# The Role of Rail in New Zealand's Freight Transport Strategy

## Introduction

What is to be the future role for rail in the NZ Freight Transport Strategy? It is generally understood that rail will play a continuing role in heavy freight haulage, and a previous government even had a declared policy of increasing the freight market share of rail (and coastal shipping), as against the dominant player road. But the only rail strategy announced in recent times is the KiwiRail Turn-Around Plan (TAP), which noted predictions of big increases in the inland freight task and set about repositioning KiwiRail to step up to the challenge. In summary, the Government agreed to plough in an initial $750M to deliver capacity increases and renewal of key assets, after which the company could continue to modernize and expand using retained profits or commercial borrowing.

Unfortunately the Turn-Around Plan has misfired: KiwiRail acknowledges it not likely to deliver the cashflow needed to sustain itself let alone to grow the rail system, and has had to resort to line closures and maintenance deferrals and to call for further investment from the shareholder.

Currently rail's market share (by tonne-km) is 15%, and despite some good gains in import-export (IMEX) container traffic is probably declining overall. Bulk and general freight appears to be stagnant, bulk because KiwiRail's market share is already high and the market is showing no signs of growth, and KiwiRail has all but lost the battle to retain a worthwhile share of the general freight market. Without some sea-change in rail's fortunes this trend will continue and KiwiRail will survive only in a few niche IMEX and heavy-freight routes.

However there are opportunities for major improvements in rail productivity and service quality, and we outline here how these could make rail into a real force in New Zealand freight transport and open up the possibility of much better overall outcomes.

## A Role for Rail Freight

The Freight Demand Study duly shows that over the next 30 years the inland freight transport market is set to grow strongly. The "blue space" for 99% of NZ's international trade begins and ends at sea ports, and the cheaper ocean freight rates that very large ships can offer will mean that freight drops and pick-ups will in future occur in larger volumes at fewer locations. The rising population will increasingly be concentrated in major cities and general freight traffic between them will also increase. So it is readily apparent that we face much heavier inland freight flows, outstripping population and GDP rises.

While handling greater freight volumes, NZ also seeks ways to become more competitive in the global marketplace. This means it would be an advantage if the current high inland freight costs could be reduced in real terms and transit performance improved.

A third issue is that transport is responsible for a high percentage of our national carbon emissions. If any significant headway is to be made in managing carbon emissions, transport is the obvious place to begin the search.

But despite the challenges of cost/service pressure and energy/carbon emissions, how is all this extra freight likely to be transported? On current trends the answer is clear: on our roads. Rail and coastal shipping will play a part, but unless big changes are made (and none of any consequence has been announced) road freight transport is set to burgeon over the next 30 years. This is especially true for the Auckland-Wellington-Christchurch corridor, which was once dominated by rail but despite the relative length of the haul which could be expected to favour rail, is now heavily dependent on road freight.

Although this road-dominated scenario is perfectly feasible it is in many ways deeply unattractive, presaging massive costly increases in highway construction and maintenance, stubbornly-high carbon emissions and liquid fuel dependence, and no prospect of significant relief on freight rates or transit speeds. This is all to the detriment of NZ's competitive international position and as a place to live and to visit.

There are many obvious advantages to the nation if much more freight went by rail, but wishing and hoping will not make it happen because there are compelling reasons why freight is increasingly carried on road: it is crucially more convenient and faster, and any price differential in favour of rail is not enough to overturn these advantages.

So if NZ is to achieve a worthwhile modal shift from road haulage, rail will need to offer significantly lower freight rates, faster delivery times and easier access to rail services – because without these shippers will not consider using rail. Currently, despite all its hypothetical virtues rail freight is simply uncompetitive. So is it a lost cause?

## Making Rail Competitive Again

Trucks and ships are getting bigger because that reduces operating costs. They are also getting significantly cleaner. But they do not have many options for increasing service speed – once the Roads of National Significance have bypassed the worst of the through-town bottlenecks transit speed will have peaked for both of these modes: ships are now slow-steaming to save fuel, and it is difficult to imagine heavy trucks travelling much faster than they do now.

Alone of all the transport modes rail has in recent years demonstrated the ability to make sharp improvements in speed, cost, capacity *and* emissions. How is this done? Simply, by making trains faster and much heavier. All over the world railways are finding ways to do this and there is no reason why it cannot be achieved here.

Not every train needs to run faster. The success of the Auckland-Tauranga container circuit shows that rail can be successful with a modest line speed even on a short-haul route, provided the traffic is point-to-point. But on the general freight routes there is a usually a need to road-bridge between a rail terminal and the customers, and to compensate for the time this takes trains definitely do need to be significantly faster.

The Turn-Around Plan argued that a reduction of 2½ hours was required on the Auckland-Wellington sector to make it competitive, and pointed to eliminating temporary speed restrictions (managing infrastructure issues) and realigning curves as the means to achieve it. Curve easement is a worthy activity, and whenever the track-bed needs rehabilitation the opportunity must be taken to consider realigning the steam-age curvature, as has been so brilliantly done on our highways. And naturally the level of speed restrictions needs to be carefully controlled and any wasted time ironed out of terminal operations. But much bigger time savings have to be found, and they will have to be affordable.

Just as with transit time, rail needs to become much more productive to make it possible to offer competitive domestic freight rates while still posting sustainable profits. Economy of scale is a traditional strength of railways but KiwiRail has found itself hemmed in by constraints, so as traffic rises it has to add additional train services, which means the cost base rises and the network loses resilience.

But there are ways to make step improvements to both transit speed and productivity.

## 1. Line Speeds

"Express Freight" trains have run at a maximum of 80 km/h in this country since the days of steam. Overseas, even on the same narrow track gauge, higher speeds are attained. On straight track this is easy - even KiwiRail's venerable DX and EF class locomotives are capable of running safely at 100 km/h, and the KiwiRail's new Chinese-built wagons are ostensibly designed for this speed. Provided wagons have adequate roll-damping and stable bogie characteristics and their centre-of-gravity is kept within safe limits, the only remaining issue is to carefully manage track geometry, especially "cyclic twist" which can induce wagons to roll and derail. In the longer term, programs to deepen, clean and properly drain the track ballast bed will make it cheaper to maintain good track geometry, but KiwiRail already has a substantial fleet of tamping machines and we see no reason why it cannot operate freight trains at 100 km/h on key routes within a short time of a decision being taken. There could be some areas where signal spacing is an issue but the next section identifies a solution for that.

However it is curve speeds that are the real villain in our leisurely rail transit performance. Curve speeds are dictated by the radius of curves but also by the level of cant (super-elevation) applied to curved track, and in NZ that has always been limited to 70mm. Cant cannot be increased willy-nilly because a wagon with an off-centre load, which has to stop on the curve for any reason, could topple inwards. Such off-centre loads can easily occur in general freight where a large number of items of disparate density are loaded in a container or box-wagon. But the solution to this is already in place: in-motion weighing facilities which can detect off-centre loads are sited across the rail network and provide excellent mitigation for this hazard. So we believe that an expert review will find that maximum cant can be safely raised and the curve speed policy revised, allowing for higher curve speeds. This will not only save time but also reduce brake-block and fuel costs incurred to slow down then accelerate out of each curve.

## 2. Train Braking

But the innovation which could revolutionise rail freight is electronically-controlled pneumatic (ECP) braking.

In NZ maximum train weight has always been dictated by crossing loop length, drawgear strength (which limits the number of locomotives which can be attached at the front of the train without ripping couplers apart), but increasingly, by the length of train that can safely be "serial-braked" down the longest and steepest gradients using the classic Westinghouse air-brake system. Because this brake cannot be partially-released, if a release is required for any reason (perhaps because speed was getting unnecessarily low, or the train had to stop and restart) a heavy train can reach an unsafe speed before the brakes are recharged enough to be re-applied. As a result some NZ freight trains tip 2000 tonnes, but the average is much, much lighter.

Electronics has come to the rescue and ECP-braked trains are now proliferating across railways in Australia, South Africa and North America. ECP braking does not suffer from a "recharge time" and can be partially released then reapplied repeatedly, or kept applied for long periods without "leaking off". At a stroke all the terrors of long gradients and runaway trains are banished, and as the drawgear problem is already being solved by the replacement or segregation of old rolling stock, ECP trains can be made much heavier and very much more productive.

And these big trains need not be slower; in fact consistent international experience is that ECP-braked trains run up to 10% faster. Because the brakes react instantaneously ECP trains "drive like a car" and once some experience has been gained drivers find they can save fuel or time, or a bit of both. And we can add to this safety and reliability benefits, and the facility for the ECP data cable to carry train "health" information (to advise the driver of derailment or impending bearing failure).

Another benefit is that the ECP cable can carry wired distributed-power (WDP) control commands, which allow locomotives to be sited in the middle or rear of very long trains. This practice allows trains to be made much longer without encountering the excessive curve resistance which would otherwise be caused by "string-lining" effect of very high combined drawbar forces on curves. Placing some of the locomotives further back in the train means peak drawbar forces are kept to a reasonable level. Without ECP this technology can still be deployed in wireless form but there are delays caused by coverage issues in cuttings and tunnels.

Finally, the instantaneous reaction time of ECP brakes means train emergency stopping distances are considerably reduced, so trains can be run faster within existing signal spacings.

So ECP really is a game-changer for rail freight. The drawback is that ECP and conventionally-braked wagons cannot be mixed within a train. This means dedicated fleet of ECP-fitted wagons must be kept segregated from the general fleet until the whole system has been changed over.

The replacement of the freight wagon fleet is well under way and it is to be regretted that ECP braking has not already been adopted by KiwiRail, as there will never be a better opportunity to introduce it than when a large number of new wagons are being introduced. But it is quite easy to retrofit wagons with ECP brakes, and once a proportion of the locomotive fleet is equipped to control ECP trains it would be easy to set up a circuit of bigger, faster trains on the critical Auckland-Wellington-Christchurch route using a dedicated ECP-equipped high-rotation wagon fleet.

Unfortunately even KiwiRail's newest locomotives have old-time all-pneumatic braking, as the change to electro-pneumatic systems has so far bypassed these shores. This greatly complicates the retro-fitting of locomotives to handle ECP trains - practically, all KiwiRail locomotives not slated for early retirement would need to be fitted with a more modern brake system, something that is long overdue.

## 3. Axle Loads

Increasing axle loads is a classic technique for reducing costs, as within the overall train maximum load the same amount of freight can be carried on fewer vehicles which reduces rolling stock costs and also means the train can be shorter, cutting infrastructure costs. Locomotives also benefit from being heavier because the tractive effort they can develop - and hence the weight of train they can haul up the ruling grade on a given route – is equal to the aggregate driving axle load multiplied by the effective adhesion ratio. This is where AC traction, able to generate 40+ % adhesion, scores over DC traction which can rarely exceed 26%. But sheer weight plays an equally vital role, and an AC-traction locomotive of 132 tonnes is around 80% more capable than a DC-traction locomotive of 108 tonnes, such as are currently being delivered to KiwiRail.

KiwiRail's major routes have an axle load limit of 18 tonnes, although large numbers of wagons built for a maximum of only 14 tonnes are still used, and when heavy containers are presented for carriage the wagon must often carry a reduced number of containers to stay within gross weight limits. This drives up the tare weight of the train for a given load, and reduces the useful load that can be fitted onto a length-limited train. Containers vary widely in loaded weight but are gradually tending to increase as shippers work to extract the best value for their freight dollar.

KiwiRail's new wagons are designed for 20 tonne axle loads, but are not permitted to exceed 18 tonnes yet. The new locomotives coming into service weigh 18 tonnes per axle, much the same as the legacy DXB and EF class locomotives from the 1970s and 80s. Replacement bridges are being built to higher figures on the sensible assumption that axle loads will be raised at some time during their 80-year lifespan. New track components (rail and sleepers) are now being bought which will also support heavier axle loads in future.

Axle load is not directly linked to track gauge, although narrow-gauge railways face stricter limits on centre of gravity height and this means there may be less to be gained by moving to higher axle loads, because height limitations imply the length must be increased, which in turn can be difficult to accommodate on a heavily-curved rail route. But Aurizon (formerly Queensland Rail National) already operates 26 tonne axle loads on the same 1068 mm track gauge and a similar structures clearance gauge to New Zealand, so 25 or even 30 tonne axles appears to be quite feasible in this country in the near future. By comparison, 25 tonnes is a typical current figure for "general freight" railways using the international standard rail gauge of 1435 mm, with many of these railways now looking to raise this to 30 tonnes. Green-field "heavy haul" railways, with world-leading economics, utilize axle loads of 40 tonnes or higher, also on standard gauge, but at the safe limits of current materials and technology.

KiwiRail is believed to be working to enable 20 tonne axles on the Auckland-Tauranga route but has not announced any plans to exceed this figure or extend its scope. So it needs to put a program in place for implementing 25 tonne axle loads on all main routes, and to align its rolling stock

replacement strategy around that program. Buying large numbers of locomotives and wagons limited to 18- and 20-tonne axle loads is short-sighted and will leg-rope its productivity for decades to come.

## 4. Route Clearances

Like axle loads, the clearance (or structures) gauge can be improved only with some difficulty. Once bridges, tunnels and passenger platforms are in place it takes significant investment to overcome the bottlenecks that they create.

Increasing the clearance gauge goes hand in hand with higher axle loads because it allows more freight to be loaded on each wagon and this improves the overall economics of freight transport. But as already noted bigger freight loads fall foul of the need to keep the centre of gravity low for stability on the narrow NZ track gauge, something that is never likely to change. So we are not going to see double-stacked containers or double-deck passenger trains in this country, but there is scope for a modest increase in maximum load height and width.

Some years ago an aspirational standard was devised of 4 metres high (this is the height above rail: the height of the wagon deck must be subtracted to give the height of the actual load) and 3 metres wide, and steady work towards this means that heights of 3.9 metres are now allowed over much of the rail network. The immediate priority for intermodal freight is to be able to carry 10ft-high containers, and without resorting to well-deck wagons or (more expensive) small wheels this implies a height clearance of 4.2 metres. The Auckland suburban network has now been redeveloped to this new standard which incidentally allowed the new electric trainsets to be made taller and more spacious, and this standard should now be implemented over the entire freight network.

Sometimes increased height clearances come with the proviso that the top corners of the load be tapered to avoid tunnel curved roofs and the like. This cuts the cost of the clearance improvement work but it badly restricts the (typically palletised) loads that can be fitted into a box wagon or container designed to fit inside it, and is a delusion.

Because road transport has severe width restrictions, there is less pressure to widen the rail clearance gauge unless longer wagons are in prospect: longer wagons need wider clearances to negotiate curves and also more ground clearance to negotiate the rail ferry link-span. Although KiwiRail is currently buying 2½ TEU[1] wagons in quantity it already has a fair number of 3-TEU wagons which are better suited to line-haul container traffic, with the only real drawback being that if 6-metre containers are largely supplanted by 12-metre containers, a 3-TEU fleet will have many empty 6-metre slots.

A hypothetical 4-TEU wagon would not suffer from this problem and could utilise a higher axle load to reduce costs. It is perhaps a feasible proposition, but achieving enough structural strength and stiffness to carry such heavy loads with an acceptably-low deck height would be a real design challenge.

Alternatively, KiwiRail could adopt multi-deck wagons, which have several shorter (12-metre) decks spanning across shared bogies, and so achieve higher axle loads with easy curve and under-belly

[1] TEU: twenty-foot equivalent unit – the most common container size, approximately 6 metres

clearances. They can carry any combination of 6- and 12-metre containers, and also offer lower manufacturing and maintenance costs because the couplers and brake equipment are shared by 4, 5 or 6 decks. This configuration is also most compatible with a "well-deck" arrangement, which allows shorter but taller loads in a low deck stepped down between the bogies. So although they don't make sense on existing axle loads, such multi-deck wagons appear to be a good option for the NZ rail system once 25-tonne axle loads are a reality.

## 5. On-Board Fuel Economy and Train Control Technology

There are many "bolt-on" electronic systems in the marketplace to enhance locomotive operations that the challenge is how to choose those which can be integrated most easily and which will not create an electronic jungle too complex to use and maintain to be of practical use. Two which combine particularly well and give a good mix of benefits are fuel economy advisers and autopilot-like navigation systems.

Fuel economy advisors have matured in recent years and there are several commercial systems on the market. They analyse the route ahead and the characteristics of the train then give advice on when to increase or reduce power - or coast or brake – to minimize fuel use while meeting the timetable schedule. This is far from a trivial matter as trains get longer and the front of the train can be climbing a grade while the tail is descending the previous one. Keeping track of the several curve speed limits that the train may be negotiating at any one time would tax the most analytic driver. Fuel economy systems perform these calculations and provide the driver with clear advice on a display together with a moving map of upcoming curves, grades and speed restrictions. KiwiRail is on the point of adopting this technology which has shown fuel savings of >20% in many in-service demonstrations.

On-board train control systems are intended not to advise the driver of speed restrictions but in the interests of safety to enforce them, along with the limits of the current "authority" or track warrant, or in signalled areas, to ensure s/he stops safely at a red light. Some systems go further and drive the train autonomously but most railways believe it is better in the interests of crew alertness and responsibility for the technology to act as a back-stop only. Control systems of this type offer greatly reduced risk of collisions and rollovers. In addition, in dark (un-signalled) territory, they can increase the tempo of operations by downloading new track warrants without requiring the driver to stop the train and transcribe a new warrant.

These systems vary widely in cost. The gold-standard European ETCS now being installed in Auckland metro system but is far too expensive to contemplate for the freight network. We believe that by piggy-backing off the IT infrastructure put in place for the fuel economy advisory system a bespoke navigation/enforcement capability could be added to the current event recorder/vigilance system at a small fraction of the cost of ETCS or its North American counterpart PTC.

Because these two classes of system use a similar driver display and rely on identical track data files (which must be quickly and reliably updated whenever temporary speed restrictions are imposed, for example) there is a compelling case to integrate them and KiwiRail is urged to follow this approach.

## 6. Fuel Usage, Carbon Emissions and Electrification

It is commonly acknowledged that rail freight uses at most 25% of the energy required by road transport to perform the same task. So merely by enabling a modal shift from road to rail, an enlightened transport strategy could make deep cuts in NZ's fossil fuel dependence and carbon emissions. But by joining the worldwide trend to electrification even greater gains could be made in emissions and energy-use. Electrification achieves this by effectively recycling braking energy and by diversifying the energy sources that can be used. It also contributes to faster freight services by utilising the high short-term power rating of electric locomotives to cut acceleration and grade-climbing times. In recent months Ireland, Latvia, Denmark and Israel have announced large-scale electrification programs. None of these states has money to burn but are convinced by the business case for electrified railways. When so much research is going in to develop workable electric cars it is ironic that railways have a cheap, tried and tested technology for cutting loose from liquid fuel dependence, yet it is not being considered.

Now that Auckland Transport is actively considering extending the electrified network down as far as Pukekohe the case for "closing the gap" to Hamilton is compelling as it would eliminate the time-wasting locomotive change at Te Rapa and improve locomotive fleet utilization. The East Coast Main Trunk with its heavy freight flows is also a prime route to be electrified. The industry has excelled itself in electrifying the Auckland network and in completely refurbishing the Wellington electrification system (after a good 60 years of use), and it would be wasteful to allow this capability to dissipate when there is more to be done. And although electrification typically requires renewal of signalling systems, re-signalling costs have reduced sharply in recent years.

The new generation of international electric freight locomotives incorporates "last mile" low-power diesel auxiliary propulsion. This means that electrically-hauled trains can be placed directly into non-electrified sidings and container transfer terminals (which for safety reasons cannot have overhead wires) without having hand over to diesel shunting locomotives, saving time and money.

They also feature AC-traction technology of course, and can take advantage of improvements in the track to be made a little heavier and 50% more capable than the current KiwiRail EF class, which have done excellent work for 20 years on the North Island Main Trunk but whose "teething problems" were never properly resolved.

## 7. Other Productivity Improvements

There are many other technological improvements coming into service around the world and ripe for deployment in this country, such as -

- Affordable automation for rail terminals allows bigger trains to be handled quickly and safely with existing yard crews;
- AC traction technology (rejected for KiwiRail's new Chinese-built locomotives) means 2 new locomotives could do the work of 3 while improving reliability and cutting maintenance costs;
- Automatic wagon park brakes obviate the need to walk each train to apply and release each one manually;
- Automated way-side machine-vision inspection facilities accurately inspect key components of wagons passing at full line speed, making trains safer and reducing inspection costs;

- New wheel profiles have been developed to reduce wheel and rail replacement costs and save yet more fuel;

– the list is extensive and is growing all the time.

All this shows that Rail is sitting on considerable untapped potential to reinvent itself and enable it to offer the business community faster and cheaper freight services. With just the measures outlined we could see freight trains of 3000 and (once some loops and terminals are lengthened) 4500 tonnes, running 3 hours faster over the Auckland-Wellington route that is the key to KiwiRail's future relevance. As freight volumes increase, instead of running more trains KiwiRail would merely lengthen each train, keeping the timetable simple and robust and labour and capital productivity rising.

## Making Rail Services Accessible

Nothing matches the convenience of a truck pulling up to a freight loading dock. Using rail involves road-bridging freight from the customer to a public freight yard or container–transfer facility, or investing in and servicing customer rail sidings. Either of these takes time, money and logistic effort which count against rail.

There are upsides for the road network if freight is taken directly between factories, warehouses and ports by means of rail sidings. The national transport strategy can promote this by zoning industrial development where direct rail services can be provided economically, and by ensuring ports have good rail access.

The rail network in NZ already goes to the places it needs to. And it could carry many times the current freight volume with very little impact on land use and the NZ way of life. All that is required is some development of freight terminals and lengthening of crossing loops - the upgrading of main trunk routes for the foreseeable future can be done within existing rail corridors.

The wider issue of "open access" to the rail network cannot be treated as *tapu*. Rail, like the National Grid, is an integrated monopoly network, and so clearly it needs to stay in public ownership and in the same way as the Grid, the fibre-optic network and the highway network, be available to many users. This does not mean that all trains must be operated by the Government. In fact Auckland, Wellington and Otago regional councils all operate train services on the national network now, and there is no reason why other parties cannot do so as well.

To be precise there are reasons, although none of them are insuperable. It is a difficult and expensive business setting up a railway operation not only because rolling stock is costly, but because of the time and cost involved in the development and documentation of the required "safety case" including detailed operating instructions, engineering codes and standards, and training syllabi and certification processes. Railways cannot operate safely or effectively without these any more than airlines can, but because each rail operator is currently expected to develop its own they are a powerful disincentive to anyone thinking of starting a railway. Add to this the need to create a network of suitable terminals and loading facilities, and maintenance depots and workshops and the barriers to entry become prohibitive unless you have a very great deal of freight to carry and a very patient investor.

So the default position is that only publicly-sponsored rail operators can survive here. How could this be changed so that entrepreneurs can realistically enter the rail freight market, at least on branch lines where KiwiRail cannot make a profit and wants to exit?

The answer is to lower the barriers to entry so that running a railway is a lot more like running a trucking company or a feeder airline. This would clearly require the Network Provider to be structurally segregated from the incumbent operator as a starting point. The network provider can then take steps to support new entrants by providing "packaged" operating procedures, codes and standards, by offering fully-maintained rolling stock on lease, and by offering access to key rail and maintenance facilities. This is the approach being taken across Europe and in Australia, where some rail freight terminals are now operated by independent franchisees precisely so that start-up operators can have fair access to them. In recent weeks such diverse administrations as Turkey and China have announced plans to break up their monolithic railways and implement a similar segregation.

KiwiRail Freight would not even need to be privatised to make sense of this scenario. But at least it would be free to become a fully commercial operation, and this we see is the key reason supporting the "open access" scenario. It would be able to respond to market conditions and commercial pressures without the paralyzing responsibility of planning developing and funding the national network. Adding into the mix the possibility – however theoretical - of the appearance of competing operators must result in concentrated thinking and an even better outcome for freight customers.

And certainly in areas where KiwiRail is struggling to make a return (the Gisborne and North-Auckland lines for example) low-cost feeder operators could step in and play a role analogous to the Air New Zealand Link airlines.

## Why Rail Went Wrong

Time and technology march on, and some believe that like canals rail is entering the evening of its life. But across the globe the opposite is happening: railways are being built and modernized at a frenetic rate even in this sustained economic downturn.

This makes the failure of KiwiRail to stay afloat in the long-haul general freight market so striking that it is instructive to identify the wrong turns which have led to its eclipse. Yes our population density and level of industrialization is low, but our long, thin geography should favour rail, shouldn't it? We have identified 4 wrong turns from which we can learn much.

### 1. Technical Eclipse

To quote John Winner, railways in the 21st Century will be saved by their engineers. No matter what management energy and commercial nous is applied, sustained commercial success depends on unrelenting productivity improvement, and the application of modern engineering techniques to the fundamental railway "conveyor belt" is spawning in our time an array of opportunities which are revolutionizing railways.

But not in New Zealand! Having been early adopters of concrete sleepers, welded track, rail ferries, containerization, single-crewed freight trains and so many other revolutionary changes in the 1970s, 80s and 90s, the spirit of innovation has departed. Only in IT is there any discernible progress in

railway operating doctrine, and even that lags behind international "best practice" as regards on-board freight trains.

The upshot is that the cost, speed and convenience of moving freight on rail has stagnated, and that is a sure recipe for commercial failure. Trucks are getting bigger, faster and cleaner every year, and ships also. Rail in contrast has opted out of the technology race, as if the world stopped turning in 1990. Why?

Railways have an in-built inertia caused by the complications of maintaining compatibility with what already exists, and the sheer difficulty of imposing change on a complicated and tightly-integrated system which militates against any kind of change. So no deliberate decision needs to be taken to stop the march of progress – this is simply what occurs when the drive for change falters for any reason.

But there was in fact a deliberate decision to subordinate engineering to commercial and operating management within the NZ rail organizational. This was done with the noblest of motives: to save the railway from "over-engineering" which was held responsible for gold-plating the railway and saddling it with unsustainable levels of debt. This is always a danger, but it had the effect of leaving the industry short of strategic thinkers with engineering expertise just when the need to modernize has become inescapable.

So a perspective on this failure might be that rail abandoned the capability of consistently raising productivity fast enough to stay in the running with competing transport modes.

## 2. Failure to Monetize Public Benefits

Investment in roads these days is backed by a comprehensive analysis of benefits to all involved parties, including such "public good" benefits as wasted personal time, the social cost of accidental injuries, and the value to citizens of improving air quality. In contrast it has been well established that rail investment with few exceptions must show a cash return on investment to the rail company, a far more challenging hurdle. This has had the effect of depressing investment in rail, which may have played a part in its progressive technical obsolescence described above. Road investment has been very healthy, and road transport productivity has risen as a result.

A well-performing railway offers enormous benefits to the wider population, and given that the rail network and even the commercial freight operation are once again publically-owned, it is time that a mechanism is found to routinely include all costs and benefits in rail investment decisions. This would be perfectly normal if planning was in the hands of a publicly-owned Rail Agency, modelled closely on NZTA and focussed on creating a sustainable and successful rail network on which freight operators have a chance to prosper. In this scenario it is conceded that the technical agenda is likely to be driven by the Agency, although mechanisms to engage operators in strategic planning consultation would be important.

## 3. Abandoning Private Sector Involvement

There may have been no other obvious way forward, but the re-nationalization of Toll Rail was a step in the wrong direction and a black mark against those responsible. Governments local and national are absolutely right for owning and managing monopoly infrastructure such as roads,

telecommunications networks, water supply systems and sewerage systems, but they are not good natural owners for risky commercial enterprises. Having done the hard work to privatise the operating railway how did this U-turn come about?

Following the take-back of rail infrastructure (in the form of Ontrack) from Toll the two parties were unable to come to an agreement on rail access charges. Negotiations dragged on until the government of the day blinked and bought the whole thing back to resolve the issue. By doing this they gave up right at the point of achieving a stable and rational arrangement for the industry which would have served it well for the future. But now we are back in the position of the Government owning a large commercial transport organization which is in the uncomfortable position of competing with honest hardworking trucking companies while being supported with public-sector hand-outs whenever it needs them.

Many people rightly mistrust this arrangement, but paradoxically it does not actually help rail precisely because ministers are loathe to be seen as providing too much taxpayer support and appearing as socialists in a centre-right government.

The Ontrack-Toll Rail was close to ideal, with the Government protecting and managing the infrastructure on behalf of the nation while the private enterprise was free to do what it does best. The only flaw was that the vital rolling stock assets were in private hands and therefore still vulnerable to being "run down" in the quest for short-term profits. Whereas a truck can be bought or leased in a matter of days the acquisition of new railway rolling stock, like rail infrastructure with which it is technically so closely intertwined, is a long-term project and surplus equipment is not easily passed between different systems. Larger countries have a rolling stock "market" which makes equipment available to operators on short or long-term lease arrangements. Some of these leasing companies are privately-owned and some are public bodies. In either case they specialise in asset management and allow operators to get on with the job of servicing freight customers and adapt to market conditions while guarding the industry against worst effects of the hardship or collapse of any particular operator.

In New Zealand such a market will not emerge in the private sector in the short term, so it makes sense for the Government to place its considerable holdings of rolling stock within such a body and to turn the operating divisions of KiwiRail (Freight, Tranz Metro and Inter-Island Line) into genuinely commercial enterprises.

## 4. The Turn-Around Plan Went Straight On

In the face of these structural issues and against all the political odds the Turn-Around Plan appeared. Jim Quinn at the head of KiwiRail was unexpectedly successful in gaining support from the National government for a heroic last-ditch effort to make rail relevant in the modern era. Even when the Global Financial Crisis hit and it would have been so easy to abandon the plan, funding commitments were honoured by National to give KiwiRail a fair chance at long-term self-sustainability.

But was it ever an achievable plan? With the benefit of hindsight we can spot the problems. The emphasis was on replacing old assets and increasing freight capacity, and both of these things certainly needed to be done. But the glaring omission is for any great change in the way KiwiRail

does business, and there was little cognizance of the need, or the abundant opportunities, for big and on-going improvements in productivity. As a result the "turned-around" railway will be heading in much the same direction as the old one, and the Turnaround Plan has really only put off the inevitable for a few years.

Was this because the scale of the required change was assessed as being out of reach? We prefer the simple explanation that rapid successive changes of senior management had left KiwiRail without enough savvy to correctly identify the underlying issue: rail's inability to compete in the freight market without faster, cheaper and more accessible freight services, and how this could be rectified.

## Putting It Right: A Strategy for Rail Freight

The Turn-Around Plan seems to have been content to hold onto hold rail's current minor market share, but we believe that the best interests of the taxpayer, the freight customer and the road user all demand a substantial lift in the role of rail in inland freighting. By making trains faster and much heavier rail freight can become a real force and play a more central role in NZ's freight task, but this will only happen if a national transport policy is crafted which takes proper account of what rail could be, rather than what it is. How will this come about?

The MOT advises the Minister on transport policy, but both these parties are reliant on KiwiRail to make the case for what is possible in rail terms, and it seems that KiwiRail's initiative has failed. The NZTA is articulate and successful in developing the road network but is at best passive towards rail, and expecting one agency to master the art of articulating the case for these quite different and often competing modes is not realistic. So the rail industry has no influential and far-sighted advocate in NZ. How then is it to step up and take its proper place in an integrated land transport strategy? We list 4 key changes that will make the difference.

### 1. Segregate Infrastructure from Commercial Operations

The rail industry must be reorganised so a public-sector body plans, manages and funds the national rail network and provides fully-maintained rolling stock for lease by rail operators. This role along with ownership of all the strategic rail assets needs to be decently separated from the commercial rail operator/s. The Engineering and Infrastructure arm of KiwiRail can be combined with the NZ Railways Corporation (owner of the rail corridor land assets) and the rail section of NZTA (which licences the many rail operators), and the whole set up as the NZ Rail Agency, charged with managing the country's rail network on a sound and sustainable basis and making it available to commercially-focussed Operators via an affordable rail-user charging regime.

The possibility of private sector involvement in rail freight services must be opened up. This will be particularly relevant to minor lines where KiwiRail cannot operate profitably, but where a budget operator can provide services much in the manner of Air New Zealand Link. Successful trucking and logistics companies are well able to take on the challenge of operating railways if relieved of the responsibility of owning and developing the national network and if provided with a ready-made pathway through the thickets of safety cases and the obscurities of rail technology - witness the mighty railways that have been built by mining companies in Australia, Brazil and Indonesia.

So let the NZ Rail Agency provide technology, safety procedures and staff certification so all operators can easily avail themselves of highly-productive equipment and standardized processes, more like what we see in the air and road transport modes.

In this new regime the Minister has two levers to work with in managing the inland transport industry: the relative setting of road-user and rail-user charges, and the relative investment levels in road and rail networks. The Ministry of Transport stands ready to provide the Minister with expert neutral advice on these matters.

## 2. Make Auckland-Christchurch Domestic Freight Viable

A substantial modal shift to rail on the Auckland-Wellington-Christchurch corridor is a major opportunity and would give startling benefits to the rail industry and to the nation as a whole.

The introduction of ECP train braking , increasing maximum train size from around 1500 tonnes to 3000 then 4500 tonnes, and increasing line and curve speeds by around 20% represent a generational opportunity to revolutionise rail freight productivity and service quality.

At the time of writing Israel has announced plans to double its rail freight capacity and increase rail's domestic container market share from 8% to 25%, by 2020. In so small a country this is a reminder that rail is not just for long-haul freight. And the new Turkish national rail operator Turktren hopes to move into profitability while multiplying rail's freight market share by *5 times* by 2023.

And KiwiRail's outrageous success in the short-haul high-cycle Auckland-Tauranga container trade proves a point: does anyone now believe all that traffic should be carried on road? And would we not say the same once the main trunk became equally successful?

## 3. Invest in substantial improvements to the rail network

The NZ Rail Agency would be expected to set new technical standards for main rail routes with the aim of substantially boosting the productivity of rail freight operator/s. These standards will include such things as 4.2 metre height clearances, 25 tonne axle loads, extended electrification, and longer crossing loops, arrival/departure roads and container-transfer facilities to handle big increases in rail freight. By using comprehensive cost-benefit analysis the Rail Agency could make a much more convincing business case for investment in rail and then create efficient programs to set about delivering these pivotal network improvements.

Planning processes must encourage easy access to rail services. Directing the Rail Agency and Regional Authorities to work together could make regional transport planning even more rail-friendly, ensuring all ports and new industrial parks, logistics centres and population centres are sited where they can be conveniently connected by high-capacity rail as well as road links.

## 4. Refocus Rail Ferries on Freight

By spinning off the Inter-Island Line business unit but retaining ownership of rail-ferries with the Rail Agency the government can exit the fluctuating shipping market with dignity, yet keep vital assets in public ownership.

The replacement vessel for Arahura can be dedicated to freight by running to a schedule based solely on the needs of rail freight and having a small crew and low running costs.

## Targets for Change

We do not advocate pouring more money into the railway sink-hole and hoping for a better result. Based on the innovations outlined in this paper we claim that the following specific targets for rail freight, although challenging, are perfectly achievable by 2023 -

- Increase average transit speed on key routes by 20%
- Reduce real freight rates by 20%
- Increase rail freight NTK by 100%
- Reduce energy consumed per NTK by 20%
- Become the dominant player on the Auckland-Wellington-Christchurch general freight route.

Yes, investment is required and this is going to have to come from the public purse. We believe that an investment of the order of $NZ 2B would be sufficient to bring this about, offset by rail access charges.

If the alternative is the commercial demise of rail in NZ triggering an orgy of road-building, this will be a nation-saving investment.

## Conclusion

We are heading down a path of remorseless increases in transport costs, transit time, and the social, economic and environmental impacts that will inevitably flow from our increasing reliance on road freight. Carbon emissions per capital will increase. There will be a scramble to build new road links and a struggle to maintain those that exist.

Or we can choose to divert a modest slice of this future spending to create a modern and progressive freight railway industry. It is not our intention here to discuss how much of the development spending could be domestic, supporting local employment and technology growth.

Lower real freight rates, faster services and major capacity increases are within easy reach, coupled with reductions in energy, emissions and liquid fuel dependency, and all this with reduced impact on land usage.

The man in the street knows that “heavy freight belongs on rail”, but the rail industry is broken and is letting the country down. To support New Zealand’s development as a prosperous and liveable society a very different rail industry will be needed. Can we summon the vision, the will and the leadership to make this happen?