Operational Efficiency

Aurizon is committed to taking the least resource-intensive approach to our operations to deliver long-term productivity improvement.

At Aurizon we measure our operational efficiency via three key metrics:

- **Network availability —** measured by CQCN closures and below rail cancellations.
- **Asset productivity —** measured by net tonnes carried multiplied by distance travelled (NTK) per active locomotive or wagon.
- **Energy productivity —** measured by litres of diesel (L) or kilowatt hours (kWh) per thousand gross tonne kilometres (GTK).

Table 2 below highlights our recent operational efficiency performance according to these metrics.

NETWORK AVAILABILITY

The CQCN set a new railings record of 226mt in FY2016. This highlights the efficiency of our network planning, scheduling systems, as well as the benefits of our proactive maintenance program. Highlights include:

- 0.7% reduction in system closure hours and a 35% reduction in below rail cancellation impact.
- 62% reduction in the number of below rail train cancellations since FY2013 (against a 24% increase in railings).

In multi-user rail networks, initiatives to improve services for one operator provides benefits to all operators. In this way the operational performance improvement in the CQCN has delivered benefits to all participants in the supply chain. As volumes have increased, closure hours have also reduced.

Key to our below rail (network) maintenance and renewal strategy is enhanced capabilities. Our CQCN is progressing on a journey to automated track inspections and has implemented a number of improvements that exploit deep analytical capability to identify complex patterns in data to predict faults, optimise the maintenance response, and improve reliability. These include:

1. Reducing the frequency of manual rail inspections from four days to eight days for selected track sections.
2. Use of remote monitoring to extend inspection periods.
3. Introduction of remotely controlled rail lubricators contributing to a reduction in rail and wheel wear.
4. Use of aerial drones for inspection of electrical overhead and bridge structures.

Avoiding traditional techniques for inspecting these assets removes or reduces the need for closing sections of the network for physical inspections, while also reducing worker exposure to hazardous environments (particularly substituting working at heights for drone inspection).

> "We are focused on improving those things within our direct control — our operations, our systems and support costs, and technology. We must change and innovate, do existing things in new ways, and stop doing the stuff that adds little value."
>
> **Lance Hockridge**
> Managing Director & CEO

Aurizon has the aspirational goal to remove the need for all physical inspections, thus removing staff from the rail corridor for the purposes of inspections. Achieving this goal would enable Aurizon Network staff to shift from 'finders of faults' to 'fixers of faults'.

Measure	Metric	FY2016	FY2015	Change
Network availability	System closures (hours)	1,018	1,025	**0.7% ↓**
	Below rail cancellation impact*	1.1%	1.7%	**35% ↓**
Asset productivity	Wagons (NTK per active wagon, daily)	14.7	14.3	**3% ↑**
	Locomotive (NTK per active locomotive, daily)	375.7	339.5	**11% ↑**
Energy productivity	L/000GTK	3.10	3.19	**3% ↓**
	kWh/000GTK	9.3	10.6	**12% ↓**

Legend ■ Improvement in metric performance ■ Decline in metric performance

Table 2:
Key operational efficiency improvements.

* Number of above rail services cancelled due to a below rail cause as a percentage of weekly agreed orders.

ASSET PRODUCTIVITY

Asset productivity has been a key area of focus for Aurizon. In 2013 Aurizon began adding wagons to coal trains in order to maximise locomotive hauling capacity. Across the Central Queensland Coal Network (CQCN) this initiative has resulted in a 5% increase in train lengths and 4% increase in payload. By comparison, if train lengths had not increased over this period, 743 more trains would need to be passing through our communities to move the same volume of coal as was hauled in FY2016 (Figure 25).

Higher train utilisation also enables us to reduce the size of our locomotive and wagon fleet. As a result we have 3% more NTK per active wagon and 11% more NTK per active locomotive compared to FY2015. While there are many contributing factors, we note that we have improved locomotive productivity significantly and now sit above the US class 1 average, as shown in Figure 24.

We have also deliberately started to standardise our fleet. This has resulted in 37% fewer wagons and locomotive classes remaining in operation (compared to FY2012), as illustrated in Figure 26.

By FY2018 we expect to halve the number of wagons and locomotive classes (compared to FY2012).

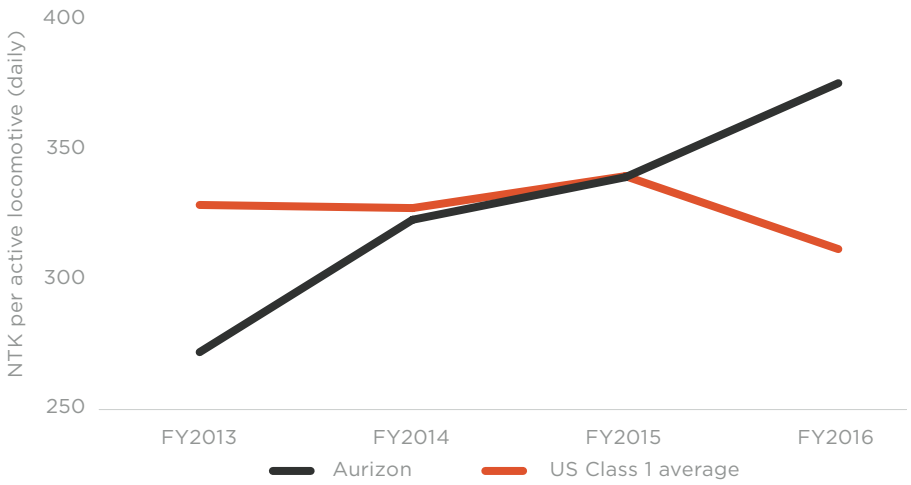

Figure 24:
Locomotive productivity — Aurizon and US Class 1's average.

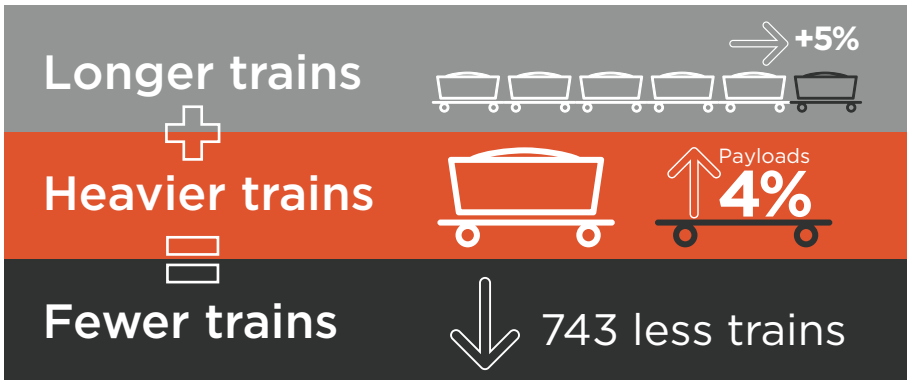

Figure 25:
Longer and heavier trains result in fewer trains.

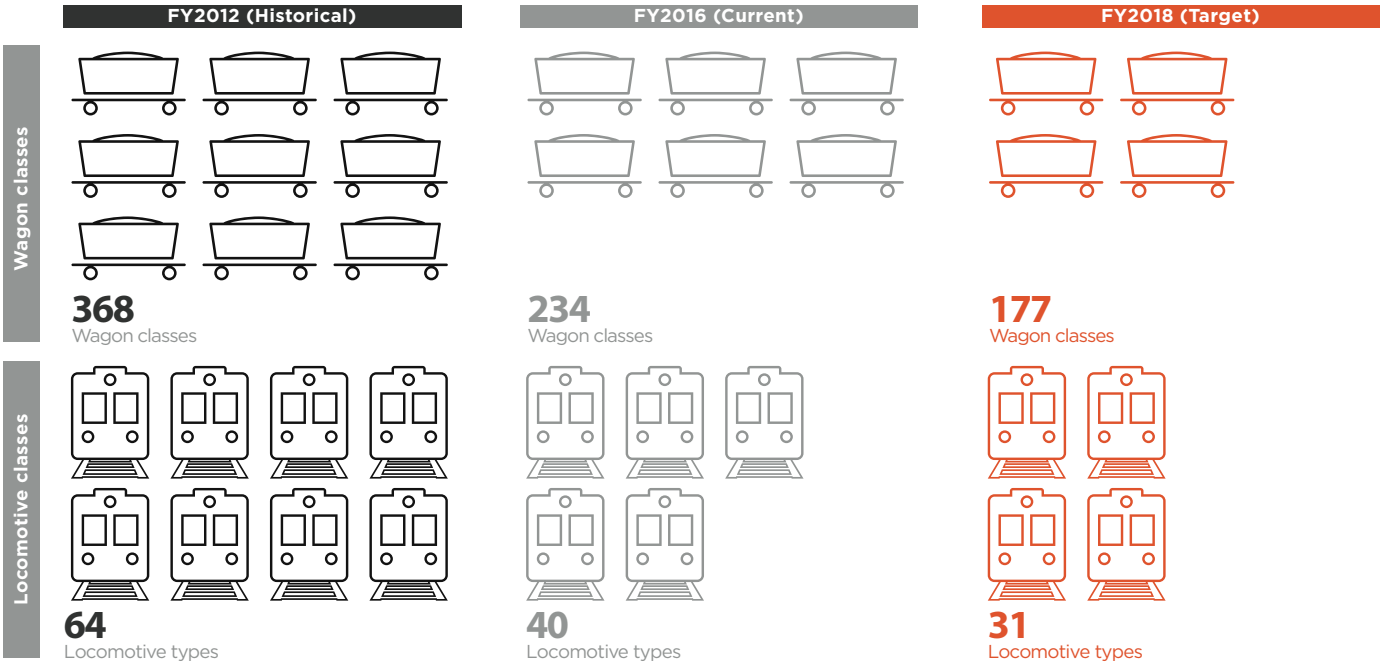

Figure 26:
Reduction in wagon and loco classes from FY2012 to FY2018.

RELIABILITY AND AVAILABILITY

The key dimensions of asset productivity are reliability and availability. To sustainably improve these operational metrics we have implemented Condition Monitoring systems to predict faults, reduce frequency of inspections required and avoid cancellations through unscheduled maintenance.

Our rollingstock maintenance strategy uses sensors to deliver information in order to understand and maintain condition, predict the issues that impact safety and reliability, reduce unscheduled maintenance events, and decongest our busy rail yards. Our technology investments have yielded significant reliability and availability improvements through both condition-based and predictive maintenance techniques.

In the FY2015 Sustainability Report we highlighted the implementation of our condition monitoring program and the expected performance we hoped to deliver. The first phase of this program began in 2014 with the following outcomes delivered in the CQCN to date:

1. Contributed to a 51% reduction in wheel usage (FY2015 as compared to FY2016), as illustrated in Figure 27.
2. 86% reduction in the number of serious operational incidents such as train partings (FY2013 as compared to FY2016).
3. Increased the wagon inspection cycle from one to two years.
4. Automated fault detection of doors, draft gear, couplers, axles, wheels and brake systems.

> "A more sustainable approach to asset maintenance will result in efficiencies for the Company over the next 10 years and improved operational performance for our customers, especially if we can intervene before an asset fails."
>
> **Alex Kummant,**
> EVP Network

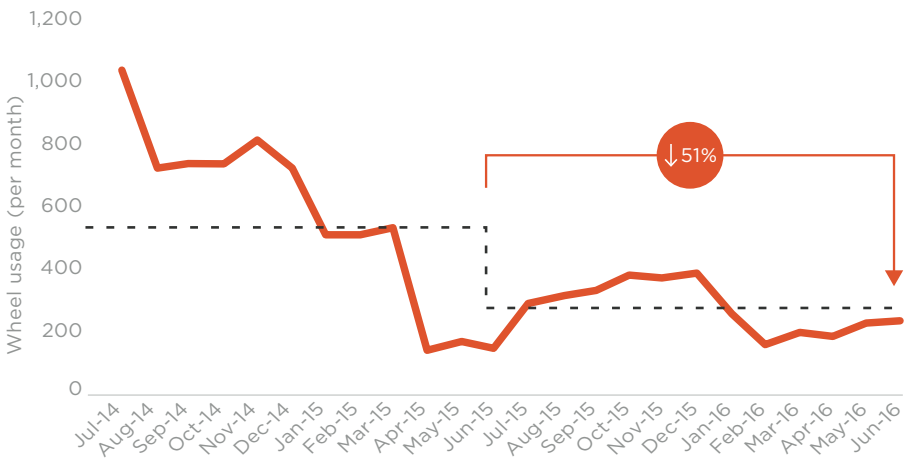

Figure 27:
Aurizon's historical wheel usage on the CQCN (benefits of condition monitoring and predictive maintenance).

ENERGY PRODUCTIVITY

Locomotive diesel and electricity usage is a focus at Aurizon as it contributed 10% of our expenditure and 92% of our greenhouse gas (GHG) in FY2016. Since FY2015, we have reduced diesel and electricity consumption per GTK by 3% and 12% respectively through more efficient rollingstock, technology, redesigning operations and introducing longer trains.

We are committed to reducing GHG emissions by 15% per GTK by FY2020 and we are delivering significant cost savings as well as outcomes for the community and the broader environment.

A key way to reduce energy consumption is through improved train handling, as it can dramatically affect the amount of energy consumed over a specific route. One study in the Blackwater Coal System showed diesel consumption could vary by up to 10% or 2000 litres across the same route with different drivers.

By working with drivers to document and educate best practices, Aurizon is seeking to have all drivers operate trains in the most energy-efficient manner. While training can progressively change driver behaviour, Aurizon has found providing dynamic advice onboard in 'real-time' to be more effective.

The next evolution of technology is to standardise train handling with GE's Trip Optimiser software (TO), which is comparable to 'cruise control' for train driving. While the driver maintains control, through the ability to intervene, TO will run the train according to a predefined driving methodology. This technology has been used in North America for over a decade, resulting in fuel savings of 3% to 10% depending on-train configuration and topography.

Early runs in our first TO corridor between Melbourne and Adelaide have confirmed these fuel savings figures. Aurizon will complete TO roll out in three more corridors in FY2017. »

CASE STUDY

Towards the digital railway of the future.

As illustrated in this chapter and throughout this Report, technology has been identified as a key component of our competitive advantage.

As Aurizon's operational efficiency improves, technology will be relied upon even more to identify productivity opportunities and achieve sustainable benefits. To give affect to this advantage, we have developed a five-year technology roadmap encompassing information and operational technology that is closely aligned to our strategy to deliver real business benefits.

WHAT DOES THIS MEAN FOR OUR BUSINESS?

- Data from monitoring equipment provides deeper insight and greater control of business operations and assets.
- Insightful operational analytics from real-time information that drives faster and better business decisions.
- Automating simplified, standardised processes to unlock safety, service quality and efficiency opportunities.
- Technology-enabled workforce to improve individual productivity and job satisfaction and increase collaboration.
- Digital channels deepen customer relationships and connect supply chains.

> "We continue to benchmark ourselves against relevant world-leading peers and partner where appropriate to access new technology and capabilities. We're mindful of where technology could take us in the future and undertake integrated enterprise planning with strong governance processes to ensure that we can unlock benefits."
>
> **Steve Mann**
> VP Technology Transformation

POSSESSION ALIGNMENT AND CAPACITY EVALUATION (PACE)

PACE gives us foresight into all track access requirements for maintenance and renewals. The evaluator allows optimisation of throughput, reliability and cost, so that we can meet capacity requirements at minimum cost. It does this by helping to smooth and reduce capacity impacts and associated costs rather than concentrating capacity impacts that lead to closures.

INTEGRATED OPERATING PLAN (IOP)

The IOP is a technology-enabled, enterprise-wide approach to continuous improvement. By applying the service design principles below, with safe work practices, Aurizon operates longer, heavier and faster trains with fewer assets and resources. As illustrated below, the IOP targets improvement opportunities in every aspect of our operations.

ADVANCED PLANNING AND EXECUTION (APEX) OPERATIONAL TECHNOLOGY

Implemented in FY2016, APEX allows us to adapt planning and scheduling of trains from two years out to 'Day Of Operations' through faster, more responsive modelling of future scenarios. This represents a step change improvement, replacing manual (paper) processes with automated (digital) processes. It has the potential to increase network capacity by 856 paths.

FREIGHT MANAGEMENT TRANSFORMATION (FMT)

Last year we provided a case study into the continued deployment of the Freight Management Transformation (FMT) program. This has involved delivery of re-engineered customer ordering, pricing and invoicing functions, as well as enhanced reporting and analytics tools.