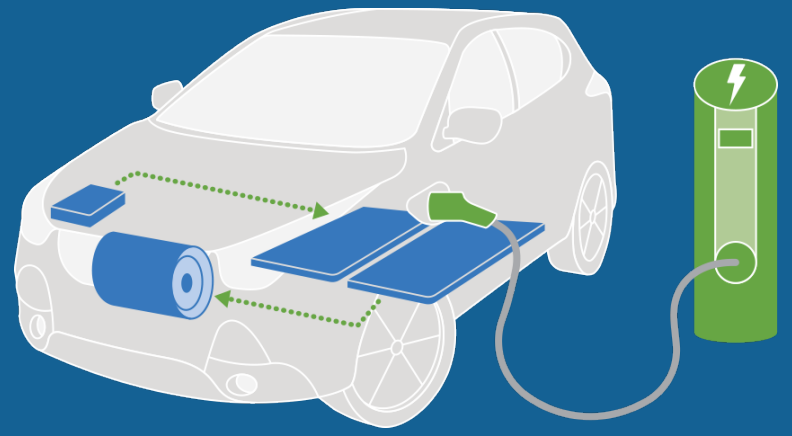




TECHNOLOGY EVALUATION: BATTERY ELECTRIC

- Non-combustion propulsion
- Range can vary based on equipment and weather largely
- Most vehicles will perform 100-200 miles
- Larger vehicles can be supplemented with fossil fuel heating units in cold weather
- Emissions dependent on electric grid generation source

TECHNOLOGY EVALUATION: BATTERY ELECTRIC PROS AND CONS



Opportunities

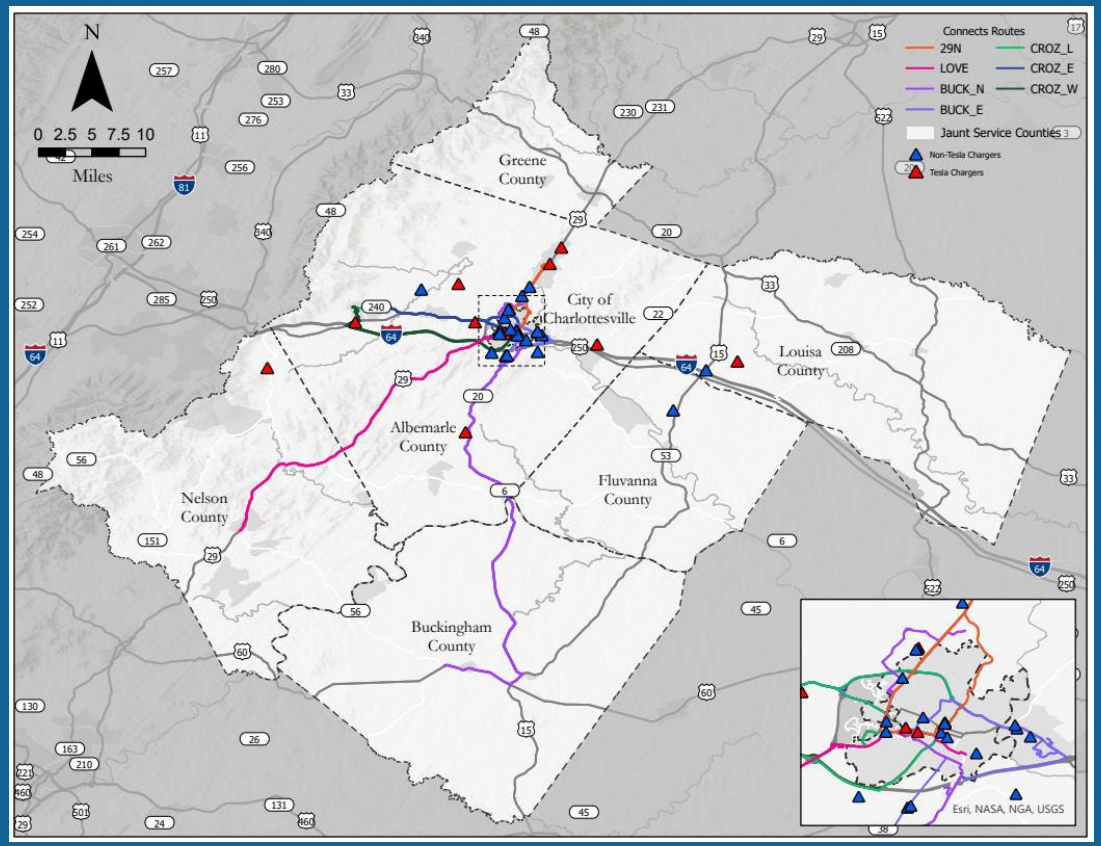
- Most fixed route service could be accommodated with commercially ready EV's
- Technology is scalable to number of vehicles deployed

Barriers

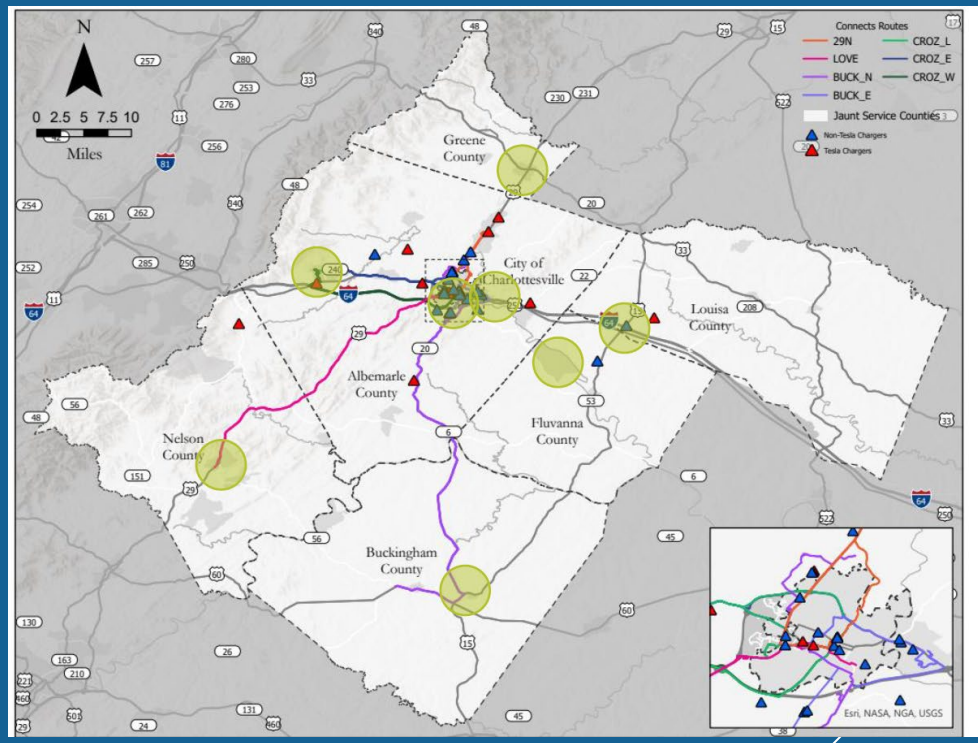
- Range
- Charging operations would require additional space and staff oversight

TECHNOLOGY EVALUATION:
EXISTING VS. POTENTIAL BATTERY ELECTRIC CHARGING STATIONS

Existing Charging Stations



Potential Charging Stations

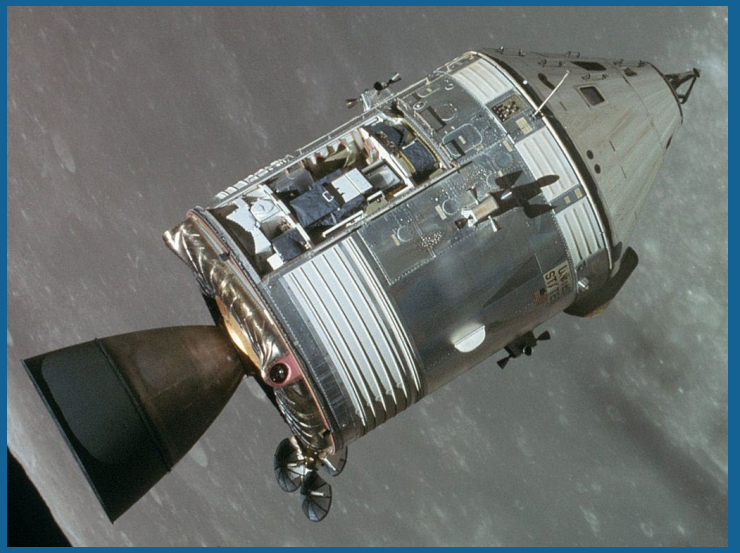


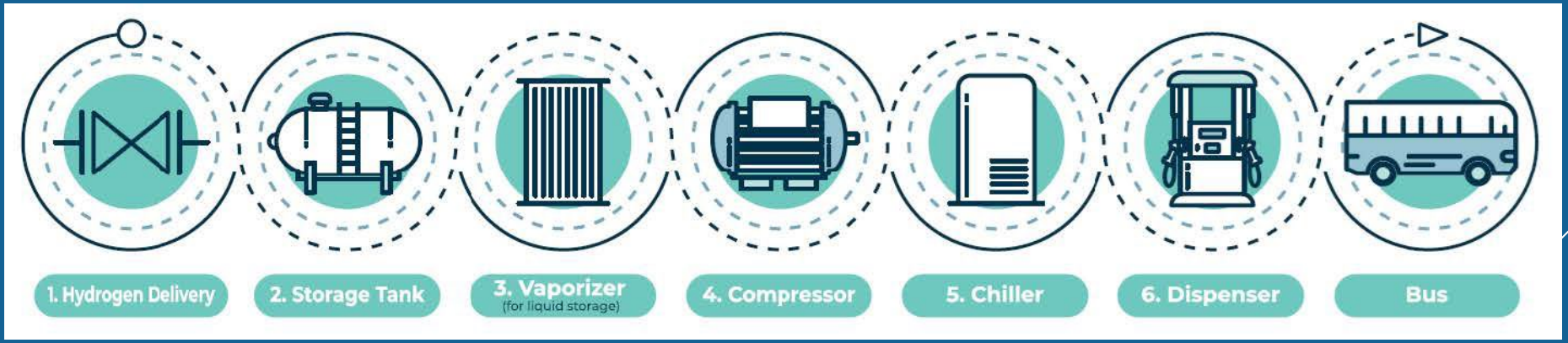
Potential Charging Locations

Jaunt County	Community
Albemarle -- west	Crozet
Albemarle -- east	Pantops (west of I-64/US250)
Buckingham	Dillwyn (Highway 20/US15)
Fluvanna	Lake Monticello
Greene	Ruckersville
Louisa	Zion Crossroads (I-64/US15)
Nelson	Lovingston
Charlottesville (City)	Jaunt HQ

TECHNOLOGY EVALUATION: HYDROGEN FUEL CELL

- Non-combustion propulsion
- Fuel is either gaseous or liquified hydrogen
- Range varies based on operating conditions
- Emissions are highly dependent on hydrogen generation





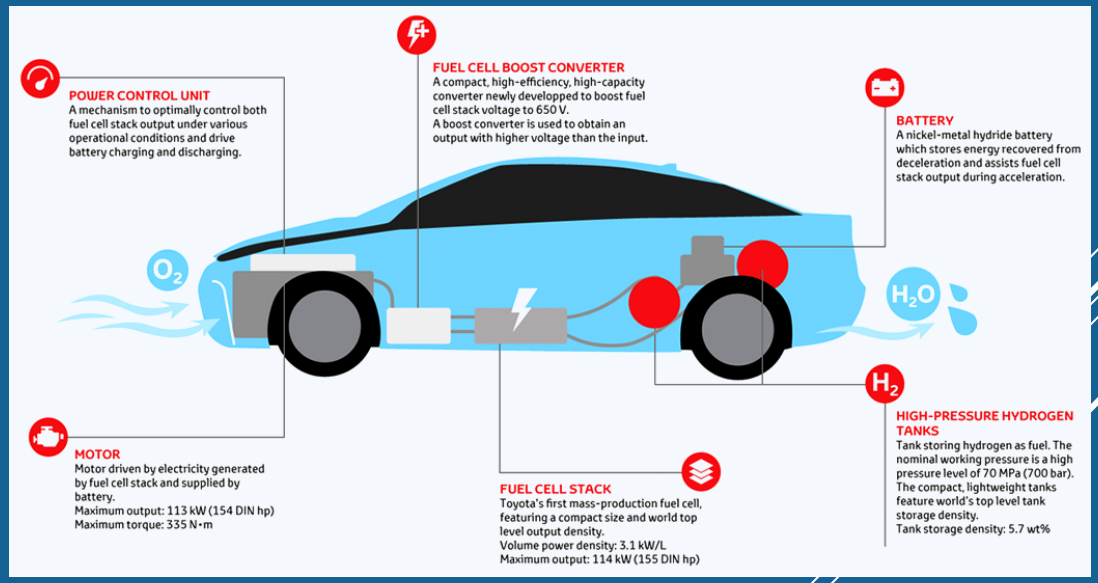
TECHNOLOGY EVALUATION: HYDROGEN FUEL CELL PROS AND CONS

Opportunities

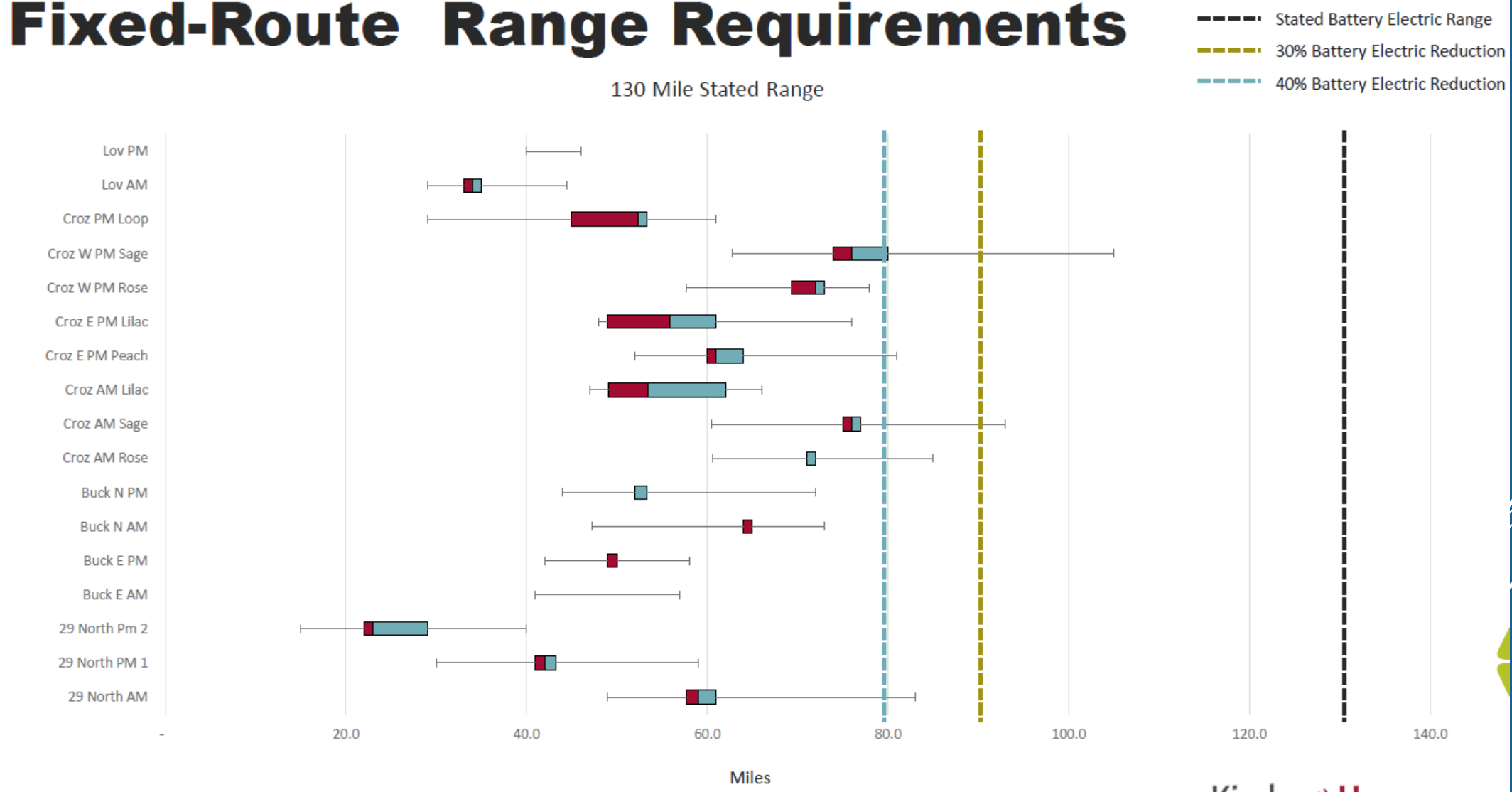
- All fixed-route and demand response service could be accommodated with FCEVs
- Hydrogen deployment tis more cost-effective for systems with more vehicles

Barriers

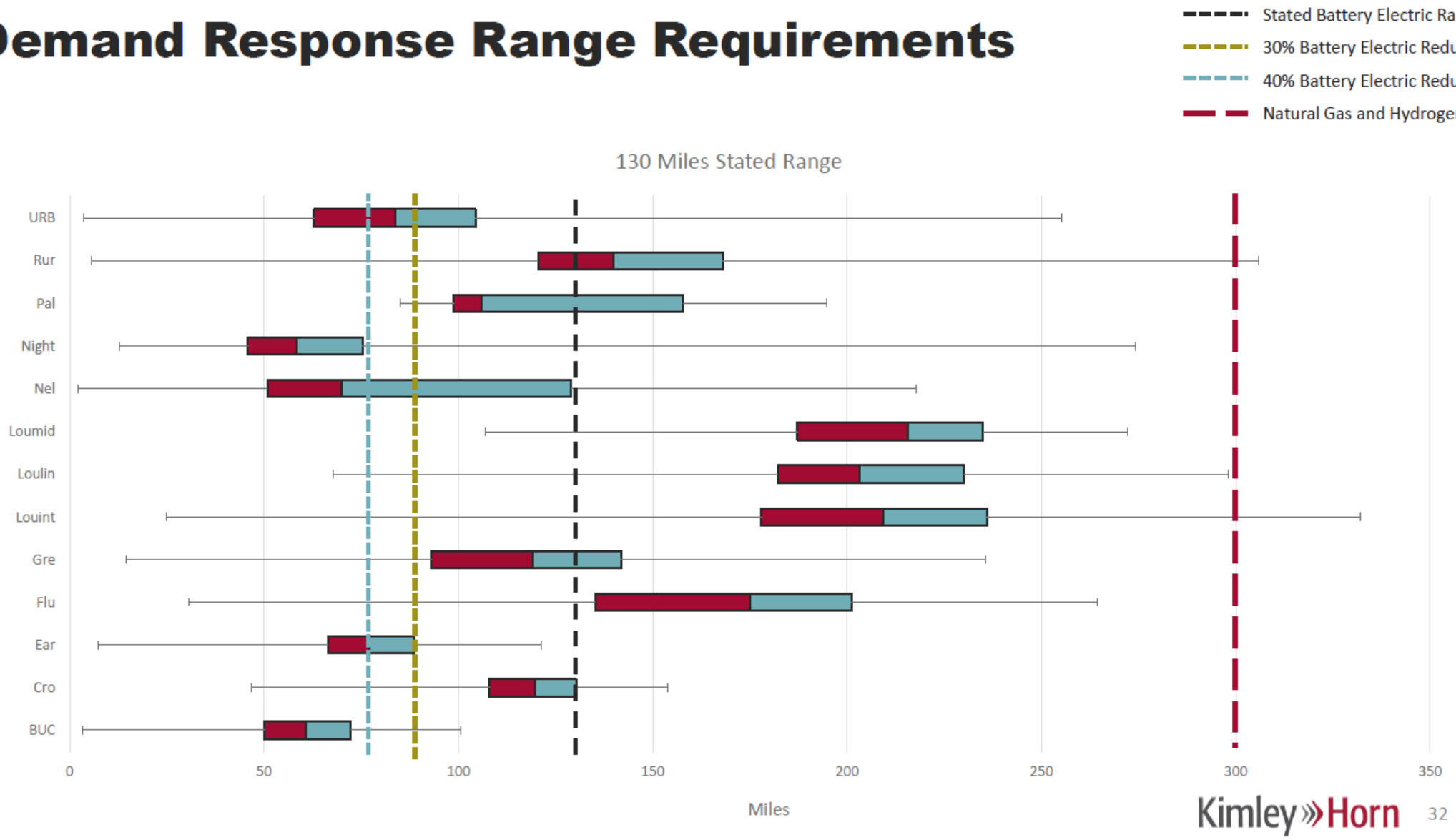
- Sourcing
- Cost
- Upstream Emissions



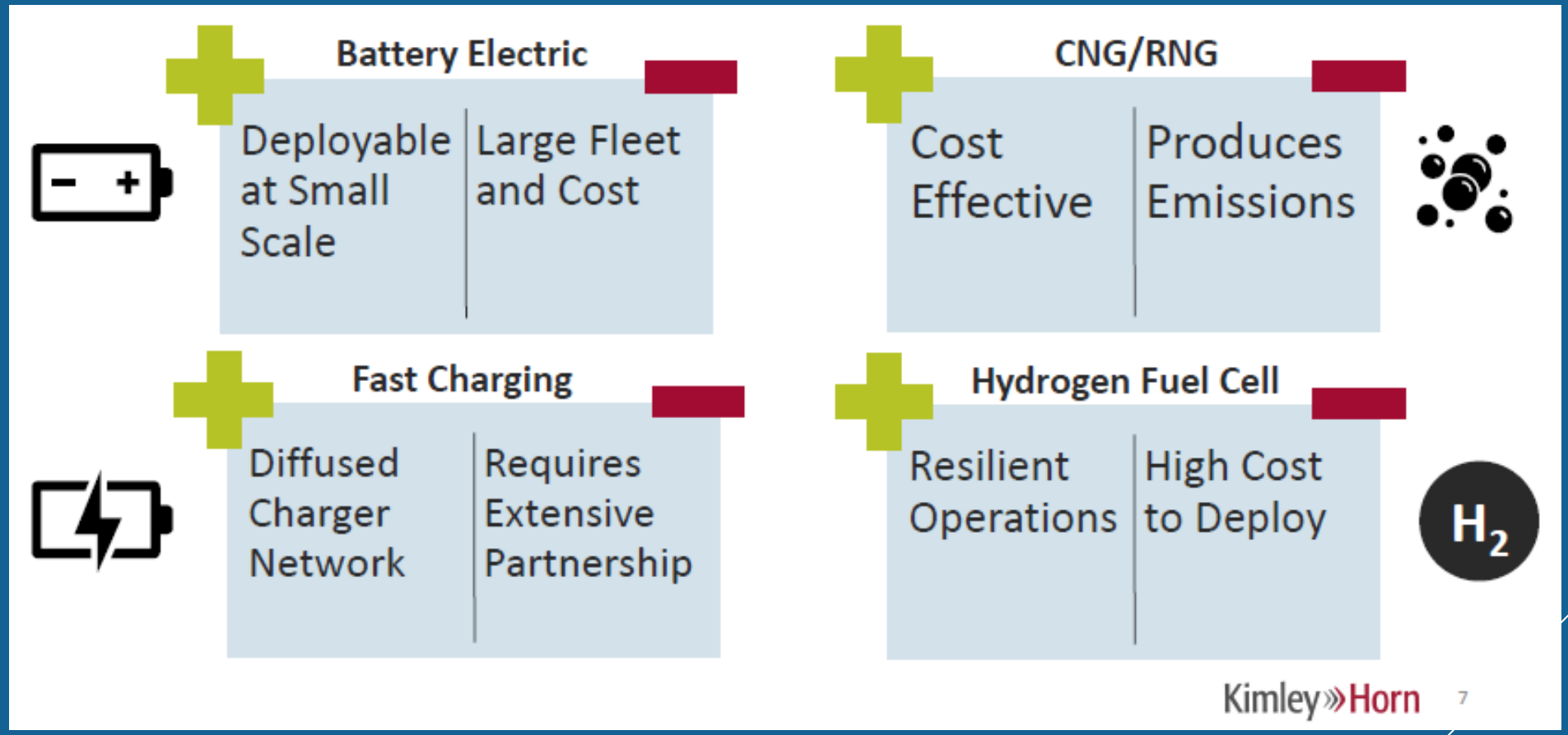
Fixed-Route Range Requirements



Demand Response Range Requirements



TECHNOLOGY EVALUATION



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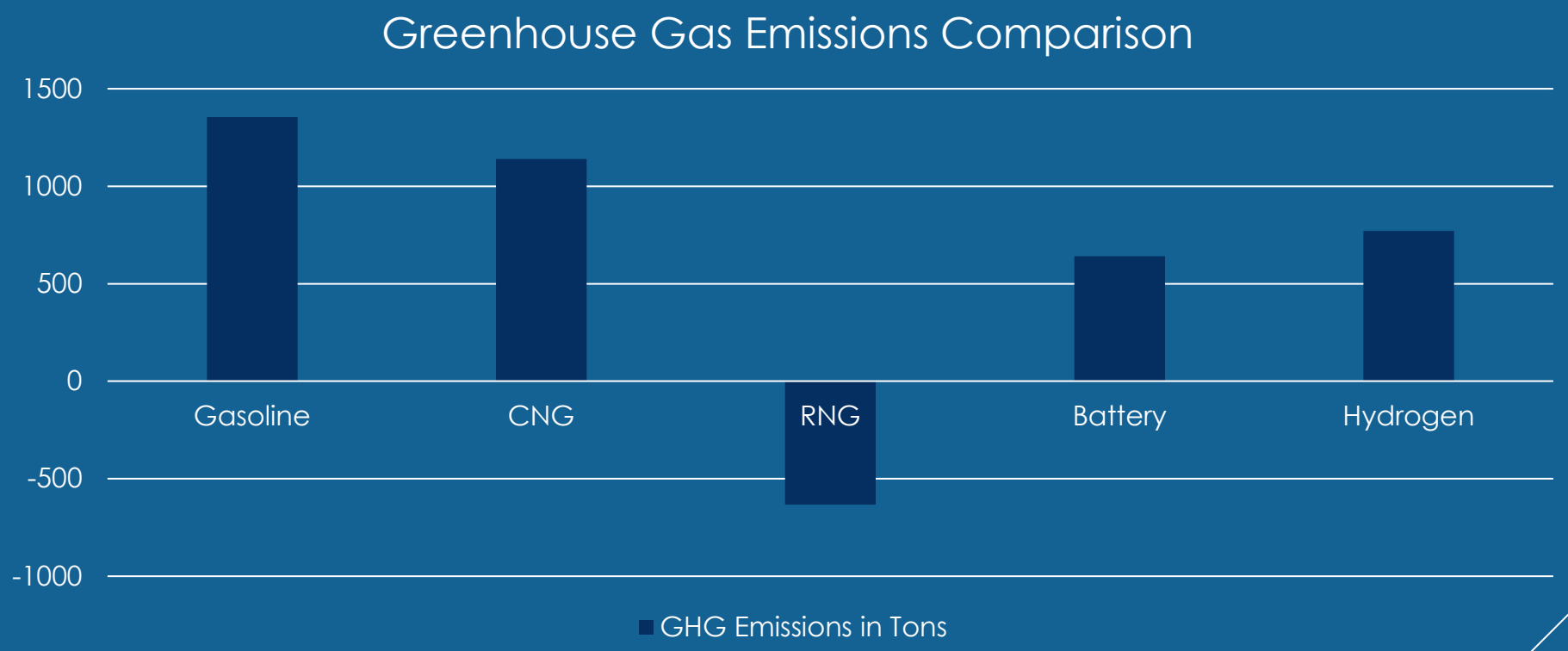

TECHNOLOGY COMPARISON ANALYSIS

Scenario	Number of Vehicles	Emissions Reduction		Vehicle Costs	Facility Costs	Operational Costs (Fuel+Maintenance)
		Long-term*	Near-term			
Current	108	-		$6.9 M	n/a	$813,000
Battery Electric	135	100%	53%	$16.2 M	$1.1 M	$422,400
Battery Electric w/ Fast Charging	108	100%	53%	$13.0 M	$4.2 M	$422,400
Hydrogen	108	100%	43%	$21.9 M	$3.5 M	$1.1 M
CNG/RNG	108	147%	16%	$8.6 M	$2.3 M	$552,000

*Assumes carbon-neutral electric grid or pure RNG

Near-term

Long-term

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RECOMMENDATIONS

- Implement battery electric vehicles as the initial deployment technology on select run classes.
- Pursue a small-scale, initial deployment of zero emissions vehicles in fixed-route services.
- Conduct future evaluation of initial deployment performance.
- Conduct partnership conversations with government entities, businesses, and utilities.
- **Jaunt is recommended to receive an implementation planning grant**

QUESTIONS