Fails to meet criteria	Not promising	Meets in some respects	Potentially meets criteria	Meets criteria

* For explanation of criteria see Box B, page 22

ASSESSMENT TABLE: **Light-duty vehicles**

	Credible			Capable		Compelling			Priority approach
	Maturity	Economic viability	Social acceptability	Fit for purpose	Net-zero pathway potential	To critical stakeholders	Related costs and benefits	Economic development opportunities	
Electric Vehicle									
Battery electric	Early maturity but with plenty of room for development in batteries and power trains to improve functionality and cost.	Purchase cost still higher than ICE vehicles but improving; in some cases, lifetime ownership costs already lower.	No particular concerns	Yes. Continuous improvement in range. Some concerns over operation in extreme weather.	Yes. Full net zero dependent on decarbonizing grid electricity and decarbonizing supply chain (net zero lifecycle vehicles).	Compelling to emerging producers. Considerable residual opposition from incumbents including dealerships	Improved driving, lower maintenance costs, no air pollution, noise reductions. Prepared for connected and autonomous technologies. Environmental risks associated with battery production and disposal, and safety	Potential jobs in supply chain: mining (lithium, cobalt, copper, etc.), material processing, battery production, auto assembly, research, design, ancillary industries. Links to connected and autonomous vehicle development	High. Potentially part of net zero emission world
Plug in hybrid electric	Early maturity with some development potential	Purchase cost higher than ICE vehicles. Two power trains mean less maintenance gains than battery electric.	No particular concerns	Yes. Range concerns eased by gasoline auxiliary motor.	Not compatible with net zero because of gasoline engine but can help accustom consumers to EVs and weaken dominance of ICE vehicles	Appealing to consumers who want to go electric, but need reassurance on range and reliability	Improved driving, reduced air pollution. GHG emissions Environmental risks associated with battery production and disposal.	Some potential jobs in supply chain (see for battery electric above). But widely seen as intermediate/transitory technology.	Medium Can facilitate transition to battery electric
Hydrogen Fuel Cell									
	Late development phase. Light duty vehicle design not yet stabilized. Hydrogen distribution network virtually non-existent.	Low at present. Vehicle purchase cost higher and distribution of hydrogen very expensive and currently impractical for light duty vehicles.	Some concerns over safety of hydrogen fueling	Yes. Good power and range.	Yes. Full net zero dependent on decarbonized hydrogen production for renewable, nuclear or methane with CCS and offsets.	Most stakeholders now backing battery electric for light duty vehicles. Some support in specific markets (Japan, California). May have potential for fleet vehicles because of centralized fueling model	Improved driving, lower maintenance costs, no air pollution, noise reductions.	Potential jobs in manufacturing and building out hydrogen economy.	Medium/high Potentially part of net zero world. But less compelling for this use today than battery electric
Ethanol									
Blended with gasoline	Mature	No vehicles cost premium. Fuel more expensive than gasoline. But frequently mandated.	Yes, widely practiced	Yes. slightly reduces octane level.	Blends not compatible with net zero emissions or with a transitional role because full ethanol endpoint is not viable (see below)	Appealing to some producers and those seeking symbolic emissions reductions	Does not eliminate air pollution. Potential land use problems. GHG reductions depend on proportion of blend, bio feed stock source and energy inputs.	Not in a net zero economy	Not a priority

Fails to meet criteria	Not promising	Meets in some respects	Potentially meets criteria	Meets criteria

* For explanation of criteria see Box B, page 22

ASSESSMENT TABLE: **Light-duty vehicles**

	Credible			Capable		Compelling			Priority approach
	Maturity	Economic viability	Social acceptability	Fit for purpose	Net-zero pathway potential	To critical stakeholders	Related costs and benefits	Economic development opportunities	
100% ethanol	Mature	Small vehicle cost premium, Fuel not currently competitive with gasoline. Prices depend feedstock.	No particular concerns	Yes. Lower energy density than gasoline.	In principle, if biomass is grown and regenerated in a net zero way. Energy inputs and vehicle production chain would need to be net zero. But not practical at scale. Land use conflicts, biodiversity pressures.	Interest from agricultural producers and some fossil energy companies.	Can use existing engine technology and parts of fuel distribution network. If energy inputs come from bio sources this could be combined with CCS for negative emissions.	Potentially new markets for biomass.	Low Could play some part in particular contexts but not at scale.
Natural gas									
Compressed or liquified NG	Mature	Natural gas is currently inexpensive, but compression and distribution costs are high	No concerns, except it is a fossil fuel	Yes. Similar to gasoline or diesel vehicles concerning power and acceleration.	No. Only 6% to 11% lower levels of GHGs than gasoline throughout the fuel life cycle.	Some interest from manufacturers, fleet operators and existing gas suppliers	Lower fuel efficiency that ICE. Air pollution not addressed.	Short term expansion of NG markets	Not a priority Fossil fuel option
Renewable NG (biogas)	Mature at small scale	More expensive that natural gas. Limited sources of feedstock.	No particular concerns	Yes. Similar to gasoline or diesel vehicles with regard to power and acceleration	Not practical at scale. Lack of necessary feedstocks. Applicable in specific contexts (for example, on farm use).	Weak interest from manufacturers. Some interest from fleet operators, potential biomass suppliers, and gas distributors.	Can use existing engine technology and fuel distribution network. Air pollution not addressed	Some local opportunities in specific industries (farming, forestry, food processing, waste disposal)	Very low. Could play some part in a net zero economy but not at scale.
Synthetic NG (power from decarbonized sources, carbon from biomass or air capture)	Early research stage	Very high costs	No particular concerns	Yes. Similar to gasoline or diesel vehicles with regard to power and acceleration	In principle, but requires net zero hydrogen (from methane with CCS and offsets) or renewables, or nuclear, and biomass or air capture	Still at research phase	Can use existing engine technology and fuel distribution network; air pollution not addressed	Remote	Very low. Could be part of net zero economy but a long trajectory
Gasoline hybrids									
Gasoline engine with battery storage and regenerative braking	Mature	Yes, now in mainstream production	No particular concerns	Yes. Saves gasoline, improved acceleration	No. powered by fossil fuels	Already in mainstream production but limited perspective in net zero world	Uses existing gasoline infrastructure. Does not address air pollution.	Not in a decarbonizing world	Not a priority Fossil fuel option
Synthetic gasoline									
Energy from zero carbon sources, carbon from bio or air capture	Early research stage	Currently very high costs	No particular concerns	Same as fossil gasoline	In principle, but requires cheap clean hydrogen and carbon from bio feedstocks or air capture.	Unclear	Uses existing gasoline engines and fuel distribution network. Does not address air pollution.	Remote	Very low. Transition to electric vehicles already underway