HVTT14: A TRANSFORMATION IN FREIGHT PRODUCTIVITY – A CASE STUDY OF HIGH PRODUCTIVITY MOTOR VEHICLES IN NEW ZEALAND

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David is a senior manager with the NZ Transport Agency, with over 35 years' experience in integrated transport planning, programming and investment. An experienced professional engineer in the transport sector, he has a leading role in the provision of planning services, including resource, urban, transport and traffic planning. Another responsibility is the development of clear national level planning and investment signals to local and regional councils and the Transport Agency's Highways & Network Operations group for developing and managing the NZ$4.5 billion per year National Land Transport Programme. David undertakes a variety of programme lead roles within the Transport Agency including Regional Economic Development, Electric Vehicles and from July 2016, the Freight Portfolio.

ABSTRACT

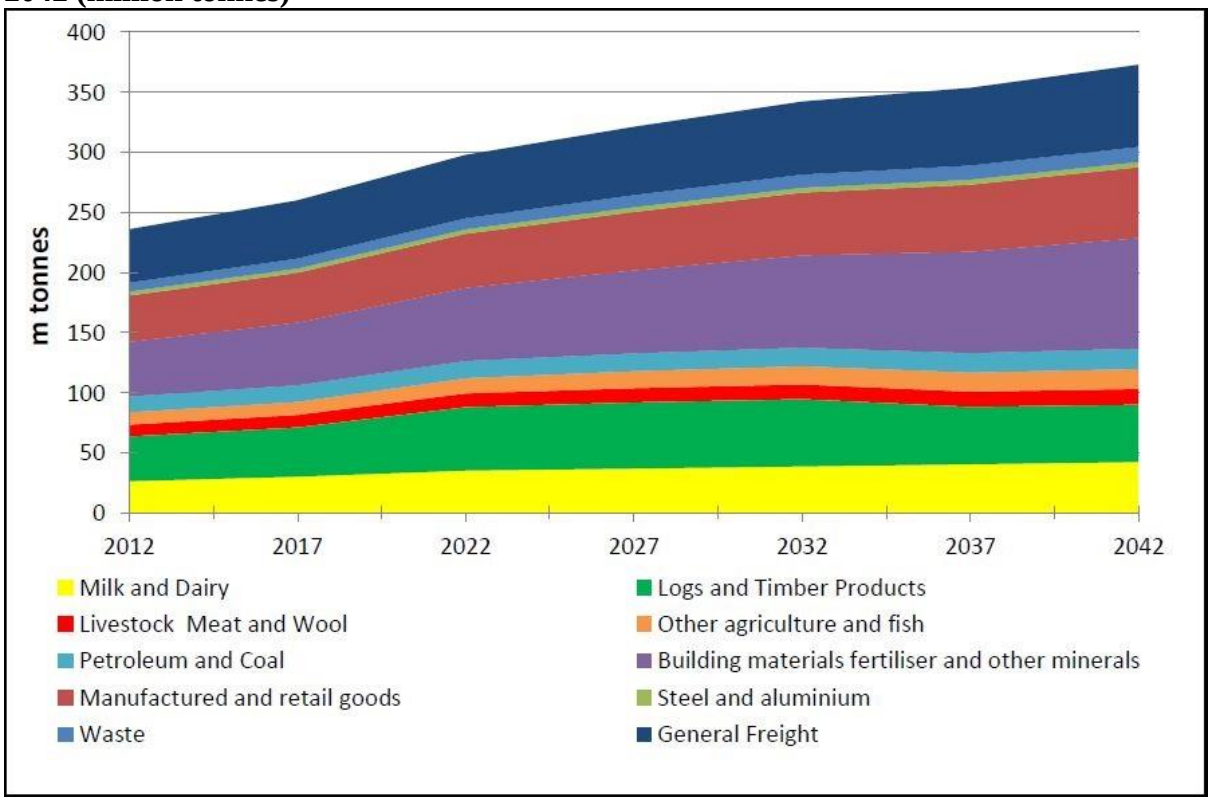
This paper outlines the introduction of High Productivity Motor Vehicles (HPMVs) into New Zealand. The background through to the implementation of the HPMV programme will be examined from a policy and regulatory perspective primarily, with some mention and referencing of the key technical elements. Challenges will be outlined and the solutions will be identified with a view to highlighting the factors that were critical to making it attractive for the industry to invest in HPMVs. The paper will conclude with a look at the programme as it stands in mid-2016.

Keywords: High Productivity Motor Vehicle, Heavy Truck, Freight, Productivity, New Zealand, Government, Infrastructure, Road Transport, Regulation, Policy, Efficiency, Safety, Stakeholders, Economy.

1 – INTRODUCTION

As a trading nation New Zealand relies on the safe and efficient movement of freight to and from domestic and international markets. The New Zealand economy is dominated by primary production, meaning large volumes of freight are moved long distances by road. Each year New Zealand moves around 250 million tonnes of freight, with this forecast to grow to around 373 million tonnes by 2042 (National Freight Demand Study, 2014).

Table 1 – Total New Zealand Freight Forecasts by Broad Commodity Group 2012 to 2042 (million tonnes)



Reducing the cost of moving this freight while minimising negative impacts on infrastructure, the environment and on the public are significant challenges facing the country. This is compounded by a number of factors.

New Zealand has a relatively low population density spread across two main islands that contain some challenging geography and geology. We have a predominantly agricultural economy moving large amounts of primary produce from rural areas to processing sites and on to 12 main export ports.

Road freight is critical in this movement of New Zealand's freight, with around 70 per cent of the freight task moved by road (on a tonne-kilometer basis). This percentage is expected to stay relatively constant in terms of the overall volume growth over the next 25 years (National Freight Demand Study, 2014).

Therefore it was clear that with the development of newer types of trucks over the last two decades that can safely carry more freight per trip, there was an opportunity to improve efficiency and therefore productivity throughout the transport system, and lower the cost of bringing goods to market.

2 – THE CHALLENGE– UNLOCKING THE PRODUCTIVITY PUZZLE

The objective of the NZ Transport Agency is to contribute to 'an effective, efficient, and safe land transport system in the public interest'. Our motto to achieve this is 'to create transport solutions for a thriving New Zealand'. As part of this goal, the Transport Agency was tasked by the Government, through its Government Policy Statement on Land Transport, to improve the efficiency and safety of freight movements in order to lift the country's economic performance.

To support this goal the regulatory settings in the Land Transport Rule: Vehicle Dimensions and Mass 2002, were amended in 2010 to allow for the introduction of high productivity motor vehicles (HPMVs). The changes allowed suitable heavy vehicles to operate, by way of a permit issued by a local council and/or the Transport Agency, at weights above the standard 44 tonne network limit (for a combination heavy vehicle) and/or additional length over 20 meters.

The changes to the Vehicle Dimensions and Mass Rule followed a trial of heavier operating weights by the Ministry of Transport (VDM Rule amendment 2010 Regulatory Impact Statement). This trial had demonstrated the improvements in productivity and safety that heavier and/or longer vehicles had been seen to enable internationally. (Moving Freight with Better Trucks, OECD Research report, 2011). On the completion of this trial the Minister of Transport, Hon. Steven Joyce, signed the Rule amendment into effect to allow for these productivity benefits to be capitalised on by New Zealand as a whole. The Transport Agency was tasked with implementing the roll-out.

Initial uptake was slow due to a complex regulatory environment and the limited number of roads that these heavier and/or longer vehicles could access due to concerns about potential damage to infrastructure, primarily structures and pavements, in addition to safety requirements. This was particularly the case in those rural and regional areas where the productivity benefits of HPMVs were needed most.

There was initial success with the development of 'pro-forma' HPMVs, 22-23 metre combinations that operated at 44 tonnes. These designs were developed with the industry, using performance based standards and including additional safety features such as additional lighting and electronic stability control. These proforma HPMVs were permitted to have full network access, as their fit-to-network was comparable to other combinations already in use. Once finalized, these designs were published on the Transport Agency's websites for industry to use when building new vehicles.

But with allowing heavier HPMVs the problem was clear: the vehicle technology was there to make productivity gains however the operating environment, in terms of infrastructure suitability, was not able to support it.

3 – SOLUTION A. – IDENTIFY AND ENABLE SUITABLE ROUTES

To open up access for heavier HPMVs the Transport Agency began a nation-wide road assessment programme to determine what routes could accommodate higher mass. As such the Transport Agency moved from a reactive approach, where industry asked what routes were available, to an enabling approach – where we determined which routes were available (or could be made available) and provided maps for industry.

Network analysis focused on high-volume freight routes where substantial numbers of heavy trucks operated. In undertaking this assessment the Transport Agency sought to adopt more of a journey approach, rather than focusing on individual road segments.

Using bridge engineering and pavement data the Transport Agency, working with local councils for first and last mile access, determined what routes could accommodate HPMVs. While most of New Zealand's road network has lighter pavements, unsuitable for higher mass, the main State highway routes could accommodate heavier axle loadings. The main constraint was some of the bridges, with only one unsuitable bridge severing a full freight journey.

As such every bridge on the State highway network was assessed and where feasible upgraded to open access. This $35 million investment programme was included in the National Land Transport Programme 2012-15, which opened up 4,500 kilometres of State highways and local road connection to full-HPMVs (weighing up to 58 tonnes). The current National Land Transport Programme 2015-18 is investing a similar amount over the next three years to extend this 'High Productivity Freight Network' to round 6,000 kilometres.

4 – SOLUTION B. – CHANGE THE VEHICLE, NOT THE NETWORK

While the increasing availability of the main freight routes allowed some uptake, the Transport Agency realised substantial gains were there to be made by looking in the middle of the weight curve.

To achieve a step-change in freight productivity and safety involved the realisation that on an industry-wide scale, greater mass did not necessarily equal greater productivity if network access was significantly restricted.

The main challenge was still the infrastructure – bridges in regional areas had not been built for sustained use by vehicles above 44 tonne along with pavements that would deteriorate quite rapidly with the higher axle loadings.

The Transport Agency, working with our consultants at Opus International, came up with an innovative solution. Because upgrading the infrastructure would be cost prohibitive, the vehicle design and the regulatory environment would have to change. This meant making a trade-off in productivity versus network access, to find the optimal balance that would reduce the total cost of moving freight (including minimalising the public infrastructure cost). We sought initial feedback from industry to see if this trade off was acceptable, given that they would need to invest in new equipment if the concept was going to work.

Having received this assurance that this additional productivity would provide sufficient value, the 50MAX vehicle concept was developed. 50MAX combinations are longer at 22-23 metres and have an additional axle, compared with standard eight-axle 44-tonne combinations. The additional length of the wheel base allowed for a majority of the bridge access problems to be resolved. While the ninth axle addressed the concerns around pavements by having the same axle loadings to allow for a gross loading of 50 tonnes.

Data collected for the initial 50MAX business case showed much of the demand for HPMVs was up to 50 tonnes. (Business case for Lower Bound* High Productivity Motor Vehicles, 2012).

*The term Lower Bound HPMV was later changed to 50MAX

The concept would allow for a productivity gain of up to five tonnes per trip, while also enabling significant network access. The business case concluded that 50MAX would support the objectives of improving freight productivity while protecting infrastructure.

The infrastructure impacts of 50MAX were tested and this found a low risk of increased pavement deterioration (Lower Bound HPMVs, Analysis of Pavement Impacts, 2012).

Similar assessments were conducted on the impact of the additional weight on bridges. (Assessment of Load Limits for Bridges, Lower Bound Loading, 2012). This confirmed that the proposed 50MAX configurations would be suitable for the majority of bridge structures across New Zealand's 94,000-kilometre public road network (See Figure 1).

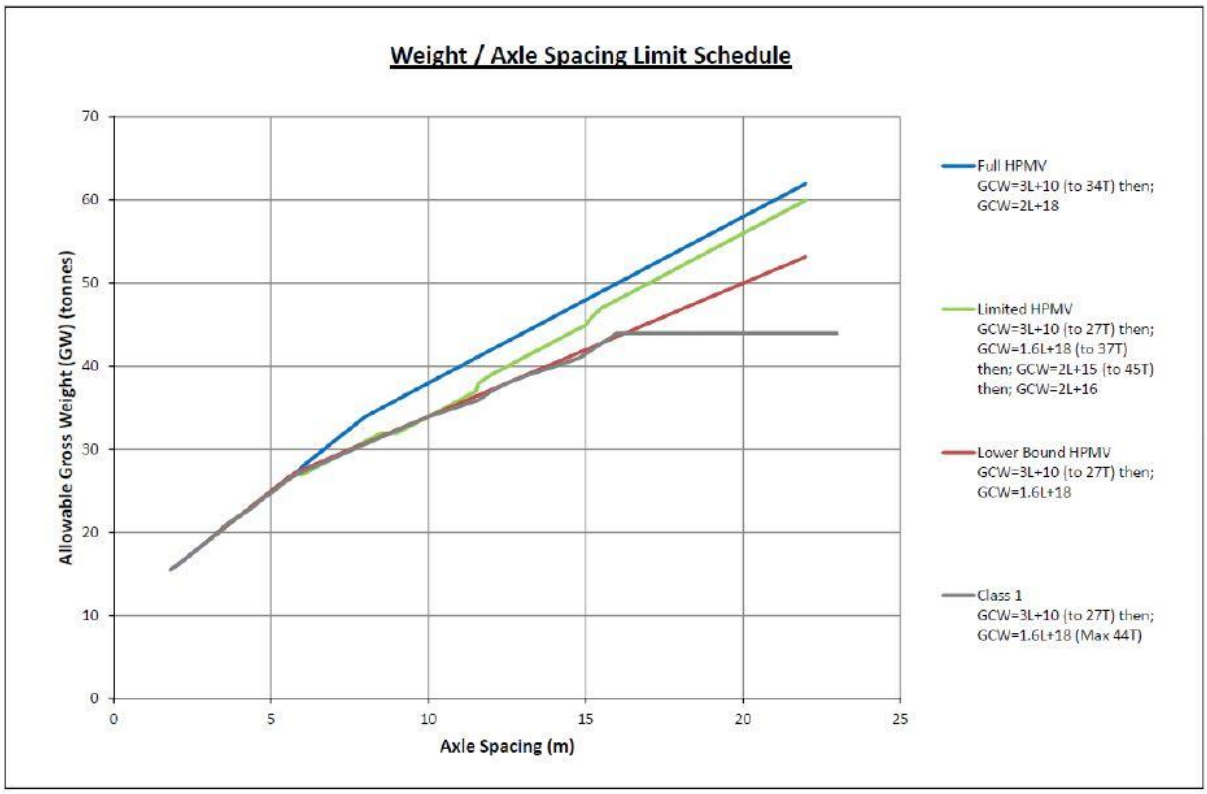


Figure 1: Allowable Gross Weight vs Axle Spacing for Full, Limited and Lower Bound (50MAX) HPMVs

Working with the Ministry of Transport, a category of road user charge (RUC) was developed for 50MAX. Road user charges are paid by heavy vehicles for every kilometre of travel on public roads. The charge is determined by the operating weight of the vehicle and the number of axles used to minimise the road impact. The 50MAX charge was developed to reflect that the vehicle was designed to minimise infrastructure impacts. (Assessment of Load Limits for Bridges, Lower Bound Loading, 2012)

This work was critical in winning the confidence of road managers to allow for access, knowing infrastructure impacts were minimal. This access made the productivity benefit, though more modest than full-HPMVs, an attractive proposition for industry to invest in.

5 – MAKING IT WORK – KEYS TO SUCCESS

A number of factors needed to come together to make the 50MAX concept a success.

Effecting the step-change in freight productivity that 50MAX has provided is not something the Transport Agency alone could achieve. Key to this was the support of road transport stakeholders to the concept and their willingness to invest in these vehicles.

As part of our wider work on freight efficiency the Transport Agency had been working to develop stronger and more collaborative relationships with stakeholders across the national supply chain. This included the road transport industry, freight owners and logistics operators, the NZ Police (specifically the Commercial Vehicle Investigation Unit (CVIU)) and our investment partners in local government. When developing 50MAX these partners were involved at every step of the way as we sought to provide efficiency benefits for the road transport industry, but not at the cost of safety or damage to roads or bridges.

As outlined above the Transport Agency commissioned and published studies on the infrastructure, safety and economic impacts of 50MAX, so people could make informed decisions on access (particularly from a local council perspective) or investment in the vehicles (from the road transport industry perspective).

Figure 2: Areas in grey indicate restricted 50MAX access to the local road network by RCA.

Transport Agency officials had extensive engagement with a range of stakeholders, from local council staff to trailer manufacturers, as we sought to design a system that would allow for the greatest improvements in productivity, again while balancing this against safety and preserving infrastructure.

We hosted joint workshops in conjunction with sector groups such as the Road Transport Forum and the RCA Forum for Roading Managers and their technical staff. This meant that elected representatives who were responsible for the final decision on HPMV, had confidence that their organisation was well informed and prepared for the new generation of trucks.

This engagement remains an ongoing process with our local government partners. In New Zealand, the Transport Agency builds and manages the state highway network on behalf of the Government, while local councils (as Road Controlling Authorities (RCAs), manage the local roads in their area. The decision for HPMV access regionally sits with locally elected councils. The cost of local roads is met by ratepayers, with support of around 50 per cent from the National Land Transport Fund, which is managed by the Transport Agency.

Overall the Transport Agency believes that this engagement has been a success, with over 90 per cent of New Zealand's local authorities granting full or partial access for 50MAX. All the access areas are linked together by access to the 11,000 kilometre State highway network.

To assist in the ongoing assessment of roads and structures the Transport Agency provided regional contacts for technical guidance for pavements and structures, with contact details provided on the dedicated webpage set up for local councils RCAs, http://www.nzta.govt.nz/commercial-driving/permits/high-productivity/50max/50max-information-for-road-controlling-authorities/

Another key to success was the Transport Agency's willingness to revisit our assumptions, procedures and our regulatory settings – to being an enabler of greater freight productivity as well as a regulator. In creating the environment for 50MAX we understood that we were asking transport operators to invest substantially in a new fleet. This required that we give them confidence that the regulatory environment would remain stable over the longer-term. We sought to deliver that confidence through an open and collaborative engagement with industry on how we were implementing 50MAX and providing a stable and more predictable regulatory environment.

Figure 2: All HPMVs are required to clearly display their H plate front and rear

An example of this regulatory adaption was a fundamental rethink of the permit system for 50MAX. Previously all trucks over 44 tonnes were issued with route-specific permits which could involve applying to multiple authorities for a single journey. The Transport Agency developed a single permit system to allow network-type access on an approved 50MAX network. Over 85 per cent of councils have now signed on to the new 50MAX-1Network permit system. We then provided online maps to show where travel could be allowed and not allowed, giving industry the confidence and ease of planning the optimal journey.

The 50MAX regulatory system introduced a simple set of required features for 50MAX truck combinations, to raise the safety performance of the vehicles. With other permits, operators must list their vehicle attributes so that the permit issuing officers can determine whether it is suitable to carry a certain load on a certain route.

With 50MAX 'proforma' vehicle designs, the easily accessible criteria for truck combination standards helped to make great improvements in permit processing times and gave industry confidence to invest. Two examples of 50MAX combinations are shown below, with the full list of proforma vehicles, plus full specifications, available to download from the Transport Agency website.

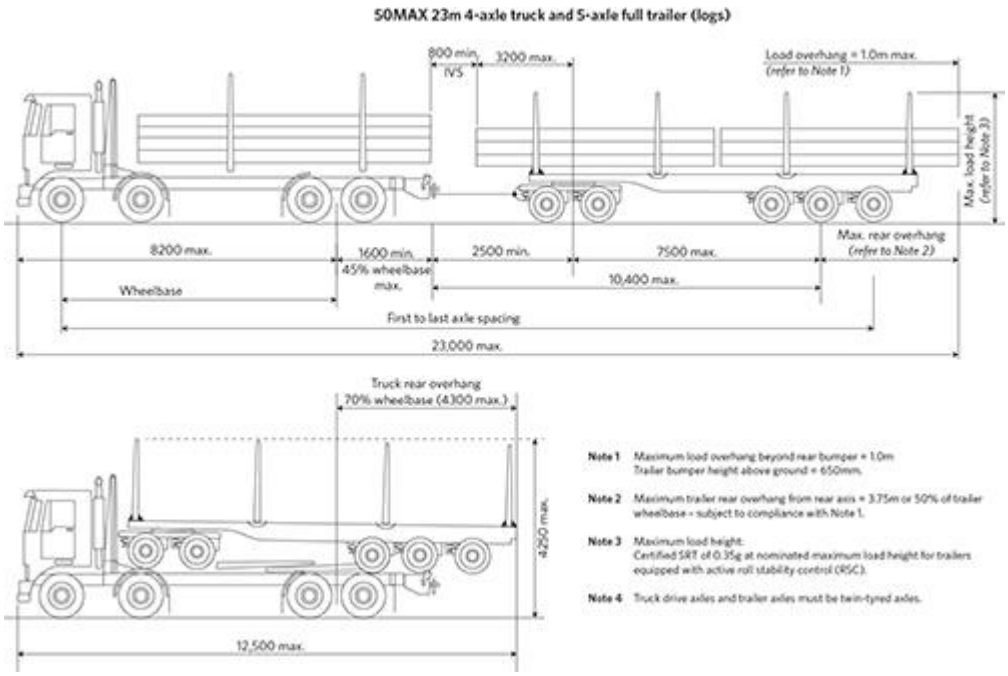


Figure 3: A 23-metre logging combination 50MAX

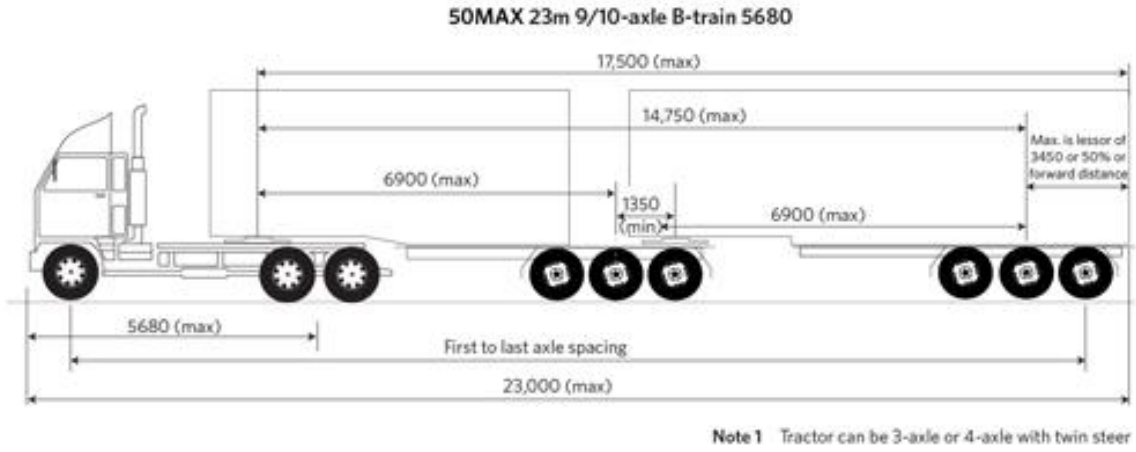


Figure 4: A 23-metre 50MAX B-train

In order to enable greater uptake of HPMVs including 50MAX, the Transport Agency made 'Moving more freight on fewer trucks' once of its strategic priorities in its Statement of Intent for 2013 to 2016.

This established key results to be achieved by 2016, with milestones along the way. This allowed those in the Transport Agency leading the work on freight to set a clear strategic direction and develop a work programme with specific goals in mind which were based around greater access and uptake, a streamlined permitting process and a smarter and more comprehensive compliance regime.

6 – 2016 AND BEYOND

As part of this priority and to represent the Transport Agency's drive to improve and measure our own performance as a delivery agent of government initiatives, we have regularly reported on uptake of HPMVs using our quarterly HPMV Mileage (or "H-Miles") performance indicator. This indicator measures travel by HPMVs including 50MAX as a proportion of all heavy truck travel (being defined as all powered units of three or more axles).

The major milestone on which the success of 'Moving more freight on fewer trucks' as a strategic priority for the Transport Agency would be measured was H-Miles of 30 per cent by the end of June 2016. This target was successfully met, with 32 per cent of all heavy truck travel done by HPMVs including 50MAX for the three months from March to June 2016.

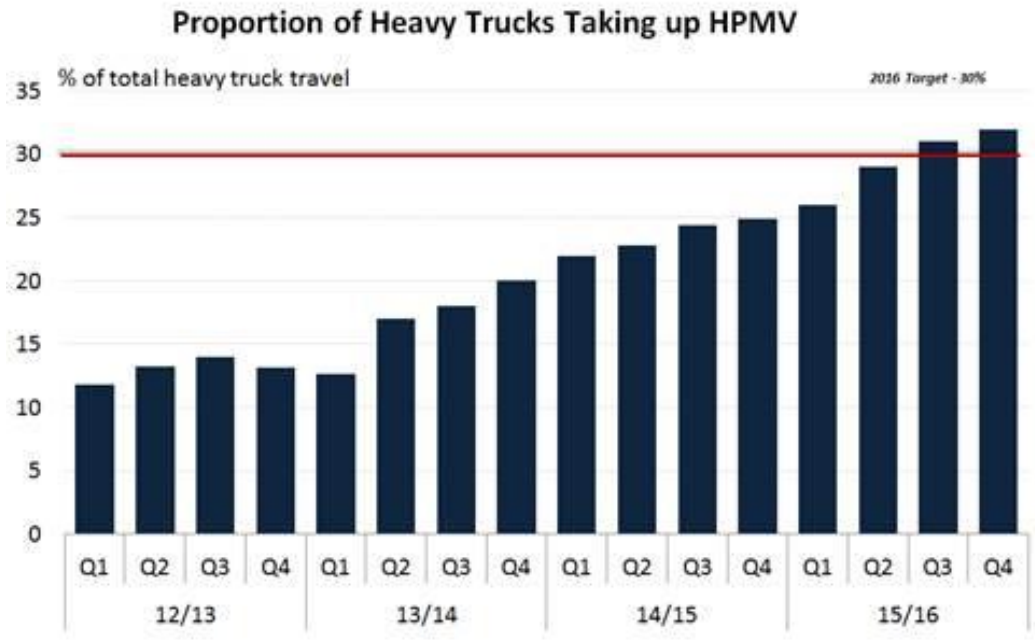


Figure 5: H-Miles data reflects the increasing uptake of HPMV over the past three years

During the quarter HPMVs travelled 138 million kilometres, up from 102 million kilometres in the same quarter last year. Of these, 50MAX combinations travelled 87 million kilometres, up from 54 million kilometres last year. In total, HPMVs have travelled more than 1 billion kilometres on New Zealand roads since 2010.

With the Ministry of Transport we have undertaken two independent reviews of the implementation of HPMVs. These reviews have shown that HPMVs reduce the required journeys needed to deliver freight by 14 to 20 per cent (Monitoring, evaluation and review of the Vehicle Dimensions and Mass Rule, May 2010 – April 2011).

We estimate that this has resulted in economic benefits from reduced kilometres travelled, not-withstanding the investment in new equipment, to be around $90-110 million over this period.

In contrast travel by ‘standard’ heavy trucks has shown a decline over the past few years as the heavy road freight task is transitioned to HPMV. This is despite the overall distance travelled by the total heavy truck fleet continuing to grow as the economy expands.

Figure 6: HPMVs are now used extensively across a range of industries in New Zealand, from logistics to manufacturing to agriculture.

The freight industry has been a particularly strong supporter of the 50MAX programme. We get regular feedback from them that 50MAX allows them to make productivity gains of up to 15 per cent, enabling them to lower the cost of transporting goods, a saving which can be passed through the supply chain to both producers of freight and consumers.

The success of 50MAX has led strong growth in terms of new units registered, replacing older trucks. With the growth of HPMVs including 50MAX we are seeing a permanent, structural shift in the heavy end of the road freight industry away from older, less safe and less productive trucks.

The number of HPMVs on the road means that moving high volumes of freight is now likely to happen on a safer, more productive vehicle ensuring the long-term durability of the HPMV programme in New Zealand. Our work here is continuing to increase the value of this significant step-change in the productivity of heavy road freight in New Zealand.

The next goal in our freight efficiency work is to achieve greater integration between road and rail freight. The continued development of HPMVs will play an important role in this, as we seek to enable more hubs where freight can be aggregated and distributed more

efficiently. Through this programme we are striving to ensure the freight network is as efficient as it can be across New Zealand's range of supply chains.

'Moving more freight on fewer trucks' has now become a standard part of our business at the Transport Agency. Through this we will continue to support the uptake of HPMVs to drive greater freight efficiency and subsequent economic benefits.

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*Lower Bound HPMV was the initial name for 50MAX