FUTURE ENERGY EXPORTS
Cooperative Research Centre

Driving Toward Tomorrow: Cost Dynamics of Hydrogen-Powered Trucks and Infrastructure in Australia

15 Feb 2024

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HSRG Hydrogen Storage Research Group

Curtin University

Green Hydrogen for Road Transport in WA

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Photo courtesy of Main Roads WA

H2 Projects in Australia

- Over 100 renewble Hydrogen projects majority located in the eastern states (~64 projects).
  - Operating – 13 (8 mobility)
  - Development or planning – over 90

CSIRO, *HyResource*, CSIRO, Editor. 2023.

H2 Projects in WA

Renewable H_2 Target Project Volume for WA: 6.7 Mt/a

25 hydrogen projects

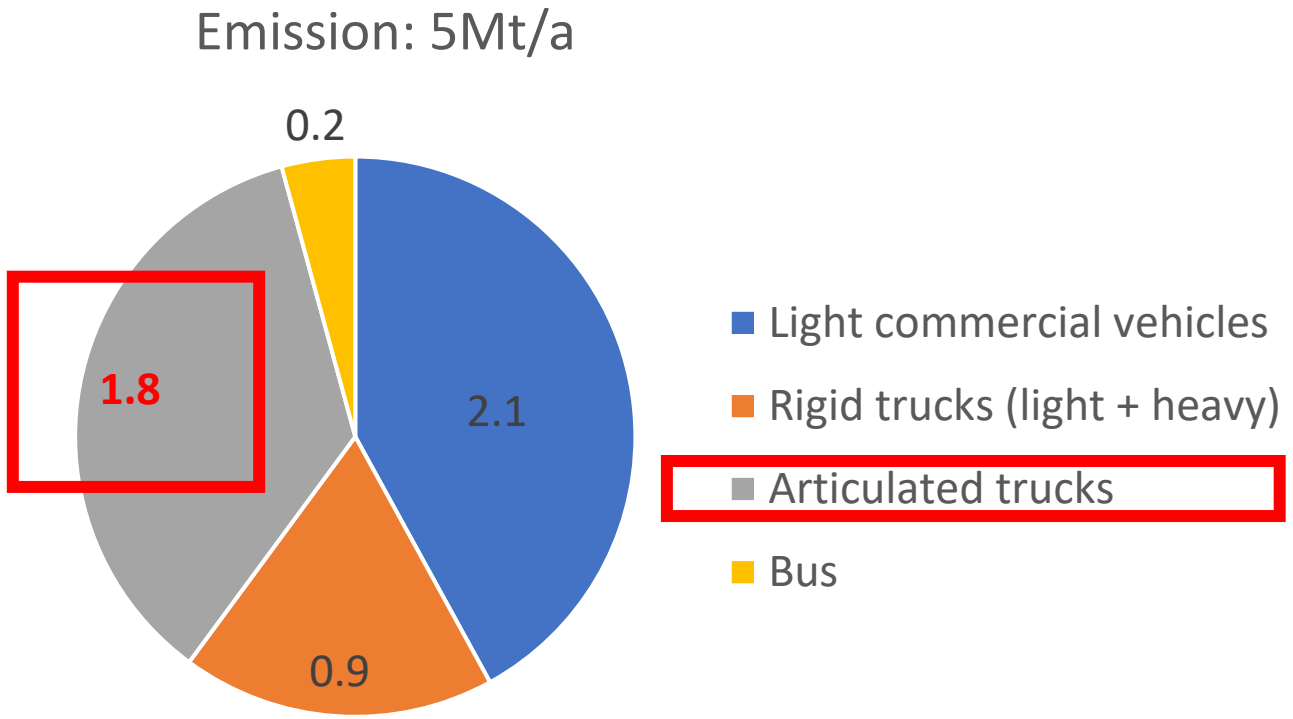
- Most along:
  - National Route 1
  - National Highway 1
- 4 are on mobility
- 4 are operational (in Perth):
  - Hazer (Bio-methane)
  - 3X ATCO, including one with FMG on mobility

CSIRO, *HyResource*, CSIRO, Editor. 2023.

Diesel Emission in WA

Vehicle Type	Weight [tonne]	Number [%]
 Light commercial vehicle	3.5[5]≤	80%
 Rigid Trucks (light & heavy)	3.5[6]-30[7]	14%
 Articulated trucks	-(40-60)+ [8]	**3%**
 Buses	(5.2[9.1]-25)+ [9.2]	3%

Australian Bureau of Statistics, 2021 (all data from 2020).

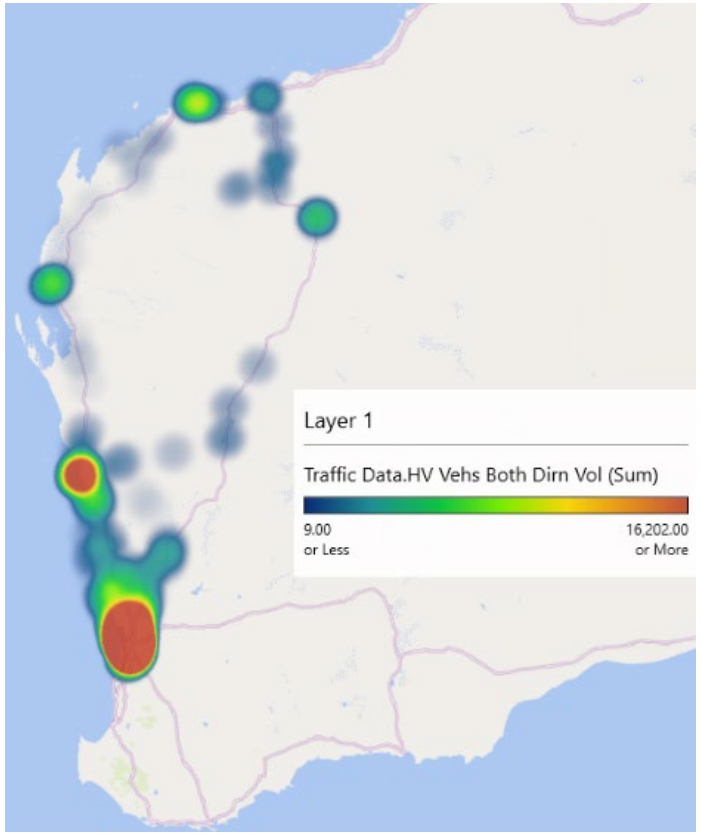


[5] GVM for light commercial vehicles: up to 3.5t. BITRE, 2017, "Light commercial vehicle safety- Information Sheet"
[6a] GVM for light-Medium rigid trucks starting at 3.5 t, National Transport Insurance, 2024, "Do you know your truck types?", [6b] under 4.5-16.5 GVM for light Rigid trucks,
[7] GVM for heavy rigid trucks 15-30 t: National Heavy Vehicle Regulator, 2016, *National heavy vehicle mass and dimension limits*
[8] GVM for articulated trucks up to 122.5 t: National Heavy Vehicle Regulator, 2019, *Common Heavy Freight Vehicle Configurations, over 3t ABS 2021*
[9] GVM for buses: 5.2 tonne (mini-bus) -25t (NTC, 2018, for a 3-axle bus). For buses 19 t (Eudy 2019), 18t Foton (2024), 18t Diesel (ARCC, 2023) ,

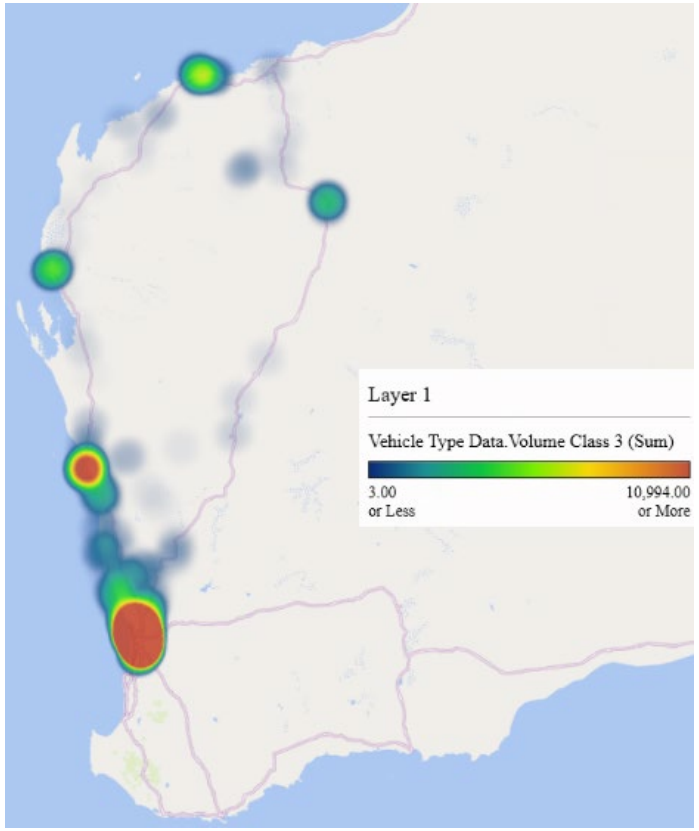
Traffic Flow for Truck Classes

Curtin University

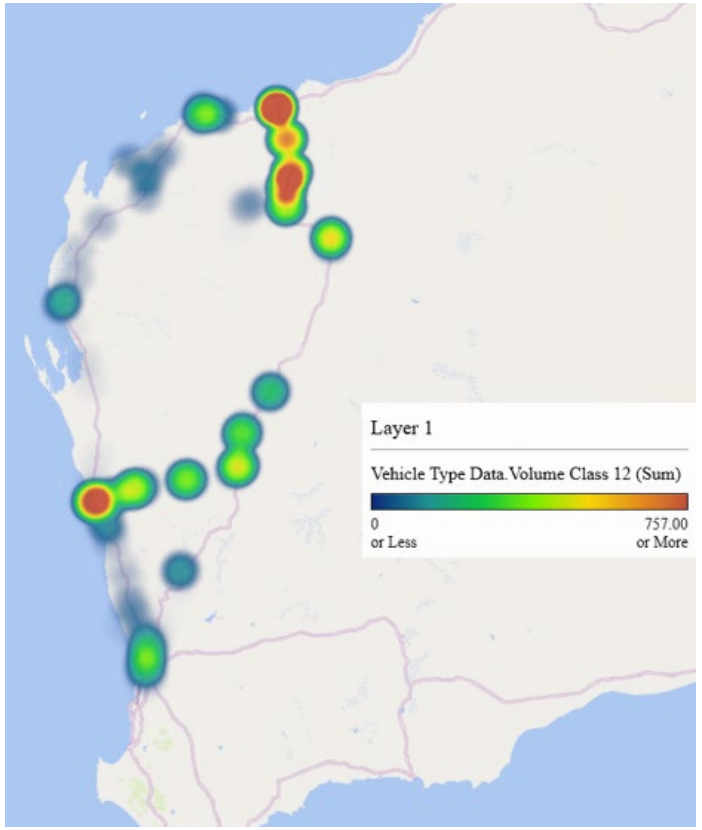
Classes 3-12
(GVM=15-115.5 tonnes)



Class 3
(GVM= ~15 tonnes)



Class 12
(GVM=~115.5 tonnes)

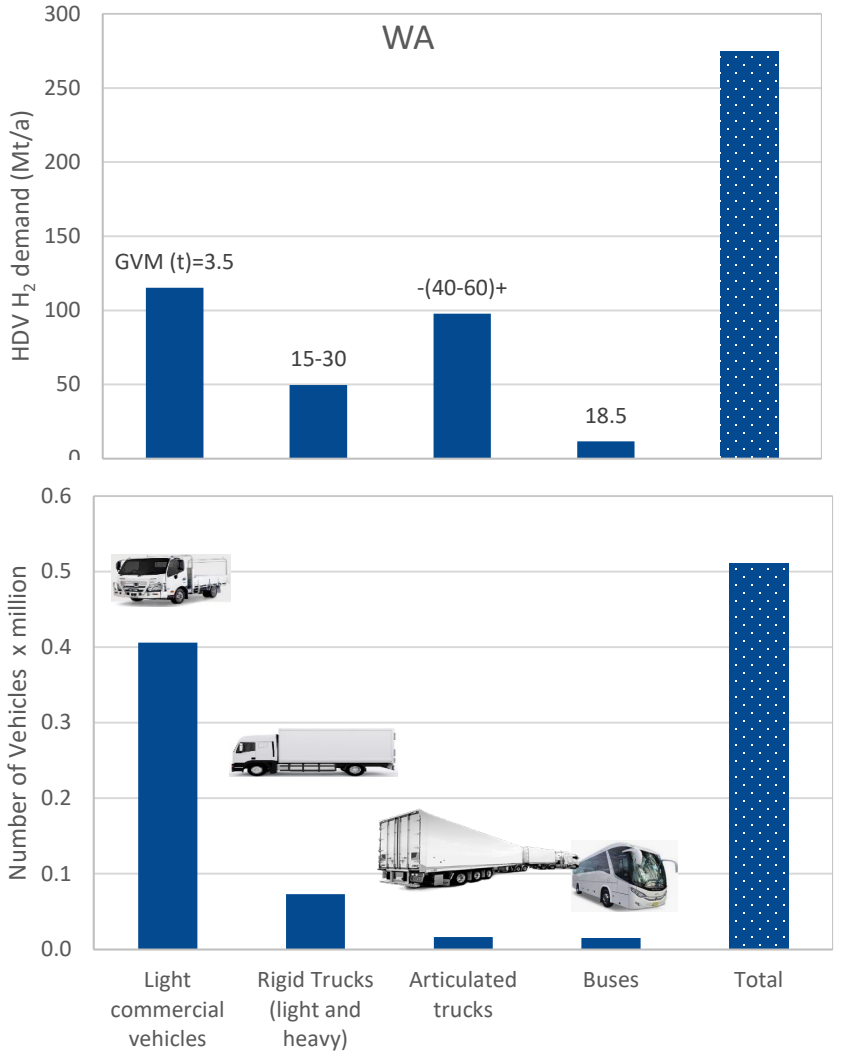


-MainRoad WA data analysed by James Crisp.
- Class conversion to GVM using AUSTRoads, Vehicle Classification System, 1994 and National Heavy Vehicle Regulator (NHVR), 2016

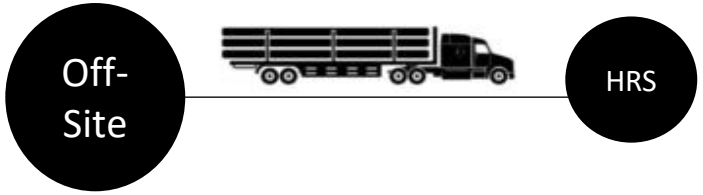
Diesel Consumption

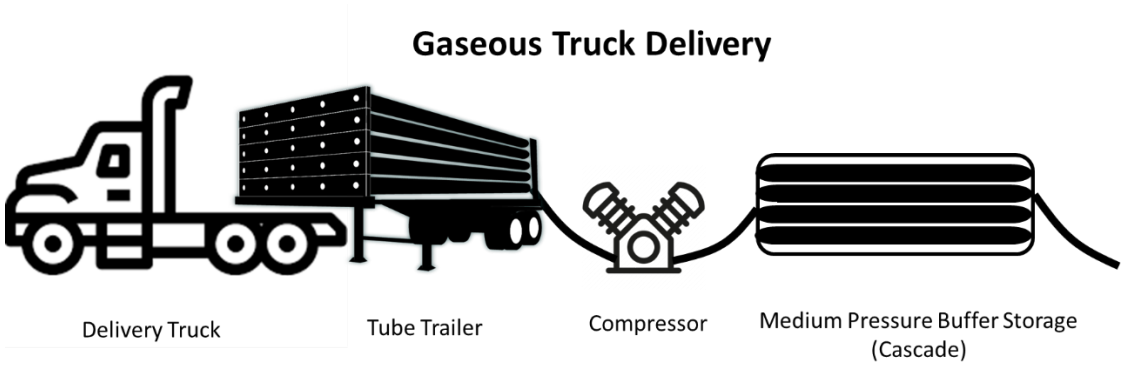
- **Renewable H_2Target Project Volume for WA: ~6.7 Mt/a**
- **Hydrogen demand to convert all diesel vehicles for WA: ~0.3 Mt/a**

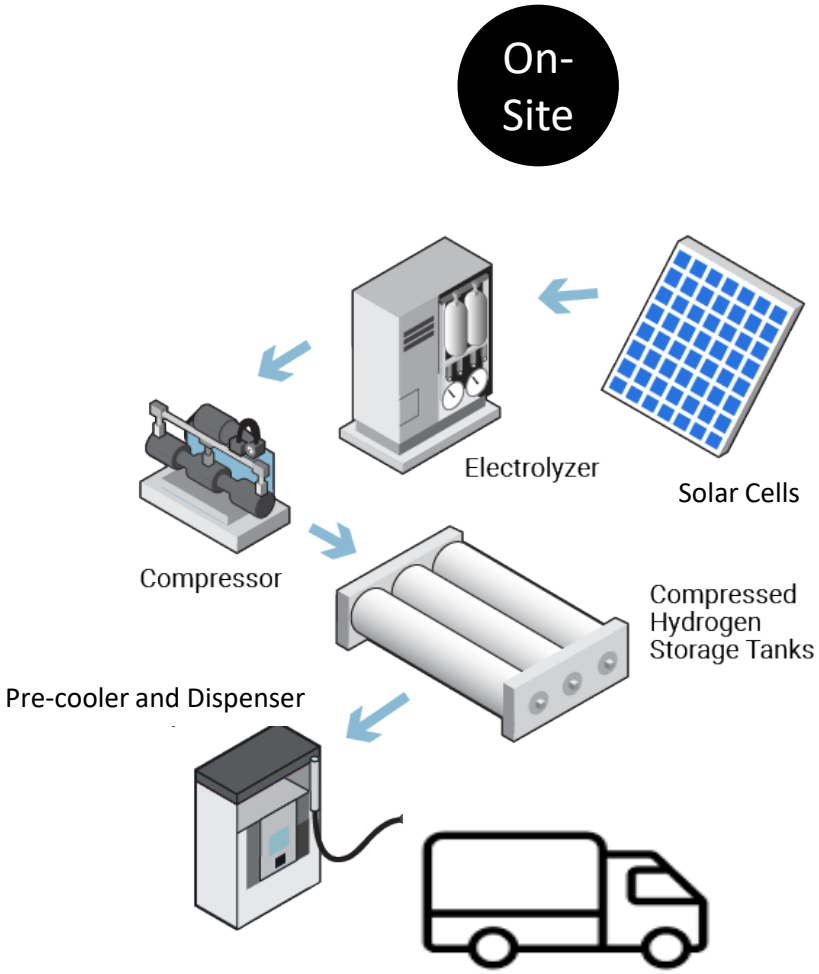
	Number of HDV x million	H_2 consumed [Mt/a]
National	4.12	2.2
WA	0.51	0.3



Refuelling Station Designs







Summary

Trucks

1. Over 50% of diesel emissions are by rigid + articulated trucks

2. Landscape Effect on Fuel Consumption increases with truck mass

3. FASTSim Simulation for trucks over GVM > 15 tonnes:
   Hydrogen trucks have a **significantly lower Total Cost of Ownership compared to electrical trucks** when considering the reduction of payload by battery weight.

Refuelling Station

1. Connecting Perth to Pilbara:

Two solutions for refuelling station locations exist depending on the class of trucks/weights

i) Class12 (~115 t): Mostly connected network along NR1 + SR 123+ GNHW 95

ii) Class 3 (~15 t): Mostly back to base along NR1 and GNHW

2. H2Pathways Calculations:

LCOH Determining Factors

- Onsite is cheaper than Offsite
- Higher hydrogen demand decreases cost

LCOH at dispenser: 9 $/kg -24 $/kg

LCOH includes hydrogen production (100 % solar), Hydrogen transport (Tube Trailers) and Hydrogen Refuelling Station

Thank You

Acknowledgement:

- Dr Mauricio Di Lorenzo
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- Prof. Craig Buckley

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