Sustainable Business Council
wbcsd Global Network Partner

Low carbon freight pathway

countdown · Fonterra Dairy for life · lpc Lyttelton Port Company · New Zealand Post · Ports of Auckland Tāmaki Herenga Waka · Swire Shipping · The Warehouse Group · TIL Logistics Group · Toll

This report has been prepared for the Sustainable Business Council by David Taylor (DETA), and Corina Comendant and Toby Stevenson (Sapere)

October 2020

Executive summary

Overarching narrative

New Zealand's heavy transport sector can be decarbonised by 2050 through the take up of a range of solutions over time. It is essential to look at the freight system as a whole and consider the trade offs and interdependencies between solutions and how they should be phased.

A smooth transition plan requires a mix of short-term initiatives that can be undertaken by individual freight and logistics companies in the next five years.

At the same time the sector wishes to work with government to provide a more enabling environment to unlock and scale medium and long term opportunities that will deliver significant emission reductions in ten years time.

Some R&D is required, along with changes in mindsets and behaviours from customers, and further collaboration by the sector.

The collaboration

- This pathway has been developed collectively by a group of leading businesses who are implementing their own decarbonization pathways. They agreed to share an ambition, knowledge and financial capital to develop a pathway that will enable the heavy transport sector to move faster towards net zero emissions.
- Thank you to Jon Adams, Managing Director – TOLL; Barry McColl, General Manager National Transport & Logistics – Fonterra; Graeme Doull, National Transport Manager – Countdown; Brodie Stevens, Country Manager and Tony Spelman, Corporate Development Manager - Swire Shipping; Rosie Mercer, General Manager Sustainability - Ports of Auckland Ltd., Sam Bridgman, Senior Sustainability Specialist - New Zealand Post; Jo Dando, Senior Safety and Sustainability Business Partner - TIL Logistics Group; Kim Kelleher, Environment & Planning Manager, Lyttleton Port Company; and Tom Kelly, Manager – Environmental Initiatives - The Warehouse Group.

Acknowledgments

- This work by the willingness of the following companies who provided information and advice to shape the pathway: the Climate Change Commission, Energy Efficiency and Conservation Authority (EECA), Hiringa Energy, KiwiRail, Ministry of Transport, Smart Freight Centre, Vector and Z Energy.
- This collaboration was facilitated by Kate Ferguson, Manager Climate at the Sustainable Business Council.
- The collaboration process has been documented by Eva Collins, Associate Professor / Associate Dean of Research & Postgraduate -University of Waikato Management School.

The ambition

- The SBC target is to halve heavy freight (2018 base year) emissions by 2030 so the sector is on a firm trajectory to net zero by 2050.
- Without interventions, these targets are significantly out of reach given projected increase in freight demand. Ministry of Transport estimates that by simply relying on improvements in electric truck technology, and having no significant biofuels uptake, there will be an increase in emissions by 2030 and a modest reduction by 2050.
- By contrast, our pathway shows that significant gross emissions reductions are possible through a transformative action plan for the sector that includes not only new technologies but also a mind shift across the heavy freight supply chain.
- Possible residual (grid) emissions from increased electrification mean that some carbon sequestration activities would be required to achieve net zero by 2050.

The challenge

- Aggressive and early action by major users and the New Zealand Government is required
- Around 17% and 56% of net emissions reductions (including residual electricity emissions) will have to come from biofuels and hydrogen together by 2030 and 2050 respectively. However, these low carbon technologies are not currently economically feasible.
- Residual electricity emissions from hydrogen generation could be significant.
- There is low customer awareness of environmental impacts from fast delivery, which in turn hampers the possibility for modal shifting. The pathway requires 12% of net emissions reduction to come from mode shift by 2050.

The opportunity

- By 2030, 28% of net emissions reductions can be achieved through options that are readily available. These include improved vehicle efficiencies, telemetrics, BEV, freight flow optimisation, and mode shift. These opportunities can be harnessed through improved collaboration across the HV supply chains, a better understanding of customer demand drivers, and government support to bring some of the required changes forward (e.g. BEV infrastructure, coastal shipping and rail infrastructure).
- The remainder of emissions will require an increasing uptake of biofuels or hydrogen, especially from 2030. Now is the time to act to remove barriers for those technologies so the scale of transformation is feasible. These barriers include high capital cost for hydrogen vehicles, and failures in the biofuels market.

Pathway – total heavy transport

Our approach

- Identify the full list of emissions reduction opportunities for each mode of transport (road, rail, coastal shipping)
- For each opportunity, gather assumptions on possible uptake and emissions savings based on international literature, NZ-specific data and interviews with SBC members
- Estimate marginal abatement costs to inform assumptions on uptake (trucks only)
- Test assumptions in workshops with SBC Heavy Freight group
- Model the pathways for each mode of transport
- Discuss findings and agree on actions in workshops with SBC Heavy Freight group

The overall pathway

- The SBC targets are very ambitious. The pathway suggests that, in order to achieve the targets, more aggressive effort will be required than the assumptions made with regards to possible uptake of de-carbonisation options. The time to act is now.

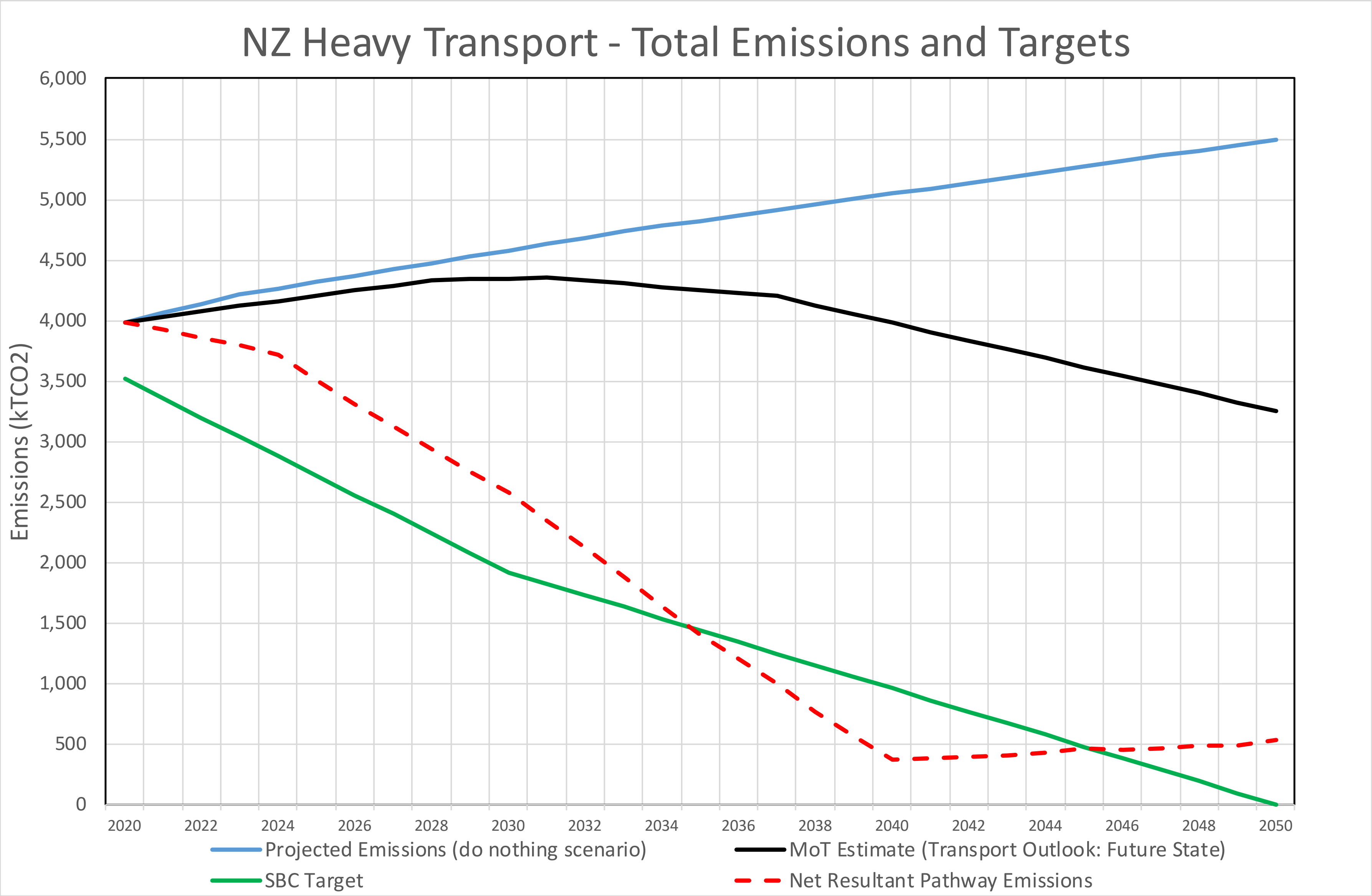
	2030		2050	
	Residual	Target	Residual	Target
Base	4,578		5,497	
Trucking	2,368	1,789	497	-
Rail	128	68	19	-
Shipping	118	63	17	-
Total	**2,615**	**1,919**	**533**	**-**

- The following graphs present the resultant pathway for road, rail and shipping modes.

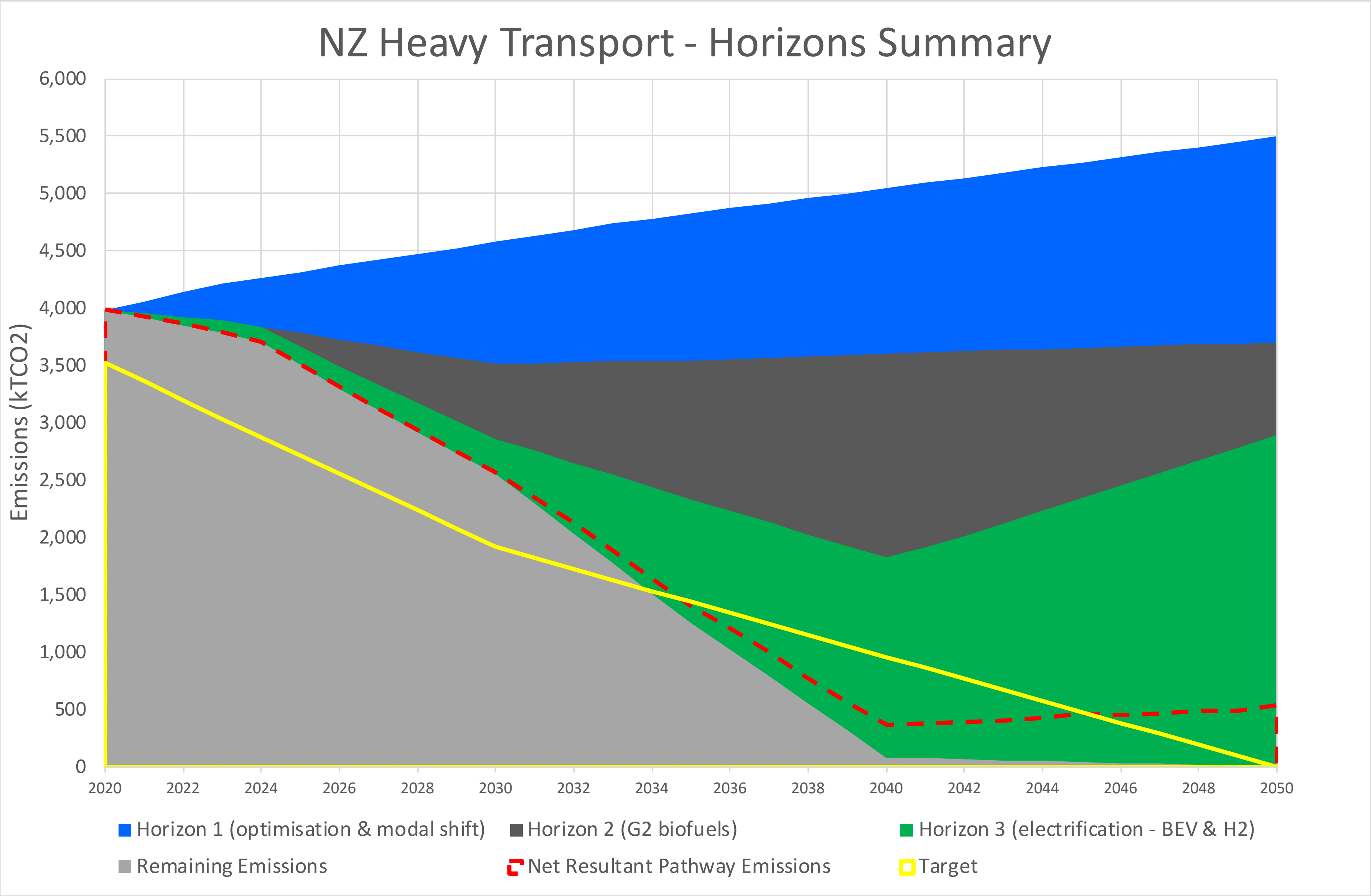
The overall pathway

- The pathway can be summarized into 3 categories/horizons of solutions:
  - Horizon 1 – Fleet optimization and modal shift. Ensuring the current fleet is operating as efficiently as possible, minimizing freight movement and moving freight in the most efficient way.
  - Horizon 2 – G2 Biofuels. Using existing vehicle stock with biofuels to minimize emissions.
  - Horizon 3 – Electrification of transport operations, primarily through battery storage (such as BEV) and hydrogen (such as FCEV).

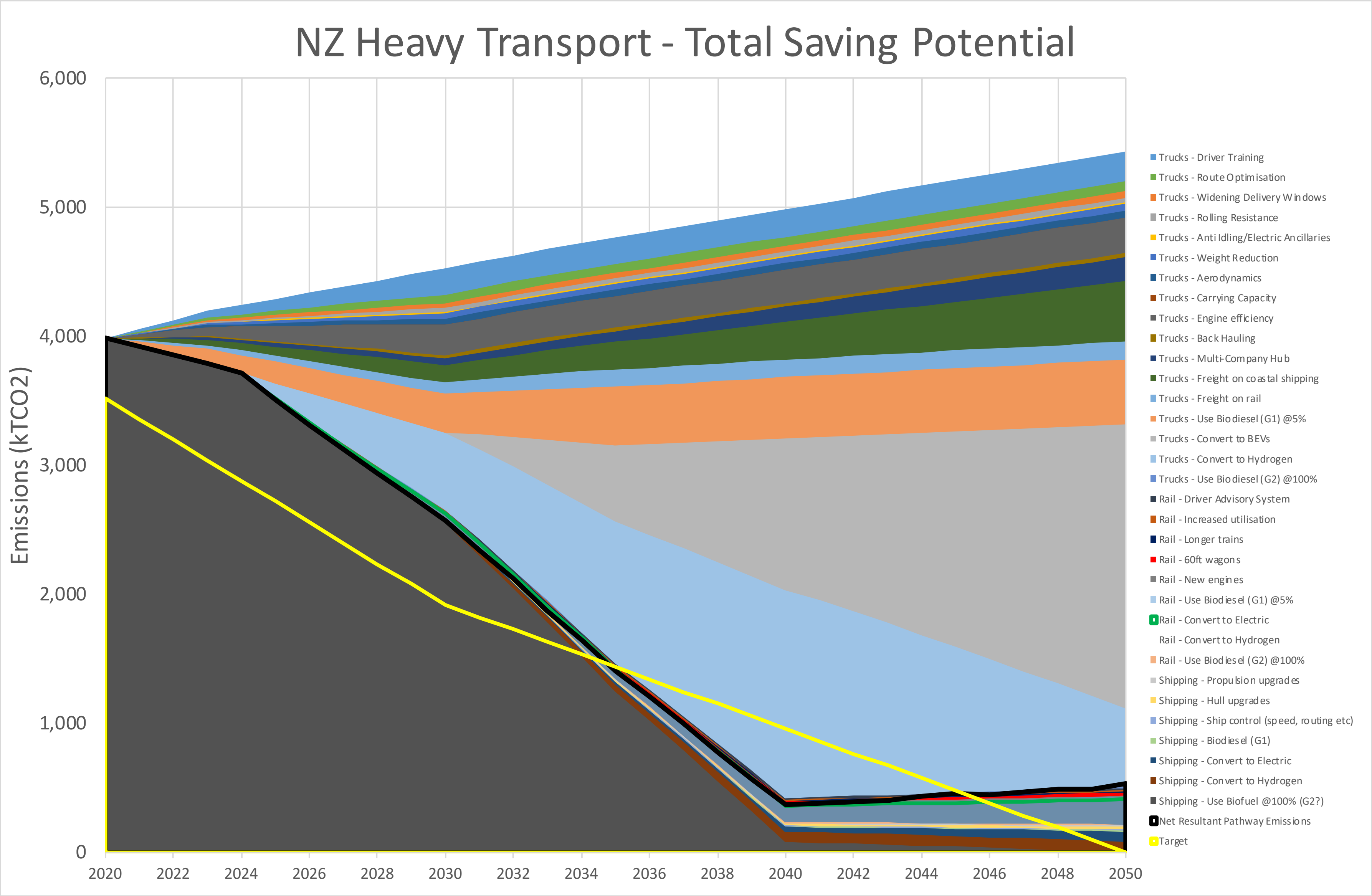
- The following graphs present the resultant pathway for road, rail and shipping modes.



Heavy transport in the chart includes trucks weighing in excess of 3.5 tonnes GVM, rail freight and coastal shipping freight

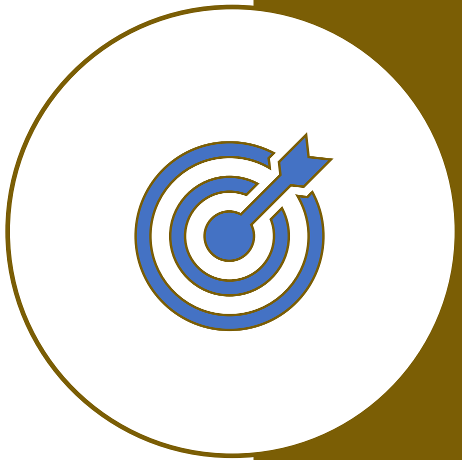


Heavy transport in the chart includes trucks weighing in excess of 3.5 tonnes GVM, rail freight and coastal shipping freight


NZ Heavy Transport - Total Saving Potential
Emissions (kTCO2)
6,000
5,000
4,000
3,000
2,000
1,000
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Trucks - Driver Training
Trucks - Route Optimisation
Trucks - Widening Delivery Windows
Trucks - Rolling Resistance
Trucks - Anti Idling/Electric Ancillaries
Trucks - Weight Reduction
Trucks - Aerodynamics
Trucks - Carrying Capacity
Trucks - Engine efficiency
Trucks - Back Hauling
Trucks - Multi-Company Hub
Trucks - Freight on coastal shipping
Trucks - Freight on rail
Trucks - Use Biodiesel (G1) @5%
Trucks - Convert to BEVs
Trucks - Convert to Hydrogen
Trucks - Use Biodiesel (G2) @100%
Rail - Driver Advisory System
Rail - Increased utilisation
Rail - Longer trains
Rail - 60ft wagons
Rail - New engines
Rail - Use Biodiesel (G1) @5%
Rail - Convert to Electric
Rail - Convert to Hydrogen
Rail - Use Biodiesel (G2) @100%
Shipping - Propulsion upgrades
Shipping - Hull upgrades
Shipping - Ship control (speed, routing etc)
Shipping - Biodiesel (G1)
Shipping - Convert to Electric
Shipping - Convert to Hydrogen
Shipping - Use Biofuel @100% (G2?)
Net Resultant Pathway Emissions
Target

Key take-aways

- In order to meet emissions targets, a range of options must be pursued vigorously, including efficiency upgrades, route minimisation, mode change and fuel change.
- Fuel changes will provide the bulk of carbon reduction savings.
- A range of fuel change options should be pursued – different technologies work for different scenarios at different times.
- Residual emissions from increased electricity use can be substantial, particularly for grid-generated hydrogen.



Pathway - road

Emissions reduction opportunities

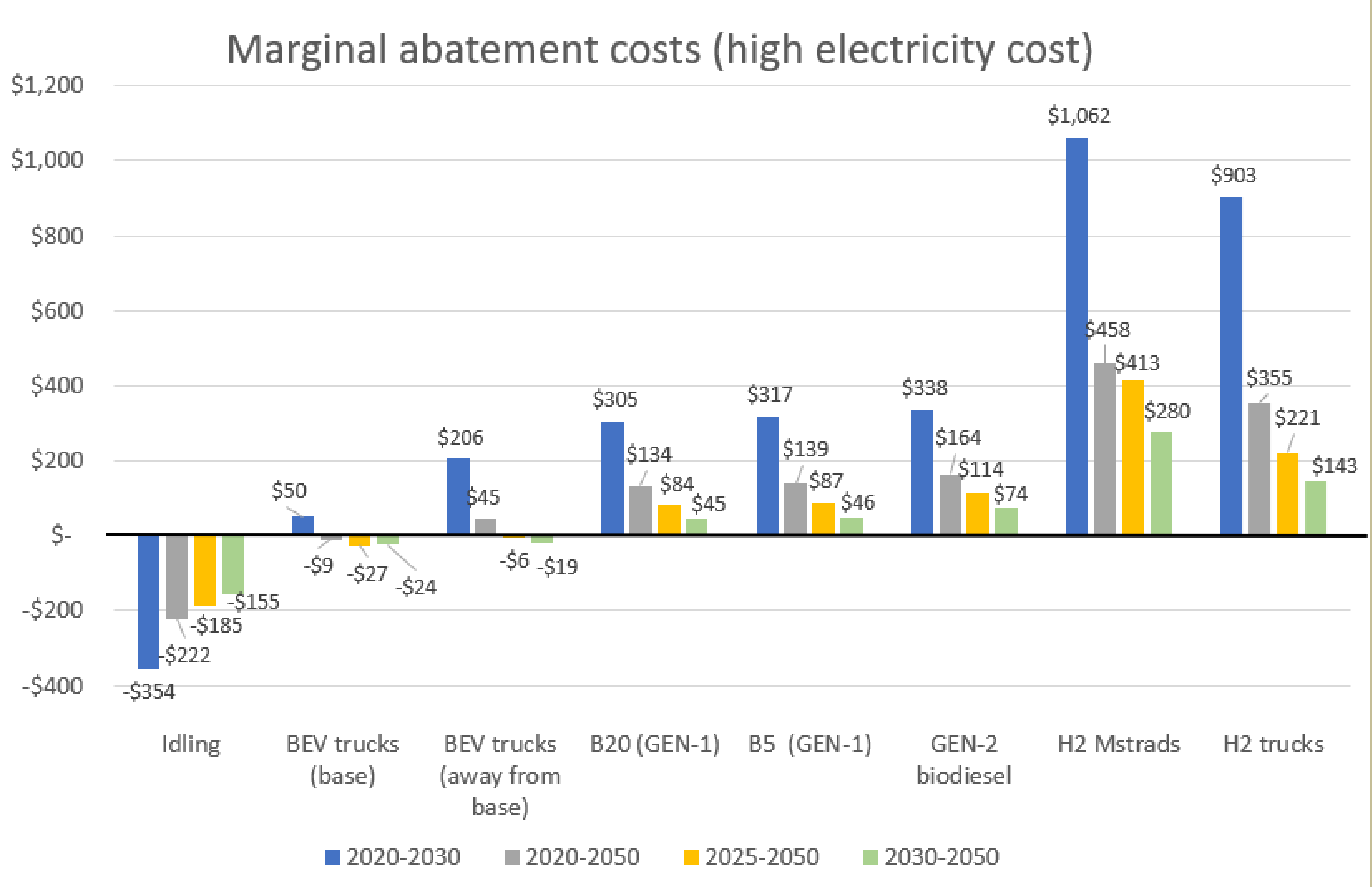
- **Driver training** to assist in drivers to make good low fuel use decisions.
- **Route optimisation** with software to optimise delivery routes, minimising trucking distances.
- **Widening delivery windows,** allowing congestion to be missed and route optimisation enhanced.
- **Reduced rolling resistance** through fully inflated tires and use of high-efficiency tires.
- **Anti-idling technology/training** to ensure vehicles don't idle when stopped and loading/unloading.
- **Weight reduction** of trucks, including replacing heavy items with lighter (e.g. rear doors) and removing unnecessary items.
- **Improved aerodynamics** through the installation of devices on long haul trucks, such as cowlings and skirts.
- **Increased carrying capacity** by using larger trucks to move more freight in one go.
- **Collaborative utilisation** between companies to maximise load sizes, minimise empty running, and optimise freight modes.
- **Maximise existing distribution hub utilisation** to minimise last mile fuel use.
- **Freight on coastal shipping/rail** where possible, rather than on road.
- **Use Biodiesel (G1)** at 5% blend in all heavy and medium trucks in NZ.
- **Battery electric vehicles** – convert existing trucks or purchase as new.
- **Convert to/purchase hydrogen** fuel cell electric vehicles (HFCEV).
- **Use Biodiesel (G2 - Renewable Diesel)** at 100% in all remaining vehicles.

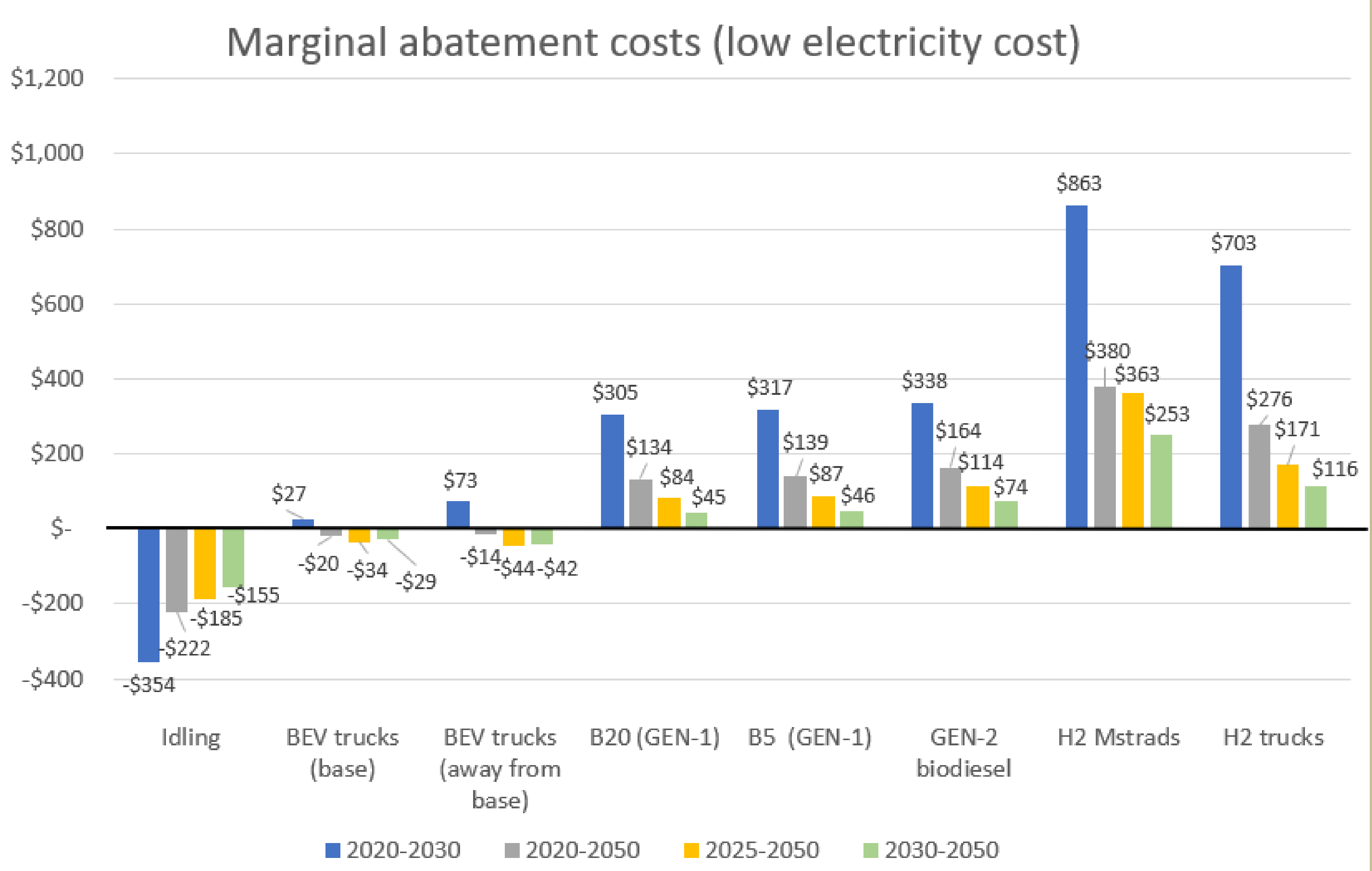
Assumptions

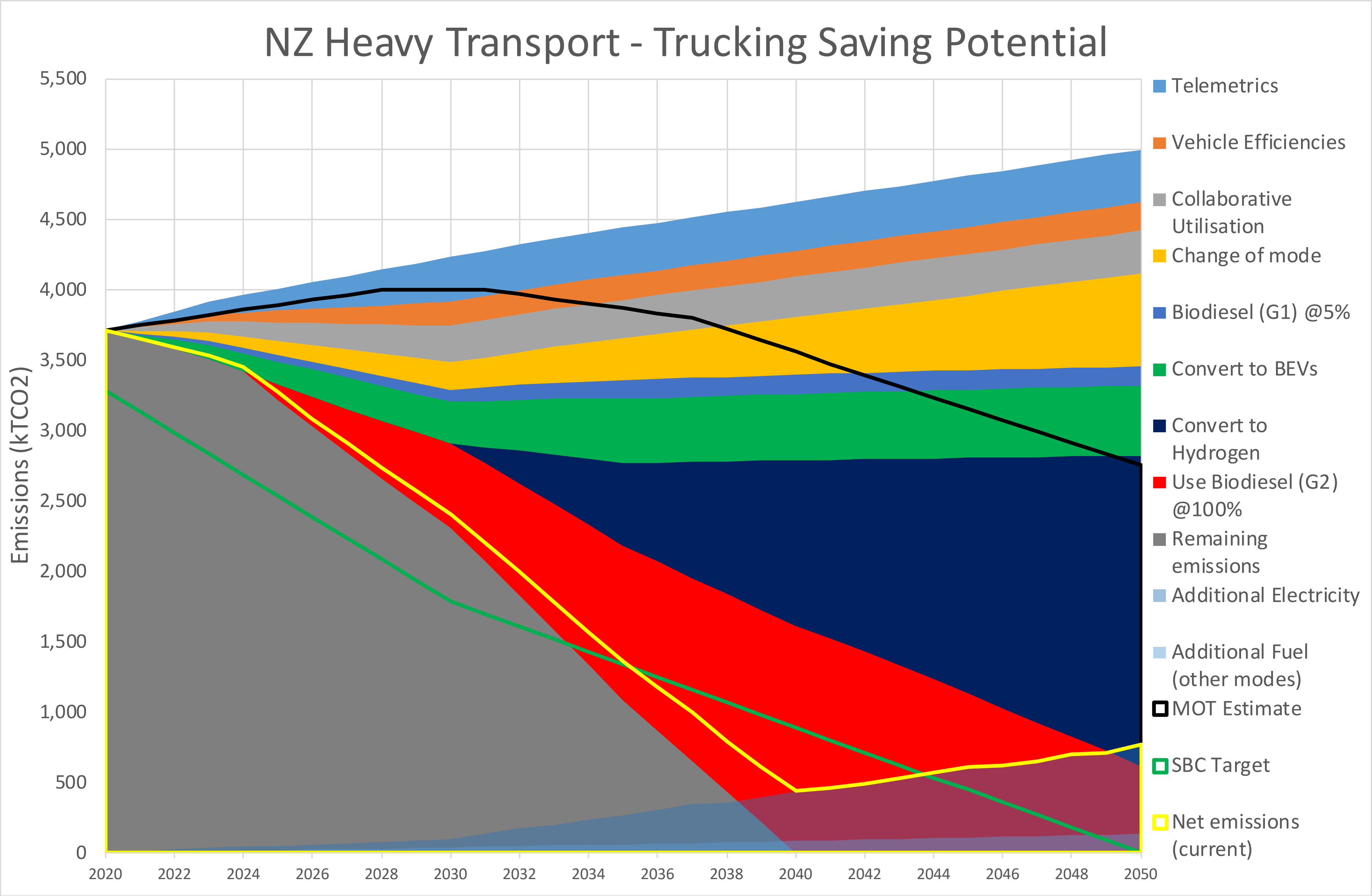
Type	Detail	Heavy		Medium		Timeframe		Savings (kTCO2e)		
		Fleet	Saving	Fleet	Saving	Start	End	Eqv 2020	2030	2050
Telemetrics	Driver Training/KPI Monitoring	25%	4%	75%	4%	2020	2030	31	53	63
Telemetrics	Route Optimisation	20%	20%	50%	20%	2020	2030	123	199	235
Telemetrics	Widening Delivery Windows	20%	7%	50%	7%	2020	2030	41	66	78
Vehicle Efficiencies	Rolling Resistance	50%	2%	50%	2%	2020	2030	29	39	46
Vehicle Efficiencies	Anti Idling/Electric Ancillaries	20%	4%	20%	4%	2020	2030	23	31	37
Vehicle Efficiencies	Weight Reduction	25%	1%	25%	1%	2020	2030	7	10	11
Vehicle Efficiencies	Aerodynamics	25%	5%	0%	0%	2020	2030	36	42	50
Vehicle Efficiencies	Carrying Capacity	25%	5%	25%	10%	2020	2030	35	47	56
Collaboration	Collaborative Utilisation	25%	25%	25%	25%	2020	2030	174	234	276
Collaboration	Multi-Company Hubs	0%	0%	25%	25%	2020	2030	-	26	31
Collaboration	Freight on coastal shipping	5%	78%	0%	0%	2020	2050	106	54	190
Collaboration	Freight on rail	14%	79%	0%	0%	2020	2050	269	137	467
Fuels	Biodiesel (G1)	100%	4%	100%	4%	2020	2035	90	88	138
Fuels	Electric Vehicle	5%	90%	80%	90%	2020	2035	97	298	499
Fuels	Hydrogen Fuel	75%	60%	10%	60%	2030	2050	516	-	2,199
Fuels	Renewable Diesel (G2)	55%	100%	10%	100%	2025	2040	1,182	597	619
Total									1,920	4,995

Assumptions – cont'd

- Heavy – Trucks over 10 tonne.
- Medium – Trucks under 10 tonne.
- Fleet - % of fleet that the opportunity could be rolled out to.
- Saving - % of carbon emissions that would be saved for an average truck if implemented.
- Timeframe – Start and End dates of the rollout (full application up to Fleet % at End).
- Savings – Estimated savings from the implemented items at each year. Eqv 2020 savings assume the full implementation of the opportunity in order to provide indications of scale.
- Mode change fleet % based on port and rail routes, freight origin and destination locations and are reviewed in line with company and industry targets.


Marginal abatement costs (high electricity cost)
$1,200
$1,000
$800
$600
$400
$200
$-
-$200
-$400
-$354
-$222
-$185
-$155
$50
-$9
-$27
-$24
$206
$45
-$6
-$19
$305
$134
$84
$45
$317
$139
$87
$46
$338
$164
$114
$74
$1,062
$458
$413
$280
$903
$355
$221
$143
Idling
BEV trucks (base)
BEV trucks (away from base)
B20 (GEN-1)
B5 (GEN-1)
GEN-2 biodiesel
H2 Mstrads
H2 trucks
2020-2030
2020-2050
2025-2050
2030-2050


Marginal abatement costs (low electricity cost)
$1,200
$1,000
$800
$600
$400
$200
$-
-$200
-$400
-$354
-$222
-$185
-$155
$27
-$20
-$34
-$29
$73
-$14
-$44
-$42
$305
$134
$84
$45
$317
$139
$87
$46
$338
$164
$114
$74
$863
$380
$363
$253
$703
$276
$171
$116
Idling
BEV trucks (base)
BEV trucks (away from base)
B20 (GEN-1)
B5 (GEN-1)
GEN-2 biodiesel
H2 Mstrads
H2 trucks
2020-2030
2020-2050
2025-2050
2030-2050


NZ Heavy Transport - Trucking Saving Potential
Emissions (kTCO2)
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Telemetrics
Vehicle Efficiencies
Collaborative Utilisation
Change of mode
Biodiesel (G1) @5%
Convert to BEVs
Convert to Hydrogen
Use Biodiesel (G2) @100%
Remaining emissions
Additional Electricity
Additional Fuel (other modes)
MOT Estimate
SBC Target
Net emissions (current)

Key take-away 1

Energy efficiency can provide significant savings at low cost. However, the uptake needs to be driven by individual organisations and the market. Vehicle upgrades, driver training and route optimisation require ongoing, incremental changes to bed in savings.

Key take-away 2

Mode shift is a key pillar in optimising the freight system. However, in order to drive this, customer perceptions need to change and additional investment is required in various networks to ensure timely, efficient and cost-effective delivery. Road, rail and coastal shipping all need to integrate to operate as a cohesive transport system, in order to move less-time-constrained freight to low-carbon modes.

Key take-away 3

Investments in BEV trucks can already deliver emissions abatement at negative costs when viewed over the longer-term horizon. However, the uptake is limited by the availability of away-from-base re-fuelling infrastructure and mass production of heavy EV models. BEVs are the focus for short-haul medium-weight vehicles. FCEVs would be more suitable for long haul given weight, productivity, recharge and driver cost penalties for BEVs, especially if FCEV capital costs and hydrogen production costs decline by more than currently assumed. We anticipate there will be overlap between these technologies, reflecting case-specific economic trade-offs.

Therefore, we assume that 80% of the medium fleet (mostly charging at base) can be electrified by 2035, and 5% of the heavy fleet is electrified by 2035. We believe this is conservative, particularly in relation to emissions savings, but still requires upgrading over half the fleet to EVs.

Key take-away 4

Biodiesel blends can serve as an important transition fuel to reduce 2020-2035 emissions from heavy freight that is difficult to electrify (e.g. due to missing away-from-base infrastructure). We assume that the highest uptake of B5 is reached by 2035, contributing 3.3% to total gross emissions reductions by then. Due to uncertainty around future feedstock for biofuel blends, and issues around the overall land-use change impact across biomass supply chains, we do not consider GEN-1 blends to be a long-term option. We think these will be replaced by advanced biofuels (GEN-2 or renewable diesel) over the long term, either imported or produced locally from biomass grown on marginal land.

Key take-away 5

From 2030, cost reductions for hydrogen and GEN-2 biodiesel mean they can both be included in the toolkit of options to reduce heavy freight emissions over the long term. Our MAC estimates are generalised, and there will be use cases where specific costs can change the cost relatively of options, e.g. depending on how far biomass for biofuel is transported for, or how electricity is generated to produce hydrogen in a specific location. We also recognise that significant investment will be required to build the infrastructure for hydrogen refuelling. Therefore, we think that renewable diesel and hydrogen options need to be seen together as a package starting with 2030, while allowing for renewable diesel uptake to start earlier in 2025.

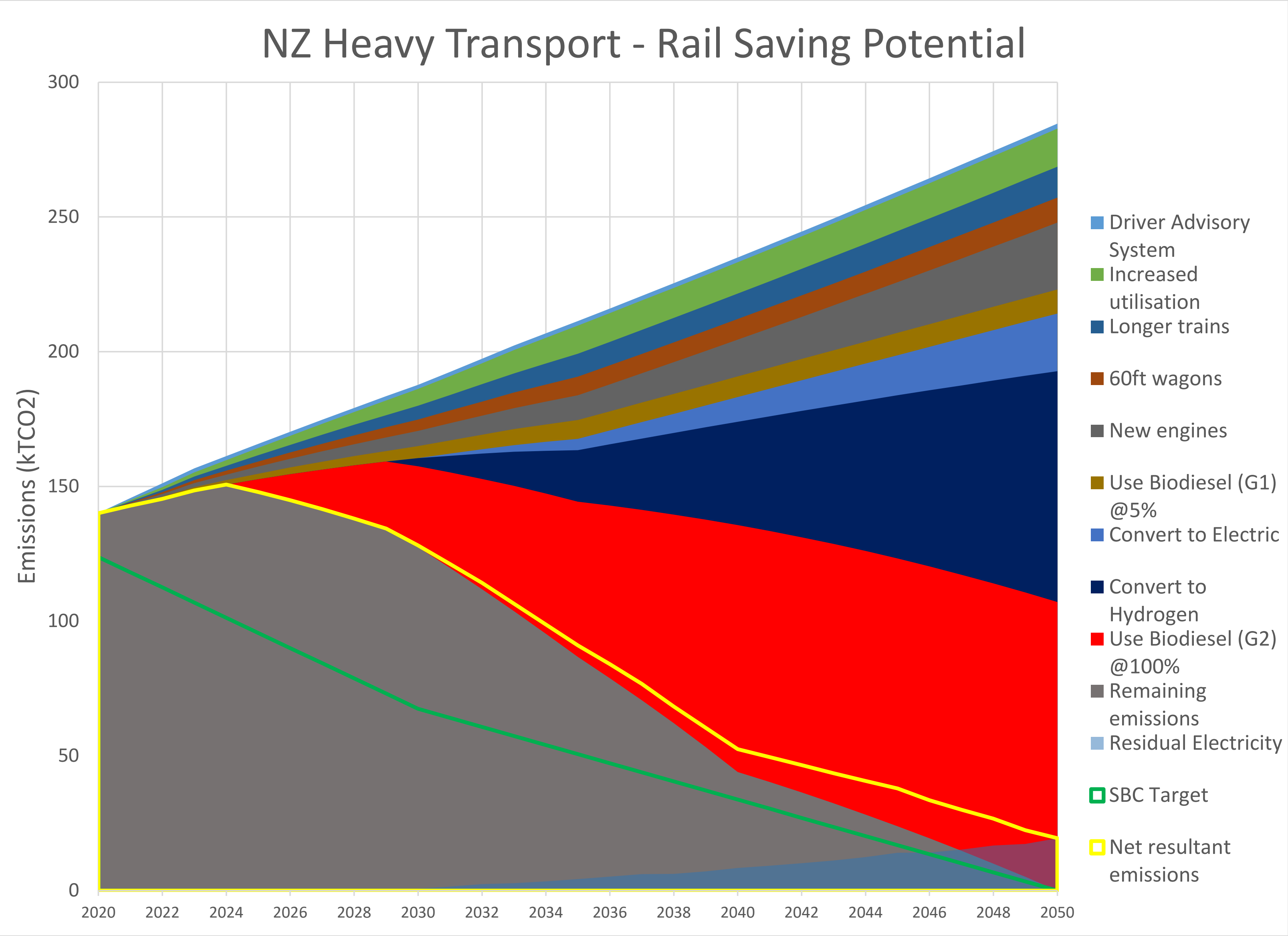
Pathway - rail

Emissions reduction opportunities

- **Driver Advisory System –** continue to improve control software to assist in drivers to make good low fuel use decisions.
- **Increased utilisation** of trains to maximise the tonnes moved per train, improving fuel/tonne.
- Operate **longer trains** as standard to minimise fuel use/tonne of freight.
- Utilise **longer wagons** to maximise the tonnes moved per train, thus improving fuel/tonne.
- **Purchase new engines** which by default have increased efficiency.
- **Use Biodiesel (G1)** at 5% blend in all engines.
- **Electrification** – increase level of electrification through new shunt engines and onboard electrical upgrades (i.e. diesel-elec hybrids).
- **Convert to/purchase hydrogen** fuel cell electric trains.
- **Use Biodiesel (G2 - Renewable Diesel)** at 100% in all remaining vehicles.

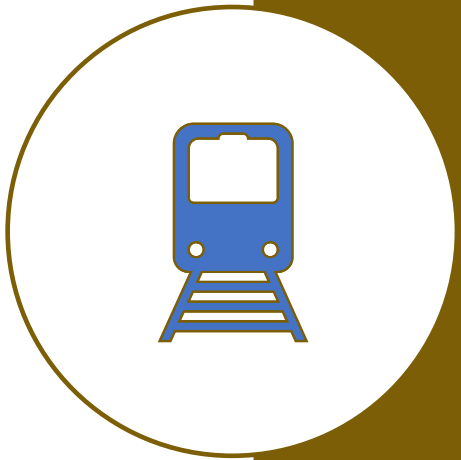
Assumptions

Type	Detail	Saving Potential		Timeframe		Savings (kTCO2e)		
		Fleet	Saving	Start	End	Eqv 2020	2030	2050
Telemetrics	Driver Advisory System	100%	1%	2020	2022	1	2	2
Vehicle Efficiencies	Increased utilisation	100%	5%	2020	2035	7	6	14
Vehicle Efficiencies	Longer trains	50%	9%	2020	2035	5	5	11
Vehicle Efficiencies	Longer wagons	50%	7%	2020	2035	4	4	9
Vehicle Efficiencies	New engines	50%	20%	2020	2050	12	6	25
Fuels	Biodiesel (G1)	100%	4%	2020	2035	4	4	9
Fuels	Electrification	10%	90%	2030	2050	9	-	21
Fuels	Hydrogen Fuel	40%	60%	2030	2050	24	3	86
Fuels	Renewable Diesel (G2)	50%	100%	2025	2040	51	30	107
Total							**60**	**285**


NZ Heavy Transport - Rail Saving Potential
Emissions (kTCO2)
300
250
200
150
100
50
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Driver Advisory System
Increased utilisation
Longer trains
60ft wagons
New engines
Use Biodiesel (G1) @5%
Convert to Electric
Convert to Hydrogen
Use Biodiesel (G2) @100%
Remaining emissions
Residual Electricity
SBC Target
Net resultant emissions

Key take-aways

- Emissions from trains are significant but are relatively minor when compared to road transport.
- Increased utilisation and lengthened trains will drive reduced carbon intensity of freight movements.
- Fuel changes will be required to provide the bulk of the savings in order to achieve target.



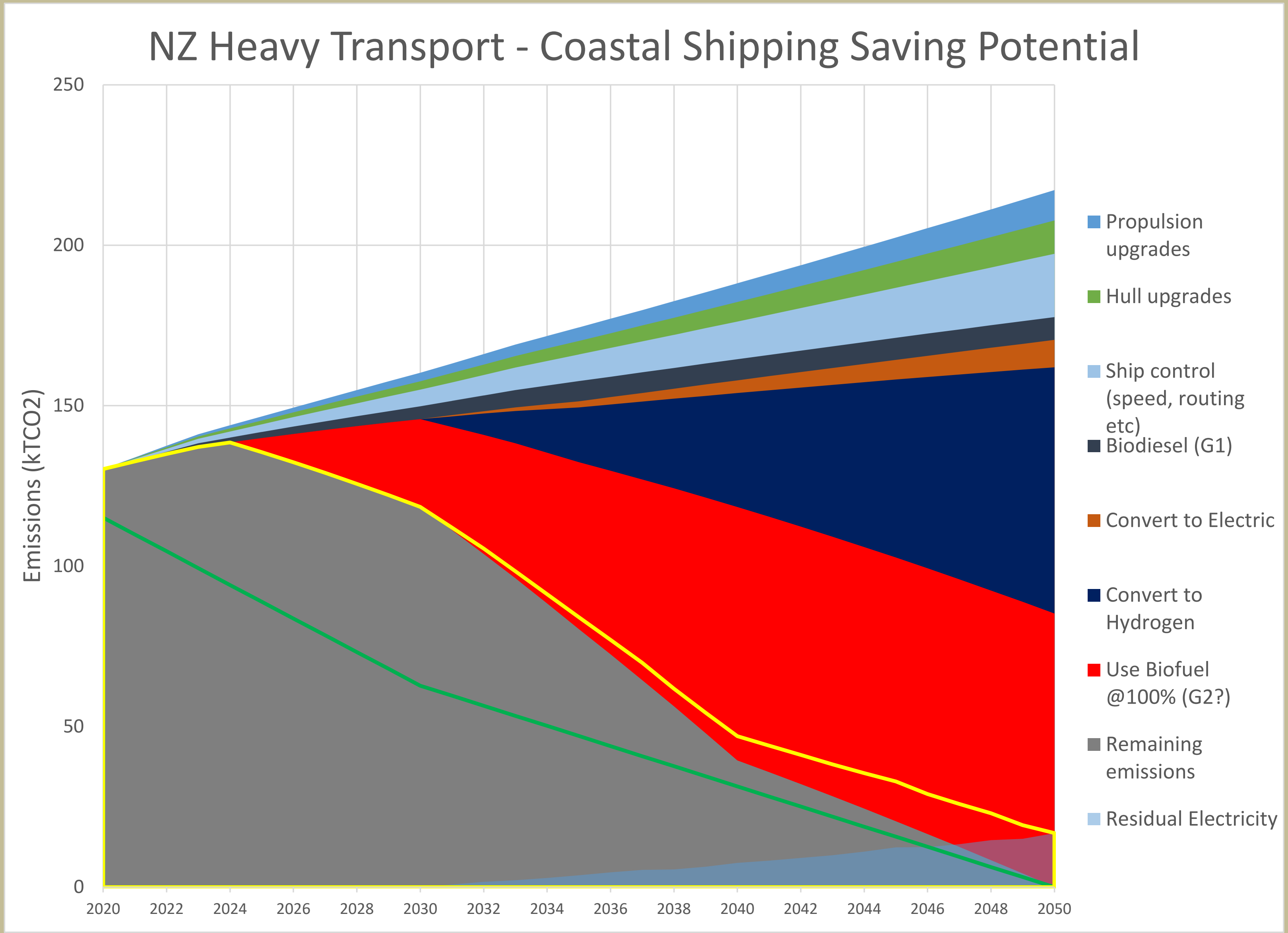
Pathway – coastal shipping

Emissions reduction opportunities

- **Propulsion Upgrades** to increase efficiency, e.g. high-efficiency propellors.
- **Hull upgrades** to minimise drag, e.g. high-tech paints.
- **Improve ship control** to minimize fuel burn, e.g. optimal speed, weather avoidance, routing.
- **Use Biodiesel (G1)** at 5% blend in all engines.
- **Electrification** – increase level of electrification through onboard electrical upgrades (i.e. diesel-elec hybrids) and batteries.
- **Convert to/purchase hydrogen** fuel cell vessels.
- **Use Biofuels (G2)** at 100% in all remaining vessels.

Assumptions

Type	Detail	Saving Potential		Timeframe		Savings (kTCO2e)		
		Fleet	Saving	Start	End	Eqv 2020	2030	2050
Efficiencies	Propulsion upgrades	100%	5%	2020	2050	6	3	9
Efficiencies	Hull upgrades	100%	5%	2020	2050	6	3	10
Telemetrics	Ship control (speed, routing etc)	100%	10%	2020	2050	11	5	20
Biodiesel (G1)	Biodiesel (G1)	100%	4%	2020	2035	4	4	7
Electrification	Electrification	5%	90%	2030	2050	4	-	9
Hydrogen Fuel	Hydrogen Fuel	45%	60%	2030	2050	26	-	77
Biofuels (G2?)	Biofuels (G2?)	50%	100%	2025	2040	49	27	85
Total							**42**	**217**


NZ Heavy Transport - Coastal Shipping Saving Potential
Emissions (kTCO2)
250
200
150
100
50
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Propulsion upgrades
Hull upgrades
Ship control (speed, routing etc)
Biodiesel (G1)
Convert to Electric
Convert to Hydrogen
Use Biofuel @100% (G2?)
Remaining emissions
Residual Electricity

Key take-aways

- Telemetrics and route optimisation are crucial in order to reduce emissions. However, this can sometimes come at the expense of performance.
- Fuel changes will be required to provide the bulk of the savings in order to achieve target – given the low cost of marine fuels currently, it is likely that this would result in significant cost increases.

Priority options and actions

Prioritisation of options

- The priority of actions that SBC Heavy Transport Group has agreed on is:
  - Promote biodiesel uptake
  - Promote hydrogen uptake
  - Promote increased uptake of Battery Electric Vehicles
  - Promote freight mode shift from road to rail and coastal shipping
  - Optimise supply chains through collaboration

- For each point, the following slides summarise the opportunity, barriers, and ways to overcome the barriers.

The Action Plan

The group has developed an action plan for the next 12 months to start removing some of the barriers identified and build a platform of actionable collaboration within the group and with the Government that will inform, promote and accelerate the transformation across the sector.

Biodiesel

- **The opportunity**: This is the easiest fuel switch solution provided supply availability, and it is applicable to all types of heavy transport. GEN-2 biofuel is particularly attractive, given it can be used with most existing engines (unlike higher-blend GEN-1 biofuels).

- Making B5 G1 blend as standard, and 55% of heavy truck fleet using 100% G2 by 2040, would save 1,600 kTCO2e (at 2040).

Biodiesel

Barriers	Work underway	What could the group/ industry agree to do?
- Market failure: competition of supply of feedstock. Strong competition from subsidised marketplaces e.g. US. - High premium over diesel - Short term supply of feedstock	- Ports of Auckland trialing renewable diesel - Availability of 5% blends at GULL	- Signal to the gov the group's intention and scale of effort / demand for biodiesel - Prepare the customers with the transition, as they will have to bear the costs as end users

How do we realise the solution?	What do we need from government?
- Interventions must be technology agnostic, and focus on emissions intensity e.g. policy and regulation encourages all lower emissions fuels to be taken up. RUC should not be used as a lever as the roads still need to be maintained - A phased 10-year approach to achieve 30% biodiesel use by the medium and heavy transport fleet by 2035. Approach similar to the MARPOL and lead phase out – signal early, create short term enablers. - Ensure NZ supply is available to reduce costs. Introduce regulations linked to emissions intensity - Local government initiatives such as low/zero carbon zones are a further lever	Gov role in enabling the supply of fuel by: - signaling the aggregate demand to biofuel producers - Helping address the current high costs driven by overseas subsidies to enable the Z plant to supply the NZ market

Objective 1: biodiesel

- **Design and implement a phased 10-year approach to achieve 30% biodiesel use by the medium and heavy transport fleet by 2035.**
- SBC key actions:
  - Assess group's future demand for GEN-1 and GEN-2 biofuels.
  - Develop business case for government intervention.
  - Work with MoT to identify and overcome barriers to GEN-2 uptake.
  - Identify an-end-to-end supply chain route, including a centralised fuelling point for GEN-2 biofuel use.
  - Complete a total lifecycle analysis of the biodiesel emissions associated with this supply chain.
  - Develop FAQs on financial performance and operational issues (e.g. engine warranties).
- Government key actions:
  - Introduce biofuel sales obligations in the short term.
  - Introduce low-carbon fuel standards over the long term.

Hydrogen

- **The opportunity:** Biofuels are fuels of transition, so interventions for biofuels and H2 must go hand in hand – from 2030 we see these as a single wedge on the pathway, as there will be trade-offs depending on future hydrogen costs and renewable diesel supply.

- Hydrogen has the benefit of higher energy density compared to BEVs. BEVs might be more efficient, but capacity is more limited to heavy freight. Overall, BEVs have productivity penalties – increased vehicle weight (due to battery) and longer refuelling times means that a greater number of vehicles might be required to perform the same transport service. This increases operating costs.

- Based on the pathway, the infrastructure (generation and fuelling stations) needs to be developed over the next 10 years. Hydrogen would save 1,200 kTCO2e of diesel emissions at 2040 (but could have significant electricity emissions associated with generation).

Hydrogen

Barriers	Work underway	What could the group/ industry agree to do?
- Regulatory barriers linked to safety (expand) - Low-carbon fuel cost premia relative to fossil fuels - Infrastructure – access - Economies of scale is significant - Overseas truck config not compatible with NZ environment. Challenge esp in the heavy-duty space, but expect the market to address this in the near term	- Ports of Auckland Gateway Hydrogen Refueler commissioned and operational for refuelling vehicles, currently refuelling vehicles on port and the first H2 bus for Auckland Transport - Hiringa Energy work with TIL and HW Richardson Group - Lots of conversations being had with key players in the South Island. - Just transition for Taranaki. But need to grow Auckland market due to freight volumes and demand considered at a national level due to economies of scale - Future of Tiwai	- Knowledge sharing on current state including by developing consistent messages on H2 role & safety, costs), which all members can use in conversations with stakeholders - Build capability and capacity for an Auckland – Wellington hydrogen route (Countdown, The Warehouse, TOLL, Ports of Auckland, Hiringa)

How do we realise the solution?	What do we need from government?
- Assess capacity for interested freight owners and operators to utilize hydrogen - Explore supply options with Ports of Auckland or other players such as Hiringa, including required infrastructure - In the next 12 months, trucks on the road as a feasibility study of lifetime costs, supported by the government. Trial will involve different uses in freight, leveraging the group's collaborative capacity	- Green Freight paper looks at Taranaki but does not scope a national network. - Govt needs to provide long-term signaling to better align existing demand with initial investment and scale up projections - Provide EECA funding for early adopters to support the trial project - Clarity and support form a road user charge exemption, e.g. trailing gear. Clarity on the mechanisms in any reduction of RUCs

Objective 2: hydrogen

- **Scale up investment in hydrogen supply, infrastructure and uptake over the next 10 years to enable 1,200 $kTCO_{2e}$ of diesel emissions to be displaced by hydrogen by 2040.**
- SBC key actions:
  - Assess group's future demand for hydrogen.
  - Explore supply options with Ports Of Auckland's refuelling facility and other suppliers including Hiringa
  - Identify resources and incentives to manage and invest for an Auckland-Wellington route.
  - By end of 2021, 10 delivered hydrogen trucks on road across different freight functions.
  - Based on the project above, complete a feasibility study (with govt support) on total lifetime costs.
- Government key actions:
  - Provide EECA funding for early adopters to support the hydrogen trial project (10 trucks by end of 2021).
  - Provide support for feasibility study of total lifetime costs.

Battery Electric Vehicles

- **The opportunity**: Current market penetration is occurring (ALSCO fleet, Waste Management conversions, Foodstuffs trial, New Zealand Post funding CAPEX to enable contractors to address the capital cost of purchasing EVs).

- The pathway shows significant uptake in medium trucks to 80% of total and 5% of heavy trucks in 2035. Results in 500 kTCO2e savings in 2035. This options is predominantly for medium-sized trucks in urban environments.

Battery Electric Vehicles

Barriers
- Upfront capex
- Charging infrastructure (although gaining momentum)

Work underway
- ALSCO fleet
- EECA EV fund
- NZ Post funding capex to enable contractors to purchase EVs

What could the group/ industry agree to do?
- Jointly procure identified makes/models of vans
- Identify infrastructure gaps

How do we realise the solution?
- Create demand, which will in turn attract more suppliers and servicing and reduce upfront capex (flesh out)
- Work with lines companies to build infrastructure
- Also role for battery storage systems to balance out loads

What do we need from government?
- Sharing of information on actual financial performance of projects supported through EECA grants

Objective 3: BEV

- **Run a joint procurement process for commonly required Battery Electric Vehicles.**
- SBC key actions:
  - Pool demand and seek more competitive rates from the market.
  - Identify and address infrastructure gaps.
  - Develop FAQs on financial performance.
  - Explore the role of battery storage systems to balance out loads.
- Government key actions:
  - Sharing of information on actual financial performance of projects supported through EECA grants.

Mode shift – consumer behaviour

- **The opportunity:** Currently, we pay too little for quickly turned around delivery. This has driven a ‘just in time’ mentality that is undervalued by the market. Explore the market opportunity for “low-carbon delivery time” service offers. This opportunity represents significant savings for any demand shift.

Mode shift – consumer behaviour

Barriers	**Work underway**	**What could the group/ industry agree to do?**
- Lack of customer awareness/care.	- Availability of customer insights/behaviours through stakeholder engagement, surveys, analysis, etc. - Overseas, consumers can choose between freight providers.	- Pool knowledge on consumer expectations and behaviours to explore how much customers care about the speed or how the goods travel.
How do we realise the solution? - Develop customer segmentation to identify particular offerings enabling there to be cheaper and slightly longer delivery times. - Develop end-to-end solutions to ensure customers still have access to real-time info on the status of their goods.		**What do we need from government?**

Objective 4: customer behaviour

- **Pool knowledge on customer insights to better explore their willingness to choose alternative service offerings.** Customers are the driving force behind the pace of freight movements. The current freight system suffers from underinvestment, as customers have paid cheap prices for fast delivery times for a long time.
- SBC key actions:
  - Test what its customers would be ‘open to’ changing about the current service offerings they receive.
  - Develop some customer segmentation to identify customers wanting to adopt lower-emission freight Government key actions.
  - Develop service offerings enabling there to be cheaper and slightly longer delivery times.
  - Develop end-to-end solutions to ensure customers still have access to real-time info on the status of their goods.

Mode shift – integrated freight network

- **The opportunity:** Huge potential for savings if there is a shift from road to rail or shipping for the inter-regional movement of goods. Moving 5% tkm more on shipping and 14% tkm more on rail would save 700 kTCO2e of road emissions in 2050 (shipping/rail emissions may increase by 150 kTCO2e).

- The role of costal shipping has evolved to include a service offering that delivers the last-mile, demonstrating how coastal shipping can be better integrated into the multi-modal transport network for goods that are not required just-in-time.

Mode shift – integrated freight network

Barriers	Work underway	What could the group/ industry agree to do?
- High comparative cost of rail	- The role of costal shipping has evolved to include the last-mile service proposition. Reflects thinking on how it can it be better integrated into the multi-modal transport, e.g. Swire work with Coca-Cola.	- Compile and share examples of integration of rail and shipping into core freight movements (TOLL and Swire). - Develop a menu of possible "low-carbon" delivery service options.

How do we realise the solution?	What do we need from government?
- Test some scenarios using POAL's supply-chain calculator, to identify where real changes to use of mode could occur (with TOLL, Countdown, The Warehouse, Fonterra). - Package together key discussion points and set up a session with KiwiRail and Swire to explore what some end-to-end solutions could look like. - Explore ways to build customer uptake of "low-carbon" delivery options. - Build the case for further investment in coastal shipping and rail in order to de-risk the value and efficiency of the services, e.g. building up partnerships with road providers to strengthen the traceability and reliability of the offering; and growing understanding across the industry of the benefits of a more integrated network.	- Address productivity perception of KiwiRail – factor in value of emissions savings through increased rail uptake rather than direct EBIT. - View the freight system as an integration of all modes rather than each in isolation.

Objective 5: integrated freight network

- **Raise awareness of the interdependencies of delivery expectations and sustainability impact and the lower-emission options offered by rail and coastal shipping.**
- SBC key actions:
  - Compile and share examples of integration of rail and shipping into core freight movements (e.g. TOLL and Swire Shipping).
  - Together with freight owners and logistics companies:
    - Identify and develop “low-carbon” delivery options.
    - Identify ways to capture benefits of “low-carbon” options (e.g. carbon reductions reflected in invoice).
  - Build customer uptake of “low-carbon” options.
  - Build the case for further investment in coastal shipping and rail in order to de-risk the value and efficiency of the services (e.g. building up partnerships with road providers to strengthen the traceability and reliability of the offering, growing understanding across the industry of the benefits of a more integrated network).

Supply chain optimisation

- **The opportunity**: Current capacities across multiple transport operators are underutilised, meaning nobody is operating at maximum capacity. Trucks are generally full heading southwards, then some empties come north. Need to move freight to other modes south-bound. This will take trucks off the road, i.e. less trucks operating in total. Mainfreight being multimodal is useful, and it is very good at filling its capacity proactively. Primary focus on road transport, but can we bring KiwiRail into some discussions once a framework is formed.

- Having some coordination of supply chain optimisation across two or more transport operators would unlock savings, improve efficiencies and reduce emissions – 25% savings on 25% of trips would save 225 kTCO2e at 2030.

Supply chain optimisation

<table>
<tr>
<td>Barriers
- Highly commercialised and competitive, particularly with retail owners operating their own distribution functions
- High trust environment and confidential platform required to share data and agree on changes to routes</td>
<td>Work underway
- Some examples of partnerships in NZ and overseas, but nothing high profile or at scale</td>
<td>What could the group/ industry agree to do?
- Identify interested parties e.g. PoA, Freightways, Mondiale, NZ Post metro, TIL, The Warehouse
- Scope up an opportunity to work together based on common objectives and trust</td>
</tr>
<tr>
<td colspan="2">How do we realise the solution?
- Test what customers would be open to changing about current service offerings.
- Software platform for main transporters to share space and loads.</td>
<td>What do we need from government?</td>
</tr>
</table>

Objective 6: optimise freight flows

- **Scope up an opportunity to collaborate by identifying interested stakeholders, identifying common objectives, agreeing on the opportunity and scope and developing the resourcing model.**
- SBC key actions:
  - Use Ports of Auckland's supply chain carbon calculator to model different route options, modes etc.
  - Identify others who may wish to be involved based on the scope, e.g. Freightways, Mondiale. Approach those who could have a higher number of empty running vehicles, as this will have the biggest saving potential.
  - Quantify the size of the opportunity and determine what's in and out of scope.
  - Identify an independent broker/software/confidential platform required to share data and agree on changes to routes needed to help facilitate the optimisation.

Acknowledgements

This work has been undertaken as a collaboration with SBC and Climate Leaders Coalition members, Sapere and DETA Consulting.

Sustainable Business Council
wbcsd Global Network Partner

sapere

DETA CONSULTING