

# Transport and Infrastructure Net Zero Consultation Roadmap

## Take the survey

Department of Climate Change, Energy, Environment and Water

---

Response received at:

July 26, 2024 at 4:03 PM GMT+10

Response ID:

sbm2f83187fd49c56d67a440

---

- 1 Confirm that you have read and understand this privacy notice.  
Yes
- 2 Please indicate how and if you want your submission published.  
Public
- 3 Published name  
Siemens Mobility
- 4 Confirm that you have read and understand this declaration.  
Yes
- 5 First name  
Carina
- 6 Last name  
O'Brien
- 7 Email  
[REDACTED]

- 8 Phone  
[REDACTED]
- 9 Who are you answering on behalf of?  
Organisation
- 10 Organisation name  
Siemens Mobility
- 11 What best describes you or your organisation?  
Industry
- 12 What sector do you represent?  
Rail  
Active transport
- 13 What state or territory do you live in?  
Victoria
- 14 Postcode  
Not answered
- 15 What area best describes where you live?  
City
- 16 1. Do you support the proposed guiding principles?  
Not answered
- 17 1.1 Please add details to your response.  
Not answered
- 18 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Not answered

19 2.1 Please add details to your response.

Not answered

20 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes

21 3.1 Please add details to your response.

Siemens Mobility supports a national policy framework approach to active and public transport, but recommends that there is flexibility and alignment with state and regional needs and it is not a one size fits all approach. Support the integration of active transport with public transport given people use multiple modes of transport from first to last mile. To support the movement of people, the framework should be linked to national net zero targets and KPIs.

22 4. What should be included in a national policy framework for active and public transport and how should it be developed?

Within a national policy framework, technology should be included. This would include investing in Trip Planning and Mobility as a Service (Maas) solutions across Australia to support people in making the most environmentally efficient transport choices. Siemens Mobility has MaaS software available that can estimate a persons co2 usage based on the transport planning options.

23 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

- Education: People need to be taken on the journey of modal shift over a period of time, and it will be a multi layered approach, depending on the existing level of knowledge and engagement on achieving net zero. An educational campaign approach is recommended to target communities and consumers on the impact of their transport choices based on CO2 emissions and help them to consciously change their mode of transport to support reaching net zero. The adoption of MaaS technology will support to help reduce barriers and raise awareness to support a modal shift.

- Mode shift incentive: Consumers need an incentive to make a change to their current behaviour. This could be a financial incentive to increase public transport usage, or tax incentives for companies with modal shift. It will be of interest to see how the reduced public transport fares currently on trial in Queensland will have an impact on modal shift. Longer term, incentives should be considered to help with the behaviour and mindset change to how people decide to move about the city.
- Change management principles applied to modal shift: Stakeholders will need to make a conscious change to the way they use transport to help achieve net zero. This will need to be gradual overtime and bring stakeholders along the journey and important that change management principles are applied. This should be a consideration when developing the framework that human behaviour needs to be a factor.

## 24 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?

- Encouraging and incentivize shift of freight from road to rail:  
As per the ARA research project “Rail Freight Productivity Review: Establishing an Efficient Freight Transport Network” only 11% of freight is rail transported across the eastern seaboard, there is the opportunity to significantly improve. This is supported by the World Bank, IEA and United Nations who have all published reports and studies that showcase the positive emission impact from shifting road to rail. See links here:
  - <https://blogs.worldbank.org/en/transport/decarbonizing-transport-shifting-people-and-goods-railways>
  - <https://www.iea.org/reports/road-transport>
  - <https://unece.org/climate-change/press/united-nations-adopts-landmark-global-decarbonization-strategy-transport-road>
- Funding for rail freight  
Rail freight has historically been underfunded compared to road. Funding needs to be allocated to support the modal shift from road to rail and ensure it is cost effective across the supply chain.
- Interoperability across rail network  
Recognizing that freight movement is a national imperative, we must address the current disparities in rail infrastructure across Australian networks. To achieve smoother goods transport, it is crucial to support existing government initiatives aimed at enhancing rail interoperability nationwide. Additionally, prioritizing signalling systems like ETCS Level 2

and establishing consistent standards for rail freight throughout Australia will further improve efficiency.

- City planning

Consideration of city planning and having freight centres and intermodal hubs in areas that have good access. The outskirts of a city might be cheaper land for logistics hubs, but the CO2 emissions for transport has an impact and increase in freight costs. Consider the integrated nature between city planning, access to clean fuel sources and transport accessibility. Last mile from freight centres to customers could use battery/hydrogen or a e-highway solution.

Industry examples

Amazon and USPS in the USA have shifted to last mile battery electric trucks

Sites for reference:

<https://www.aboutamazon.com/news/transportation/everything-you-need-to-know-about-amazons-electric-delivery-vans-from-rivian>

<https://www.technologyreview.com/2022/12/22/1065792/postal-finally-getting-evs/>

## 25 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?

Firstly, shifting from road to rail presents an exciting opportunity. The challenge lies in the dominance of road transport, which significantly contributes to emissions due to fuel consumption and congestion. By incentivizing businesses to choose rail for long-haul freight, we can reduce the carbon footprint. Financial incentives, streamlined regulations, and investments in rail infrastructure will make rail transport more attractive.

Secondly, allocating funding for rail freight is crucial. Historically, rail has been underfunded compared to road transport. However, strategically allocating funds can level the playing field. By improving rail infrastructure, enhancing safety measures, and supporting research and development, we ensure cost-effectiveness across the supply chain.

Thirdly, addressing interoperability across rail networks is essential. Disparities in rail infrastructure limit the seamless movement of goods. To improve efficiency and reduce emissions, we must standardize signalling systems (such as ETCS Level 2) and establish consistent rail freight standards nationwide. Infrastructure upgrades will facilitate smoother cross-network operations.

Lastly, strategic town planning and well-located freight centers offer an opportunity to optimize freight movement. Urban sprawl and poorly situated logistics hubs increase emissions. Establishing intermodal hubs in areas with good access to both rail and road networks is crucial. Additionally, for the last mile from freight centers to customers, using battery-powered, hydrogen-fueled, or e-highway vehicles can further reduce emissions.

Integrating clean fuel sources into urban logistics completes the picture.

26 7. Do you agree with the proposed net zero pathway for light road vehicles?

Yes

27 7.1 Please add details to your response.

Not answered

28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?

Not answered

29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

Not answered

30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?

Yes

31 9.1 Please add details to your response

Not answered

32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

Not answered

33 10.1 Please add details to your response. Why did you rank them in that order?

Not answered

34 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

Not answered

35 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

Not answered

36 13. Do you agree with the proposed net zero pathway for rail?

Yes

37 13.1 Please add details to your response.

Siemens Mobility agrees there should be a plan and pathway forward for achieving net zero for rail and the transport sector. However, the current focus of the roadmap is only on rolling stock, and Siemens Mobility believes there needs to be consideration for the ecosystem across the rail and transport sector to support the journey to net zero. (e.g. mode shift policies). Other considerations include enhanced digital signalling technology to improve efficiency of the network and condition monitoring to improve the productivity of track monitoring and maintenance.

Several critical strategies warrant consideration to the net zero pathway for rail as outlined below:

- Digital Signalling Technology to improve network efficiency: Implementing advanced digital signalling technologies, such as ETCS L2 (European Train Control System Level 2) and ATO (Automatic Train Operation) over ETCS, can significantly enhance network efficiency by up to 30%. These systems promote safer and more streamlined rail operations while aligning with interoperability discussions currently taking place across State Transport ministers and the National Transport Commission. Introduction of Digital Signalling Technologies will increase the capacity of the existing network assets, creating an increased opportunity to promote mode shift from road transport – in particular for rail freight.

- Operational improvements to improve efficiency and productivity using Artificial Intelligence and Condition Monitoring: Leveraging artificial intelligence (AI) and condition monitoring tools is crucial for efficient track maintenance and increased availability. Rather than dispatching personnel to physically inspect rail infrastructure, technology can identify issues in real time, and not periodically when someone is attending site for scheduled maintenance. For instance, Rail Fusion on the Aurizon network (between Alice Springs and Darwin) employs real-time monitoring to detect and address problems swiftly. This also reduces the CO2 footprint for rail infrastructure and rolling stock maintenance.

- Rolling Stock Options: Consider the infrastructure requirements of rolling stock options to achieve net zero:

**\*\*Battery Electric Locomotives (BEL)\*\***

- For Battery Electric locomotives, the consideration to evaluate factors such as battery life, storage, accidents, and end-of-life disposal. Lithium resources are finite, so sustainable management is crucial, and it is not a long-term solution. Distance is also a factor with BEL suitable for short distances.

- Holistic environmental impact considerations to produce and dispose of batteries to be considered.

- A consideration is the availability of raw materials and the competition with the car and IT industries for batteries

- Agree with retrofitting with battery electric/hydrogen trains as a good incremental solution

- Batteries will add weight to the existing rolling stock. This needs to be a consideration with existing tracks and ensuring they can withstand the wear and tear over time and infrastructure may need to be upgraded.

**\*\*Hydrogen-Powered Trains\*\***

- Hydrogen infrastructure development to produce and distribute efficiently is essential for the transition to hydrogen trains. Hydrogen production is still in early stages and the fuel costs are high that do not make this an attractive alternative to current fuel sources. Support is needed from the government for infrastructure development.

- Hydrogen trains are suitable for longer distances (i.e. 600-800km) and best suited to the freight network. Given the location of Australia's heavy haul and freight network, predominantly in Western Australia and Queensland, Hydrogen production needs to be aligned with energy providers to build the necessary infrastructure where the freight requirements currently are. Given the construction and infrastructure build costs, this planning is needed in the short term to ensure it is available in the next 5-10 years as per the current proposed pathway.

- It is important to consider the ecosystem and in particular the legislation and

regulations relating to safe and sustainable application of Hydrogen. Trials currently underway in Europe are progressing well and hydrogen application in freight trains will further reduce CO2 emissions in support to mode shift from road transportation.

#### **\*\*Electrification\*\***

- Suggest exploring electrified rail systems as a long-term solution. Only 11% of Australia's rail network is electrified and provide sustainable approaches. Cost is a consideration and a detailed operational assessment should be considered as it may not represent value for month from a CAPEX and OPEX perspective in remote low density traffic areas.
- Full electrification is not always required. In most cases, partial electrification is sufficient when partnered with battery electric locomotives. Within partial electrification, emerging technologies such as Static Frequency Converter (SFC's) and low cost of ownership overhead line equipment can significantly reduce the cost of even partial electrification.

#### **\*\* Biodiesel \*\***

- This is a short-term solution and does not put strain on current network and allows time to build up infrastructure as it will allow existing assets to reach their end-of-life minimising early investments to achieve early returns on sustainable targets.
- HVO fuel successfully trialled in the UK by DB Cargo. Exert from article "DB Cargo UK has successfully trialled the use of 100% renewable Hydro-treated Vegetable Oil (HVO) as it continues to look for new and innovative ways to power its fleet and decarbonise its operations." It is important to acknowledge that the supply and quality of HVO is however a challenge.

#### **\*\*Hybrid\*\***

- Consider Hybrid fuel solutions to build in redundancy across propulsion systems and increase range, quicker transition to operations and realise significant reduction in emissions e.g. bio diesel/battery, Pantograph install to charge batteries during service etc.
- Consideration on distance of moving people/goods: There is no one size fits all approach to the alternative fuels due to the distance requirements of moving people/goods across Australia. Operational scenarios, geography, accessibility, and other similar factors need to be considered to decide which technology mix to be deployed in each instance.
- Leveraging existing assets: Look at how existing assets and technology can be utilised to help with the transition. For example, regenerative braking, signalling and refurbishing existing rolling stock as many fleets are not end of life and will require refurbishment.
- Safety regulations: For hydrogen and battery technologies to gain broad acceptance, industry and regulators need to prove the safety case. This involves safety analysis of

hydrogen applications, experiments to understand full-scale incidents, and technical solutions for time- and cost-optimal outcomes. A comprehensive risk assessment using empirical modelling, simulation-based computational fluid dynamics (CFDs) for hydrogen dispersion, and quantitative risk assessments is crucial.

- Rail infrastructure and Ecosystem Evaluation: It is essential to thoroughly assess the existing network infrastructure and ecosystem of the rail network. For example, for Hydrogen trains to be a reality, consultation and collaboration with the energy sector is required - A key factor for the successful adoption of this technology is legislation and regulation.

38 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels. Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

1: Low carbon liquid fuels

2: Hydrogen fuel cell

3: Battery electric

39 14.1 Please add details to your response. Why did you rank them in that order?

LCLF is a short-term solution and does not put strain on current network and allows time to build up infrastructure. Battery Electric has end of life considerations with a negative impact on the environment and resources are on increasing demand by other key industries – car manufacturing and IT industries. A consideration is the repurposing of batteries for low-cost, second life energy storage solutions. Several companies are already doing it (reference site: <https://www.repurpose.energy/>)

Low carbon fuels can only be used if they can be used a direct replacement for diesel without modifications to ensure operators can still utilise the full asset life of existing locomotives.

40 15. What role should low carbon liquid fuels play in rail decarbonisation?

This is a short-term solution and does not put strain on current network and allows time to build up infrastructure.

41 16. What additional actions by governments, communities, industry and other s

## now and in the future to reduce rail emissions?

To address the imperative of reducing rail emissions, a multifaceted approach involving government and stakeholders is essential. Below are suggestions that can be taken now and, in the future, to reduce rail emissions.

1. **Signalling Upgrades:** Upgrading signalling systems (i.e. Digital Signalling Systems – ETCS L2) will allow rail to operate freight and urban rail and reduce the current bottlenecks in major cities.
2. **Long term freight corridor protection:** As per the ARA Future of Freight and Infrastructure plan, protect dedicated freight lines in high volume areas to alleviate congestion caused by shared metropolitan networks. Identify freight channels and freight movement across the city to identify future intermodal hubs.
3. **Connecting Intermodal and Freight Hubs in Outer City Areas:** Many city transport hubs currently exist in inner city areas and there is lack of industrial real estate in town planning. Consequently, this leads to increased trucking costs, and increased cost of goods for consumers. To address this gap, prioritizing and planning rail and intermodal hubs so will promote efficient freight movement, significantly reduce road-based emissions, and help with addressing the cost-of-living crisis.
4. **Energy Network Collaboration:** Collaboration between governments and industry is essential to develop energy networks. Key focus areas include:
  - a. **Renewable Energy Adoption:** Supporting rail electrification using clean energy sources.
  - b. **Hydrogen Infrastructure:** Developing hydrogen legislation and regulation, production, storage, and distribution for rail networks.
5. **Future Workforce planning:** As new technologies emerge (such as digital signalling, AI, and decarbonisation), training and education is critical. Ensuring a skilled workforce capable of managing and maintaining a sustainable future and long term support the rail industry in Australia.
6. **Road-to-Rail Shift:** Collaborating with road freight operators is necessary to encourage a transition to rail. This can significantly reduce overall emissions. Providing incentives for companies to choose rail transport to support this shift. There are regulations between road and rail that will need some consideration to encourage a decrease in CO2 emissions. For passengers, a multi-modal solution that utilises Mobility as a Service to overcome existing barriers.
7. **Staged and Planned Transition:** Implementing emission reduction measures incrementally allows for minimal disruptions. Support mechanisms, both financial and policy-related, are essential to facilitate the transition of rail operations. In Queensland for example 70% is from fossil fuel and there needs to be a plan to transition to clean energy.
8. **Safety:** Consideration for the safety of hydrogen and battery electric locomotives with lithium batteries is essential and dangerous.

9. Modal shift – more locomotives in the market: As there is a shift to increasing rail for freight, the locomotives in the market. The life span of a locomotive is approximately 30 years. With a large quantity in the market, support to transition the train or purchase new trains will need to be required as many are nearing the end of their life span.

10. New infrastructure development – High Speed Rail: Look to new technology and infrastructure developments for High Speed Rail across Eastern Australia. This will help with more sustainable modes of travel and alternative sources of transport.

11. Track Re-alignment: The Sydney to Brisbane line turns the equivalent of about 177 circles. Tuning the line for high speed on the line, enhance efficiency and reduce travel time making rail freight even more attractive. [railknowledgebank.com/Presto/content/GetDoc.axd?ctID=MTk4MTRjNDU0NWQ0My00OTBmLTIIYWU0ZWJmM2U2OTE0ZDY3&rID=NDM0Mw==&pID=Nzkx&attchmnt=True&uSesDN](https://www.railknowledgebank.com/Presto/content/GetDoc.axd?ctID=MTk4MTRjNDU0NWQ0My00OTBmLTIIYWU0ZWJmM2U2OTE0ZDY3&rID=NDM0Mw==&pID=Nzkx&attchmnt=True&uSesDN)

12. Look to global best practice: Seek out global networks to see best practice for initiatives making the rail sector more sustainable. In England for example, Network Rail have net zero passenger and freight solutions with hydrogen and battery power to identify the most sustainable mode of transport.

13. Regulatory Landscape in Australia: Australia's regulatory landscape is complex with many regulators and a regulatory situation where there are more regulators than operators, indicating a need for regulatory reform.

**\*\*A use case application from the UK\*\***

Partial electrification is a concept that is gaining global traction in the rail industry. Siemens Mobility has released a report highlighting how partial electrification can save the UK taxpayer billions of pounds while also reducing CO2 emissions. Find more details here: [https://www.siemens-mobility.com/en/press-releases/2023/04/2023-04-13-siemens-mobility-reports-on-the-impact-of-partial-electrification-on-the-uk-railway-sector](#)

- Siemens' British battery trains set to save £3.5bn and consign diesel trains to history
- BHP Orders Four Battery Electric Locomotives For WAIORail Network
- Innovative Siemens Mobility mobile rail charging facility to be demonstrated at Long Marston

In Australia, we have the potential to reduce electrification costs and achieve net zero by combining cutting-edge technologies such as bi-mode trains & locomotives with Rail Charging Converters (RCC), Station-to-Station (S2S) and cost-effective overhead line systems (like Sicat SX). These technologies provide high efficiency and reduce costs on both greenfield and brownfield projects.

UK is installing the world's first RCC at Long Marston and locally Siemens Mobility has submitted a proposal for a similar application in Australia. Siemens Mobility is currently talking to FMG about partial electrification of the line using SFC technology.

It's well documented that electrifying a brownfield rail line or network is significantly more expensive than its counterpart. Partial electrification can help mitigate these costs by avoiding the need for costly modifications such as tunnels, etc., due to the increased electrical clearances required for overhead line equipment (OLE). At the absolute minimum, we can not only save money but also enhance the visual appeal, especially in urban areas. For existing diesel-only lines, partial electrification allows us to electrify only a fraction of the line (20-30%). The exact percentage depends heavily on the geography and timetable. This approach can also be applied to new lines.

reducing the total cost of ownership if operators and asset owner plan their asset replacements with On short or spur lines with infrequent traffic, it is even possible to avoid electrification altogether, and Using Designer tools, we can accurately dimension partial electrification schemes, optimizing the design. This approach could be a game changer for customers with large networks, such as Sydney Trains and a pragmatic and cost-effective pathway to enhance a rail network's efficiency, reliability, and environmental diesel. It allows us to leverage the benefits of electrification where it matters most while maintaining scalability for future expansions.

## 42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

Addressing the challenges and opportunities to reduce rail emissions involves several strategic actions:

1. **National Standards Approach:** Ensuring that standards are developed nationally is crucial. Otherwise, we risk perpetuating the same interoperability issues faced today. By adopting a national rather than state-based approach to decarbonisation standards, we need to harmonize regulations, practices, and targets across the entire rail network in Australia. This consistency will assist to mitigate interoperability challenges that currently exist due to varying state-level standards. This is important for rolling stock alternative fuels where we have a green field opportunity. A unified approach will facilitate seamless rail operations and enhance efficiency.
2. **Hydrogen Legislative Updates:** Legislative requirements related to hydrogen need timely updates to reflect technological advancements. As hydrogen gains prominence as a clean energy source, regulations should accommodate its safe production, storage, transportation, and utilization within the rail sector.
3. **Overcoming Interoperability Challenges:** Addressing existing interoperability challenges is paramount. For instance, overcoming gauge differences (track widths) is essential for the movement of goods across Australia. Standardizing gauge where possible will improve freight flow.
4. **Locomotive Product Emissions Consideration:** Evaluating emissions related to locomotives is critical. By considering the environmental impact of different locomotive models and technologies, we can make informed decisions to reduce emissions effectively.
5. **Last Mile Journey Solutions:** The “last mile” journey—connecting rail terminals to final destinations—is often overlooked to integrate Mobility as a Service solutions. Focusing on efficient last-mile solutions, such as integrating rail with local transport networks, will

enhance overall emissions reduction efforts and promote a mode shift mindset across the public transport sector.

43 17. Do you agree with the proposed net zero pathway for maritime?

Not answered

44 17.1 Please add details to your response.

Not answered

45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Not answered

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

Not answered

47 19. Do you agree with the proposed net zero pathway for aviation?

Not answered

48 19.1 Please add details to your response.

Not answered

49 20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.

Not answered

50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?

Not answered

51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Not answered

52 21.1 Please add details to your response.

Not answered

53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?

- Look to international best practice – focus on UK/Europe

The RSSB in the UK has a rail carbon reporting tool that allows companies to use and provide a national standard. Link here: <https://www.rssb.co.uk/sustainability/net-zero-carbon-rail>. A recommendation would be to speak to RSSB on how this is being managed and could be implemented through a federal government department or the ARA, the peak body for rail (RSSB equivalent in UK).

- Provide support and incentives for Circular Economy Practices: Adopting circular economy practices to reduce the end-of-life wastage and encourage sustainable practices. Siemens Mobility has undertaken research into the remanufacturing of existing point machines in the Pilbara region, a commitment to circular economy principles. These practices can reduce CO2 emissions and extend assets useful life. Encourage this across products where possible and not just the larger 'big ticket' items, as we have seen the benefits of point machine refurbishments across the rail network. There are thousands of point machines across the rail network, and it would support the net zero targets for these to be refurbished using circular economy principles than thrown away to waste.

54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

Not answered

- 55 23. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?

Not answered

- 56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?

Low carbon fuels can only be used if they can be used as direct replacement for diesel without modifications to ensure operators can still utilise the full asset life of existing locomotives. LCLF is a short-term solution, and it is important that the solution does not put strain on current network and allows time to build up infrastructure.

HVO fuel successfully trialled in the UK by DB Cargo. Exert from article:

“DB Cargo UK has successfully trialled the use of 100% renewable Hydro-treated Vegetable Oil (HVO) as it continues to look for new and innovative ways to power its fleet and decarbonise its operations.” It is important to acknowledge that the supply and quality of HVO is however a challenge.

<https://uk.dbcargo.com/rail-uk-en/news/uk-news/DB-Cargo-UK-successful-ly-trials-new-HVO-fuel-in-bid-to-decarbonise-its-operations-5764438>

- 57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

- Strategic advisory committee

Create a strategic advisory group between industry, suppliers and the government to support the final Roadmap and Action plan, as well as the adoption across transport and infrastructure networks. Technology will play a key role in the transition to net zero and it is important to have suppliers advising on the opportunities and capabilities of emerging technology.

- Feedback

Technology and solutions to support the transition to net zero is rapidly evolving both in Australia and around the world. From the roadmap, it is important to note there are

international partnerships for energy supply and production, but less so when it comes to technology. As recognised in the consultation roadmap, the rail industry will require new rolling stock, particularly for the freight industry. Partnerships to trial and implement solutions for Australia's unique conditions are important for the rail industry.

58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

- Example of partnership and collaboration: Siemens Mobility & Deutsche Bahn – “H2goes Rail”

Together with Deutsche Bahn, Siemens Mobility in Germany are working to advance the climate-friendly transportation transition. For the joint project "H2goes Rail", Siemens Mobility developed the next generation of hydrogen trains with the Mireo Plus H, and DB developed a new type of hydrogen refuelling station. In a joint project, Deutsche Bahn and Siemens Mobility developed a brand-new overall system consisting of a hydrogen train and a newly designed filling station. Learn all about this project and find out how we worked with DB to bring about the future of hydrogen technology on rails. More information on the project: <https://www.mobility.siemens.com/global/en/portfolio/references/h2goesrail.html>

59 25.2 What opportunities can Government leverage to show leadership in Australia and internationally?

- Support commitments: Opportunity to show leadership both nationally and internationally to reach net zero targets by 2050 across all transport modes.
- Provide investment certainty: Over the past 15 years in Australia, there has been a history of uncertainty for industries relating to emissions reduction. By providing a roadmap and pathway that looks at the needs of the country above political agendas, it would attract investment across the transport and infrastructure industries to support future sustainability projects and innovation development.
- Develop and Retain local talent: Ensure local talent working in the transport and infrastructure sectors is educated and retained in Australia due to the positive pipeline of investment and development, and not lost to other countries that are more progressive and advanced.

- Hydrogen infrastructure and export: Collaborating with industry to establish hydrogen hubs for transport infrastructure. This investment in renewable industry can drive economic growth and create employment opportunities.

60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

Not answered

61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

Not answered

62 27. Do you have any feedback on the proposed review process?

Siemens Mobility representatives are available if required for a follow up meeting and discussion.

63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

- Consideration of investment

The journey to net zero will require investment from governments at all levels and companies. At a time with high investment costs and tighter government budgets, it is important there is a planned approach to the transition, and we need to start today.

- Long term policy planning

The transition to net zero needs to take a 'what is best for Australia' long term view, rather than a 3-year election cycle planning approach. The roadmap being developed needs to ensure it does not get caught up in politics and looks at the most suitable long-term pathway for Australia. Otherwise, the country is at risk of delayed or no investment and costs to support the transition to net zero will only increase and end up costing taxpayers and companies more in the long run.

64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

Not answered

65 29. Is there any further information or documentation that you wish to be considered with your submission?

Siemens Mobility technology and solutions to support Australian rail achieve net zero:

- Rolling stock
  - o Hydrogen: Replace diesel-powered trains operating on non-electrified rail lines with emission-free hydrogen-powered trains
  - o Battery: Mireo Plus B combines all the benefits of the Mireo platform with a high-performance battery system.
  - o Vectron Dual Mode: dual power locomotives unite the advantages of full-featured diesel locomotives with those of electric locomotives. This combination empowers the customer to respond flexibly to traction requirements – with or without an overhead wire.
  - o Avenio Light Rail: Trams are equipped with hybrid energy storage system without any overhead contact lines while energy is supplied at tram stops.
  - o Velaro Novo – Latest high speed rail train based off the proven Velaro platform that is 15 percent lighter than previous generations and reduces energy consumption by up to 30 percent.
  
- Brake Monitoring System
  - o Solution: A shift of transport volumes from road to rail is an important factor for more sustainability. The Brake Monitoring System makes rail transport more efficient and secure at the same time.
  - o Benefits: Increased efficiency through automated reporting and live updates. Improved overall security through detailed visualization of incorrect settings directly before the departure. Guaranteed availability through data obtained to prevent unexpected outages, reduce maintenance costs, and provide early indication of wear and tear.
  
- Signalling – “ATO over ETCS”
  - o Solution: Automatic train operation “ATO over ETCS” enables greater punctuality and rail network efficiency through optimal speeding and fewer braking operations.
  - o Benefits: Better punctuality through energy-optimized driving. Shorter halting times through optimization of entry/exit phases. Lower operation costs through less energy consumption and maintenance needs. Enhanced braking passenger experience through smooth driving.
  
- Trip Planner
  - o Based on Hacon’s Mobility Platform, a variety of data and interfaces were integrated into one comprehensive trip planner, including public and private transport, demand

responsive services (DRT), road traffic information, car and bike sharing providers, taxis, carpooling services, and domestic flights with real-time data.

- Case studies
  - o Norway – Digitalization of Norwegian railway (Signalling)
    - ? Norwegian Railways, wanted to transport more people and use fewer resources.
    - ? By digitalizing the infrastructure Siemens increased their capacity by 20%. We did that without adding a single carriage or locomotive.
    - ? Benefits
      - From: 11,200 signals; To: 0 signals
      - From: 330 interlockings; To: 1 digital interlocking
      - From: 10 types of IXL; To: 1 data center
      - From: 15,000 km of installed cables; To: 3,000 km of installed cables

66 Would you like to upload a document?

No

67 Have you removed any identifying information from your submission?

Not answered

68 Upload a submission

Not answered

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

71 Upload supporting file

Not answered