

Future Energy Action Plan 2020–2025



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Executive summary

As part of its efforts to combat climate change, the NSW Government has committed to achieving net zero greenhouse gas (GHG) emissions across the economy by 2050. Transport for New South Wales (TfNSW)'s Future Energy Strategy focuses specifically on the transport sector in NSW and the action TfNSW is taking to achieve the 2050 target.

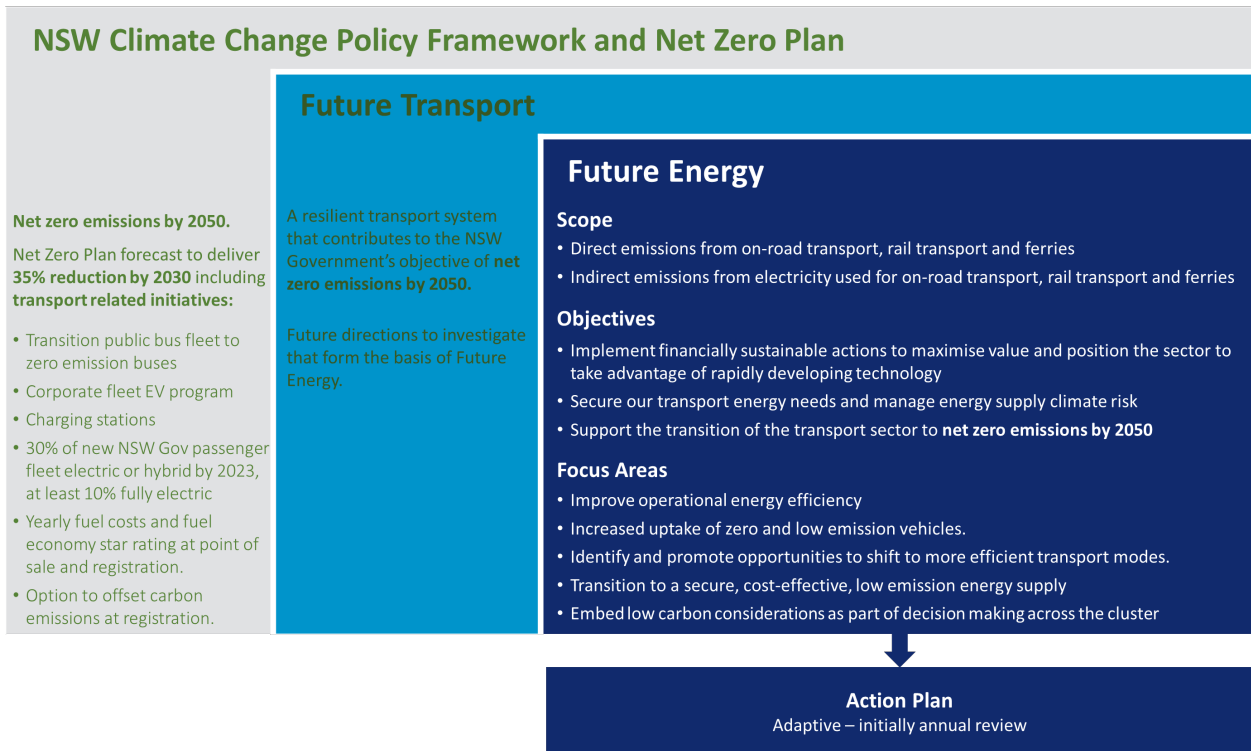


Figure 1 – Future Energy Policy Framework

The transport sector accounts for approximately 20 per cent of NSW's GHG emissions with cars, trucks and buses producing 85 per cent of transport emissions. The transport cluster¹ contributes around 6 per cent of total transport emissions, with over 90 per cent of cluster emissions from rail and buses. The Future Energy Strategy addresses both of these points. Transport for NSW can lead by example with its passenger fleet, provide infrastructure to support electric vehicles and continue to work across government to develop measures to support the uptake of electric vehicles. For the buses and trains under its control, Transport for NSW can intervene directly to achieve net zero GHG emissions from its energy use.

The benefits of Future Energy go beyond reducing GHG emissions. They include increased energy security, supporting economic development, improving access to mobility, reducing traffic and parking congestion, saving consumers' money, reducing air and noise pollution, and increasing public health and safety.

¹ The transport cluster is the extended network of government agencies and private organisations which work together to deliver transport services including TfNSW, Sydney Trains, NSW Trainlink, Sydney Metro, STA and all public transport services managed by TfNSW.

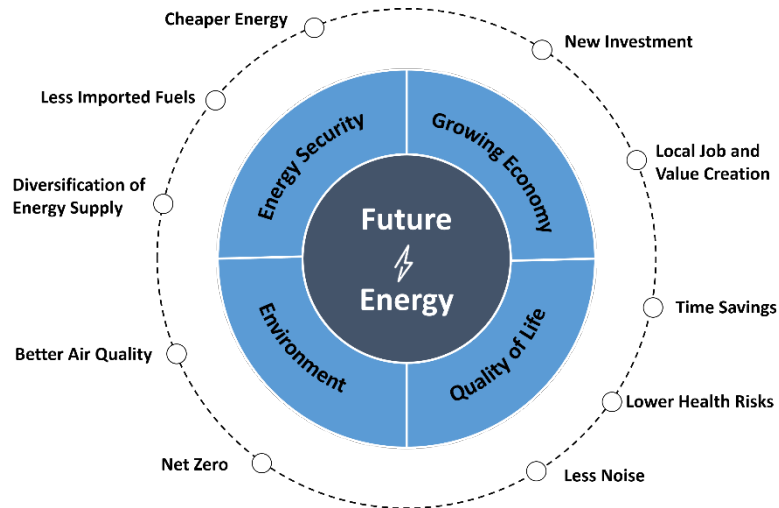


Figure 2 – The benefits of Future Energy

This Future Energy Action Plan outlines initiatives being undertaken by Transport for NSW at the cluster, sector and economy-wide levels, including headline actions and other supporting actions. The headline actions have been developed to have a high impact on the priority areas for action, building a strong foundation for the move towards net zero emissions.

Transport for NSW will continue to update this Future Energy Action Plan and will monitor and report on our progress in delivering outcomes.



Headline actions

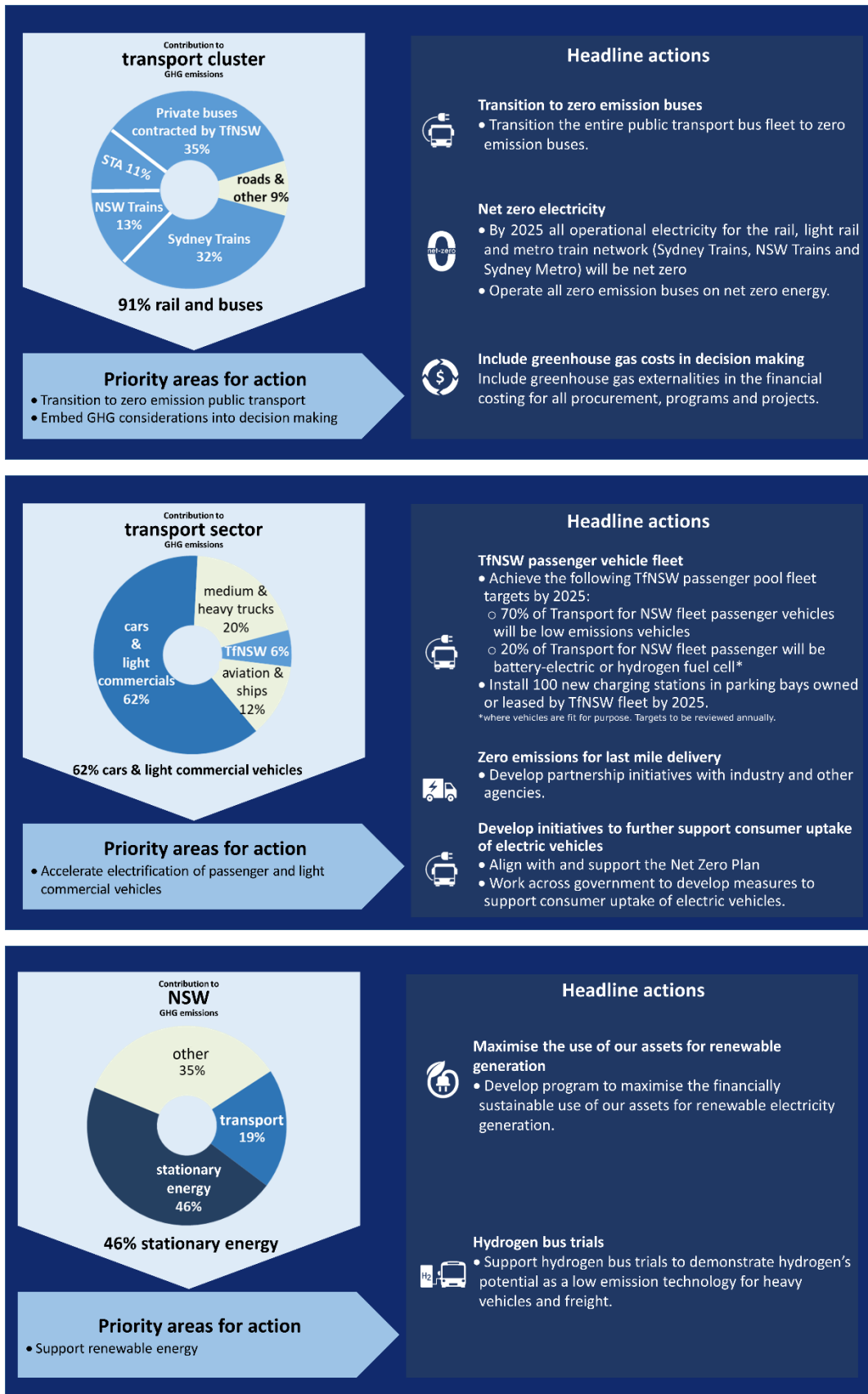


Figure 1 – Headline actions

Summary of Actions

The table below lists the headline and other supporting actions and identifies the focus areas impacted by the actions.

	Improve operational energy efficiency	Increase uptake of zero and low emission vehicles	Shift to more efficient transport modes	Transition to a secure, cost-effective, low emission energy supply	Embed low carbon considerations in decision making
Headline actions					
Cluster					
Net zero emission buses					
Net zero emissions electricity for the rail network					
Include greenhouse gas costs in decision making					
Sector					
Transport for NSW passenger vehicle fleet					
Zero emissions for last mile delivery					
Develop initiatives to further support consumer uptake of EVs					
Economy-wide					
Maximise the financially sustainable use of our assets for renewable generation					
Hydrogen bus trials					
Other actions by primary focus area					
Improve operational efficiency					
Improve energy efficiency during rail operations					
Enable excess regenerative energy capture and reuse					
New bi-mode rail regional fleet					
Bus priority infrastructure program					
More energy efficient ferries					
Improved road infrastructure operational energy efficiency					
Smart technology corridors program					
Easing Sydney's congestion					
Intelligent congestion management program					
Increased uptake of zero and low emission vehicles					
NSW regional and car park electric vehicle charging program					
Identify and promote opportunities to shift to more efficient transport modes					
16 cities improvement program					
Greater Sydney Bus Strategy					
Mobility as a service					
On demand bus, ferry and e-bike services					
Travel choices program					
Investing in walking and cycling					
Fast rail					
Transition to a secure, cost-effective, low emission energy supply					
Solar photo voltaic (PV) for rail facilities					
Improve rail electricity use planning					
Embed low carbon considerations as part of decision making across the cluster					
Creating awareness about carbon footprint by mode of transport					
Whole-of-government collaboration and coordination					
Close research-practice collaboration					

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Abbreviations and acronyms

Table 1 – Terms and meanings

Term	Meaning
AC	Alternating current
API	Application Programming Interface
BEV	Battery electric vehicles
BPIP	Bus Priority Infrastructure Program
CAV	Connected and Automated Vehicles
CBD	Central Business District
CMIP	Cycling and Micromobility Investment Program
DC	Direct current
DEMU	Diesel Electric Multiple Units
DPIE	NSW Department of Planning, Industry and Environment
EDMS	Energy Data Management System
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GHG	Greenhouse Gas
HVAC	Heating, Ventilation and Air Conditioning
ICE	Internal Combustion Engine
ITS	Intelligent Transport System
LED	Light Emitting Diode
LGC	Large-scale Generation Certificate
MaaS	Mobility-as-a-Service
MTMS	More Trains, More Services program
MTRDP	Medium Term Rail Development Plan
PPA	Power Purchase Agreement
PV	Photovoltaic
RCoP	Research Community of Practice
RET	Renewable Energy Target
RFEOI	Request For Expressions Of Interest
SSD	State Significant Development
TDM	Travel demand management
TfNSW	Transport for New South Wales
TMC	Transport Management Centre

1. Introduction



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1. Introduction

The NSW transport network connects people and places, boosting economic growth and opportunity. Our vision for Future Energy is one where Transport for NSW is a leader on the journey to net zero emissions by taking strong actions to reduce emissions from its operations and supporting the transition of the transport sector to net zero emissions.

The TfNSW Future Energy Strategy (Future Energy) contributes to the NSW Government Climate Change Policy Framework's goal of net zero emissions by 2050 and the medium-term goals in the NSW Net Zero Plan Stage 1: 2020–2030. Future Energy expands on the commitment made in the Future Transport 2056 Strategy to build a resilient transport system that contributes to the NSW Government's objective of net zero emissions by 2050.

The transport sector is the second largest source of greenhouse gas (GHG) emissions in NSW. The transport sector contributes 19 per cent of the state's greenhouse gas emissions², and is a growing source of GHG emissions (Figure 2). All transport modes

must first flatten GHG emissions growth and then reduce GHG emissions to meet the government's economy-wide net zero commitment.

Decisions we make today will build a future system that is sustainable and affordable for our customers and the community and contributes to the state's future economic development.

NSW is already a national leader in energy efficiency³. As the world moves to net zero emissions, NSW will be part of the global transformation of the world's energy system. This transition will create investment and job opportunities in emerging industries such as advanced energy, transport, carbon farming and environmental services.

This Action Plan outlines priority areas, headline actions and other initial actions that will ensure Transport for NSW's energy needs are secured from sustainable sources and support the transition of the transport sector to net zero emissions by 2050.

² Department of the Environment and Energy, National Inventory Report 2017 2019

³ NSW Office of Environment and Heritage, NSW Climate Change Policy Framework 2016

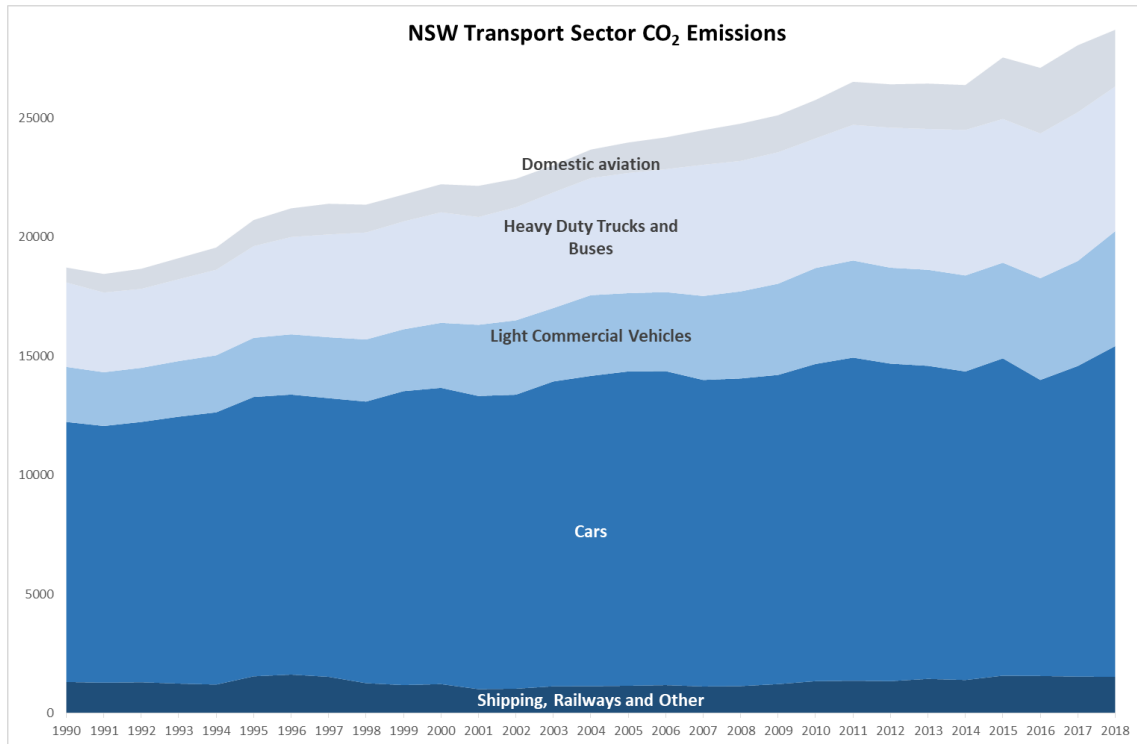


Figure 2 – NSW Transport Sector CO₂e emissions⁴

1.1 Future Energy framework

Future Energy outlines Transport for NSW's commitment to ensuring our transport energy needs are secured from sustainable sources, and supports the transition of the transport sector to net zero emissions by 2050. This is consistent with the objectives of the NSW Government's climate change policy framework.

Future Energy Strategy

The Future Energy Strategy is the keystone document of this framework. The Strategy details the strategic context, scope, objectives and focus areas for Transport for NSW to reduce emissions through operational changes and transitioning to a secure, cost-effective, low emission energy supply.

Future Energy Action Plan

The Future Energy Strategy is supported by this Future Energy Action Plan, which outlines actions being taken by Transport for NSW at

the cluster, sector and economy-wide level to support the transition of the transport sector to net zero emissions by 2050. This includes headline actions that have been developed to have a high impact on the priority areas for action, building a strong foundation for the move towards net zero emissions.

The Future Energy Action Plan outlines:

- The actions that Transport for NSW is taking now to reduce carbon emissions from our operations and the transport sector. Each action includes a description of why the action was included, what it encompasses, how it will be implemented and who is responsible for its implementation
- How we will report on progress
- An adaptive management framework to identify new actions and improve existing actions as we work together to transport our customers and the community to a net zero future.

⁴ Australian Greenhouse Emissions Information System, Department of Industry, Science, Energy and Resources.

1.2 Priority areas for action

This Action Plan reflects the energy hierarchy and includes actions that are ‘lean’ (reduce

energy demand), ‘clean’ (improve energy efficiency) and ‘green’ (intelligent use of renewable energy).

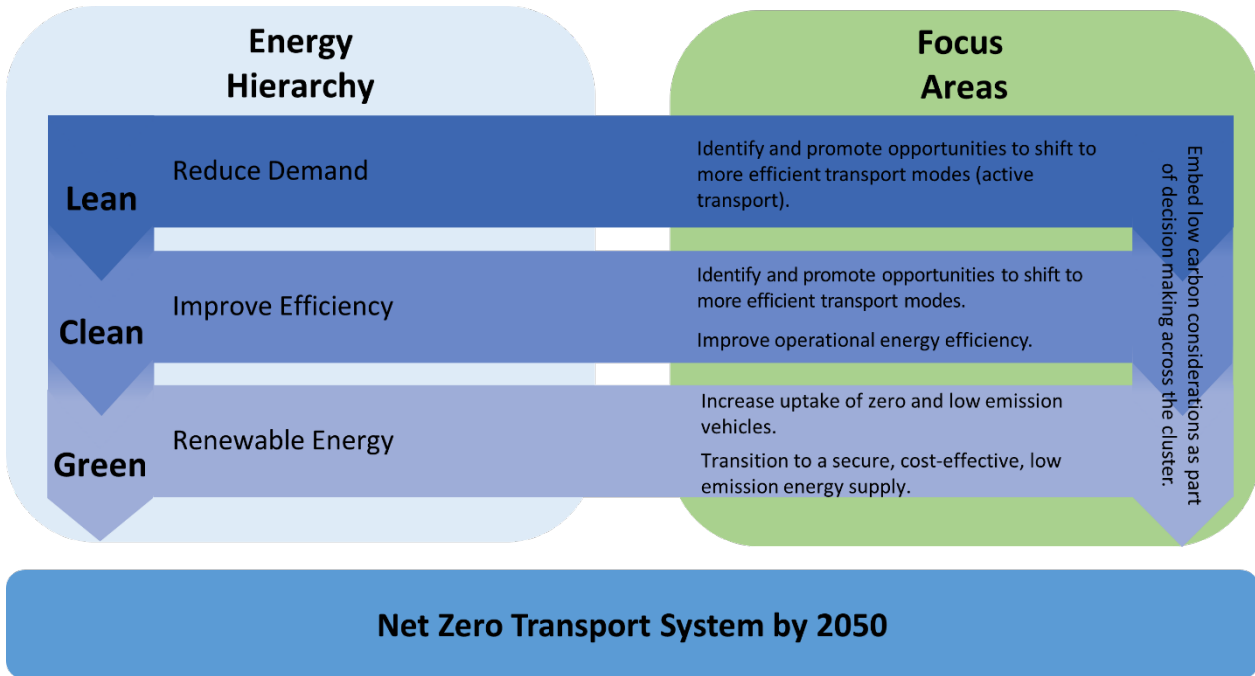


Figure 3 – Energy hierarchy and focus areas

Future Transport and Future Energy outline a pathway to net zero emissions that includes reducing the need to undertake high GHG emissions travel, shifting to cleaner transport modes and improving the efficiency of vehicles. However, initiatives in these areas are not able to accomplish net zero emissions on their own. To reach net zero emissions, the transport sector will need to run on zero emission energy. To achieve net zero emissions by 2050, we need to build on the Future Transport commitment to transition to a cost-effective, low emission energy supply.

Renewable electricity is currently the only mature zero emission energy with the potential to power transport at scale. It can be deployed either directly (e.g. battery electric cars, electric trains) or in the form of other energy carriers (e.g. hydrogen).

As the transport sector will require significant electricity from the grid, decarbonisation of the electricity grid is a prerequisite for a zero emissions transport system.

While this Action Plan includes actions to reduce demand and improve efficiency, it has a particular focus on steps we can take now to transition the transport sector to renewable energy by:

- Electrifying transport modes while maximising use of electricity from renewable generation
- Supporting demand for renewable energy.

Cluster

As rail and buses account for 91 per cent of greenhouse gas emissions from the Transport for NSW cluster, ensuring net zero electricity

to power rail and buses is the cluster's priority action. The remaining 9 per cent of cluster emissions can be reduced through embedding net zero considerations in decision making and lifecycle costing for all projects.

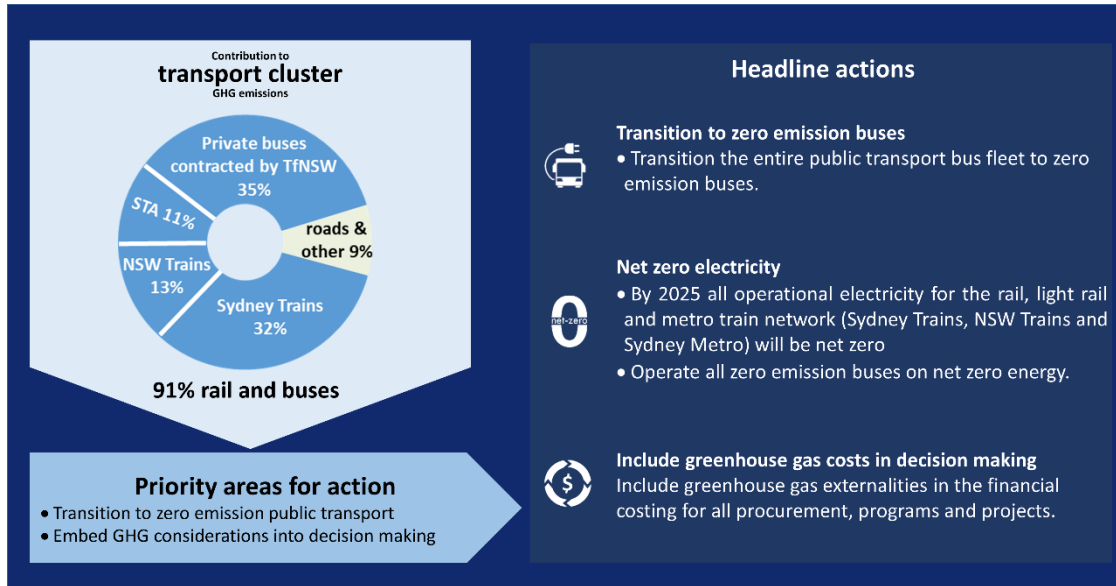


Figure 4 – Cluster headline actions

Sector

On-road transport (cars, light commercial vehicles, trucks, buses and motorcycles) makes up 85 per cent of total transport emissions, with passenger and light commercial vehicles contributing 62 per cent. Electric vehicles, particularly when powered by renewable electricity, provide a pathway to significant reductions in emissions from on-road transport.

While electric passenger vehicles currently have higher purchase prices than petrol and diesel vehicles, they are forecast to fall in price to cost the same as traditional internal combustion engines by the end of the decade.

A number of electric light commercial vehicles are coming to market, although the technology is not yet as mature as for passenger vehicles.

Accelerating the electrification of passenger and light commercial vehicles is a clear priority for the transport sector as a whole. Transport for NSW will take a leading role in initiating this shift by electrifying the Transport cluster passenger vehicle fleet and updating the NSW Electric and Hybrid Vehicle Plan to support a similar uptake of private passenger electric vehicles. Transport for NSW will also support emissions reduction initiatives such as last mile delivery and the development of low and zero emissions technologies for medium and heavy freight.

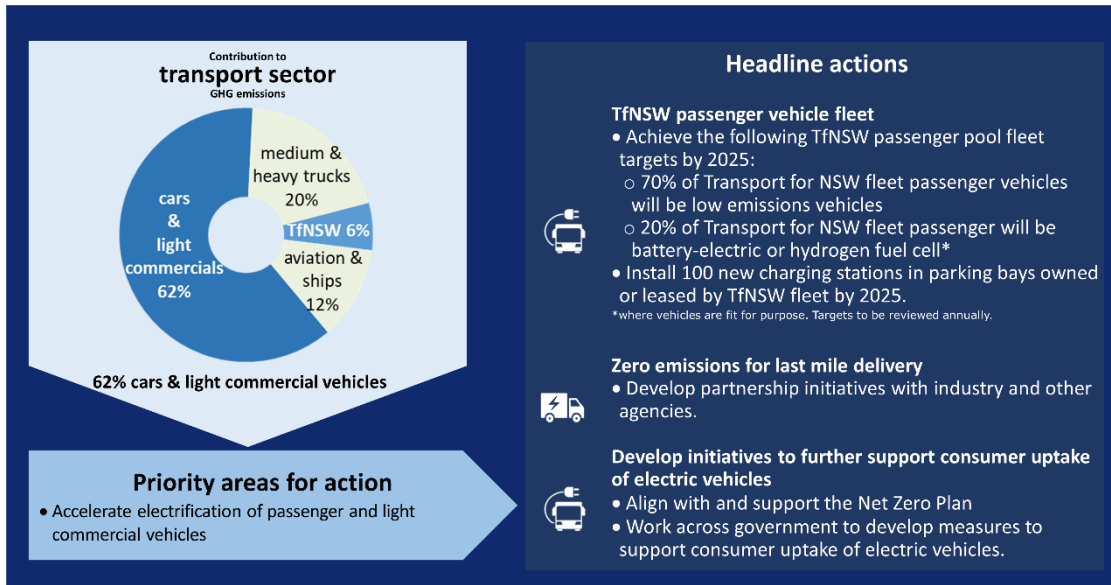


Figure 5 – Sector headline actions

Economy-wide

The transport sector is the second largest source of GHG emissions in NSW. The transport sector is also a growing source of GHG emissions. In 2016-17, transport accounted for almost 19 per cent of the state’s GHG emissions, an increase of 12 per cent since 2005⁵. However, the largest source of state-wide GHG emissions is stationary energy use (primarily for electricity generation), which at

46 per cent accounts for almost half of all emissions in NSW. The shift to renewable energy sources is a significant economy-wide priority. Transport for NSW can play an important role in supporting this shift by using net zero electricity for the electric rail network, undertaking hydrogen bus trials and ensuring we maximise the financially sustainable use of our assets for renewable energy generation – for example by the use of rooftop solar.

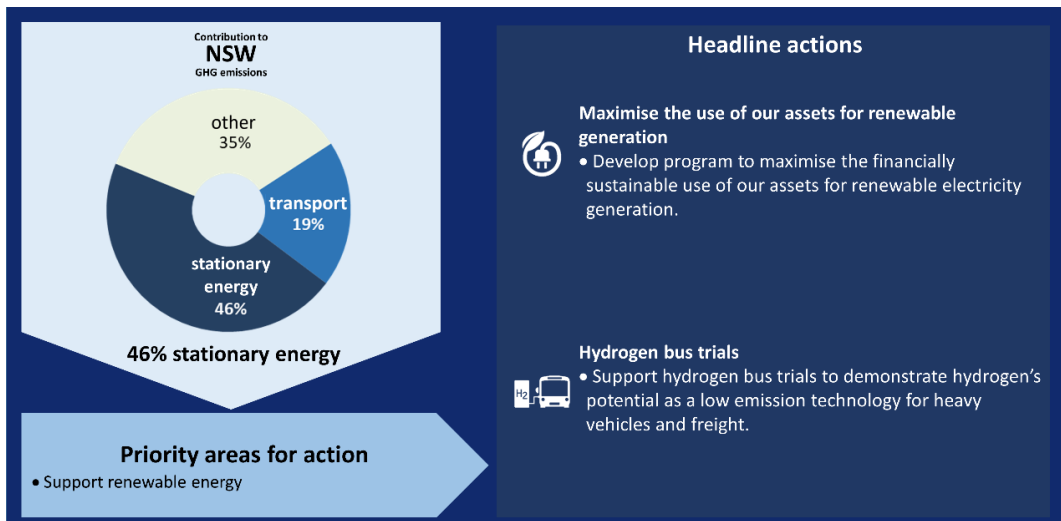


Figure 6 – Economy-wide headline actions

⁵ Department of the Environment and Energy 2018, *State and Territory Greenhouse Gas Inventories 2017*, Canberra, p. 4

2. Plan implementation and governance



2.1 Adaptive management

The implementation framework for Future Energy incorporates an adaptive management approach to help Transport for NSW respond to changes and learn from experience as we work together to transport our customers and the community to a net zero future.

Adaptive management is an iterative process of reviewing and making changes to programs and projects throughout implementation. Adaptive management emphasises the need to change with the environment and to learn from doing.

Achieving net zero emissions will require new approaches, and there will be many challenges along the way for which we do not yet have all the answers. New information and technologies will emerge during our journey, and an adaptive management approach facilitates the incorporation of further information into strategy implementation.

Transport for NSW will work to embed net zero considerations into decision making so we can identify and take advantage of the rapid technological change in low emission energy.

2.2 Governance

Each action led by Transport for NSW identifies which department or unit within the Transport cluster is responsible for its delivery within the designated timeframe.

The action plan will be revised annually over five years to ensure the actions are responding to ongoing developments in the low carbon and energy industries, and are effective in achieving the Future Energy objectives. Through this process, actions may be revised based on individual business case processes, funding availability, developing new technologies and changing customer needs.

Triannual workshops focusing on gap, barriers and opportunity analysis will be carried out to support and inform future decision making by identifying any additional actions that could be initiated within the short-term or in the next five year action plan. An annual forum will also be held to reflect on any shared lessons learned. Annual updates of the action plan will be published to share outcomes of the ongoing implementation process and report on the progress of each action.

Reporting, adaptive management and capacity development

Pick important problems. Fix them. Tell everyone. Repeat.



3. Headline actions



3.1 Cluster

Zero emission buses

Our commitment: We will transition the entire public transport bus fleet to zero emission buses powered by net zero electricity.

Why

With significant public health, community amenity, passenger comfort and operational cost benefits, zero emission buses are becoming a standard approach internationally.

The transition to a sustainable, net zero public transport system is a foundation action in the journey to a net zero transport system. It provides clean and cost-effective mobility to customers while decreasing our dependence on imported fuels and supporting local industry and jobs.

The transition to zero emission buses has the potential to deliver savings over the lifetime of the vehicles, particularly on fuel and ongoing operating and maintenance expenses. Fuel savings of up to 75 per cent are achievable and, at scale, maintenance costs could be reduced by up to 40 per cent. Electric buses also offer a smoother ride for passengers and cleaner, quieter running that brings social benefits to communities⁶.

What

The NSW Government is committed to taking advantage of new technology that improves passenger comfort and community amenity, delivers future cost savings, reduces GHG emissions and reduces the impact that current diesel buses have on air quality and people's health.

NSW has already begun introducing electric buses into the NSW bus fleet. Customers in Sydney's Inner West have been able to experience cleaner and quieter electric buses with Transport for NSW commencing a two

year trial to integrate five electric buses in a regular route service. The trial started in July 2019 and is being run by Transit Systems. The trial's focus is on measuring the benefits of fuel and maintenance cost savings, providing cleaner, quieter bus services with reduced emissions as well as monitoring customer comfort. Based out of Leichhardt depot, the five electric buses have been successfully tested on every route. The buses are able to travel around 350 km using approximately 80kW per hour of electricity, while regenerating, depending on traffic conditions, 30-40 per cent of their battery capacity through braking.

In 2019, the NSW Government announced \$10 million for a trial of ten electric buses and associated infrastructure at Randwick Bus Depot. The trial will test the feasibility of transitioning bus depots to partial or full electric operations.

Transport for NSW trialed NSW's first electric and automated Smart Shuttle for passengers at Sydney Olympic Park in partnership with industry. Transport for NSW has also partnered with industry, researchers and local councils to develop and co-deliver electric and automated shuttle trials at Coffs Harbour and Armidale.

An electric bus trial was also undertaken in 2019 on Nowra Coaches services between Kiama and Bomaderry railway stations using a Yutong E12 electric bus, which is currently operating in the Transit Systems trial. Approximately 8,500 passengers used this service, showing high levels of service satisfaction.

The NSW Government issued a Request for Expressions of Interest (RFEOI) in May 2020 seeking to partner with bus operators and industry to develop trials of zero emission buses in the Sydney and Outer Sydney Metropolitan Areas⁷. The trials will provide an opportunity to develop greater understanding around battery, electric and hydrogen fuel cell

⁶ NSW Electric and Hybrid Vehicle Plan, 2019

⁷ The Outer Sydney Metropolitan Area includes cities located from Newcastle to Wollongong

buses while supporting local capability in the mobility ecosystem. The learnings from these trials will help inform a strategic framework for the wider zero emission bus rollout and will investigate environmental sustainability (including Scope 1-3 emissions), operational cost and customer experience.

Transport for NSW is also developing a Zero Emission Bus Strategy to inform the transition to zero emission buses. With a major focus on sustainability (environmental, social, economic), the Strategy will help reduce Transport for NSW’s contribution to transport-

based emissions and support the NSW Government’s goal of net zero emission by 2050. The Strategy will consider the strategic pathway for the transition, opportunities for both electric and hydrogen fuel cell technology, energy requirements to support the transition, and the infrastructure, customer and financial implications.

This action will take advantage of the opportunity presented by its ageing bus fleet to become the first Australian state government to shift to an all-electric bus fleet.

When and how

Action	Next steps	Timeline	Responsibility
Zero emissions buses	Commence trials of zero emission bus technologies	2021	Greater Sydney
	Completion of Inner West bus trial	July 2021	

Added benefits

- Reduced reliance on imported fuels and potentially enhance security of supply
- Improved air quality
- Improved passenger comfort
- Reduced traffic noise
- Updating the bus fleet with the latest safety technology e.g. autonomous emergency braking (AEB) for vulnerable road user (VRU) systems (AEB VRU systems).



Figure 7 – Electric buses at the Leichhardt Depot

Net zero electricity for the rail network

Our commitment: Transition to net zero emission electricity for electric rail (Sydney Trains, NSW Trains and Sydney Metro) by 2025.

Why

The train network currently makes up around 86 per cent of electricity use across the Transport cluster.

The transition to a sustainable, net zero public transport system is a foundation action in the journey to net zero transport. It provides clean and cost-effective mobility to customers, while protecting the global environment and supporting local industry and jobs.

What

Sydney Metro has committed to offsetting 100 per cent of its operational electricity. Sydney Metro Northwest has a power purchase agreement with the Beryl Solar Farm, which has 260,000 solar modules on a 145 hectare site outside Gulgong. The Sydney Metro City & Southwest line, planned for completion by 2024, will also offset 100 per cent of the emissions generated by its operational electricity use. The same offsetting commitment is intended for the Sydney Metro West and Western Sydney Airport projects which are currently in the design stage.

Sydney Trains is currently assessing and costing options for achieving net zero emissions by 2025. The outcome of the assessment will determine the best value pathway for Sydney Trains to move to net zero emissions electricity.

When and how

Action	Next steps	Timeline	Responsibility
Net zero electricity for the train network	Sydney Trains initial market review of net zero electricity options	December 2020	Sydney Trains
	Net zero pathway strategy confirmed	July 2021	
	Sydney Metro City & Southwest procure an offset.	Source electricity with nett zero GHG emissions by the time the line is commissioned (2024)	Sydney Metro

Added benefits

- Improved air quality
- Directly support the renewable energy industry.

Net zero electricity for the light rail network

Our commitment: To transition all light rail operational electricity use to net zero sources by 2025.

Why

The transition to a sustainable, net zero public transport system is a foundation action in the journey to a net zero transport system. It provides clean and cost-effective mobility to customers, while decreasing our dependence on imported fuels, and supporting local industry and jobs.

What

Sydney Light Rail (CBD and South East Light Rail, and Inner West Light Rail) has commenced transitioning to net zero electricity sources. The electricity contract awarded to ERM Power for the period of January 2020 – June 2021 includes a required minimum of 20 per cent green power.

Post June 2021, Sydney Light Rail will be using Sydney Trains' electricity contract for large sites which is currently out for tender. The chosen emissions offsetting strategy and approach will be aligned with Sydney Trains' chosen method.

Sydney Light Rail is investigating other procurement options of additional Large Scale Generation Certificates (LGCs) considering current budget and market constraints, with the aim of achieving net zero emissions as soon as feasibly possible.

Parramatta Light Rail is investigating the use of 100 per cent renewable energy sources for the operational phase, to commence from June 2023. Newcastle Light Rail will investigate procurement options for renewable energy and LGCs considering current budget and market constraints, with the aim of achieving net zero emissions as soon as feasibly possible.

When and how

Action	Next steps	Timeline	Responsibility
Net zero emissions electricity for the light rail network	Increase green power mix for CBD and South East Light Rail, and Inner West Light Rail	June 2021	
	Confirm feasibility of procuring LGCs to offset 100% carbon emissions for Sydney Light Rail	April 2023	Greater Sydney
	Investigate options for 100% renewable energy for operations of Parramatta Light Rail	June 2022	
	Confirm feasibility of procuring renewable energy and LGCs to offset 100% carbon emissions for Newcastle Light Rail	December 2021	Regional Outer Metropolitan

Added benefits

- Support a pipeline of infrastructure upgrades for the renewable energy sector
- Support market innovation and clean technology.

Include greenhouse gas costs in decision making

Our commitment: We will include GHG externalities in the Cost Benefit Analysis where they are potentially significant.

Why

All markets feature a degree of imperfection. Market failure refers to a situation where the market does not deliver an efficient outcome. This generally occurs in cases where private incentives are not aligned with the broader interests of society as a whole.

Externalities are one type of market failure. An externality is a consequence of an industrial or commercial activity which affects other parties without this being reflected in the final cost of a good or service. Externalities can be either positive (external benefit) or negative (external cost).

Greenhouse gases are a negative externality, because they impose a cost on everyone, not just those who are directly or indirectly

(through their consumption patterns) responsible for producing them. The adverse effects of greenhouse gases are external to the market, which means there is usually only an ethical – rather than an economic – incentive for businesses and consumers to reduce their emissions.

What

Cost Benefit Analysis (CBA) is an evidence based method for systematically organising and presenting information to help government understand all impacts of policies and projects, including economic, social and environmental. CBA helps decision makers evaluate options and identify the best means to improve the welfare of the people of NSW. Both the NSW Treasury Guidelines and the Transport for NSW guidance include GHG externalities in CBAs.

Ensuring GHG externalities are included in CBAs where they are potentially significant makes sure that the GHG costs or benefits are included when evaluating options.

When and how

Action	Next steps	Timeline	Responsibility
Include greenhouse gas costs in decision making	Include GHG externalities in CBAs where they are potentially significant	Ongoing	All areas using CBAs as part of business case or decision making

3.2 Sector

Transport for NSW passenger vehicle fleet

Our commitment: To include in our fleet by 2025:

- Seventy per cent of passenger vehicles are low emission vehicles, where fit for purpose
- Twenty per cent of passenger vehicles are battery electric or hydrogen fuel cell, where fit for purpose
- One hundred new charging stations in parking bays owned or leased by Transport for NSW.

Why

Transport for NSW recognises the opportunity to be a leader in the uptake of low and zero emission vehicles.

Passenger and light commercial vehicles are responsible for 62 per cent of all transport emissions in NSW. Electric vehicles are becoming more price competitive. Prices of battery electric vehicles (BEV) have fallen 85 per cent since 2010⁸ and the total cost of ownership is almost on parity with internal combustion engine vehicles (ICEVs).

Under the DPIE Net Zero Plan Stage 1: 2020-2023, the NSW Government is working towards a whole-of-government electric or hybrid passenger vehicles target of 30 per cent of new vehicles by 2023, including at least 10 per cent battery electric vehicles.

Government fleet vehicles are typically resold to the second-hand market after three to five

years, giving NSW drivers more electric vehicle options at a lower cost.

Additionally, new renewable generation, such as wind and solar, supported by energy storage technology (such as pumped hydro, batteries and thermal storage) is expected to replace most of the retiring coal-fired power stations over the coming decades. This makes electric vehicles a viable low emissions option.

What

Growing the pool of electric vehicles and charging infrastructure used by Transport for NSW will send a clear demand signal to the market for vehicles which will ultimately have lower fuel and maintenance costs. Transport for NSW has already installed 38 charging stations in its Macquarie Park, Argyle Street, Milsons Point, Elizabeth Street and Burwood office buildings. Transport for NSW will install a further 100 charging stations in its office buildings by 2025.

Key challenges that will need to be considered include the lack of unified platforms for charging stations, annual subscription charges and market readiness. Targets will be reviewed annually to enable adjustment to changing market conditions and anticipated relaxation of supply constraints.

Additionally, 70 per cent of new passenger vehicles purchased or leased will be low emission vehicles (LEVs) by 2025 (where fit for purpose), with at least 20 per cent battery electric. This target builds towards the medium term target of 100 per cent LEVs by 2030. Next steps will include ascertaining availability and current usage of electricity across Transport for NSW, building and progressively increasing the ratio of electric vehicles in the passenger fleet.

⁸ DPIE Net Zero Plan. Stage 1: 2020-2030 (2020)

When and how

Action	Next steps	Timeline	Responsibility
Transport for NSW electric vehicle fleet	Assess options for installation of charging bays in regional offices	ongoing	Corporate Services
	Investigate procurement pathway for new charging bays and ongoing cost	December 2023	
	Increase BEV fleet to 10%	June 2023	
	Increase LEV fleet to 30%	June 2023	
	Increase LEV fleet to 70% (including 20% BEV where fit for purpose)	June 2025	

Added benefits

- Reduced reliance on imported fuels and potentially enhance security of supply
- Improved air quality
- Incentivise manufacturers to sell a greater range of electric vehicle models
- Increased lower cost electric vehicle options for NSW drivers.

Zero emissions for last mile delivery

Our commitment: Develop partnership initiatives with industry and other agencies.

Why

Last mile delivery is the final leg of delivery from the warehouse to consumer. While the name implies the last mile, the final delivery can range from a few blocks to more than 100 kilometres. However, the focus of last mile logistics is to deliver items to the end user as fast as possible.

A study published by the World Economic Forum in 2020⁹ found that:

- Demand for last mile delivery in cities is expected to grow by around 78 per cent by 2030, resulting in an increase in emissions of over 30 per cent under a business as usual scenario
- With ecosystem-wide change, interventions could reduce emissions and traffic congestion by 30 per cent, and delivery cost by 25 per cent, compared to the do nothing scenario.

What

There are a number of different technical solutions that could be deployed to provide last mile delivery while reducing GHG emissions. Two of the most advanced solutions are:

- Light vans: although mostly petrol or diesel now, in the future, electric or fuel-cell powered could be used in cities, towns and, to some extent, larger rural areas if refuelling is available. However, there are still very few ultra-low emission vans on the market and hydrogen refuelling stations are currently very scarce. Delivery hubs could, in the future, have hydrogen refuelling stations installed to address this.
- e-Cargo bikes and similar: suitable for the centre of cities where there are many small items to be delivered in a reasonably contained area. However, they offer few advantages over electric light vans for rural areas due to the distances and time involved, and reduced density of deliveries.

We will work with the freight industry and other agencies to develop partnership initiatives to support low emission last mile solutions.

When and how

Action	Next steps	Timeline	Responsibility
Zero emission for last mile delivery trials	Explore partnership options	July 2021	Customer Strategy and Experience, Freight

Added benefits

- Reduced delivery cost
- Reduced congestion.

⁹ <https://www.weforum.org/reports/the-future-of-the-last-mile-ecosystem>

Develop initiatives to further support consumer uptake of EVs

Our commitment: We will align with and support the Net Zero Plan and work across government to develop measures to support consumer uptake of electric vehicles.

Why

On road transport (cars, light commercial vehicles, trucks, buses and motorcycles) makes up 85 per cent of total transport emissions, with passenger and light commercial vehicles contributing 62 per cent. Electric vehicles, especially when powered by renewable electricity, provide a pathway to significant reductions in emissions from on-road transport.

What

The global electric vehicle market is growing rapidly, with about 2.1 million electric vehicles

sold around the world in 2018. Electric vehicles present a significant opportunity for motorists to reduce their yearly car operating costs. Already, the average driver can save about \$1300 a year on fuel costs and about \$300 on annual maintenance costs by switching to an electric vehicle. While electric passenger vehicles currently have higher purchase prices than petrol and diesel vehicles, they are forecast to fall in price to cost the same as traditional internal combustion engines by the end of the decade.

The NSW Electric and Hybrid Vehicle Plan and Net Zero Plan Stage One outline the actions the NSW Government is already taking to support the uptake of passenger electric vehicles.

Transport for NSW will work across government to develop further measures to support consumer uptake of electric vehicles.

When and how

Action	Next steps	Timeline	Responsibility
Develop initiatives to further support consumer uptake of EVs	Explore options to encourage EV adoption	July 2021	Customer Strategy and Experience

Added benefits

- Reduced reliance on imported fuels and potentially enhance security of supply
- Improved air quality.

3.3 Economy-wide

Maximise the financially sustainable use of our assets for renewable generation

Our commitment: We will develop programs to maximise the financially sustainable use of our assets for renewable electricity generation.

Why

Transport for NSW has a wide range of assets across the state, from offices to depots and transport corridors. Transitioning to renewable electricity is essential if we are to achieve net zero. There are potential cost savings in local generation, particularly if it is 'behind the meter'.

What

Any electricity user – whether they are big or small, a domestic user, or a commercial or industrial organisation – will have meters on

their premises that calculate how much energy has been taken from the grid and how much is owed to the utility provider. In simple terms, behind the meter refers to anything that happens onsite, on the energy user's side of the meter. Conversely, anything that happens on the grid-side is deemed to be in front of the meter.

Electricity generated behind the meter is not subject to network charges. Network charges are paid to the electricity distributors, and can make up between 30 and 50 per cent of an electricity bill. The savings on network charges means that on-site behind the meter generation has the potential to be cheaper than grid electricity.

Transport for NSW will develop and implement programs to ensure we are maximising the business opportunities for the use of our assets for renewable electricity generation.

When and how

Action	Next steps	Timeline	Responsibility
Develop programs to maximise the financially sustainable use of our assets for renewable electricity generation	Scope potential for developing behind the meter electricity generation	June 2021	Environment and Sustainability

Added benefits

- Reduced cost of power system augmentation, helping to reduce the overall cost of supply faced by consumers.

Hydrogen bus trials

Our commitment: We will support hydrogen bus trials to demonstrate hydrogen’s potential as a low emission technology for medium and heavy vehicles and freight.

Why

Almost half of all interstate freight in Australia is carried on roads, and NSW accounts for more than one third of the country’s total road freight¹⁰. The NSW population will be 12 million by 2056, requiring double the current metropolitan freight load. Although technology is not available for significant de-carbonisation of heavy duty and long-haul freight, low and zero emission technology is starting to become commercially available for light commercial vehicles and medium duty urban freight.

Hydrogen fuel cell technology is expected to be the most likely means of enabling a

transition to net zero within the heavy freight industry in the medium to longer term as they are lighter, provide longer range and quicker refuelling compared to battery electric vehicles. Hydrogen bus trials and the development of the NSW Hydrogen Strategy can provide greater insights into hydrogen technology and its long term application in public transport and freight, while also building local capability and expertise in NSW.

What

Next steps of this action will be further informed by the National Hydrogen Strategy (2019) and the Future Fuels Strategy¹¹. These steps will include a hydrogen fuel cell bus trial to assist in incubating hydrogen as a low emission technology for heavy vehicles and freight, and investigating the feasibility of conducting hydrogen fuel cell train trials for the South Coast Line between Port Kembla and Kiama.

When and how

Action	Next steps	Timeline	Responsibility
Hydrogen fuel trials	Hydrogen fuel cell bus trials through RFEOL for zero emission buses	December 2021	Greater Sydney
	Investigate feasibility of hydrogen fuel cell train trials	December 2021	DED Rolling Stock Delivery

Added benefits

- Build capability and expertise in emerging EV technologies in NSW
- Better integrated planning.

¹⁰ <https://www.business.nsw.gov.au/support-for-business/innovation-and-research/knowledge-hubs/transport-and-logistics-knowledge-hub>

¹¹ Discussion paper released February 2021 <https://consult.industry.gov.au/climate-change/future-fuels-strategy/>

4. Other actions by primary focus area



4.1 Improve operational energy efficiency

Improve energy efficiency during rail operations

Our commitment: To reduce electricity consumption from rail operations by:

- 10% by scheduled train kilometres by 2025 for Sydney Trains
- Ensuring new buildings designed for Sydney Metro projects include energy efficiency measures.

Why

The International Energy Agency has called energy efficiency a “hidden fuel” and it is highly cost effective. The cheapest energy is the energy we don’t use. Improving energy efficiency of operations will save money, reduce energy use and reduce exposure to fluctuations of the energy market.

What

Sydney Trains has set a target to reduce electricity consumption by up to 10 per cent on a scheduled train kilometres basis by 2025

When and how

Action	Next steps	Timeline	Responsibility
Improve energy efficiency during rail operations	Continue to investigate opportunities to install LEDs in Sydney Trains’ infrastructure as funding becomes available and opportunities arise	ongoing	Sydney Trains
	Investigate and trial HVAC and stabling mode improvement opportunities for Waratah and SGT fleet	Q2 2021	
	Embed energy efficiency measures into the design of the City & Southwest line	December 2023	Sydney Metro

Added benefits

- Reduced burden on electricity supply system
- Reduced operational cost of rail facilities and operations.

against a 2019 baseline. Previous energy efficiency initiatives included the installation of light emitting diode (LED) lighting across approximately 209 Sydney Trains and NSW Trains stations, reducing station lighting energy consumption by up to 35 per cent and saving approximately 6 GWh and around 4,860 t CO2e per annum. LED lighting has also been retrofitted on the Tangara train fleet and NSW Trains’ V-set fleet, replacing approximately 16,500 and 9,800 fluorescent lights respectively, and within the city underground tunnels.

Other energy efficiency areas being investigated by Sydney Trains include heating, ventilation and air conditioning (HVAC) and stabling mode enhancements.

New buildings designed for Sydney Metro must achieve at least a 15 per cent energy efficiency improvement, when compared to minimum standards set out in the relevant National Construction Code. Efforts being investigated to achieve this target include the use of efficient glazing as well as design elements of building fabric, mechanical, electrical and lighting systems.

Enable excess regenerative energy capture and reuse

Our commitment: To investigate and implement options to enable excess regenerative energy to be captured and reused at select locations.

Why

Energy recycling or recovery process can capture and reuse energy that would otherwise be wasted, saving money, reducing energy use and reducing emissions.

What

Ninety per cent of the Sydney Trains fleet is already equipped with regenerative braking capability. Regenerative braking enables train motors to act as generators under braking conditions returning electricity back into the overhead wiring system to power other nearby accelerating trains and to power onboard auxiliary systems. The reuse of this energy provides substantial energy usage reduction. Sydney Trains is investigating the potential for using energy storage and recovery

technologies (such as batteries, supercapacitors and inverters) to recover excess regenerative braking energy at select locations.

A regenerative braking system is operational on the Sydney Metro Northwest line. Sydney Metro will investigate options to further enhance the reuse of energy recovered from the regenerative braking system on the City & Southwest line through the use of wayside energy recovery systems.

Additionally, Sydney Light Rail has installed Hesop reversible power substations across its network. This technology allows the light rail vehicles to recover 99 per cent of the energy usually lost during their braking mode. The recovered energy can be reused to power other vehicles running on the same line, or injected back into the network.

At Newcastle Light Rail, regenerative braking sends excess traction power back into the NLR grid for use by other vehicles charging simultaneously.

When and how

Action	Next steps	Timeline	Responsibility
Enable excess regenerative energy capture and reuse	Modelling and technology assessment	July 2021	Sydney Trains
	Confirm feasibility of options to maximise the reuse of energy recovered from regenerative braking through the use of wayside energy recovery systems	December 2021	
	Complete design and install the regenerative braking energy recovery system on the City & South West line	December 2023	Sydney Metro

Added benefits

- Reduction of operating cost
- Reduction of maintenance cost (savings on brake pads)
- Reduced burden on electricity supply system.

New bi-mode regional fleet

Our commitment: The new regional rail fleet will operate in bi-mode configuration, providing a more energy efficient and less emissions intensive rail service.

Why

Bi-mode is a diesel-electric hybrid that will allow the new fleet to run on overhead power when operating on the electrified section of the train network. When operating outside of the electrified network, the train uses on-board Diesel Electric Multiple Units (DEMUs) to generate its electricity.

Using this technology will reduce annual carbon emissions by over 540 tonnes and diesel particulate emissions by over three tonnes.

What

The NSW Government is replacing the ageing NSW regional rail fleet of XPT, XPLOER and Endeavour trains, which includes trains that are up to 37 years old. The new trains will improve safety, accessibility, amenities and

reliability for customers who travel from Sydney to many regional centres in NSW, as well as Canberra, Melbourne and Brisbane.

The new fleet will operate in bi-mode configuration, which is a first for Australia. The first new trains are expected to be running from 2023, with the full fleet coming into service progressively.

Capital funding of \$1.26 billion for the new fleet, a new maintenance facility in Dubbo, network enabling works and other project delivery costs have been allocated and a \$2.8 billion contract with Momentum Trains was signed in February 2019. Momentum Trains will finance the project, design, build and maintain the new fleet as well as design, build, maintain and operate a new, purpose-built train maintenance facility in Dubbo to help stimulate regional economies and create sustainable job opportunities and skills.

Planning and design work has commenced for the maintenance facility and the fleet of 29 new trains, including 117 new carriages forming 10 regional intercity, nine short regional and 10 long regional trains.

When and how

Action	Next steps	Timeline	Responsibility
New bi-mode rail regional fleet	First train fleet deployment	2023	Infrastructure and Place – Rail Delivery

Added benefits

- The reduction in emissions will result in an annual saving of approximately \$1 million through associated health and environmental benefits
- Savings in diesel cost of over \$2 million annually
- Reduced noise and air quality impacts from regional rail fleet when travelling along the electrified network.

More information

<https://www.transport.nsw.gov.au/projects/current-projects/regional-rail>

Bus priority infrastructure program (BPIP)

Our commitment: To deliver infrastructure that makes bus services faster and more reliable.

Why

Buses are a key part of Sydney's growing and evolving public transport network. Sydney's buses provide more than 220 million trips a year across the city. As Sydney grows, the bus system needs to meet the challenges this growth will bring. Delivering improvements to the road corridor and implementing bus priority measures will improve the reliability of bus services affected by congestion at network bottlenecks. It is anticipated that this will make bus services more attractive to users, encouraging a shift away from emissions-intensive private vehicle use for short trips.

What

The Bus Priority Infrastructure Program (BPIP) will deliver infrastructure that makes bus services faster and more reliable, such as bus lanes, bus priority at intersections and more efficient bus stop placement. These projects help provide:

- priority red bus lanes or bus only lanes along key corridors
- bus priority at signalised intersections with bus jump starts and B-phase signals
- more efficient bus stop placement to encourage good patronage and meet walking distance guidelines of 400 metre spacing

- strategically located bus layovers to cater for current and future growth and reduce 'dead running' time for out of service buses returning to depots
- improved bus priority traffic signal operations along key corridors to provide green light priority for buses
- integration of bus services to support major transport projects such as light rail and metro
- a more seamless customer experience through improvements to wayfinding signage or accessible ground surface indicators.

Installing infrastructure to improve on-time running of bus services will also enable increasing the frequency of these services and aim to reduce the amount of lost time on the network due to delays and inefficient servicing. This will provide an integrated package of service and infrastructure improvements designed to provide more reliable journeys for bus customers across Sydney's key bus corridors. It will also support customer demand for strategic centres and growth precincts.

In the 2019-20 program, there were over 20 projects at different stages of design development and delivery including changes to bus stop locations, bus access and priority improvement projects, bus zone extensions, bus only link roads, improved bus priority and access to Sydney Light Rail and Metro, intersection upgrades, and a bus priority and capacity improvement project with various upgrades across Macquarie Park.

When and how

Action	Next steps	Timeline	Responsibility
Bus Priority Infrastructure Program	Identification, development and delivery of suitable bus priority measures to improve bus network performance, efficiency and reliability for bus customers	Ongoing	Greater Sydney
	Macquarie Park Bus Priority and Capacity Improvement implementation	January 2023	

Added benefits

- Reduced bus operating cost
- Improved air quality
- Improved reliability of bus services for customers.

More information

<https://www.rms.nsw.gov.au/projects/easing-sydneys-congestion/bus-priority-program.html>

More energy efficient ferries

Our commitment: To continue to deliver energy efficiency initiatives that reduce emissions from the ferry network.

Why

The International Energy Agency has called energy efficiency a ‘hidden fuel’ and it is highly cost effective. The cheapest fuel is the fuel we don’t use. Improving energy efficiency of operations will save money, reduce energy use and reduce exposure to fluctuations of the energy market.

What

The Sydney metropolitan area ferries network comprises nine routes serving Sydney’s Harbour City, the Northern Beaches, Lower North Shore, Eastern Suburbs, Inner West, Northern Suburbs and destinations along the Parramatta River. Around 13 million litres of fuel is consumed delivering services each year.

When and how

Action	Next steps	Timeline	Responsibility
More energy efficient ferries	First River Class ferries introduced on Parramatta service	November 2020	Greater Sydney
	First Fleet Class refurbishment	December 2021	
	Emerald class fleet transition for Manly service	Early 2021	

Added benefits

- Improved air quality
- Improved service frequency and travel time.

Transdev Sydney Ferries, the operator of the Sydney Ferries network, achieved carbon neutral certification through offsets in 2019 under the umbrella of the Australian Government Climate Active initiative.

Additionally, Transdev Sydney Ferries has installed a fuel monitoring system aboard the fleet. The system is designed to assist, identify and highlight the effects of fuel consumption reduction initiatives, related costs and environmental impact.

Transport for NSW will explore and implement other initiatives to further reduce emissions from the ferry network, including fleet modernisation. As a first step, 10 new River Class ferries will be introduced on the Parramatta River service, which will be more fuel efficient than the existing fleet.

The First Fleet Class is also being refurbished with new more fuel efficient engines.

Improved road infrastructure operational energy efficiency

Our commitment: To continue to trial and implement energy efficiency measures for new road and bridge projects.

Why

The International Energy Agency has called energy efficiency a 'hidden fuel' and it is highly cost effective. The cheapest energy is the energy we don't use. Improving energy efficiency of operations will save money, reduce energy use and reduce exposure to fluctuations of the energy market.

What

Lighting on our road infrastructure, stations and facilities is a significant consumer of energy. Transport for NSW currently owns around 15,000 streetlights across NSW, with the overall road network (almost 185,000 kilometres in length) having over 600,000 street lighting lamps in service. Street lighting is the single largest source of carbon emissions from local government, typically accounting for 30 to 60 per cent of their total emissions¹² and contributes to approximately 17 per cent of emissions from road operations.

Smart street lighting infrastructure has additional features that increase efficiencies and productivity through data collection, sharing and analytics. Transitioning to LED lighting, smart street lighting and other operational energy efficient technologies will contribute to emissions reductions from these sources.

Transport for NSW has been trialling and implementing operational energy efficiency measures in new and refurbished road assets on a project by project basis, including replacement of traditional lighting lamps with LEDs and smart street lighting trials, while maintaining safety requirements. Over 4000 traffic signals have already been converted to LED technology, reducing energy consumption by 67 per cent.

One such project included the installation of 260 new energy efficient LED heritage-style light fittings on the Sydney Harbour Bridge. The Hawkesbury River Bridge is another example of an integrated problem solving approach between different asset class groups. Other projects currently considering and planning energy efficiency or renewable energy initiatives include South Batemans Bay Link Road, Pacific Highway Woolgoolga to Ballina and Coffs Harbour Bypass.

The Roads and Maritime Sustainability Strategy 2019–2023 included a target to install energy efficient LED light sources into all new and end-of-life replacement street lights owned by Transport for NSW. The new 10 year contract for Sydney Maintenance requires that permanent street lighting or area lighting must use LED lights or technology of similar energy efficiency performance for any new installations or end-of-life replacements. Sydney Asset Planning is also developing a policy to upgrade street lighting more widely to LEDs. Additionally, Transport for NSW uses solar panels to power roadside signage, alert and messaging systems wherever possible.

¹² <https://www.energyrating.gov.au/products/street-and-public-lighting>

When and how

Action	Next steps	Timeline	Responsibility
Improved roads operational energy efficiency	Investigate options for smart street lighting trial at South Batemans Bay Link Road	August 2021	Infrastructure and Place
	Completion of policy to upgrade street lighting to LED	June 2021	Greater Sydney
	Completion of Pacific Highway, Glenugie to Tyndale solar PV powered rest stop	December 2020	Infrastructure and Place
	Completion of energy efficiency and greenhouse gases strategy for Coffs Harbour Bypass project	June 2022	Infrastructure and Place

Added benefits

- Lower operational cost.

Smart technology corridors program

Our commitment: To increase the use of technology to actively monitor and better manage the road network, improving traffic flows and ensuring road infrastructure is ready for Connected and Automated Vehicles (CAV) and Battery Electric Vehicles (BEVs).

Why

Smarter roads offer opportunities to help reduce fuel consumption and associated emissions through improved traffic flows and reduction in instances of stopped traffic due to incidents. Intelligent traffic lights for example, can determine the flow of the traffic in an improved manner and change from red to green more efficiently to clear traffic queues, reducing the number of stops in traffic by up to 15 per cent. These lights will also be more responsive to priority road users such as buses and emergency vehicles as well as to pedestrians and cyclists. Enhanced forms of vehicle detection can facilitate improved service for more energy efficient forms of transport, such as BEVs.

Smart signs offer modern and straightforward solutions to quickly and accurately inform road users of current and future restrictions, addressing legibility and roadside clutter issues. Drone utilisation can improve - and be a complementary technology to - the current means of traffic and incident management. Drone operators can visually ascertain incident severity, lane closures, queue lengths, vehicle movements, traffic density, driver behaviour and network issues. This significantly improves the efficiency and scope of incident detection and consequently, a quicker restoration to pre-incident conditions.

What

In 2019, the NSW Government announced \$400 million to install intelligent traffic lights at 500 intersections across Sydney, Wollongong and Newcastle in 14 corridors. The Intelligent Traffic Light Program (ITLP) will develop new technologies to provide adaptive coordination

of traffic signals and queuing management at signalised intersections. It will also provide dynamic prioritisation for specific vehicle types and users such as pedestrians, cyclists, buses, heavy vehicles or emergency vehicles. Improvements in the advanced traffic management of all user and vehicle types via the ITLP will substantially contribute to reduction in greenhouse gas emissions. The ITLP provides the opportunity to decarbonise operational energy usage and will play a key role in the realistic transition to greater CAV uptake.

A trial of smart digital clearways and parking signage is also being funded through a \$95 million investment. Technology options and testing locations for smart signs are being investigated as part of a Strategic Business Case. Smart signs will enable remote and dynamic changes to electronic signage, allowing better communication of clearway and parking arrangements. Smart signage will also improve management of special events and contribute to congestion reduction as a result of improved parking compliance, reduced lane disruption and minimising the need to tow vehicles during peak traffic flow. The program will seek energy efficient and sustainable outcomes for the operation of smart signs including solutions through AC power and solar power where feasible.

Additionally, \$25 million has been committed to trial the use of drone technology and virtual variable sign messaging. This will improve real time road network monitoring and fast reporting and clearing of traffic incidents, providing a significantly enhanced ability to manage disruptions via operational interventions. An initial six month trial carried out by the Transport Management Centre (TMC) for incident management scenarios proved the validity of the concept, and the benefits related to rolling out the use of drones to a wider set of transport commanders with integration of drone usage into TMC operational systems.

When and how

Action	Next steps	Timeline	Responsibility
Smart technology corridors program	Drones & Virtual VMS Program Strategic Business Case	September 2021	Greater Sydney
	ITLP Strategic Business Case	April 2021	
	Smart Signage Program Strategic Business Case	November 2021	

Added benefits

- Improved safety and (time/energy) efficiency for all road users, including active transport modes
- Ability for operators to change signs remotely reducing safety risk to operators
- Improved situational awareness of operators
- Reduction of travel time to minimise congestion and in certain situations even prevent it from occurring, leading to environmental benefits
- Operations and maintenance costs savings
- Decarbonisation of operational energy sources.

Easing Sydney's congestion

Our commitment: To support Sydney's growing population by delivering significant improvements to reduce Sydney's congestion and improve traffic flow.

Why

To create thriving and well-connected communities, a holistic approach to congestion management is required with efficient use of transportation infrastructure a component. Vibrant, healthy communities have convenient, clean and cost-effective transportation, with attractive alternatives to private motor vehicles. The NSW Government recognises this and has committed \$32.2 billion for public transport projects and \$23.4 billion for road projects between 2019–2023.

Congestion costs Sydney around \$5 billion each year (nearly \$1,100 per person) and leads to increases in fuel consumption and associated GHG emissions. Minimising congestion and ensuring smooth traffic flows at moderate speeds on highways has been reported to reduce greenhouse gas emissions between 8¹³ and 20 per cent¹⁴. Initiatives such as the Smart Motorway also provide motorists with information about travel times and incidents to help plan their journeys and make better-informed transport mode choices.

What

The NSW Government is investing \$600 million to build the M4 Smart Motorway project, which will introduce intelligent technology to the M4 Motorway between WestConnex at Mays Hill to Mulgoa Road, Penrith. This is the State's first smart motorway, and was completed in 2020, it improves traffic flow through the use of ramp meters, lane use management and variable speed limit signs, vehicle and hazard

detection, variable messaging signage and CCTV coverage.

In March 2019, NSW Government announced \$200 million to upgrade other major motorways into smart motorways. The Project will deliver targeted intelligent transport system upgrades along the Pacific Motorway between Pennant Hills Road at Wahroonga in the south and Central Coast Highway at Kariong in the north. The proposed upgrades include vehicle and hazard detection, additional CCTV coverage, and information systems such as lane-use management signs along the motorway. The upgrades will be integrated into operations through a motorway management system.

Additionally, the NSW Government has committed \$30 million to reduce congestion around the Parramatta local government area by upgrading key intersections that provide access to the Parramatta CBD.

The \$300 million Pinch Point program focuses on reducing congestion and improving traffic flows on corridors such as Pacific Highway, Cumberland Highway, Parramatta Road, Old Windsor Road, The Kingsway, Campbelltown Road and Hoxton Park Road. The Gateway to the South Program is a \$300 million program of intersection improvements that provide short to medium-term solutions to improve travel time and reliability for all road traffic, including buses and freight. This program has completed projects in Menai, Kogarah, Monterey and Engadine, and aims to address critical pinch points along the A1, A3 and A6 routes south of the M5 Motorway.

Another way Transport for NSW will deliver this commitment is through the installation of new and extended clearways as part of the Sydney Clearway Strategy. This program has already installed over 729 kilometres of clearways on some of Sydney's busiest corridors since 2013.

¹³ Ubiergo, GA, & Jin, W 2016, 'Mobility and environment improvement of signalized networks through Vehicle-to-Infrastructure (V2I) communications', *Transportation Research: Part C*, vol. 68, pp. 70-82

¹⁴ Asian Development Bank 2010 *Reducing Carbon Emissions from Transport Projects*

When and how

Action	Next steps	Timeline	Responsibility
Easing Sydney's congestion	Completion of M4 Smart Motorway	December 2020	Greater Sydney
	Completion of Gateway to the South Program	June 2022	
	Completion of the \$300m Pinch Points Program	June 2022	
	Completion of concept design of M1 Smart Motorway Wahroonga to Gosford project	September 2021	
	Completion of M1 Smart Motorway Wahroonga to Gosford project	December 2024	

Added benefits

- Supports Future Transport 2056 Greater Sydney initiatives
- Improved air quality
- Health benefits from reduced congestion
- Improved safety for all road users
- Improved travel reliability.

More information

<https://www.rms.nsw.gov.au/projects/easing-sydneys-congestion/index.html>

Intelligent congestion management program

Our commitment: To improve the NSW Transport Management Centre's (TMC's) multi-modal transport coordination capability.

Why

The integrated transport system for NSW relies on a multi-modal transport coordination capability. Transport for NSW's Intelligent Congestion Management Program (ICMP) is improving travel demand management across the network, as well as the ability to respond to disruptive events quickly (around five minutes). This significantly reduces the duration and adverse impact of network events, leading to reduced congestion and lower vehicle emissions due to idling and stop-start cycles.

What

Transport for NSW is investing \$123 million in the Intelligent Congestion Management Program (ICMP). This program will be a key

enabler of multi-modal transport coordination, providing integrated technology and real-time data for multi-modal event planning and management that will address current state problems.

The new capabilities will use real-time data, predictive analytics and decision support on roads and public transport so operators can predict 30 minutes into the future and act within five minutes of an event occurring. These new capabilities will be rolled out in three phases between May 2020 and July 2021.

In the future, ICMP will build capability to disseminate information to travellers from intelligent journey planning and decision-making forecast models. This could shift travel behaviours and reduce the pressure on the road space, curbing the growth of travel by private vehicles and reducing emissions. ICMP's new capabilities include offline simulations to support road occupancy licensing and major event planning.

When and how

Action	Next steps	Timeline	Responsibility
Intelligent congestion management program	Phase 1 roll out	May 2020	Transport Coordination
	Phase 2 roll out	January 2021	
	Phase 3 roll out	July 2021	
	Benefit tracking and assessment report	October 2021	

Added benefits

- Contribute to achieving the vision of Future Transport Technology Road Map
- Improved road safety
- Better-informed traffic management decision making.

More information

<https://www.transport.nsw.gov.au/projects/current-projects/intelligent-congestion-management-program-icmp>

4.2 Support and enable increased uptake of zero and low emission vehicles

NSW regional and commuter car park electric vehicle charging program

Our commitment: To co-invest in fast chargers in regional NSW and commuter car parks, and develop an online platform to encourage the uptake of electric vehicles.

Why

The NSW Government recognises that electric vehicles offer significant economic benefits to customers and environmental and health benefits to communities.

Although vehicle electrification has started slowly in Australia, the global transition to electric vehicles is advancing rapidly – driven by improving technologies, falling battery costs and government policies – meaning local opportunities are closer than ever.

The NSW Electric and Hybrid Vehicle Plan identified lack of charging infrastructure and customer information as key barriers to the take up of electric vehicles in NSW.

In 2019, there were only about 390 public charging points (21 fast chargers) in NSW. This has led to range anxiety – the perceived risk that a vehicle may run out of charge before a charging point is reached.

Although most charging is expected to occur at home, access to public charging is essential to those without their own charging facilities and to overcome range anxiety.

What

The NSW Electric and Hybrid Vehicle Plan committed \$3 million seed funding to partner with industry and local councils to co-deliver electric vehicle fast charging in regional NSW, and \$2 million for electric vehicle chargers in

commuter car parks in the greater Sydney metropolitan area. The program will be delivered through collaborative co-investments with industry via a two stage procurement process.

The NSW Government partnered with the NRMA to deliver at least 20 additional electric vehicle fast chargers to the existing regional network along the State's major highways. This will help create the most comprehensive regional charging network in the country, opening regional NSW up to electric vehicle owners.

The extended regional charging network will reduce range anxiety for EV drivers, support the regional tourism economy and promote local investment in regional centres along the Newell, Barrier, New England, and Kamilaroi highways. Once the network is complete by 2022 it will allow people to travel to Broken Hill, Moree and Bourke, and to link up with major routes in Queensland, Victoria and South Australia.

The commuter car park electric vehicle charging trial will benefit electric vehicle owners who lack access to home charging. Nearly 30 per cent of households in NSW do not have access to parking to install an electric vehicle charge point. These households will be reliant on public charging infrastructure to operate an electric vehicle. The chargers will also support commuting journeys by encouraging travel by public transport. The trial will investigate commercial models to operate chargers in commuter car parks and also provide the basis to understand customer needs for chargers at commuter car parks.

Transport for NSW launched a new [web portal](#) on the corporate website to make it easier for consumers to access information about electric vehicles and charging infrastructure locations helping them make a more informed choice when purchasing their next car.

When and how

Action	Next steps	Timeline	Responsibility
NSW regional and commuter car park electric vehicle charging program	Complete regional EV charging program	2022	Smart Innovation Centre
	Request for proposals for delivery of EV charging commuter car park 2-year trial	2021	

Added benefits

- More convenient access to public transport targeted at BEV users
- Fuel and maintenance cost savings that would benefit individuals and the broader economy
- Support modes of transport that produce less air and noise pollution.

4.3 Identify and promote opportunities to shift to more efficient transport modes

16 cities service improvement program

Our commitment: To deliver improved and more efficient customer facing transport services at 16 cities in NSW.

Why

Regional cities in NSW are often heavily car-dependent. In Coffs Harbour, 78 per cent of residents of the urban area used their car to get to work on 2016 census day¹⁵. On average across the 16 cities¹⁶ in the program, 76 per cent of residents commute to work by private car (either as driver or as passenger) and only 0.5 per cent use public transport.

Vibrant, well-connected and healthy communities have convenient, clean, and cost-effective transportation, with attractive alternatives to motor vehicles. The 16 Cities program will improve public transport services for regional communities by improving the efficiency of the transport network, ensuring

routes are customer-focused and more direct. This will increase patronage due to services being more attractive and contribute to reducing car-dependence and associated fuel emissions.

What

The 16 Cities Service Improvement Program has approved funding of \$57 million to be invested over three years. Since 2016, the Rural and Regional Planning and Development Services have already delivered, as part of this program, a new approach to service planning in regional and rural NSW. Two pilot projects were planned in Wagga Wagga and Tweed Heads during 2017–2018. The pilot projects trialled human-centred service design approaches and carried out extensive engagement with local stakeholders, community groups and members, local operators and Transport for NSW staff. The new service plans started in December 2019 (Tweed Heads) and March 2020 (Wagga Wagga).

Planning works and community consultation for service improvements in the remaining cities will be delivered in stages over the next four years to June 2024.

¹⁵ Australian Bureau of Statistics, Census of Population and Housing 2011 and 2016

¹⁶ Albury, Armidale, Bathurst, Coffs Harbour, Dubbo, Grafton, Griffith, Nowra-Bomaderry, Lismore, Orange, Parkes, Port

Macquarie, Queanbeyan, Tamworth, Tweed Heads and Wagga Wagga.

When and how

Action	Next steps	Timeline	Responsibility
16 cities service improvement program	Service improvement planning and consultation in Dubbo, Nowra-Bomaderry, Coffs Harbour, Bathurst, Queanbeyan, Lismore, Albury and Griffith	June 2020–2024	Regional and Outer Metropolitan
	Service improvement planning and consultation in Armidale, Tamworth, Port Macquarie, Orange and Grafton	June 2020–2024	
	Service improvement roll out in Armidale, Tamworth, Port Macquarie, Orange and Grafton	June 2020–2024	

Added benefits

- Reduced car dependence
- Improved travel choices and mobility in regional cities.

Greater Sydney bus network strategy

Our commitment: To develop and deliver a 10 to 20 year strategy for Greater Sydney's bus system that offers capacity, reliability and flexibility for our customers and meets future growth challenges.

Why

NSW Government investment in infrastructure and urban growth occurring and planned to occur over the next 10 to 20 years will substantially change Greater Sydney. Transport for NSW will help achieve successful investment outcomes by delivering an integrated and supportive bus network.

A higher level of integration between transport services within the network would enable customers to more easily connect to flexible services and experience seamless and reliable journeys. Comfort, reliability and a more flexible network will make public transport a more convenient option. The Greater Sydney Bus Network Strategy will help reduce emissions from private vehicles by encouraging users to shift to more energy efficient modes of transport.

What

Transport for NSW will develop the Greater Sydney Bus Network Strategy (the Strategy) by July 2021, investigating opportunities and challenges for the bus network for 2020–2036. The Strategy provides direction for the ongoing development and management of the bus system, including:

- integration of bus services within the broader public transport system
- provision of supporting bus infrastructure and bus fleet
- definition of bus operating characteristics and hierarchy
- identification of the future rapid and frequent bus network
- alignment to the Greater Sydney Integrated Network Plan and Future Transport corridors and centres.

The strategy will also investigate challenges and opportunities, including intelligent services (such as MaaS), zero emission buses and autonomous transit, and be supported by the Greater Sydney Bus Network Plan (GSBNP) which details the four-year plan for network changes.

When and how

Action	Next steps	Timeline	Responsibility
Greater Sydney Bus strategy	Rapid Bus Program business case development	2021–2022	Customer Strategy and Technology; Greater Sydney
	Deliver rapid bus delivery program Phase 1	2023–2026	
	Deliver 14,000 additional weekly services	2023	
	Deliver frequent bus delivery program Phase 1	2022 to 2026	

Added benefits

- Reduced car dependence
- Improved travel choices and mobility
- Improved reliability of bus services.

Mobility-as-a-Service

Our commitment: To enable the development of mobility-as-a-service products and markets through trials and partnerships.

Why

Mobility-as-a-Service (MaaS) is a dynamic, growing market with small and large actors working together to give customers improved travel options that suit individual needs and circumstances, not just on main transport routes. At its most basic, it is a service that sits between customers and their mobility options to enable seamless travel. MaaS is one of many options for cutting down private car ownership and single person use being explored by Transport for NSW. MaaS will help meet future demand and provide true multi-modal solutions, including active transport options.

What

Transport for NSW launched the Transport Digital Accelerator in 2018 to facilitate direct collaboration between the public and private sectors, connecting teams from the Transport cluster with industry, researchers, entrepreneurs and start-ups in the digital space. The accelerator process is designed to deliver rapid customer-focused outcomes,

through collaborative working in co-design teams.

The first pilot challenge for MaaS included five industry participants who received seed funding, incubation support, web service hosting, space at the Sydney Start-up Hub, partner mentoring and coaching, exclusive access to data and application programming interfaces (APIs), and access to transport experts. The challenge aimed to answer the question of “How would you give customers an ideal door-to-door mobility service experience and seamless combinations including the first and last mile options?”

There were four MaaS pilots in progress in 2019-2020 with an additional two trials commencing in August 2020, running for 12 months in the Waverley Local Government Area (LGA). Transport for NSW is also collaborating with iMOVE Cooperative Research Centre in producing a report on emerging business models and lessons for MaaS operators and regulators.

Additionally, Transport for NSW has already integrated several MaaS products into its Trip Planners and developed the world’s first data specification for the sharing of MaaS products being used. This [Flexible Transport Service specification](#) will help enable and build the MaaS ecosystem in NSW.

When and how

Action	Next steps	Timeline	Responsibility
MaaS	Assessment report on business models and lessons for MaaS	December 2020	iMOVE
	Support the Waverley LGA MaaS trials	August 2020–2021	Customer Strategy and Technology

Added benefits

- Improved last mile connectivity
- More complete view of transit options.

On-demand bus, ferry and e-bike services

Our commitment: To introduce on-demand services, where appropriate, as an efficient form of public transport in both metropolitan and regional settings across NSW.

Why

Vibrant, healthy communities have convenient, clean and cost-effective transportation, with attractive alternatives to private motor vehicles. A customer's choice for whether or not they take public transport each time they make a journey is heavily influenced by the ease with which their journey's first or last mile could be taken. On-demand is a flexible public transport service designed to fill that first or last mile gap and provide connections to transport hubs and popular destinations like shopping centres or hospitals. This contributes to emissions reductions by encouraging customers to switch from emissions intensive private motor vehicle use to mass transport for such trips.

What

On-demand services use technology to aggregate travel demand to meet market needs. Customers usually book their trip ahead of time or at the time of travel via an app to travel between their home and a local

hub. Transport for NSW has been a world leader in trialling on-demand services. Since October 2017, 25 on-demand bus services (21 pilots and four permanent services), one on-demand e-bike pilot and one on-demand ferry pilot have been introduced across Sydney and regional NSW, delivering more than one million customer journeys as of March 2020. In October 2019, Opal Connect was launched on some On Demand services in Sydney. This was an easy way to pay for on-demand travel and earn rewards comparable to Opal travel benefits.

On-demand bus services are currently available across Sydney's Inner West, North West and Northern Beaches as well as Lake Macquarie, Central West, Orana (between Mudgee and Dubbo), Moree, North Coast (Northern Beaches of Coffs Harbour and Northern Rivers), Riverina Murray, South East and Tablelands regions.

Some on-demand bus services have been expanded to include additional areas as they grow in popularity. The Lake Macquarie service, for example, has been running since 2018 and was expanded in 2019 to include seven more suburbs.

Similarly, the on-demand electric bike service in Newcastle has seen usage increase over the course of the trial, leading to the service continuing for at least another two years.

When and how

Action	Next steps	Timeline	Responsibility
On-demand bus, ferry and e-bike services	Completion of the on-demand public transport pilot program and transition of some pilots to permanent services	2020-2021	Public Transport Contracts and
	Potentially introduce additional on-demand services through the Greater Sydney Bus Contracts renewal process based on evaluation criteria	ongoing	Partners, Greater Sydney
	Extend operation of e-bike service in Newcastle for at least two years	2020–2022	

Added benefits

- Reduced car dependence and increased public transport usage
- Improved travel choices and mobility in metropolitan and regional settings
- Improved efficiency of the public transport network
- Improved customer experience due to flexibility and convenience of service.

More information

<https://transportnsw.info/travel-info/ways-to-get-around/on-demand>

Travel choices program

Our commitment: To provide a platform that enables commuters to make informed choices about their daily commute, including more energy efficient modes of transport.

Why

Passenger vehicles are the single biggest contributor to greenhouse gas emissions from the transport sector in NSW. Improved access to information about transport modes can help shape long term, sustainable travel behaviour, aligned to future workplaces. One Waratah train can move the equivalent of 176 full cars or 11.2 Sydney buses. Combined with net zero operational energy actions for rail and bus networks, the Travel Choices program will provide support for those making the shift to more sustainable ways of moving into, out of and around Sydney.

What

Travel Choices is Transport for NSW's public facing transportation demand management (TDM) program that commenced in 2015. It is a free resource to help individuals, businesses and organisations prepare for and adapt to the changes to Sydney's transport network. The Travel Choices team provides support for those making the shift to more sustainable ways of moving into, out of and around Sydney.

To date Travel Choices has worked with over 850 businesses and organisations across Sydney and has contributed to a 13 per cent reduction in vehicles entering the CBD and a corresponding 14.7 per cent increase in public transport trips during the morning peak (2019 statistics, pre-Covid). This is sustained behaviour change year on year.

This reduction has been achieved despite the additional demands placed on the CBD through construction and new development. It occurred as a combined result of the Travel Choice program, implementation of traffic management strategies, increased public transport services and pedestrian priority, and ongoing advertising campaigns.

The program was expanded to the Northern Beaches to support the introduction of the new B-Line services (Bus Region 8) in late 2017 and to Macquarie Park in 2018 to support the upgrade of the Epping to Chatswood Rail Line for Sydney Metro North West. Most recently Travel Choices has developed a Covid-Safe Travel Choices initiative supporting large employers in Sydney as they plan and prepare during Covid-19 for the new normal. The program responds to the needs of businesses and employees to help them make the right decisions about if, when and how to travel for work at various stages during this period and beyond.

One of the major drivers currently influencing demand has been the adoption of widespread working from home (WFH). While the TDM program promoted WFH pre-Covid, the mass adoption of this practice during Covid-19 is hugely influencing travel demand.

Time and cost savings, and increased productivity and flexibility are just some of the benefits that could be realised by NSW workers and businesses as the way we work changes in the wake of the pandemic.

Transport for NSW continues to sponsor research into these areas through a number of projects, including through a research partnership with iMove and the Sydney University Institute of Transport Logistics, examining how the impact of Covid-19 and working from home will impact on travel demand models. It appears likely that working from home will continue to be a major driver for travel demand as most studies reveal that the majority of workers with the ability to work from home plan to continue doing so for two to three days a week.

Transport for NSW is currently exploring the implications of these changes in demand across the transport network and for related infrastructure and is also pursuing a range of options to support these changes. These include major expenditure on infrastructure and behaviour change campaigns encouraging the use of active transport, and exploration of initiatives to encourage off peak travel to flatten the peak, long associated with mass commutes into Sydney's CBDs.

The TDM team is also responsible for strategic and operational land use planning including assessing development proposals for all State Significant Developments and many smaller proposals where there is a network impact or TDM benefit.

While the TDM team has a formal role conditioning, reviewing and assessing Transport Impact Assessments and Green Travel Plans, the team also works with proponents and tenants on preparation and implementation of travel plans to ensure success.

The team proactively provides free input to achieve best practice outcomes and shares information within the Transport Cluster to inform strategic and service planning considerations.

The team also works with other planning authorities to influence strategic planning statements, development control plans and local environment plans to achieve TDM outcomes. For example many local councils now require a travel plan as part of their development assessment process.

The Travel Demand Management Community of Practice has been established to create a forum where people from state and local government agencies, organisations, businesses and community groups can share evidence based TDM strategies, policies and initiatives.

Focused on supporting long term, sustainable travel behaviour, the Community of Practice provides members with an opportunity to discuss and share TDM ideas, case studies and resources and for all to develop a network of partners in the TDM field that can further benefit and support workplaces.

The group has over 80 members with representatives from university, health, local and NSW Government, peak bodies, community groups and businesses.

Collaboration and conversation is encouraged within the group and a dedicated collaboration platform in Microsoft Teams has been set up to support further dialogue and sharing of TDM strategies, ideas and resources.

When and how

Action	Next steps	Timeline	Responsibility
Travel choices program	Expansion of Travel Choice program to Chatswood to Bankstown line for Sydney Metro South West	Ongoing	Greater Sydney
	Work with DPIE on targeted behaviour change initiatives in Parramatta	Ongoing	
	Work with City of Sydney on behaviour change programs for Green Square (mode shift to active transport and travel outside of peak periods)	Ongoing	
	Use the Travel Choices program to support sustainable transport outcomes that have become possible as a result of Covid-19	Ongoing	
	Conduct and act on research exploring how aspects of Covid-19, such as increased flexible working arrangements, can be used to reduce demand on transport networks and retime journeys	Ongoing	
	Condition developments and work with proponents to ensure that all State Significant Developments and other major developments provide travel plans and sustainable transport solutions	Ongoing	
	Use the Travel Demand Management Community of Practice to expand the breadth and understanding of TDM initiatives that support sustainable transport outcomes.	Ongoing	

Added benefits

- Improved last mile connectivity
- More complete view of transit options
- Reduced traffic in Sydney CBD.
- Encourage sustainable transport choices.

More information

<https://www.mysydney.nsw.gov.au/travel-choices>

Investing in walking and cycling

Our commitment: To deliver projects that make walking and cycling safe, comfortable and convenient transport modes that are accessible to a wide range of users.

Why

Active transport such as walking and cycling are integral to thriving, healthy communities. Walking and cycling are also zero emission transport options.

Over 1.1 billion trips a year in NSW are made on foot or by bicycle, including around 600 million trips associated with a public transport journey. Over a million people in NSW ride a bike at least once a week (13 per cent of the population) and 2.6 million people ride at least once a year.

More people walking and cycling will reduce overall network energy use and associated emissions in addition to delivering positive health, wellbeing and environmental outcomes. Increasing the number of people choosing active travel options for short trips to their local and city centres will be achieved by identifying projects that deliver safe, well connected infrastructure such as bike paths, footpaths and improved crossings.

What

The NSW Government is focused on walking and cycling projects that align with the Future Transport 2056 strategy. This outlines the government's 40 year vision for transport planning to meet the demands of NSW's predicted population growth. Walking and cycling for commuting and short trips relieves pressure on our roads and public transport networks, and are part of a healthy lifestyle for our communities.

Nearly \$600 million will be invested into walking and cycling infrastructure over the next four years. This will bring the NSW Government's total investment to around \$1 billion over ten years.

The Walking and Cycling Program provides grants for active transport projects proposed by councils and NSW Government agencies every year. In 2020-21, funding for 91 projects was approved as part of the Walking and Cycling Program.

The Greater Sydney Principal Bicycle Network builds on Future Transport's commitment to support people cycling for short trips within and between centres, including the provision of safe and accessible cycleways.

Major transport projects are also delivering active transport links and infrastructure. For example, the Mulgoa Road upgrade and the Sydney Gateway Project in Mascot both include a new separated path for pedestrians and cyclists. The M6 Extension Stage 1 project incorporates a new shared cycle and pedestrian pathway through Brighton-Le-Sands including a bridge over President Avenue.

Other major projects and initiatives include pop-up cycleways and safer speed limits, a commuter cycling network in Wagga Wagga, the Parramatta Light Rail active transport link, Sydney Metro Walking and Cycling infrastructure, cycleways in the CBD and Southern Harbour Bridge Ramp, the Sutherland to Cronulla Active Transport Link, the Eastern Suburbs Cycleway, plus investigations into a Walking Strategic Business Case and a Regional Cycling Strategic Business Case.

When and how

Action	Next steps	Timeline	Responsibility
Investing in walking and cycling	Walking and Cycling Program application assessment and project delivery in collaboration with Councils	Ongoing annually	Customer Strategy and Technology
	Delivering active transport links and infrastructure as part of major transport projects	Ongoing	
	Investigations into a future Principal Bicycle Network are underway	2021	Customer Strategy and Technology
	Investigation into walking infrastructure and investment	2021	Customer Strategy and Technology
	Investigation into regional cycling infrastructure and investment	2021	Regional & Outer Metropolitan, & Customer Strategy & Technology

Added benefits

- Deliver walking and cycling outcomes as set out in Future Transport 2056, Building Momentum and A Metropolis of Three Cities
- Enable positive health, wellbeing, social and environmental outcomes
- Reduced congestion on our roads and public transport networks.

More information

<https://www.rms.nsw.gov.au/business-industry/partners-suppliers/lqr/active-transport/index.html>

<http://www.parramattalightrail.nsw.gov.au/walking-and-bike-riding>

Fast rail

Our commitment: To improve journey travel time on regional train lines.

Why

The NSW Government has a vision for vibrant, well-connected and growing regional economies, providing NSW residents with more jobs, greater opportunities and better quality of life. One of the key elements of our vision for regional NSW is better connectivity between regional centres and international gateways.

Making regional travel faster, safer and easier brings huge economic potential to NSW regional towns and cities by making it easier to invest, do business, build a lifestyle and visit our regional towns.

What

The NSW Government's commitment to develop a blueprint for the delivery of a fast rail network is a major piece of State-shaping work. Work is already underway on four potential fast rail corridors: Sydney to Newcastle and Port Macquarie, Sydney to Wollongong-Bomaderry, Sydney to Central West and Sydney to Canberra.

The NSW Government has committed to provide an initial \$295 million to start early works for the fast rail network. This includes planning for improved alignments north of Mittagong and between Sydney and Woy Woy, for route improvements between Sydney and the Central West and for duplication of some of the line between Berry and Gerringong.

When and how

Action	Next steps	Timeline	Responsibility
Fast rail	Planning of the fast rail network and studies for all four corridors	Ongoing	Regional and Outer Metropolitan
	Strategic business cases for Sydney to Bomaderry (via Wollongong) and Sydney to Central West (via Bathurst and Orange) in partnership with the National Faster Rail Agency.	Ongoing	

Added benefits

- Supports 'hub and spoke' model connecting cities and centres outlined in Future Transport 2056
- Enable further economic development in regional cities from increased connectivity
- Reduced congestion on regional road network
- Improved travel choices and mobility.

More information

<https://www.nsw.gov.au/projects/a-fast-rail-future-for-nsw>

4.4 Transition to a secure, cost effective, low emission energy supply

Solar photovoltaic for rail facilities

Our commitment: Trial solar photovoltaic (PV) and increase use of behind the meter PV to power rail network facilities.

Why

The cost of solar generation has reduced by more than 73 per cent over the period of 2010–2020¹⁷. As these technologies become more cost-effective, they generate new opportunities for economic growth and jobs. By moving early on new technologies, Transport for NSW is positioned to access savings as costs continue to fall and increase opportunities for local businesses to become more globally competitive by developing goods, services and business processes that create new market opportunities.

Installing solar PV can also allow our train facilities to contribute to the capacity of our electricity grid by responding to rising electricity demand and peak energy usage times while remaining a cost-effective solution and reducing our carbon emissions.

What

Sydney Trains has been trialling the use of solar PV systems on a range of buildings including network maintenance bases, crew bases, stations and carparks. Sydney Trains currently has approximately 855kW of solar PV installed across the network at 27 locations and will continue to actively

investigate further opportunities to deploy solar PV on buildings and facilities.

Separately, as part of the Sydney Metro North West line, a 1.1 megawatt array has been installed over two thirds of the roof space of the Sydney Metro Trains Facility (SMTF) at Tallawong Road to power a portion of the SMTF and train stations. It is the biggest solar array on any NSW Government building.

The Dubbo Rail Maintenance Facility currently under construction will include rooftop solar PV generating around 2400MWh per annum or at least 95 per cent of the low voltage energy demand required to power the maintenance facility. Onsite battery storage will also be provided to work towards achieving net zero emissions from onsite power demand.

The Parramatta Light Rail Stabling and Maintenance Facility will have approximately 1000 solar panels (a 300 kilowatt solar array) installed on the roof to power the site. Excess power generated will feed back into the local electricity network. It is projected that the system will generate at least 360 megawatt hours in the first year, equivalent to powering 50 households for one year. This will result in substantial savings of electricity from the power grid and an overall reduction in greenhouse gas emissions.

In a first for Transport for NSW, Newcastle Light Rail installed and commissioned a solar PV system and solar thermal hot water system at the Light Rail Vehicle depot in November 2018 prior to the commencement of operations.

¹⁷ DPIE, Net Zero Plan. Stage 1 (2020-2030) 2020

When and how

Action	Next steps	Timeline	Responsibility
Solar photo voltaic (PV) for rail facilities	Complete business case assessment and selection of additional train facilities and related locations where solar PV systems can be trialled	Ongoing	Sydney Trains
	City & Southwest Sydney Metro Trains Facility and services buildings designed to include solar PV on roofs	December 2023	Sydney Metro
	Solar PV installed at the Dubbo Rail Maintenance Facility to generate at least 95 per cent of onsite low voltage energy demand	2023	Regional Outer Metropolitan
	Solar PV installed at Parramatta Light Rail Stabling and Maintenance Facility	2023	Greater Sydney

Added benefits

- Reduced reliance on external energy sources
- Reduced vulnerability to fluctuations in the renewable energy market
- Reduced burden on electricity supply system during daylight times of high demand
- Reduced operational cost of rail facilities.

Improve rail electricity use planning

Our commitment: To improve rail electricity use planning through the use of an energy data management system (EDMS) and a 10 year power corridor plan.

Why

A better understanding of current and future electricity usage enables better informed decision making. This action involves two initiatives: the 10 Year Power Corridor Plan, and Sydney Trains' EDMS.

Over the next ten years, the More Trains, More Services (MTMS) program will provide additional services to meet the predicted growth in customer demand. The 10 Year Power Corridor Plan allows MTMS to make sound decisions based on future power requirements projections.

Using an EDMS enables better monitoring, analysis, tracking and reporting of energy

data. This can help identify opportunities for further energy efficiency improvement as well as to monetise and validate the benefits of these improvements, and drive evidence-based decision making.

What

A 10 Year Power Corridor Plan, along with a clear understanding of stakeholder priorities, will be used to formulate an Integrated Power Scope for the 10 year period to deliver the MTMS ambitions. The 10 Year Power Corridor Plan will include synergies with the MTMS business cases.

The 10 Year Power Corridor Plan will also predict rail energy consumption to provide forecasting data to other energy initiatives.

Separately, Sydney Trains is in the process of finalising the procurement of a dedicated EDMS to enable improved energy data management and electricity bill checking and validation.

When and how

Action	Next steps	Timeline	Responsibility
Improve rail electricity use planning	Complete implementation of EDMS	December 2020	Sydney Trains
	Completion of 10 Year Rail Power Strategy – T2, T3, T4, T5 & T8 lines	March 2021	Infrastructure and Place
	Completion of 10 Year Rail Power Strategy – T1 & T9 lines	To be aligned with MTMS stages	Infrastructure and Place

Added benefits

- Provides a 10 year energy consumption forecast to other energy initiatives
- Supports a pipeline of power infrastructure upgrades.

4.5 Embed low carbon considerations as part of decision making across the cluster

Creating awareness about carbon footprint by mode of transport

Our commitment: To embed carbon emissions considerations into customer websites and trip planning products.

Why

Transport for NSW supports customers in making informed choices in transport modes by providing accessible, credible and actionable information on emissions from various transport modes.

What

TripGo is an app endorsed by Transport for NSW which shows door-to-door transport

options across Greater Sydney as well as how to travel in the fastest, cheapest and most environmentally friendly way. One of the features of the app is the provision of CO₂ emissions and calories burnt for different transport modes on the route selected, as well as providing information about how cycle-friendly the route is.

Over the next year, information will be developed and made available on transport.nsw.gov.au to provide a rule of thumb for carbon emissions per person per kilometre travelled by different modes of transport. To improve customer's experience using Transport for NSW's trip planning products and raise awareness about carbon emissions, options to include carbon footprint calculations within trip planning information will be investigated.

When and how

Action	Next steps	Timeline	Responsibility
Driving awareness about carbon footprint by mode of transport	Make carbon emissions by mode of transport infographic available on transport.nsw.gov.au	June 2021	Customer Strategy and Technology
	Investigate options to include travel carbon footprint in Transport for NSW trip planning products.	June 2021	

Added benefits

- Increased awareness about carbon emissions more generally as a consequence of personal choices
- Enable positive health, wellbeing, social and environmental outcomes.

Whole-of-government collaboration and coordination

Our commitment: To collaborate, coordinate and contribute to actions with other NSW Government departments to achieve the NSW Government goal of net zero emissions by 2050.

Why

The NSW Government as a whole purchases around \$20 billion of goods and services each year, spends about \$400 million annually on electricity, employs 10 per cent of the State's workforce and operates 13,000 passenger vehicles for public sector staff. The purchasing power of the NSW Government can help provide the market with confidence and contracts to supply more affordable, low emissions products and services.

What

Transport for NSW is engaging and collaborating within and across levels of government to share information and help coordinate actions to reduce emissions from the transport sector through a number of models.

Transport for NSW collaborates with the Infrastructure and Transport Senior Officials' Committee (ITSOC)'s Land Transport Technology Working Group developing the National Low and Zero Emission Vehicles (LZEV) Work Program. This program was endorsed by the Transport and Infrastructure Council in August 2019 and updated in May 2020.

The working group is comprised of representatives of the Australian Government, states and territories, Austroads, the Australian Local Government Association and New Zealand Ministry of Transport. The development of the LZEV Work Program included targeted industry consultation with 16 peak bodies in August 2019 to inform the 20 actions in the program. The LZEV working group will continue to develop and implement the action plan, with implementation expected to be complete in the first quarter of 2022.

Transport for NSW will also provide feedback on the soon to be released National Electric Vehicle Strategy paper being prepared by the Australian Department of Industry, Science, Energy and Resources. They will continue to share information with other state agencies through the Australian and NZ Road Agency Sustainability Knowledge Sharing Group.

Additionally, Transport for NSW is a member of the newly established Inter-Agency Working Group on Electric Vehicles chaired by DPIE. This group meets at officer level once a quarter or when needed to discuss government policies and programs relating to EVs and EV charging infrastructure. The group's aim is to share information and experience to ensure whole-of-government collaboration and coordination.

More locally, TfNSW undertakes a range of collaborative initiatives across NSW State and local governments. These include:

- Working with Greater Sydney Commission, UNSW, Randwick Council, NSW Health and Australian Turf Club on a variety of travel demand management strategies seeking to redistribute demand on the transport network in the Randwick Health and Education Priority Precinct
- Producing a Travel Plan Toolkit for Health Precincts and working with NSW Health to implement TDM in their developments
- Working with NSW Health and other key stakeholders on a Transport Demand Management Strategy to redistribute demand on the transport network in the Westmead Health Precinct
- Collaborating with the Greater Western Sydney Health Partnership on TDM initiatives, including conducting a travel survey for all staff across the three western Sydney Local Health Districts

- Working with NSW Health, Get Healthy at Work and the NSW Office of Sport on initiatives that encourage active transport
- Working with the Department of Customer Services' Behavioural Insights Unit to tailor TDM behaviour change strategies and provide best practice advice to businesses.

When and how

Action	Next steps	Timeline	Responsibility
Whole-of-government collaboration and coordination	Collaborate with NSW Health to redistribute demand on the transport network in the Westmead Health Precinct	Ongoing	Greater Sydney
	Collaborate with Greater Sydney Commission, UNSW, Randwick Council, NSW Health and Australian Turf Club at Randwick Health and Education Priority Precinct	Ongoing	
	Collaborate with the Greater Western Sydney Health Partnership on TDM initiatives, including conducting a travel survey for all staff across the three western Sydney Local Health Districts	Ongoing	
	Work with NSW Health, Get Healthy at Work and the NSW Office of Sport on initiatives that encourage active transport.	Ongoing	
	Produce a Travel Plan Toolkit for Health Precincts and work with NSW Health's Health Infrastructure and the Ministry of Health to implement TDM in their developments	Ongoing	
	Work with the Department of Customer Services' Behavioural Insights Unit to tailor TDM behaviour change strategies and provide best-practice advice to businesses	Ongoing	
	Implement LZEV work program actions	April 2022	Customer Strategy and Technology
	Provide feedback to the Commonwealth once the National EV Strategy is available	Ongoing	
	Continue to participate and contribute to Inter-Agency Working Group on Electric Vehicles and the Australian and NZ Road Agency Sustainability Knowledge Sharing Group	Ongoing	

Added benefits

- Better integrated planning.

Close research-practice collaboration

Our commitment: To support Future Energy (FE) research needs while continuing to collaborate with and support the research sector.

Why

Innovation across research, private and government organisations can drive change through the uptake of new technologies. Ensuring that research and information are a deliberate part of planning can help ensure useful scientific knowledge about emerging technologies reaches decision-makers and is used to achieve Future Energy objectives.

Research communities of practice provide a framework for a closer research practice interface as well as a forum for Transport for NSW staff to access knowledge that enables them to embed low carbon considerations in their project decision-making.

What

The Research Hub fosters collaboration and information sharing between the Transport for NSW cluster, the tertiary sector, industry and other government agencies interested in transport and related research. The Research Hub outlines Transport for NSW's Strategic Research Directions, Problem Statements and how partners can engage to solve some of transport's biggest challenges.

Current priority problem statements include how to measure effects of mode shift-based emissions reduction strategies, and modelling the future need for electric vehicle charging in NSW. A new community of practice will be established to validate program statements and support research that may inform Future Energy actions.

Additionally, Transport for NSW will continue to work with key research and knowledge development organisations including universities and national research centres such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Transport Cooperative Research Centre (known as iMOVE CRC).

Transport for NSW will continue to be an active participant in the Austroads¹⁸ Future Vehicles and Technology Program and the associated Research Communities of Practice (FV&T RCoPs) including for Low and Zero Emission Vehicles (LZEVs). This RCoP aims to identify, evaluate and prioritise research projects that relate to the LZEV theme, and provide guidance to the FV&T program. The RCoP also encourages the sharing of information on lessons learned from LZEV initiatives, identification of opportunities and barriers to a transition to LZEVs and aims to reduce duplication of effort across member agencies.

¹⁸ Austroads is the peak organisation of Australasian road transport and traffic agencies

When and how

Action	Next steps	Timeline	Responsibility
Sustainability research community of practice	Develop problem statements relevant to Future Energy actions	July 2021	Safety Environment and Regulation
	Continue to be an active participant of the Austroads FV&T program including LZEV RCoP	Ongoing	Safety Environment and Regulation
	Continue to participate as industry partner in relevant research projects by leading Australian research organisations	Ongoing	

Added benefits

- Promote career development opportunities for Transport for NSW staff
- Support Australia's research sector
- Foster innovation networks.



Future Energy Action Plan

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