ELECTRIFYING TRUCKS IN BRITISH COLUMBIA

Pacific Institute for Climate Solutions
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AN ANALYSIS BY UBC & PACIFIC INSTITUTE FOR CLIMATE SOLUTIONS RESEARCHERS
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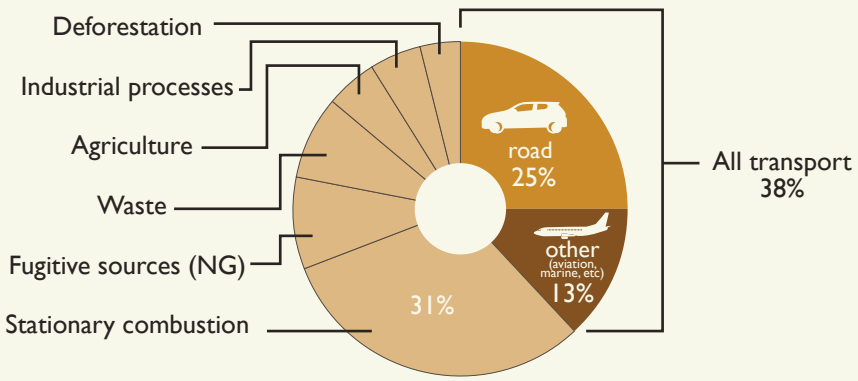
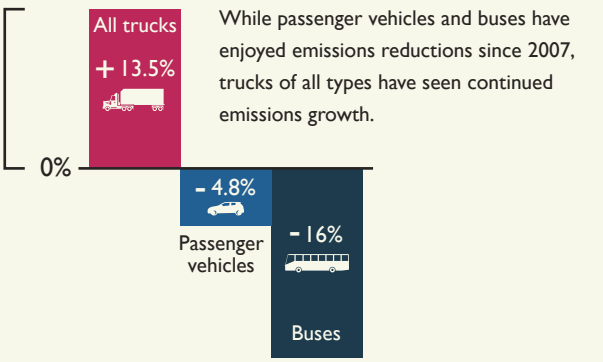
TRANSPORT IS THE BIGGEST SOURCE OF GREENHOUSE GAS EMISSIONS IN BC

All emissions in BC by sector (2014)



GHG emissions change since 2007



While passenger vehicles and buses have enjoyed emissions reductions since 2007, trucks of all types have seen continued emissions growth.

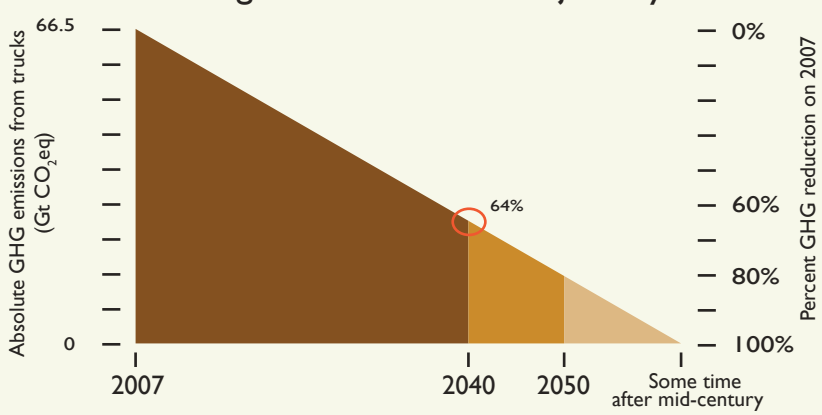
PASSENGER - 12% OF GHGs			FREIGHT - 13% OF GHGs		
0.78%	5.43%	5.75%	2.33%	6.83%	4.19%
buses	cars	minivans, SUVs, etc.	light trucks	medium-duty trucks	heavy-duty trucks

HOW MUCH DO WE NEED TO CUT EMISSIONS IN THE TRUCKING SECTOR?

WHY DO WE CARE ABOUT 2040?

To meet the province's overall legislated GHG emissions reduction target of 80% by 2050, the road freight sector must cut its emissions by 64% by 2040. Analysis of the requirements of electrification of trucking depends upon GDP projections, electricity forecasts and natural gas production and demand in BC, which were only available until 2040.

Legislated emissions trajectory

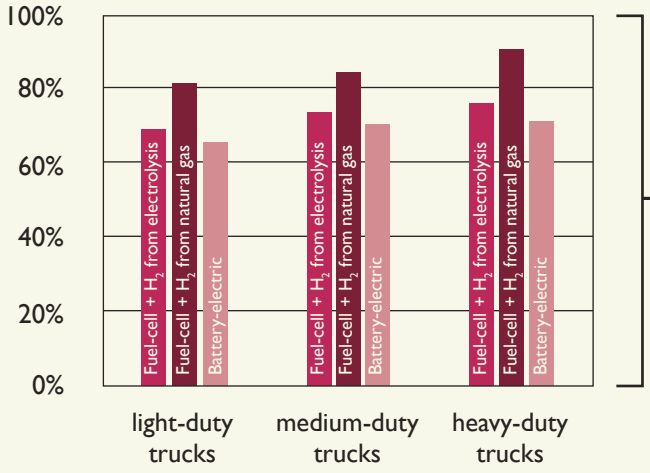


ELECTRIFICATION OPTIONS

	Energy intensity	Very long charging time	Carbon intensity	Need carbon capture & stroage (CCS)	Range, weight, volume & temperature challenges
Battery electric	low	Y	N	N	Y
Fuel-cell/ hydrogen from electrolysis	high	N	N	N	N
Fuel-cell/ hydrogen from natural gas	med	N	Y	Y	N

HOW FAST DO WE NEED TO ELECTRIFY TRUCKS?

Proportion of truck stock by class needed to be all-electric by 2040



The proportion of the truck stock needed to be all-electric of all classes, either battery electric or fuel-cell-electric, by 2040 is at least 65%.

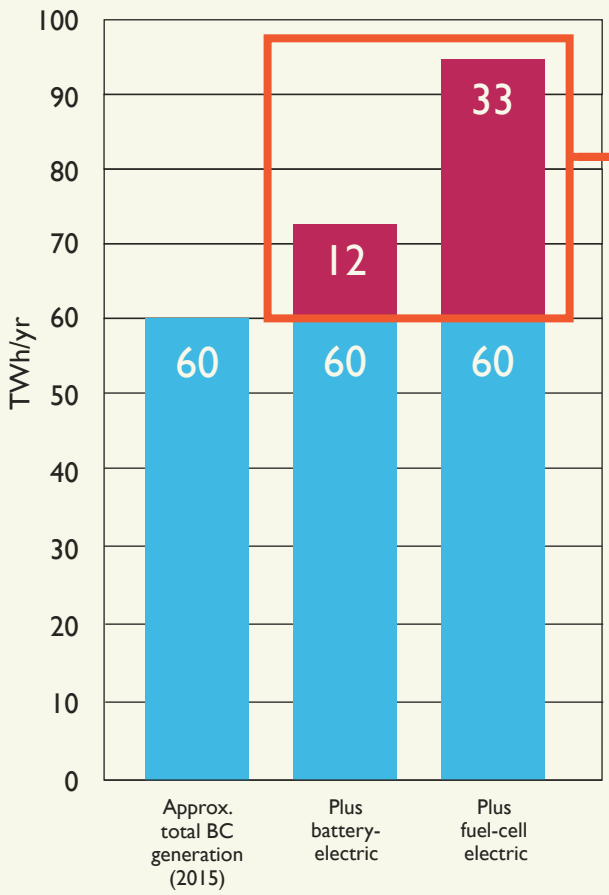
65% OF ALL TRUCKS ELECTRIC BY 2040

Annual truck sales vary between 5% and 7% of the total stock. So this means that to achieve that 65% penetration rate by 2040, as early as 2025, all new sales need to be of electric trucks, regardless of type.

100% OF ALL NEW TRUCKS SOLD ELECTRIC BY 2025

HOW MUCH ELECTRICITY DO WE NEED TO DO THIS?

Electricity generation requirement for 64% trucking decarbonization by 2040



Lower bound

BATTERY-ELECTRIC:

+20% OF CURRENT ELECTRICITY GENERATION IN BC

Upper bound

FUEL-CELL & ELECTROLYSIS:

+55% OF CURRENT ELECTRICITY GENERATION IN BC

WHY SO MUCH ELECTRICITY FOR FUEL CELLS?

Production of hydrogen by electrolysis, or the splitting of water into its component hydrogen and oxygen atoms by passing an electric current through the water, uses a lot of electricity. Hydrogen then needs to be pressurised and transported, processes that also require electricity or some other clean energy.

Production of hydrogen by 'cracking' natural gas instead of electrolysis requires less electricity. But this produces greenhouse gases and thus would need to be coupled with carbon, capture and storage (CCS) technologies.

SOURCE: Talebian, H. et al, Electrification of road freight transport: Policy implications in British Columbia. *Energy Policy 115*, **2018**, 109-118.