
Rail Infrastructure Strategy Review - Summary

Prepared for
Infrastructure NSW

11th April, 2012

Executive Summary

Introduction

- Interfleet Transport Advisory has been retained by Infrastructure NSW (INSW) to advise on potential ways of optimising the performance of the CityRail network from an infrastructure investment perspective.
- This presentation summarises that advice, which has been further shaped by meetings with key NSW government stakeholders during the week commencing 12th March 2012.
- Much of our advice is consistent with current Transport for NSW (TfNSW) initiatives, including the Network Efficiency Plan and the draft Long Term Strategy (which was reviewed as part of this work).
- However, we believe that there are opportunities for incremental actions to be taken to improve capacity in the most heavily trafficked areas that would allow the \$5 billion CBD Relief Line (and the harbour crossing) to be deferred for 10 years or more, and that this approach can provide material service improvements at relatively low cost (i.e. it offers better value for money, noting also that these major capital investment projects are not deemed affordable over this timeframe).

Introduction (continued)

- We therefore recommend that for the next 5 years the focus should be on the operational improvement and reform agenda, along with improving the "customer experience". Over time, this has the potential to generate a greater "willingness to pay" within the community, and thus provide the foundations for a virtuous cycle of investment and improvement.
- We would welcome the opportunity to engage with TfNSW and further develop plans along the direction we indicate in this report.

The position to date

- The draft LTRS (phase 5 report) highlights the list of strategic planning and operational reviews which have sought to shape rail's future in NSW since 1989.
- What typifies all reports to date is the centrality of big infrastructure solutions to the problems of growth and planning. In spite of continued predicted population and demand growth, we see this desire to plan and construct large rail projects as problematic, since:
 1. Concentrating attention on developing and promoting these solutions has allowed the necessary process of reform of CityRail operating practices to be deferred;
 2. The incremental steps that can be taken have not yet been implemented or assessed for impact
 3. The sensible integration of public transport modes, fare structures and ticket media has taken a back seat to big infrastructure at a time when Sydney is clearly falling short of international good practice in this area; and
 4. The technical, financial and operating risks associated with these larger schemes are yet to be fully understood but have, until recently, been pursued as an immediate priority.

The position to date (continued)

- We remain further concerned about the nature of the solutions since:
 1. There is a reliance on relief and duplication of crowded routes instead of developing networks;
 2. There has been a reluctance to demand critical appraisal of the assumptions that cause certain schemes to be promoted. In particular we are concerned at the “Reduced Reliability” concept in the Base Case that would halve the BCR of the incremental options if removed;
 3. Investments tend to form a package of indivisible solutions that must be brought forward in a pipeline rather than a pool of flexible solutions that can be brought forward as necessary; and
 4. The capex cost to facilitate an incremental peak passenger movement in the 2036 Base Case is ~\$95k. For LTRS Phase 5 options this rises to \$280k upwards for each further passenger.
- Finally, we have seen no historic appetite for tackling the enormous existing operational subsidy levels to free cash for investment. We calculate that the subsidy for South West Trains (a similar scaled UK rail operation) is approximately 60c/passenger journey compared to the CityRail subsidy of some \$6/passenger journey. There are two reasons for this:
 1. A profoundly inefficient operation, well documented in LEK’s June 2008 report; and
 2. A low fare base (for a developed global city) and consequently weak price differentials make using ticket prices as a market signal ineffective ‘like pushing on string’.

Realising change

We believe that there are immediate and practical steps to achieving a transformation in network performance that defers big infrastructure investment until the optimal time in the future whilst creating a virtuous circle of improvement to support investment. These steps comprise:

1. Making best use of station and track assets:
 1. Refining service patterns to reduce waiting time on platform,
 2. Better crowd and flow management to keep dwell times consistently low,
 3. Implementing modern signalling to increase capacity in the core route at an affordable price.
2. Creating a path to a new 2031 Plan which fully exploits the existing network by:
 1. Acknowledging the underlying logic of sectorisation and many of the building blocks of the 2031 Long Term Rail Strategy without pursuing the CBD Relief line until properly appraised against our more dynamic base case,
 2. Develop and deliver a high capacity, high frequency mass transit concept ('Metro-style') between Hornsby and Liverpool/Epping (via Strathfield),
 3. Providing over-crowding relief by using more of the relatively under-used assets of the City Circle and the interchange stations at Hornsby, Epping and Chatswood,
 4. Moving to single-deck trains that optimise load/unload times consistent with world practice, combined with Automatic Train Operation (ATO) in the core route.

Realising change (continued)

3. Asserting a powerful customer vision and encouraging a service-driven rail system where Sydney-siders want to use rail and are prepared to pay a fair fare for their journey with:
 1. An attractive off peak service along key corridors,
 2. Competitive discounts for multi-mode and off-peak tickets,
 3. Compelling network journeys through non CBD interchange,
 4. A proper price for a ticket to those who use scarce peak capacity.
4. Re-structure to create smaller, effective management vehicles to demonstrate the value of sectorisation e.g. separating the Illawarra/Eastern Suburbs services from the rest of the network - followed by the other high capacity operations.
5. Create solutions that release the power of driven yet accountable management teams – using a mix of performance incentives, franchising, and ultimately privatisation as a force for further cost efficiencies in the system.
6. Contract a customer service culture that drives up the latent demand in the system freeing cash for future investment.

Main Report Summary

The remit for the review

- Interfleet Transport Advisory has been commissioned by Infrastructure NSW to develop and test a hypothesis that a private franchisee might propose an efficient long term rail strategy. This review has been undertaken in light of strategic option studies by RailCorp and Transport for NSW (TfNSW) as part of their preparation of a Long Term Strategic Plan for Rail which, as part of the TfNSW Transport Master Plan 2031, is due to go to public consultation in 2012.
- The objectives of the report are to:
 1. Produce a network-wide train operating plan for 2031 (peak trains per hour by sector) that:
 - Optimises use of existing assets – meeting capacity requirements whilst avoiding (if at all possible) multi-billion dollar investments in new track capacity,
 - Integrates / connects the NWRL in the most effective way, and
 - Improves network-wide customer service outcomes (particularly speed and frequency).
 2. Set out short, medium and long term change agendas, including:
 - Customer-focussed “quick wins”,
 - Operating efficiency plans, including revised staffing requirements and savings to taxpayers,
 - Staged transition towards the longer term network operating plan, with approximate timing of service changes and major investments and high-level assessment of implementation risks, and
 - Strategy for managing PPP risks – addressing lessons learnt from UK & Victoria experiences.
 3. Through the above, enable INSW to play a leading and positive role in the further development of the Long Term Strategic Plan for Rail (via the Transport Master Plan process)

Background trends and future plans

Growth projections

- Over the last decade investment in other transport modes (motorways) has kept back growth in rail patronage - and the appetite of the railway to attract new customers.
- But rail is growing steadily, putting pressure in particular on services to the CBD, and over the next 20-25 years patronage is expected to grow by some 50%.

Resources employed

- Over the last five years staff numbers have risen at more than 3% per annum and salary costs by some 6% per annum,
- Costs per passenger journey are also rising, suggesting declining productivity, and yet fares have been static.

Cost recovery

- This is less than 25% compared with over 50% in New York and Montreal.

Capital investment

- Investment has also risen dramatically over the last few years to some \$1.5 billion per annum. Were current plans under the LTRS to be approved, the capital requirement would remain at or above this high level annually for the next 10 years and more.

LTRS options and their appraisal

- All options under consideration by TfNSW assume that the construction of the CBD Relief Line is a necessity.
- No options have a benefit/cost ratio of more than 1.0, suggesting at best poor value, although appraisal work is incomplete.
- The appraisal for such a major programme would normally include other transport interventions for comparison.

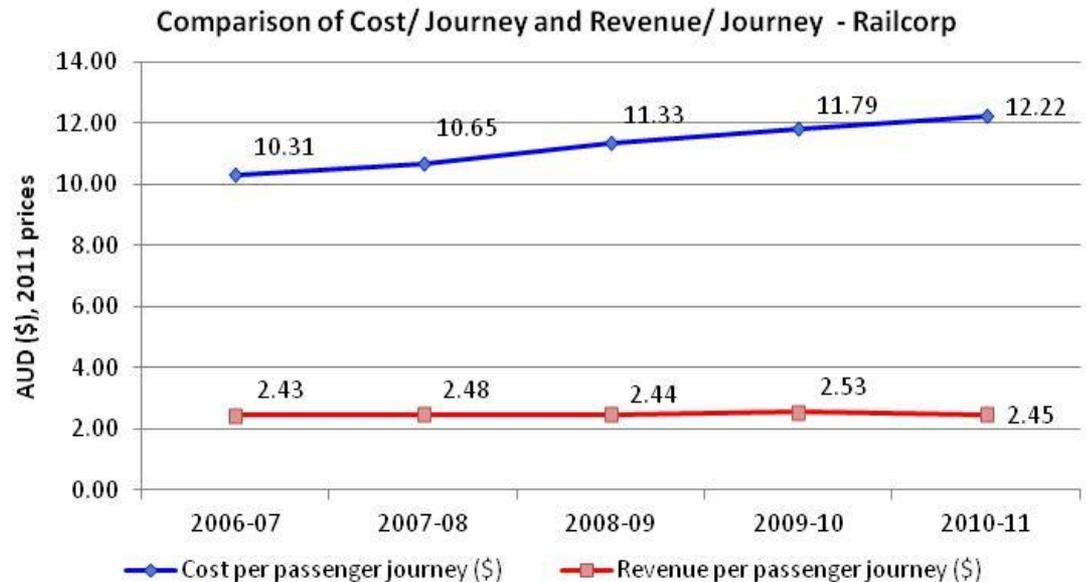
Trends in operating cost & revenue

Operating Cost/ Passenger Journey

Based on data obtained from the Annual reports, we have been able to plot the trend for costs/ journey for RailCorp converted to 2011 prices.

Costs/ journey (including fixed and variable costs) have continued to rise steadily over the last 5 years suggesting that productivity has not improved, but declined.

The revenue per journey however remained more or less the same during this period, showing a decline in the cost recovery from passengers over the 5 years reviewed from 23.6% in 2006/07 to 20.0% in 2010/11.



Notes:

The cost, revenue and journeys data used in the calculation above include both CityRail and CountryLink journeys.

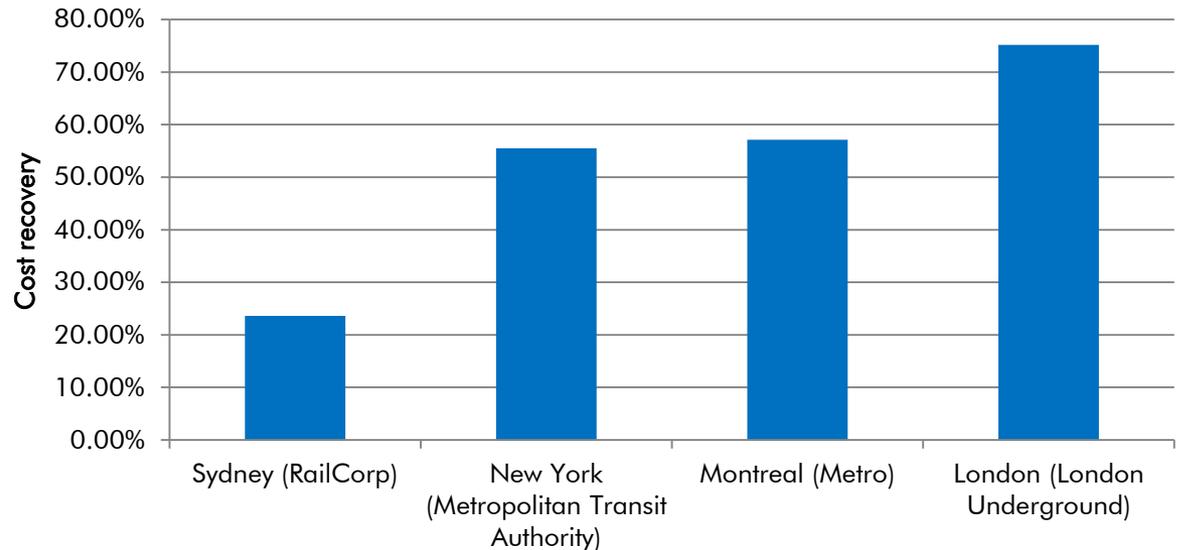
Costs are measured as operating expenses (including depreciation).

Benchmarking - Cost recovery

From our benchmarking analysis of the percentage of operating expenses recovered from users in fares:

- RailCorp recovers less than 25% of its costs from users – requiring over 75% as subsidy by the taxpayer.
- This is less than half that of major comparators such as New York MTA and Montreal Metro.
- It is only a third of that achieved by London Underground.

Benchmarking of cost recovery for rail and metro systems



Operating subsidy is some \$1.7 billion/annum; reducing that will depend as much (or more) on achieving savings in variable costs as it will on increasing revenues.

Sources:

RailCorp (2010), 2009-10 Annual Report;
Transport for London (2010), Annual Report and Accounts, p.122;
Societe de Transport de Montreal, Annual Report (2006-7 figure)
Metropolitan Transport Authority, 2009-10 Annual Report.

Project appraisal- LTRS phase 5 options

- Economic Appraisal of infrastructure projects is a vital tool used by planners and governments worldwide to determine if investment is likely to yield adequate returns given budget constraints.
- It is particularly useful for large capital cost projects such as transport infrastructure where a number of alternatives between modes and specific development options for a selected mode need to be tested and ranked for funding, in line with overall policy objectives.
- It is usual for investment decisions to be based on the outcome of an economic appraisal that maximises the benefit between projects and for various permutations of the same project.

The key findings of the strategic economic appraisal for all the LTRS Options was undertaken are as follows:

Option	BCR	IRR
MREP	0.6	4.1%
Suburban- West Link	0.9	6.1%
Suburban- Sector 5	0.4	2.4%
Customised 3 Tier services	1.0	7.1%
Modified 3 Tier	0.6	4.5%
Harbour Link 3 Tier	1.0	7.0%
West Link 3 Tier	0.8	5.4%

Source: Strategic Economic Appraisal, LTRS Ph 5, PwC, Aug'11

Notes:

1. All LTRS options other than the Base Case include the \$5 billion CBD Relief Line.
2. None of the options offers a BCR greater than 1, which is the usual criterion for project selection.

Network structure and capability

- Sydney's rail system has developed as a single entity, without the tiered network of infrastructure of many world cities.
 - It lacks a second level of rail network - the equivalent of the New York Subway, the Paris RER and Metro, or the London Underground;
 - It fails to provide interchange possibilities that give a network flexibility and convenience for passengers and operational robustness.
- Sydney relies all the more on CityRail's radial system of lines which represent the only off-street public transport alternative to the car.
- The problem of demand in the Sydney CBD has been seen as a lack of capacity on existing lines rather than a lack of a network, and so efforts have concentrated on reinforcing existing patterns.
- Without a diversified network to distribute 'locational advantage', the concentration of land use pressures and passenger demand in the CBD are inevitable.
- Hence, there are strong reasons to test any long term transport strategy for its contribution to diversifying the network – whether or not credence is given to the 'City of Cities' concept, the broadening of the CBD itself increasingly demands network diversification.
- Indeed, CityRail need not be the only answer to this conundrum.
- Yet, while it is the only show in town there is much can be done to expand its capability without major new build projects beyond those already committed.

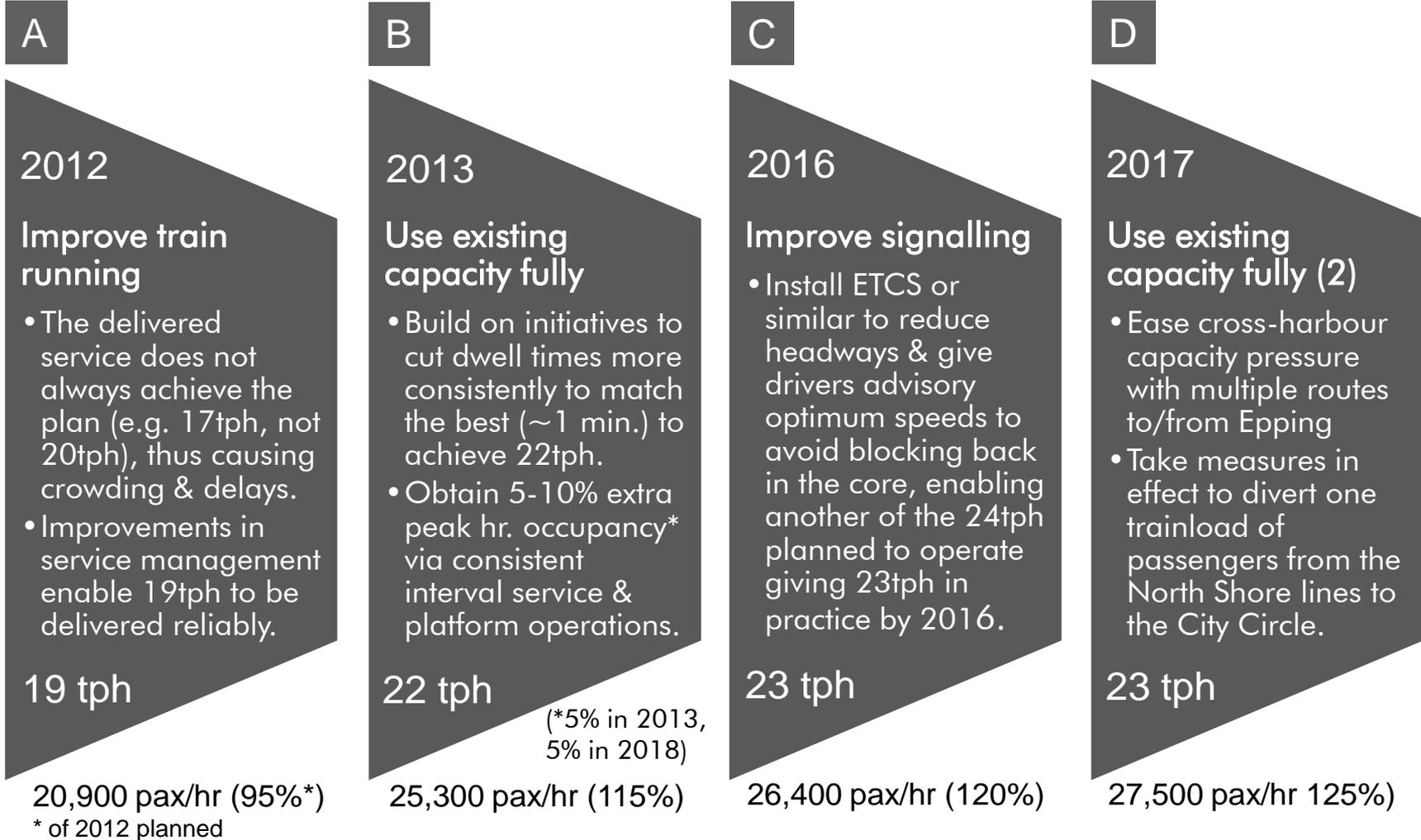
Opportunities for *expanding* existing network capability

- Capacity issues are already being felt on the CityRail network, especially on the North Shore line (peak service 20tph on this core route). Demand is forecast to grow broadly by 50% by 2036.
- A programme of platform management at CBD stations is already being rolled out and more can be done to improve access and full use of the platforms.
- Simplifying the train service might unlock additional capacity by decongesting platforms (e.g. at Town Hall) and reducing dwell times further – thus allowing additional trains to be run.
- Introducing advanced signalling on selected parts of the network should enable headways to be reduced on core routes, allowing extra trains to be operated. Whilst this is not a trivial initiative, it is very do-able and relatively affordable.
- Introducing single-deck stock on selected routes could enhance throughput by reducing station dwell times and also allow services to be speeded up. Although at the expense of seat capacity per train, this could deliver all the seat capacity required for longer journeys while adding standing capacity for shorter journeys.
- Taken together these changes – and further management changes to exploit the network better - could allow investment to be deferred substantially.

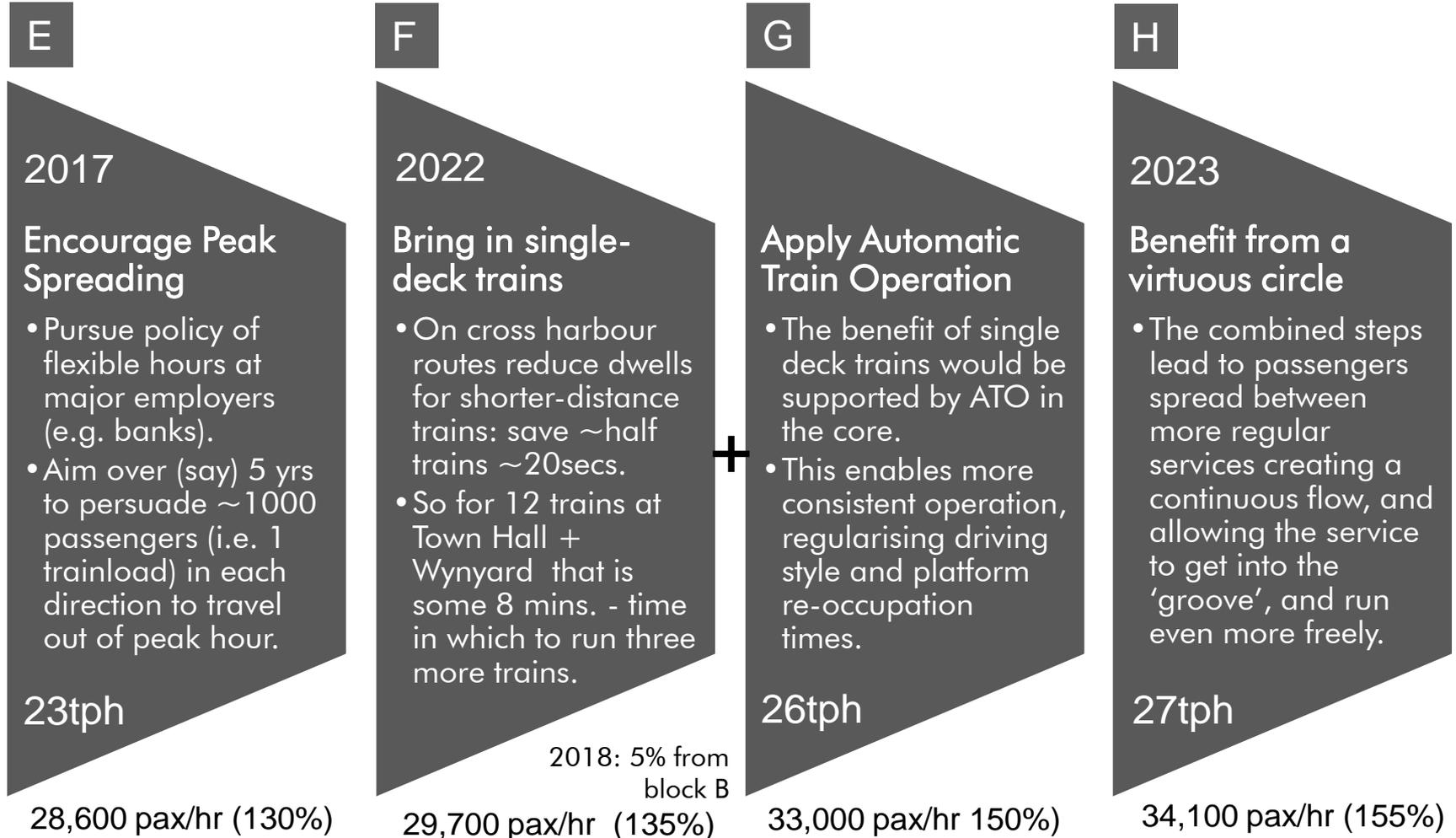
Opportunities for making *best use* of network capability

- However, to exploit network capability fully, further management and policy changes can be made:
 - The development of fares policy to create a 'centre of CBD' origin/destination zone, increase absolute fares and also the ratio of peak to off-peak fares would better value scarce resources (as would making fares reflect more closely the incremental costs of longer journeys);
 - Encouraging flexitime in Government and other offices in the CBD could also transfer passengers from the peak hour to the much less crowded peak shoulder hours;
 - Land-use strategies to promote growth at rail-served centres such as Parramatta and Chatswood could be promoted more strongly, potentially combined with faster and more regular train services to such destinations, especially in the off-peak;
 - A network strategy designed to encourage more traffic to use the Strathfield – Epping link could divert passengers away from the congested core. This could be supplemented by creating a fares differential, with via-CBD fares being more expensive (pricing of expensive capacity is good economics).

The first four building blocks for a plan

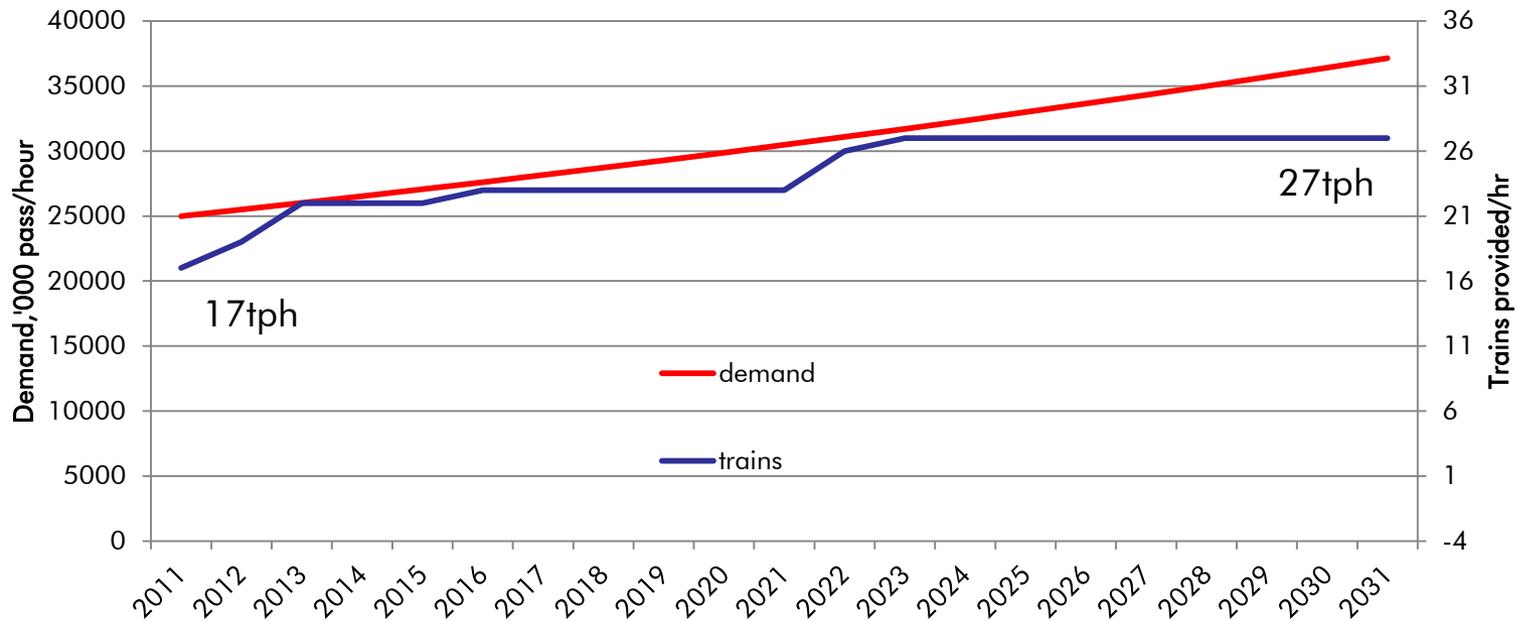


A further four building blocks



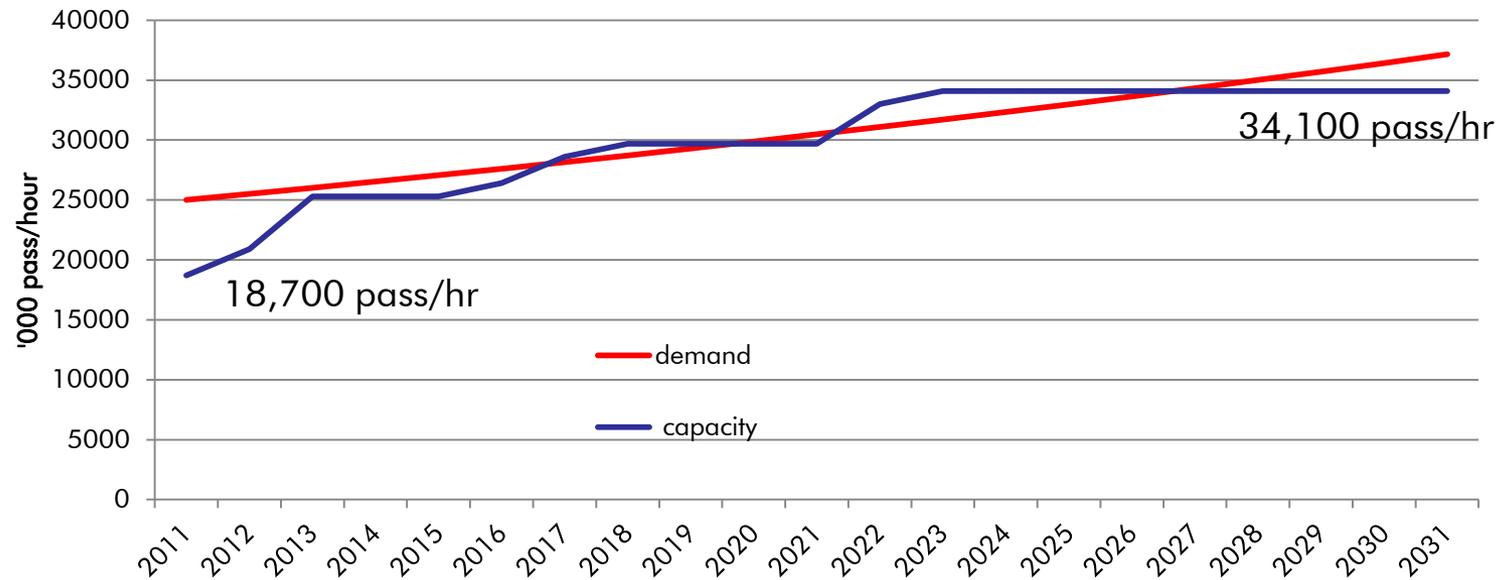
In the plan demand is met partially by extra trains...

Sydney North Shore Line:
Growth in Peak Hour Demand v. Trains per Hour



...and partially by other means

Sydney North Shore Line: Growth in Peak Hour Demand v. Passenger Capacity *



* Capacity for existing stock is assumed to be 1100 passengers per train (900 seated and 2/3 of the 300 standing capacity), and no increase is assumed for new single deck stock, although in practice carrying 1200-1300 passengers should be achievable.

Developing the train plan to meet demand

Demand

- The two charts, above, show meeting the demand on the critical North Shores line depends on having both train paths and fully using passenger capacities.
- The second chart of growth in demand versus passenger capacities allows for some re-direction of traffic via other routes, as described in the building blocks, but shows clear capacity to 2026/27 – with demand to 2031 not out of reach of being met.
- This is very high level and detailed demand modelling and monitoring will be needed.

Introduction of 'Metro-style' services

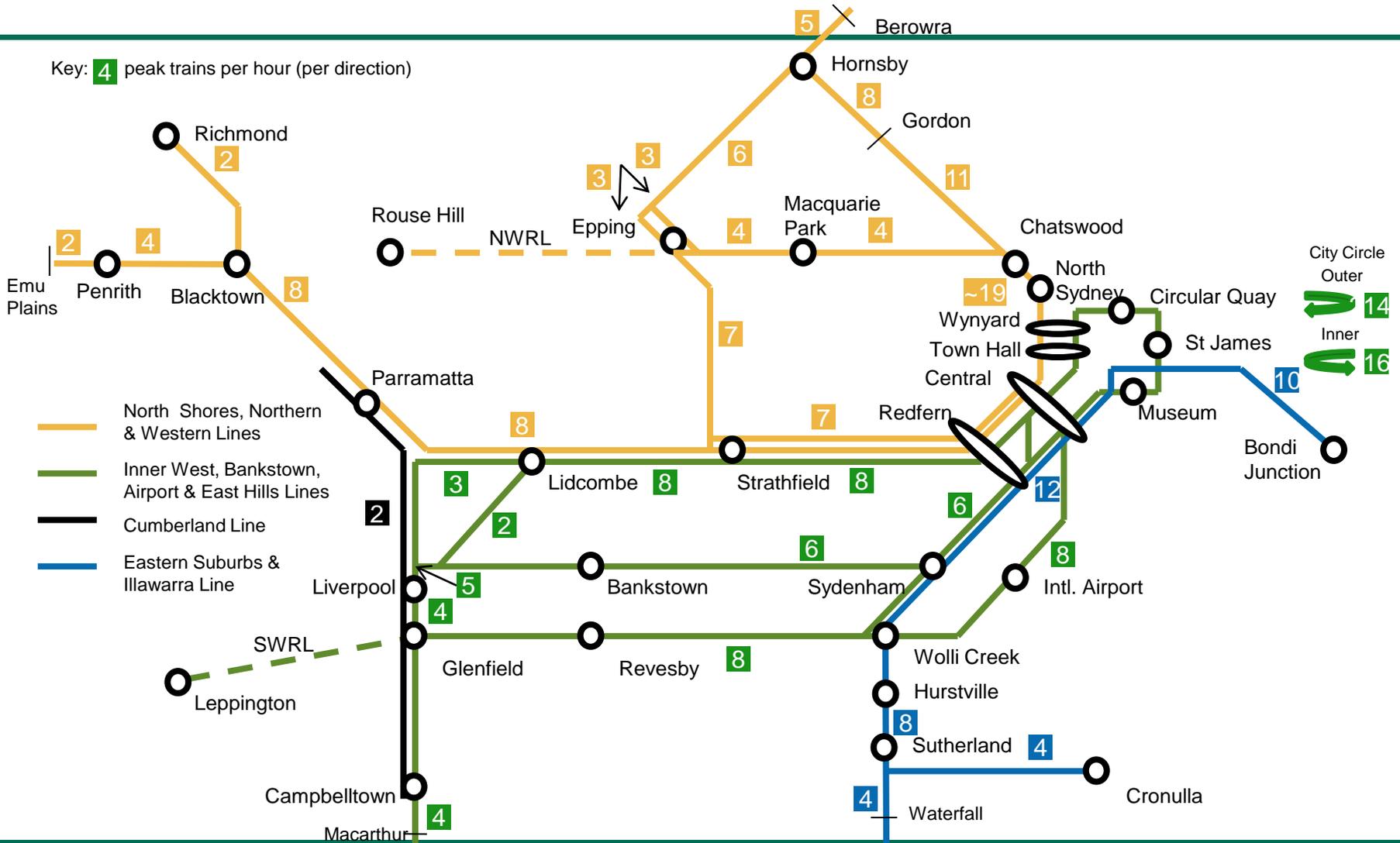
- The diagrams of the network, below, in 2011 and as it might be in 2031, show the introduction of single deck trains for a Metro-style service

- Ideally these Metro-style services (a concept put forward in some LTRS options) would not mix with other services, with sectorisation fully applied.
- Achieving sectorisation by 2031 is unlikely as existing rolling stock assets need to be exploited over their full anticipated life. This leaves scope for further improvements in due course.

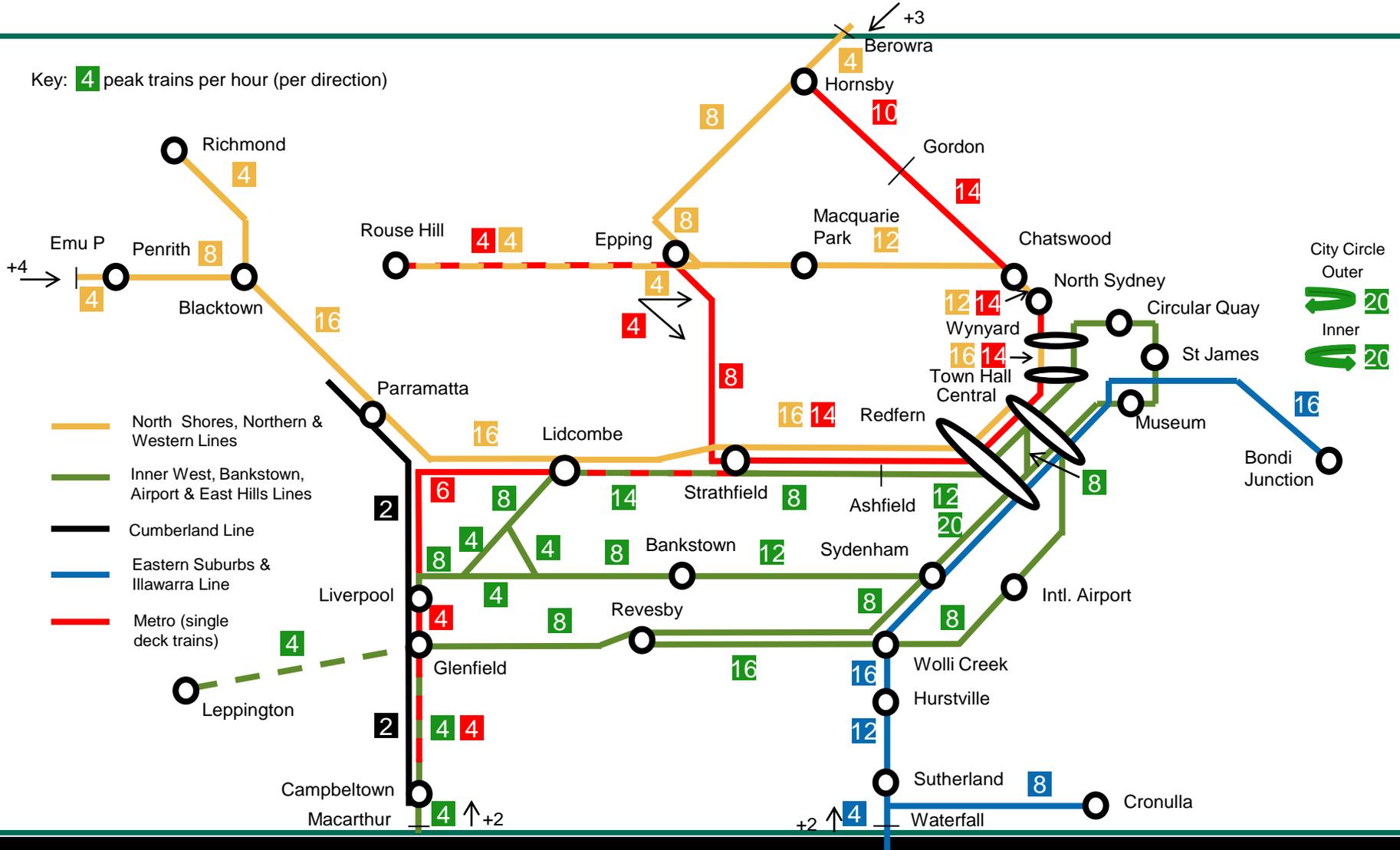
Other Key Principles

- 4tph is assumed to be the minimum peak frequency to be attractive from branches.
- Starting/terminating more than 4tph per location is not generally shown except at Hornsby which has the turn-back capability.
- The longest-distance routes (e.g. Penrith) could include some skip-stopping to spread loads and improve journey times.

The existing train operating plan (2011)



A potential 2031 train operating plan



The need for a train service action plan

- TfNSW/RailCorp, in its assessment of the risks around the LTRS Base Case, either dismissed as unworkable or did not explore the potential for a train operating plan for 2031 such as that set out above. We have presented a potential plan, not the only possible plan. It is based on a range of options that can be selected from and implemented in varying degrees and timing.
- We would expect to see other similar plans developed for comparison (before implementing sectorisation and franchising), the aim being to maximise the use of existing infrastructure in the light of Sydney's forecast economic and population growth, with limited investment - concentrating that particularly on signalling, stations and rolling stock.
- A fully detailed plan needs to be developed, with the short and medium terms actions such as those we have identified fleshed out, with each action costed, analysed for operational robustness and deliverability, its benefits appraised and a business case prepared.
- Longer term actions leading to a plan broadly of the type suggested by the Three Tier option (one of the existing LTRS options with the best BCRs) should be kept in the frame for the future, albeit modified by the experience of some ten years which will have been spent by then transforming the existing railway.
- In due course future long term plans would need testing against a range of options across the transport modes, but immediate efforts should be concentrated on developing the shorter and medium term action plan to effect the transformation the existing system needs.

Transforming customer service

Principles and concepts to apply

- Low ticket prices do not *per se* make a service feel valuable – fares should rise so customers are valued as improvement is delivered.
- There is evidence of people shifting back to car as soon as road capacity is created (even with a toll). Getting people out of cars will require making rail aspirational.
- This means that rail cannot serve all members of society equally and that it must focus on its core products and corridors.
- The absence of a vibrant and heavily marketed weekend/off peak market must be replaced with a customer focussed vision for this, the only true discretionary, segment
- Retention and recruitment of customers needs reward and this can happen more readily where private-sector disciplines apply.

Actions to be taken

- A necessary pre-cursor to customer service improvement is a change to the organisational incentives through either:
 - Sectorisation of CityRail into Business units;
 - Market Testing of routes; and
 - Franchising.
- Persuading people out of cars is key and this requires a step change in *culture*. Key areas to then tackle include:
 - A clear and easy to use compensation regime;
 - Cleanliness and crowding, incl. at stations;
 - Developing strong self-service;
 - Good use of technologies common elsewhere;
 - Processes that work without staff, but where staff are required that they are excellent in their presentation and interaction with customers;
 - A passion to deliver more and better rail services with network benefits (connectivity, etc..)

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Inner West Line	Good service
Airport & East Hills Line	Good service
South Line	Good service
Cumberland Line	Good service
North Shore Line	Good service
Western Line	Good service
Carlingford Line	Good service
Olympic Park services	Good service
Northern Line	Good service
South Coast Line	Moderate delays
Southern Highlands Line	Good service
Blue Mountains Line	Good service
Newcastle & Central Coast Line	Good service
Hunter Line	Good service

South Coast Line
 South Coast Line - Moderate delays

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- New Year's Eve - Saturday 31 December
- Travelling to Sydney Olympic Park
- Travelling to Moore Park Event Precinct

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- Changes to CityRail fares from 2 January 2012
- New cool zone locations this summer
- How we restored South Coast Line services

trackwork Christmas trackwork

Lidcombe to Granville Monday 26 and Tuesday 27 December

trackwork Christmas trackwork

North Shore Line Monday 26 to Friday 30 December

Trackwork man

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Way forward for CityRail

- There should be a clear understanding that reducing the price of a rail ticket to below that of a coffee does not make the service feel valuable – fares should rise to a level where customers are valued as investment, reform and improvement is delivered.
- There is evidence of people shifting back to car as soon as road capacity is created (even with a toll). Getting people out of cars will require making rail aspirational.
- This means that rail cannot serve all members of society equally and that it must focus on its core products and corridors.
- The absence of a vibrant and heavily marketed weekend/off peak market must be replaced with a customer focussed vision for this, the only true discretionary, segment.
- Governance and ownership structures must reward retention and recruitment of customers – this can happen in a state-owned enterprise, but will happen more readily where private disciplines apply.

Transforming operational efficiency

Opportunities for greater efficiency

- Reform of the existing railway organisation and its operational practices followed by the introduction of the private sector into railway operations could be expected to deliver substantial savings.
- The scale of these savings has been well trailed in the LEK report of June 2008 and explored more tactically in the Treasury's RailCorp preliminary study of March 2011. Savings substantially greater than \$500k per annum could eventually be expected.

HR issues

- Resistance from the unions and passengers to headcount reductions will be a key constraint to be overcome.

Actions required

- It is considered that the following actions will be required to facilitate the changes:
 - High level political will and support: a strong indication is needed of determination to see through the reforms to deliver an efficient outcome;
 - The initiation of the reform process by RailCorp as part of the business process re-mapping that would arise from a sectorisation programme;
 - The use of a risk sharing approach in the procurement of a private sector operator allowing the successful bidder to gain a limited share in the benefits arising from the successful delivery of the savings.

Applying private sector disciplines through franchising

Approach

- Learning the lessons of franchising in the UK and in Melbourne, the benefits of private sector disciplines can be gained by franchising fully integrated infrastructure and operations - with freedom given to innovate.
- Given the network size, the risks associated with the process can be mitigated by breaking the operation down into several franchises, using the tiers and sectorisation as a basis, and to phase the transition.
- Revenue risk need not be transferred to the operator although some off-peak patronage incentive would be appropriate.
- Giving responsibility for upgrades and expansion works to franchise operators can be considered particularly for green-field or relatively modest capital schemes.

Short term actions (1 to 3 years)

- Confirm franchising model, review sectorisation to maximise sector separation. v. a unified franchise.
- Undertake market soundings.
- Complete RailCorp re-organisation into sectors to create customer focus, commercial orientation, deliver major efficiency savings.
- Prepare for franchising the first sector (e.g. the Eastern Suburbs and Illawarra Line).

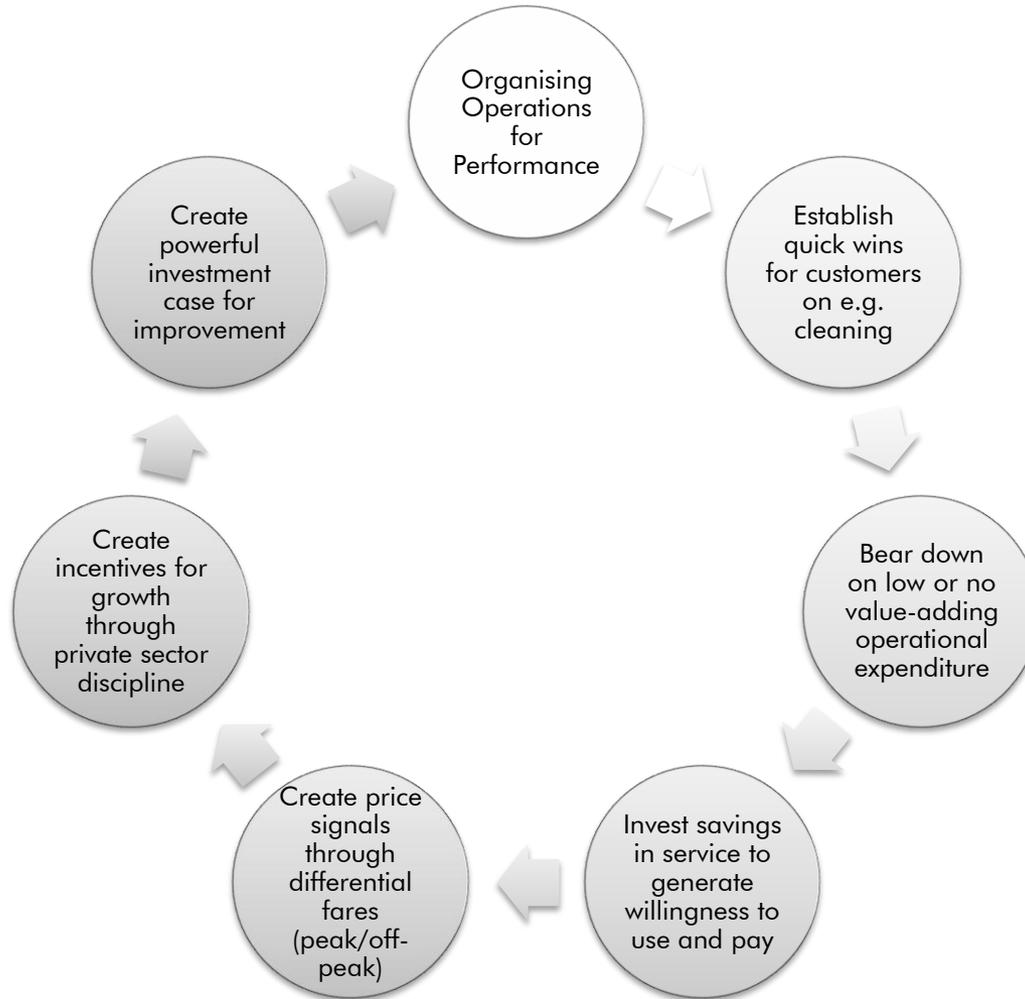
Medium term (3 to 5 years)

- Run competition to award the first franchise.
- Preparations for franchising further sectors.

Longer term

- Review of franchising experience to date, refine the franchising model, continue franchising and refranchising.

The Virtuous Circle



Conclusion

- This report describes an alternative future for CityRail that is far removed from the one currently in prospect: as an increasingly unaffordable yet also under-valued, if important, operation likely to be constrained by a lack of funds to invest in capacity expansion.
- The alternative future can be characterised by:
 - An operating plan that seeks to maximise the use of the existing CityRail network with relatively modest investment principally in signalling, stations and rolling stock;
 - A customer focussed vision, turning CityRail's system into a service that is highly valued by its users;
 - Major improvements in CityRail's operating efficiencies to offer customers and the taxpayer real value for money - thus releasing significant funds for investment; and
 - The application of transformational private sector disciplines and innovation through the progressive introduction of franchising.
- The aim of private sector involvement will be to spur the reform necessary to achieve real change.
- Long term investment in the railway infrastructure, stations, and rolling stock (as well as in ticketing, marketing and customer facing functions) will remain essential if the railway is to fulfil its function of providing an alternative to congested street-based public and private transport.
- Hence the development of longer term investment strategies to follow on from the North West Rail Link should not be deferred too long, but the timing will depend on the success of TfNSW and RailCorp in handling the short and medium term in a sustainable manner.

Annex:

Detailed description of the eight building blocks
for the potential train operating plan for 2031

2012-2013: Building blocks A and B

2012: Building block A - Improve train running

- Congestion is currently not minimised because the timetabled peak service (of 20tph on the North Shore line) is not always achieved in practice; it is common for the delivered service frequency to be only 17tph in the peak hour, and this causes crowding on trains and at stations, as well as delays to journeys. Whilst accepting that operational problems will always arise, continued improvements in service management (e.g. ensuring that passengers are evenly-spread out along platforms, use of manual tannoy announcements by platform staff with roving microphones) should enable the average delivered train frequency of the existing service to increase to 19tph. This will build confidence in the service to allow the following steps to be made.

2013: Building block B - Use existing capacity fully

- Evidence from the core rail corridor in Sydney is that platform reoccupation times can already be low in international terms (e.g. around one minute) but are typically 2.5 minutes. The current programme of initiatives to provide a smooth flow of train service through this line section is clearly helpful, but it would appear that more trains could be run in this corridor even with the existing signalling. We estimate that an increase in the timetabled service to 24tph would be feasible within a couple of years, given the ongoing experiences and skills being learnt from dwell time management at Town Hall, which we understand are being rolled out to Wynyard.
- However, in practice, this would probably only deliver 22tph (compared to the 17 of 20 achieved now). There is a degree of service control available at the converging junctions at Central and Chatswood which should enable this.

2013: Building block B - Use existing capacity fully (contd)

- Average train loadings across the peak hour itself (not the 3-hour peak period) are currently below (in some cases, much below) train capacities. Because railway costs are significantly driven by peak requirements, this is economically inefficient (as is reflected in low cost recovery ratios).
- It is also not what is seen in other countries: for instance, in Britain, “capacity” is defined as seats + up to 35% standing (depending upon train type) but some train operators have passengers in excess of this capacity across the entire 3-hour peak period. Broadly, CityRail is carrying an average 1000 passengers/ train in the peak hour on trains with a notional capacity of 1200 (an appropriate capacity for a major wealthy country such as Australia).
- The irregularity of the service will be contributing to a failure to use capacity well (trains running on short headways are likely to be under-used whereas those running on long headways may genuinely be in excess of capacity), but this will improve as operational measures continue.
- It is not unreasonable to assume that trains can carry 50 extra passengers in the short-term (2 years), and 100 extra in the medium-term (5 years). Split between 8 coaches, these are increases of only 6 and 12 passengers per carriage. However, across the peak hour, of roughly 20 trains, this leads to a capacity increase of 1000 and 2000 passengers per hour in the short- and medium-term, equivalent to one and two extra trains.
- This leads to an assumption that capacity increases by one trainload in each of 2014 and 2018.

2016-17: Building Blocks C and D

2016: Building Block C - Improve signalling

- Improvements in signalling (ETCS or similar on key sections of the network) would be expected to reduce headways, as inter-train spacing and hence platform reoccupation times can be reduced safely, without risk of Signals Passed at Danger. Blocking-back should be reduced, as drivers are given advisory optimum speeds, thereby avoiding the delays inherent in stopping outside stations and then restarting – which leads to delays also being caused to following services. We believe that this should enable another of the 24tph planned service to be operated, giving 23tph in practice by 2016.

2017: Building block D - Use existing capacity fully - 2nd stage

- The network can be managed in many ways. For example the NWRL from Rouse Hill to Epping can be connected to the CBD by two routes. We recommend that under the current CityRail train specification NWRL passengers are given the choice of direct trains to the city centre both via Chatswood and via Strathfield. Our analysis shows that the running times are relatively similar by both routes. This should make it possible to encourage (e.g. through advertising and perhaps pricing too) passengers for Central to travel via Strathfield, and those for North Sydney to travel via Chatswood. As well as spreading the benefits of the new link across the network, such routings minimise the number of passengers travelling on the congested core, and hence the impact of the extra demand from the NWRL extension.

2017: Building Blocks D (cont'd) and E

- It should be possible to divert one trainload of passengers from the North Shore lines to the City Circle either by adjusting stopping patterns, or by substituting a Western line service for a South line train. The latter has considerable spare capacity, but still provides access from the Western suburbs directly to Town Hall and Wynyard; this therefore reduces the number of interchanging passengers at Central, as well as freeing up a train slot on the North Shore line. This might be achieved at the same time as NWRL opens.
- Note also that a proportionately-greater increase in City Circle services would (with suitable advertising) make these more attractive to passengers seeking city centre access from arrivals in the terminal platforms at Sydney (Central).

2017: Building block E - Encourage peak spreading

- It would appear that Sydney's office workers have more fixed hours, compared to the situation in many other world cities. Spreading the peak has been an important feature of managing urban rail congestion elsewhere (e.g. in London), with Government departments and major employers (such as banks) encouraged to pursue a policy of flexible hours around core times, which can actually lead to offices being open for longer hours than currently.
- Workers benefit because they travel in less-congested conditions, whilst there may be other reasons why, for some, travelling earlier or later may fit in with other domestic commitments.

2017-22: Bldg Blocks E (cont'd) and F

- Whilst huge change is unlikely, we believe that it should be possible to persuade 1000 passengers (i.e. one trainload) in each direction on the core route to travel either earlier or later than the peak hour over a period of (say) 5 years.
- This might require improvements in train service in the shoulder peak hours, in order to encourage them to do so, or simple but attractive off-peak multi-mode day tickets. We are not assuming any Smartcard-enabled fares incentive (which would achieve more significant results).

2022: Building block F - Bring in single-deck trains

- Around the world, it is not common for inner-suburban railway passengers to expect a seat. The CityRail approach of providing double-deck stock to do this, even for those on very short (e.g. 10-minute) journeys is unusual; the Paris RER, which is one of the few other systems worldwide with double-deck stock, concentrates on serving passengers from more distant suburbs. The normal situation, exemplified by the ex-KCRC lines in Hong Kong, is to provide capacity through maximising standing space, with some longitudinal seats.
- The benefits of this are to minimise the numbers of passengers left behind on platforms (who do cause genuine delays) and to minimise station stop times. This is achieved by providing more doors, and by avoiding internal stairways.

2022: Building block F - Bring in single-deck trains (cont'd)

- These measures typically speed up passenger flow by 0.25 pass/s/metre of door width which, for a typical number of 40 passenger movements at Town Hall (the critical station) would save 10 seconds per train (from 40s to 30s). Installation of a third set of doors would reduce flows (and hence the passenger time) per door by one-third, to around 20s.
- Over a period of one hour, in which only the shorter-distance Northern line trains were formed of more open, single-deck stock, would therefore save about half the trains 20 seconds; saving 20 seconds for 12 trains at both Town Hall and Wynyard is equivalent to 8 minutes, in which it would should be possible to run three more trains.
- As it is not clear that capacity on a double-deck train can be fully-used by inner-suburban passengers (because, for instance, the middle of 3-seat units may be unreachable, or undesirable), we contend that the crush loading of a single-deck train, with a better flow of passengers through the train, is not dissimilar. With several stations having crowding issues, single-deck trains would save time at all these stations, thereby reducing journey times.
- Another tranche of single-deck operation, for the outer-suburban lines, could be contemplated in 30-35 years' time, when the Waratah trains now entering service will be life-expired. This would create the potential for a further 2-3 tph.

2022-23: Building blocks G and H

2022: Building block G - Apply Automatic Train Operation

- ATO enables a smoother operation of all trains at more consistent speeds and headways. The Thameslink project in London is already preparing to deliver 24x12tph of a similar, multi-branch, suburban/regional railway. However, CityRail's trains are all 8 cars, and our estimates show that, with 4 cars less, these will have Run-Out/Run-In times about 2 seconds/car (8 seconds/train) quicker than London. That generates a benefit of over 3 minutes compared to the London example, which is certainly sufficient to run another train. ATO supports an extra 3 tph being achieved with single deck trains.

2023: Building block H - Benefit from a virtuous circle

- It should be remembered that many of the above contribute to a virtuous circle of improvement. For instance, when an additional train is run on the core section, the existing quantum of passengers is spread between more services, meaning that slightly fewer of them need to catch any particular train.
- This makes a marginal (but not trivial) reduction in station stop times, and hence enables the service to run even more freely. The best example of this can be seen in Moscow, where a 40tph metro service is operated, and passenger flow becomes a continuous stream, rather than a lumpy flow.
- The combination of measures here would be expected to add a further one tph of capacity.