



**Australian Government**

**Department of Infrastructure, Transport,  
Regional Development and Communications**

# National Heavy Vehicle Charging Pilot

Small Scale On-Road Trial Evaluation Report

February 2020



© Commonwealth of Australia 2020  
February 2020

## Ownership of intellectual property rights in this publication

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia (referred to below as the Commonwealth).

## Disclaimer

The material contained in this publication is made available on the understanding that the Commonwealth is not providing professional advice, and that users exercise their own skill and care with respect to its use, and seek independent advice if necessary.

The Commonwealth makes no representations or warranties as to the contents or accuracy of the information contained in this publication. To the extent permitted by law, the Commonwealth disclaims liability to any person or organisation in respect of anything done, or omitted to be done, in reliance upon information contained in this publication.

## Creative Commons licence

With the exception of (a) the Coat of Arms; (b) the Department of Infrastructure, Transport, Regional Development and Communications photos and graphics; and (c) [OTHER], copyright in this publication is licensed under a Creative Commons Attribution 4.0 Australia Licence.

Creative Commons Attribution 4.0 Australia Licence is a standard form licence agreement that allows you to copy, communicate and adapt this publication provided that you attribute the work to the Commonwealth and abide by the other licence terms.

Further information on the licence terms is available from <https://creativecommons.org/licenses/by/4.0/>

This publication should be attributed in the following way: © Commonwealth of Australia 2020

## Use of the Coat of Arms

The Department of the Prime Minister and Cabinet sets the terms under which the Coat of Arms is used. Please refer to the Commonwealth Coat of Arms - Information and Guidelines publication available at <http://www.pmc.gov.au>.

## Contact us

This publication is available in hard copy or PDF format. All other rights are reserved, including in relation to any Departmental logos or trade marks which may exist. For enquiries regarding the licence and any use of this publication, please contact:

Director - Publishing and Communications

Communications Branch

Department of Infrastructure, Transport, Regional Development and Communications

GPO Box 594

Canberra ACT 2601

Australia

Email: [publishing@infrastructure.gov.au](mailto:publishing@infrastructure.gov.au)

Website: [www.infrastructure.gov.au](http://www.infrastructure.gov.au)

# Contents

1.	Executive Summary .....	2
2.	Background and context.....	4
2.1	Heavy Vehicle Road Reform.....	4
2.2	The National Pilot.....	4
3.	Small scale trial scope and objectives .....	6
3.1	Scope.....	6
3.2	Objectives .....	7
3.3	Key questions for evaluation.....	8
4.	Approach and methodology.....	9
4.1	Evaluation resources.....	9
5.	Findings and conclusions .....	11
A.	Build stakeholder confidence in the National Pilot .....	11
A.1	Participants .....	12
A.2	Telematics service providers .....	13
A.3	Government stakeholders .....	14
B.	Identify and address operational issues to improve the design of the large scale trial .....	15
B.1	Data collection process .....	15
B.2	Comparison of mock charges with PAYGO charges.....	17
B.3	Adequacy of methods to report/detect vehicle configuration .....	18
B.4	Data limitations and constraints .....	19
C.	Build capability within the Department for trial administration .....	20
6.	Findings and recommendations.....	22
	List of abbreviations/glossary.....	26
	Appendix A – List of trial participants .....	28



# 1. Executive Summary

The National Heavy Vehicle Charging Pilot (the National Pilot) is an innovative industry partnership testing potential direct road user charging options for heavy vehicles, as part of the Transport and Infrastructure Council's (TIC) Heavy Vehicle Road Reform (HVRR) agenda.

It takes a structured approach to trialling the feasibility of replacing annual heavy vehicle registration and fuel-based road user charges with a national direct user-charging system.

The Small Scale On-Road Trial (the small scale trial) was a 'proof of concept' trial. It used telematics data to generate mock invoices comparing charges that participants would pay under a basic mass-distance charge model compared to the amount of PAYGO charges the vehicle was estimated to have accrued during the same period under the current charging system.

The trial commenced in mid-July 2019 and concluded on 31 January 2020. During the trial, a total of 12 heavy vehicle operators participated, contributing 259 vehicles including buses, rigid and articulated trucks across all states.

The overarching objective was to inform the development and implementation of the Large Scale On-Road Trial (the large scale trial), scheduled to commence during 2020.

The trial also sought to:

1. Build stakeholder confidence in the National Pilot and direct road user charging for heavy vehicles
2. Identify and address operational issues to improve the design of the large scale trial
3. Build capability within the Department for trial administration.

## **Key lessons learned**

- The trial demonstrated that gathering distance and location data is feasible and can be done efficiently through an automated Application Programming Interface using telematics service providers' open source databases.
- Extraction of fuel consumption data from participants' systems and recording of configuration data by participants was difficult. Workable supplier solutions will need to be found for the large scale trial.
- Under the mock charge rate schedule used in the small scale trial, some participants, including line haul operators and operators of fuel efficient bus fleets found they may pay more under a mass-distance charge than under PAYGO. The large scale trial will test alternative charging rates.
- Data collection methods used by the Department were labour intensive and not feasible on a large scale. A database automating the process should be developed for the large scale trial.
- Regular, face to face or individualised engagement with stakeholders was proven to be the most effective way to engage with the heavy vehicle industry.
- Trial communications materials were well received but could have better explained the trial context and used clearer language to explain mock charges incurred by participants.

### Small scale trial fast facts

<b>Total distance travelled</b>	7,711,338 kms
<b>Total fuel consumption</b>	4,035,042 litres
<b>Total number of invoices produced</b>	63
<b>Total number of vehicles by configuration</b>	Rigid – 62 Articulated – 103 Buses – 94 <b>TOTAL: 259</b>



## 2. Background and context

### 2.1 Heavy Vehicle Road Reform

The Department of Infrastructure, Transport, Regional Development and Communications (the Department) is leading the Australian Government's contribution to HVRR, working closely with the Department of the Treasury. HVRR aims to achieve productivity gains, improve the efficiency of road investments and strengthen the links between what heavy vehicle users pay in charges and the services they receive. This is in the context of a growing freight task and plateauing heavy vehicle productivity.

All jurisdictions are working together on HVRR. This follows a direction from the Council of Australian Governments (COAG) in 2015 to accelerate HVRR, and a direction from the Transport and Infrastructure Council (TIC) in 2019 to develop implementation details on a package of supply-side reforms (changes to the way in which road services are provided) for consultation and decisions in 2020.

### 2.2 The National Pilot

Separately, the National Pilot is testing options for potential future changes aimed at influencing consumption of road services, or 'demand side changes'. The National Pilot is at an early stage and governments are not currently considering demand side changes. No decision has been made to move to mass, distance and/or location based charging. Any future decision will be informed by the results and evaluation of the National Pilot.

Each stage of the National Pilot will build upon lessons learned from previous stages. Safety and compliance activities not related to the collection of heavy vehicle charges are outside the scope of this project and the HVRR program.

Moving to a fairer and more sustainable heavy vehicle charging and investment system will take time and requires decisions on a large number of technical and policy issues. Starting trials now will:

- Allow governments and industry to develop experience and evidence to inform these decisions over several years.
- Provide extensive opportunities for governments to work in partnership with heavy vehicle industry stakeholders to ensure that reform takes into account the needs of users.
- Allow any problems to be identified and corrected, providing important policy lessons before decisions are made on implementation.



The National Pilot currently comprises two on-road trials:

- Small scale trial (2019–20) – a ‘proof of concept’ trial involving 12 heavy vehicle operators and 259 vehicles. The trial used a small sample of heavy vehicle operators to test the feasibility of generating mock invoices using telematics data and was not representative of the heavy vehicle industry.
- Large scale trial (2020–21) – a larger trial involving up to 100 heavy vehicle operators and 1,000 heavy vehicles from a range of industries in every state and territory using a mix of telematics and non-telematics options for reporting road use data. This trial will test a wider range of data collection methods and will include operators who do not currently have telematics installed. The Department will supply telematics or manual distance recording devices to eligible operators.

The benefits for participating businesses are:

- Testing direct user charging for heavy vehicles in a practical way and seeing how distance based charging could work for their business
- Opportunity to help inform and influence policy on heavy vehicle charging options
- Ability to request analysis of the data provided to the trial to benefit their business.

This report discusses the evaluation outcomes of the small scale trial.



## 3. Small scale trial scope and objectives

### 3.1 Scope

The small scale trial ran for six months, from July 2019 to January 2020. It involved 12 volunteer participants and 259 vehicles from the truck and bus industries based in Queensland, New South Wales, Victoria, South Australia and Tasmania. Trucks included rigid and articulated configurations. Participation was voluntary. Participants were mainly recruited through participating telematics service providers and state and territory industry associations. A list of trial participants is at [Appendix A](#).

Most participants were line haul (long distance) operators doing interstate or long distance intrastate trips and were not a representative sample of the heavy vehicle industry<sup>1</sup>, as most heavy vehicle trips undertaken in Australia are intrastate<sup>2</sup>. A more representative sample will be included in the large scale trial.

The trial commenced with 11 heavy vehicle operators contributing 111 vehicles. During the trial, the number of vehicles increased to 259 as a number of participants added more vehicles to help them better understand and compare business running costs.

All participants used existing telematics systems to generate data for the trials. These systems, at a minimum, provided distance data in an easy-to-access format. Some of these telematics systems provided detailed location data and fuel consumption data. Only one telematics system was capable of supplying the Department with data relating to a vehicle changing configuration (adding or removing a trailer or trailers) during a trip.

A third party invoicer collected data and generated invoices for those participants whose telematics service provider chose not to be involved in the trial.

The Department also collected trial data and generated invoices for some participants who were already providing data to the Department under an existing data collection agreement, or whose telematics service providers did not participate in the trial.

---

<sup>1</sup> Rigid trucks account for the majority of the Australian heavy vehicle fleet at 70.4 per cent, followed by articulated trucks and buses at 14.2 per cent and 12 per cent respectively. Source: *9208.0 – ABS Survey of Motor Vehicle Use, Australia, 12 months ended 30 June 2018*.

<sup>2</sup> On average, rigid trucks, non-freight carrying trucks and buses travel more kilometres intrastate at 22.22%, 19.58%, and 54.04% respectively, compared to articulated trucks that travel 12.98% more kilometres interstate. Source: *9208.0 – ABS Survey of Motor Vehicle Use, Australia, 12 months ended 30 June 2018*.



The trial did not involve the collection of charges. The mock charges used were for testing purposes only and did not represent an endorsement by Government to implement them.

The trial did not set out to make findings in relation to recommended heavy vehicle charges. The charge rate schedule used was basic and designed for a proof of concept trial only. Some trends were noted<sup>3</sup> and will inform development of the charge rate schedules to be tested during the large scale trial.

In accordance with data confidentiality and participant agreements used in the trial, the Department cannot publicly release individual mock invoice results. Data used to generate mock invoices was treated as commercial in confidence and used for trial purposes only.

## 3.2 Objectives

The overarching objective of the trial was to inform the development, refinement and implementation of the large scale trial. The contributory objectives were:

1. Build stakeholder confidence in the National Pilot and direct road user charging for heavy vehicles. This includes participants' experience of different aspects of the trial and likelihood of participation in the large scale trial.
2. Identify and address operational issues to improve the design of the large scale trial. This covers the experience of invoicing, system performance and ease of use of the system from the perspective of participants, telematics service providers and the Department.
3. Build capability within the Department for trial administration. This includes the knowledge and skills developed by the Department as a result of administering the trial.

To gauge how well each contributory objective was fulfilled, a number of measures were defined. Measures<sup>4</sup> were predominantly qualitative, with results based on feedback from participants, telematics service providers, government stakeholders and the Department.

---

<sup>3</sup> In the small scale trial, line haul operators and operators of more fuel efficient bus fleets found they may pay more under a mass-distance charge than under PAYGO.

<sup>4</sup> Measures included participants' experience of different aspects of the trial and likelihood of participation in the large scale trial; experience of invoicing, system performance and ease of use; and the level of knowledge and skills gained by the Department through administering the trial.



### 3.3 Key questions for evaluation

Key questions to be answered by the evaluation included:

- How effective was the technology used in the trial? How easy was it to use?
- Were communications materials distributed during the trial effective, easy to understand and timely?
- What, if any issues were encountered around data accuracy and transmission? How could these be resolved for the large scale trial?
- Could the policy design, such as charge rate schedules be improved? If so, which aspects and how?
- Did the Department provide adequate support for participants and vendors in the trial?
- Were mock invoices accurate and easy to understand?
- What were participants' and service providers' experience of data security and privacy?
- What were participants' and service providers' experience of the trial in general? Based on this, would they participate in the large scale trial?

## 4. Approach and methodology

The evaluation was informed by the Department's Monitoring and Evaluation Framework and the Evaluation Framework developed by Arup and D'Artagnan Consulting, as part of strategic advice they provided on the design and implementation of the National Pilot.

### 4.1 Evaluation resources

#### 4.1.1 Evaluation data collection and methods

The Department conducted its own evaluation of the trial. The evaluation assessed the effectiveness of the trial in achieving its stated objectives using participant-focused and system-focused data.

##### **a. Participant-focused (trial experience) data**

Data were collected to gain insights from participants, telematics service providers and state and territory government representatives on their experience of the trial and support for future trials.

Experiential and attitudinal data were collected in interviews and surveys conducted after the issue of the second and fourth invoices during the trial.

Participants and telematics service providers who participated in the trial were surveyed either by telephone or by completing an electronic survey, depending on their preference, as part of the trial evaluation process. Two separate surveys, with questions tailored to the needs of both groups, were administered.

State and territory government representatives who meet monthly as part of a Trials Working Group convened by the Department were surveyed in a short telephone interview at the commencement and end of the trial.

##### **b. System-focused (system performance) data**

Data were collected to ensure any operational and technical issues were identified and, where possible, addressed during the trial.

Data collected focused on overall system performance and the accuracy of data transmission, as well as feedback from participants and telematics service providers on the ease and cost of administering the charging system. It included:

Routine data:

- Charging and location data – telematics service providers, the third party invoicer<sup>5</sup> and some participants supplied the Department with a spreadsheet each month containing charging (distance and mass) and location data for each participating vehicle.

---

<sup>5</sup> A third party invoicer was employed by the Department to collect telematics data and generate mock invoices for participants whose telematics service provider was not involved in the small scale trial.

- 
- Experiential and attitudinal – a customer service log was updated by the Department following interactions with stakeholders about system performance and technical issues.

Non-routine data:

- Information relating to tampering incidents – vendors were required to supply an incident report in the event of detected tampering.
- Information relating to data breach – the trial Data Manager would provide an incident report in the event of a data breach.

All data was stored on the Department's secure records management system. Access to the data was restricted to the Department's data managers, as per the Department's trial data confidentiality agreement with participants and service providers.

## 4.1.2 Evaluation limitations

### **a. Participant-focused (trial experience) data**

All participants, service providers and state government representatives were provided with surveys to complete. Generally, a majority of responses were received, however a higher completion rate in some groups would have provided a more representative sample of qualitative data about the trial experience.

The first survey was completed by:

- 72 per cent of trial participants
- 33 per cent of telematics service providers
- 67 per cent of government representatives

The second survey was completed by:

- 64 per cent of trial participants
- 50 per cent of telematics service providers
- 83 per cent of government representatives.

### **b. System-focused (system performance) data**

Charging and location data was provided by 80 per cent of telematics service providers and participants on a monthly basis. A small number of providers and participants did not provide data at monthly intervals. Invoices were produced when data became available, rather than on a monthly basis, for these participants. The Department did not receive information about their trial experience or issues encountered during the trial for those participants.

## 5. Findings and conclusions

### A. Build stakeholder confidence in the National Pilot

#### A.1 Participants

Through their involvement in the trial, participants trialled a possible new charging system based on existing technology and received greater insight into their current running costs.

The trial achieved its objective of building stakeholder confidence in the National Pilot. All small scale trial participants who responded to the second survey (64 per cent of trial participants) expressed interest in joining the large scale trial.

A mean score of 8/10 was consistently achieved across the two participant surveys in response to questions on the:

- Quality of the Department's communication to participants about the small scale trial.
- Simplicity of joining the trial.
- Level of confidence in the Department's ability to run the trial.

Comments from participants regarding these three elements of the trial were:

- *Communication has been excellent from all persons from the Department.*
- *All the people I have worked with on the trial have been nice to deal with and have been quick to respond to any questions I had.*
- *The Department staff I have dealt with have been extremely helpful and willing to assist in any way they can.*
- *The Department could provide more context to support a better understanding of the trial and what it would lead to.*
- *We are 100 per cent certain the Department will complete the small scale trial but don't believe it will lead to anything.*

Most participants (92.85 per cent) reported no particular problems during the trial and no drivers raised any issues. One issue was raised relating to the ability to track telematics devices that are reallocated to a different vehicle during the trial (a truck involved in the trial was taken out of service, with its telematics device relocated to a new vehicle). The participant suggested the Department consider how the association of a registration plate to a telematics on-board unit is managed when operating at scale. It was suggested that protocols for managing enrolment, changeover cancellations and the timing of this should be considered.

Most participants (87.5 per cent) had no issues with the distance recording technology used. One participant reported problems recording vehicle configuration through their telematics system, while another had a minor issue with a telematics device that did not sync straight away.



Most participants (73 per cent) reported that participating in the trial required no or little additional time for their company. One participant spent one additional hour per week, and another spent two to three additional hours per week on the trial.

No privacy or data security issues were encountered by any of the participants.

Most participants (80 per cent) reported their mock invoices were correct. Incorrect information on invoices, as identified by participants, included vehicle classification issues and a “teething issue, nothing major” that was not specified by the respondent, however these were quickly resolved to participants’ satisfaction.

Close to 40 per cent of participants reported their mock invoices were easy to understand, while 25 per cent indicated that they did not understand how the proposed fixed rate mock charge<sup>6</sup> was calculated. Other operators suggested that vehicle fleet IDs be added to mock invoices and charge rates could be better explained.

Final feedback received from participants in the second survey was:

- *The biggest hurdle for the successful running of this trial and the large trial is for the Department to be able to understand this industry – how it works and operates on a daily basis. It is going to be very difficult to develop a charging regime that is simple, practical, fair and workable to both governments (all levels including local governments) and operators in all the various diversities of this industry.*
- *Much work is still to be done from an industry acceptance perspective but this trial helps everyone understand the challenges and the options going forward.*
- *The trial needs to ensure that operators are not going to be charged more than they are currently.*
- *It is exciting to see the Department’s swift action about this trial. We look forward to being of assistance for the future of this and other trials.*

#### **Key recommendations**

- Ensure large scale trial participant communications materials clearly explain trial context and benefits of participating.
- Improve readability of mock invoices by clearly explaining mock charges.
- Test draft mock invoices for the large scale trial with a small focus group before use.
- Protocols for managing enrolment, changeover cancellations and timing should be considered for the large scale trial.

---

<sup>6</sup> A nominal \$600 annual registration charge was set for each vehicle under the proposed heavy vehicle charge rate schedule used in the trial. Trailers were not subject to this charge. The purpose of the nominal registration charge was to ensure each vehicle was appropriately licenced to travel on roads and to minimise any potentially inappropriate distortions in vehicle purchase choice between light vehicles and small rigid heavy vehicles.

## A.2 Telematics service providers

Through their involvement in the trial, three telematics service providers and one third party invoicer tested their ability to calculate accurate distance charge data including location, distance travelled and vehicle configuration from data received from participants' telematics systems.

Their role included providing a correctly rendered mock invoice to the participant each month and a customer service helpdesk to answer questions from participants about mock invoice calculations and technical issues.

Telematics service providers rated their confidence in the Department's ability to run the small scale trial as 8/10 (mean score) across the two surveys.

One respondent commented that overall, their involvement in the trial had been "a very positive experience. Departmental staff were efficient and prompt with their actions. Instructions and feedback were clear and concise. The participants provided data regularly and responded to queries within a reasonable timeframe. The telematics service provider's Application Programming Interface (API) worked well. It reduced workload for heavy vehicle operators and provided a reliable source of distance data. Fuel data consistency and accuracy is a challenge".

Another respondent noted that customer/participant behaviour had "largely settled into a routine that, were this trial to be 'locked in' for continuous operation at scale, would enable a higher degree of automation to be achieved. Part of the success, however is that the trial is revealing/confirming lessons about the capabilities and weaknesses of the two principal 'new' technologies we have been testing: fuel use data recording, and manually declaring and recording configuration via the OBU. The recording is working well in each case, but the weak point is the need for human action to supply the right data in the right timeframe".

The quality of the Department's communication about the small scale trial to service providers received a mean score of 7.3/10. Comments indicated telematics service providers would have liked to have received monthly updates on trial progress specifically targeted at them, including regular face-to-face meetings.

Problems identified during the trial included telematics service providers' ability to extract fuel consumption data and vehicle configuration data. In addition, one telematics service provider reported problems with the distance recording technology used, due to system outages. More discussion on these issues can be found in Section B.

Telematics service providers noted time taken to work on the trial ranged between one to three hours per week. No privacy or data security issues were reported.

### Key recommendations

- Use targeted and more regular communication materials for all suppliers during the large scale trial.
- Consider regular face-to-face meetings with suppliers during trial.



### **A.3 Government stakeholders**

Government stakeholders who are members of a jurisdictional Trials Working Group, comprising representatives from Victoria, New South Wales, Queensland, South Australia and Western Australia, received regular progress reports about the trial through monthly Trials Working Group meetings, a monthly trial update report and the regular trial newsletter. The governments of Tasmania, the Northern Territory and the Australian Capital Territory chose not to participate in the working group due to resourcing constraints, however all jurisdictions attended face-to-face consultations on the trials.

Government stakeholders, including representatives of all levels of government, rated small scale trial communications as 8.6/10 (mean score). Comments indicated general satisfaction with the approach and results of the trial.

Government stakeholders rated their level of confidence in the Department's ability to run the large scale trial as 8/10 (mean score). One respondent recommended the large scale trial test the broadest range of technology possible. Others reiterated the importance of keeping jurisdictions involved and engaged, emphasising that they were satisfied with the Department's current approach of engaging closely with industry and the states.

#### **Key recommendations**

- Continue to regularly update jurisdictions on progress of the large scale trial in the lead up to and during the trial, including face-to-face consultations.
- Apply learnings from the communications approach taken with Trials Working Group members in the small scale trial to other stakeholder groups for the large scale trial.



## B. Identify and address operational issues to improve the design of the large scale trial

During the trial, a variety of data was collected using a range of methods to generate mock invoices for trial participants.

System-focused (system performance) data collected in the trial was categorised as routine and non-routine.

Routine data comprised distance, location, configuration and fuel consumption data from some telematics service providers, the third party invoicer and some participants. This data was used to check invoices generated by telematics service providers and the third party invoicer and to generate mock invoices. A spreadsheet containing this data for each participating vehicle was provided each month to the Department.

Routine data collected was also experiential and attitudinal. A customer service log was updated by the Department following interactions with stakeholders by telephone, email or face to face.

Non-routine data collected comprised information relating to incidents of tampering with telematics devices. Vendors were required to supply an incident report in the event of detected tampering.

Non-routine data also comprised information relating to a data breach, whereby the trial Data Manager would provide an incident report in the event of a data breach.

No tampering or data breach incidents were recorded by the Data Manager during the trial.

### **B.1 Data collection process**

Three telematics service providers and one third party invoicer were required to collect location, distance travelled and vehicle configuration data from participants' telematics systems. Fuel consumption data was collected either from telematics systems or manually, depending on system capability, to calculate the fuel excise component of the PAYGO charges that participants currently pay.

Location data was collected for four participants using GPS coordinates provided by telematics systems. A third party invoicer collected this data for three participants. The Department's Bureau of Infrastructure, Transport and Regional Development (BITRE) received this data from one participant, through an existing data collection arrangement.

Distance travelled data was obtained through a distance summary report generated through the vehicle's telematics system, or if this was not available, it was calculated based on location data.

Configuration data was collected to determine a vehicle's mass or if this was not available, a proxy was used. Only one telematics system used in the trial could automatically report configuration. Most telematics systems used in the trial were unable to automatically report configuration, as trailers did not have distance trackers. In these cases, drivers were required to manually enter configuration into their on-board units, however this did not consistently occur. The reporting of configuration data was therefore a significant issue in the trial. More discussion on this issue and the implications for the large scale trial is in Section B.3.

Only two participants could provide fuel consumption data extracted through their telematics system.



The extraction of fuel consumption data from telematics systems was generally difficult as not all telematics devices were linked to the vehicle's engine. This was particularly the case for older vehicles used in the trial, which were not capable of recording fuel consumption in real time. One telematics service provider reported that extracting fuel consumption data was "messy from the participants' side as there are no incentives for participants to do it well, as opposed to reporting it for tax purposes".

Fuel consumption data by vehicle was not available for the trial's monthly invoicing purposes, as the fuel data that businesses report on a monthly basis to the Australian Tax Office is usually calculated for the entire fleet and is not broken down by vehicle. Most participants had to manually estimate each vehicle's fuel excise costs using fuel sheets derived from fuel purchases using company credit cards. More discussion on this issue and the implications for the large scale trial is in Section B.2.

The third party invoicer used an API to collect three participants' vehicle data from telematics service providers. The process was automated, which meant there was no additional work required by the trial participants. It also enabled data to be captured in the same format for multiple vehicles and from different telematics service providers, minimising the time and cost involved in interpreting results. It is recommended that automated APIs using telematics service providers' open source databases be used in the large scale trial.

One participant provided location and distance data to the Department under existing data collection agreements with BITRE. Some participants also provided odometer readings directly to the team administering the trial. The Department used this data to generate invoices for these participants whose telematics service providers did not participate in the trial. Odometer readings were collected in a simple manner, using email exchange and Excel files. The manual collection of odometer readings was quite labour intensive at times and not feasible on a large scale.

Odometer technology is rudimentary for the purposes of road user charging, as it provides data on distance travelled only. It is, however easy to implement on a wide scale and can be used to calculate road user charges.

The odometer readings used in the small scale trial relied on participants providing company records to the Department. Odometer technology could be used in the large scale trial, but readings would need to be verified by photographs linked to a particular vehicle or odometer inspections.

#### **Key recommendations**

- The Department should work with stakeholders to find solutions for recording of configuration data and extraction of fuel consumption data for the large scale trial.
- Automated Application Programming Interfaces (API) using telematics service providers' open source databases should be used in the large scale trial.
- The Department should develop a database automating the data collection and invoice generation process for large scale trial participants who wish to provide odometer readings.
- Odometer readings should be verified using either a smartphone application linking photographs of readings to a particular vehicle or onsite inspections.

## B.2 Comparison of mock charges with current PAYGO charges

The small scale trial tested a mass–distance charge rate model with trial participants. Mock charges were calculated using distance data collected from telematics devices. A third party invoicer assisted in cross checking location data with distance data to reduce errors in reporting.

A major challenge in comparing an alternative distance charge with PAYGO charges is the difficulty of estimating current PAYGO charges.

PAYGO charges comprise annual heavy vehicle registration and fuel-based road user charges. The registration component was relatively simple to calculate, as trial participants provided their vehicle registration details. However, as outlined in Section B.1, the fuel excise costs were difficult to calculate on a per vehicle basis as businesses usually only keep records of their total fuel consumption for Business Activity Statement reporting to the Australian Tax Office. For this reason, fuel consumption data per vehicle configuration was not available.

Only a few trial participants were able to provide fuel consumption data extracted through their telematics system. The majority of participants had to manually estimate each vehicle's fuel excise costs. In this case, two main approaches were used to approximate fuel use in each vehicle:

- Using a historical or industry fuel consumption average.
- Linking fuel card and fuel sheet records to each vehicle.

The first option relied on collecting historical fuel consumption rates from trial participants and working with them on an estimated litre per kilometre figure for their vehicles. Manufacturer data and broader statistics in fuel consumption were also used to work out a fuel consumption rate. For example, a B double vehicle is expected to use a certain litre per kilometre figure on a particular type of road, hauling a particular type of cargo.

The second option of linking fuel card or sheet records to each vehicle was time consuming. One trial participant noted that this process took their staff one to two hours per week to administer.

The Department used both methods to estimate fuel consumption for PAYGO charges and while trial participants did not raise any issues with the accuracy of these estimates, there were flaws inherent in the process.

It is important to note that estimation of a vehicle's fuel consumption was only relevant to the calculation of current road user charges – it is not relevant to the calculation of mass–distance charges.

### Key recommendations

- Estimation methods should be used in the large scale trial where fuel consumption data cannot be automatically collected so that a comparison of an alternative distance charge with PAYGO charges can be made.
- To reduce administration costs for trial participants, historical and industry fuel consumption averages should be used.



### **B.3 Adequacy of methods to report/detect vehicle configuration**

As outlined in Section B.1, the telematics systems used in the trial were unable to automatically report configuration, as trailers did not have their own distance trackers. Drivers were required to manually enter configuration into their on-board units, however there were reporting challenges inherent in this approach.

Only one trial participant was able to detect vehicle configuration changes during a trip. This participant provided distance stamps to indicate when trailers were attached or disconnected for a vehicle combination.

However, this reporting raised challenges, namely:

- A number of readings could not be reconciled with the total distance travelled due to the lack of a data checking system.
- Where manual reporting was used, configuration changes were not consistently reported.

For the majority of trial participants, a static configuration was used to calculate their mock invoices. This is adequate for rigid trucks and buses, where configuration does not change. However, for articulated vehicles that change trailers, this approach will not allow for the accurate calculation of a mass–distance charge, as mass will change depending on the vehicle’s configuration over the month.

In the absence of configuration data, one telematics service provider generating mock invoices for articulated vehicles reported they defaulted to the highest cost option where that occurred. This service provider suggested that separately tracking trailers for tax purposes (as occurs in New Zealand) may be an alternative to declaring configuration, however it would present its own technical challenges. There would be a range of options available that could be tested to provide differing levels of assurance.

#### **Key recommendation**

- Trailer tracking should be one of the options tested to report configuration in the large scale trial.
- The reporting of configuration should be included in the procurement requirements for the large scale trial to test market solutions to automate the provision of configuration data.



#### **B.4 Data limitations and constraints**

Constraints were mainly technological in nature, as discussed in Sections B.1, B.2 and B.3.

Mock charges did not take into account whether the vehicle had travelled on public (chargeable) versus private (non-chargeable) roads. Telematics service providers did not offer the additional mapping and data analytical capabilities to distinguish between public and private roads for charging purposes.

Furthermore, the Department did not have access to proprietary software systems to easily distinguish public and private roads from a set of GPS coordinates.

Fuel consumption data gathered did not differentiate between fuel consumption for powered equipment connected to the truck, such as concrete mixers which would be exempt from road user charges and distance travelled.

##### **Key recommendation**

- The ability to reporting distance travelled on public versus private roads and the apportionment of fuel consumption use should be included in procurement requirements for the large scale trial.



## C. Build capability within the Department for trial administration

A team of six staff within the Department planned and administered the small scale trial, undertaking the functions of trial management, recruitment, communication and stakeholder engagement, data collection and management and invoice generation.

Team survey responses showed the team's knowledge of the heavy vehicle industry, distance recording technology and trial management experience grew steadily over the duration of the trial.

The team demonstrated its capacity to collect and analyse distance based data from telematics providers and participants and generate mock invoices for five participants.

They found collection of accurate fuel data from vehicles by trip is complex and varies by operator and telematics system. This raised a variety of issues that will need to be further explored and resolved ahead of the large scale trial (see Findings and Recommendations table in Section 6).

The team's ongoing engagement with stakeholders, participants and service providers in the lead-up to and during the trial was well received by industry and built confidence in the National Pilot. Undertaking face-to-face or individualised engagement with stakeholders and seeking regular feedback from industry was proven to be the most effective way to engage the heavy vehicle sector and engender mutual trust and co-operation.

The small scale trial provided important lessons for the Department to learn and adapt to new technologies in collecting data. The Department initially gathered data for most participants using manual means, which included email requests for monthly distance travelled and fuel data. This process resulted in delays and additional administrative work for trial participants and was also prone to human error.

The Department consulted with the trial's third party invoicer and BITRE to improve its data gathering capabilities. As a consequence, the Department implemented an automated approach using an API, which allows data to be gathered directly from telematics systems.

The Department used this API to significantly reduce administrative work for trial participants and gather a larger subset of data, including location data for heavy vehicles. API tools obtained from the third party invoicer will provide options for building sophisticated data gathering tools for the large scale trial.

The Department discovered the small scale trial procurement model would not be transferable to the large scale trial, which would need to represent the complexity of the Australian heavy vehicle industry and test a variety of technology and data collection methods and suppliers:

- A larger number of small to medium-sized operators, particularly those with rigid vehicles in their fleet, would need to be recruited as participants for the large scale trial. Participants would be drawn from all states and territories and from a variety of industries. Telematics devices would be supplied to eligible operators for the life of the trial.
- A wider range of data collection methods, including telematics and manual recording options such as hubodometers and odometers (for those who do not wish to use telematics) would be used.
- On-board scales would be tested in a sub-trial on dynamic (actual) mass.



There were also important probity matters highlighted by the small scale trial that would need to be worked through ahead of the large scale trial, due to the complexity and high value of the procurements involved. These include conflict of interest and data confidentiality considerations in trial recruitment, procurement and operations.

Probity will need to be achieved through robust tendering processes which conform to Commonwealth policy, principles and legislative requirements.

#### **Key recommendations**

- The large scale trial participant recruitment strategy should target small to medium sized operators with rigid vehicles from all states and territories and a variety of industries.
- The large scale trial procurement plan should represent the complexity of the Australian heavy vehicle industry and test a variety of technology and data collection methods and suppliers.
- A probity plan should be developed and an external probity adviser engaged to provide advice on all probity related matters for the large scale trial.
- The Department should continue to engage comprehensively with heavy vehicle industry stakeholders in the lead up to and during the large scale trial.

## 6. Findings and recommendations

### Objective 1: Build stakeholder confidence in the National Pilot

Findings	Recommendations for large scale trial
<p>Trial communications materials for participants were effective, easy to understand and timely, however could have provided more context for the trial and HVRR.</p>	<p>Ensure participant communications materials clearly explain:</p> <ul style="list-style-type: none"> <li>• The weaknesses in the way roads are currently funded and heavy vehicles charged for their use.</li> <li>• The potential benefits of an alternative heavy vehicle charging system that is more efficient, cost reflective and transparent.</li> <li>• How participation in the trial will help inform future policy.</li> </ul>
<p>Some participants reported that readability of mock invoices could have been improved by better explaining the mock charges used and adding vehicle fleet ID to invoices.</p>	<ul style="list-style-type: none"> <li>• Improve readability of mock invoices by clearly explaining mock charges.</li> <li>• Add vehicle fleet ID to invoices.</li> <li>• Test draft mock invoices for large scale trial with a small focus group before use.</li> </ul>
<p>The ability to track telematics devices that are reallocated to a different vehicle was raised as an issue by one participant.</p>	<p>Protocols for managing enrolment, changeover cancellations and timing should be considered for the large scale trial.</p>
<p>Participant experience of the trial was very positive:</p> <ul style="list-style-type: none"> <li>• Confidence in the Department’s ability to run the trial was 8/10 (mean score).</li> <li>• Most participants (73 per cent) reported that participation in the trial took them 0–30 minutes additional time/effort per week.</li> <li>• All participants reported no privacy or data security issues were encountered in the trial.</li> <li>• Most participants (87.5 per cent) reported no issues with the distance recording technology used.</li> <li>• All participants reported they bore no additional costs for participating.</li> <li>• All participants expressed interest in joining the large scale trial.</li> </ul>	<p>Ensure participant communications materials emphasise:</p> <ul style="list-style-type: none"> <li>• The minimal time/effort required to participate in the trial.</li> <li>• Participant satisfaction with the way privacy and data security were handled in the trial.</li> <li>• Ease of use of telematics systems to encourage participation of those with and without telematics systems.</li> <li>• No cost nature of trial participation.</li> </ul> <p>In addition:</p> <ul style="list-style-type: none"> <li>• Use small scale trial participants to promote large scale trial participation via published material and videos.</li> <li>• Invite all small scale trial participants to participate in the large scale trial.</li> </ul>

<ul style="list-style-type: none"> <li>Quality of the Department's trial communications for telematics service providers was rated 7.3/10 (mean score).</li> <li>Telematics service providers requested communications materials targeted at them and more regular one-on-one communication with the Department during the trial.</li> </ul>	<p>Ensure the Department:</p> <ul style="list-style-type: none"> <li>Uses targeted and more regular communication materials for all suppliers during the large scale trial.</li> <li>Considers regular face-to-face meetings with suppliers during the trial.</li> <li>Discusses suppliers' requirements with them in the development of targeted communications materials.</li> </ul>
<p>State and territory government representatives were satisfied with the level and type of engagement undertaken with them in the lead up to and during the small scale trial.</p>	<ul style="list-style-type: none"> <li>Continue to regularly update jurisdictions on progress of the large scale trial in the lead up to and during the trial, including face to face consultations.</li> <li>Apply learnings from the communications approach taken with Trials Working Group members in the small scale trial to other stakeholder groups for the large scale trial.</li> </ul>

**Objective 2: Identify and address operational issues to improve the design of the Large Scale On-Road Trial**

<b>Findings</b>	<b>Recommendations for large scale trial</b>
<p>Reporting configuration data was problematic</p>	<ul style="list-style-type: none"> <li>Work with participants, telematics service providers and third party invoicers to test market solutions to automate the provision of configuration data.</li> <li>Trailer tracking should be an option tested in the large scale trial.</li> </ul>
<p>Extraction of fuel consumption data was an issue</p>	<ul style="list-style-type: none"> <li>Work with participants, telematics service providers and third party invoicers to find solutions for extraction of fuel consumption data from participants' systems.</li> <li>Where fuel consumption data cannot be automatically collected, the following methods should be used: <ul style="list-style-type: none"> <li>Estimation methods</li> <li>Historical and industry fuel consumption averages.</li> </ul> </li> </ul>
<p>The use of an automated API to collect data demonstrated the extensive benefits of using automated cloud systems for this purpose.</p>	<p>Use an API to capture location data from telematics providers, where practically possible. This will allow the collection and analysis of more</p>

	data without significant increases in staffing resources.
The collection of data by the Department was labour intensive and not feasible on a large scale.	<ul style="list-style-type: none"> <li>• Develop a database automating the data collection and invoice generation process for large scale trial participants who wish to provide their data to the Department via an API or odometer readings.</li> <li>• Odometer readings should be verified using either a smartphone application linking photographs of readings to a vehicle or onsite inspections.</li> </ul>
Accuracy of distance travelled data collected could be improved.	<ul style="list-style-type: none"> <li>• Obtain location data (latitude and longitude) to improve accuracy of distance travelled and ability to identify errors.</li> <li>• Consider plug-in, portable in-vehicle monitoring devices or hubodometers for fleet operators without telematics units installed. Some hubodometer products allow wireless data reading and have an API-like ability to export data.</li> <li>• Use odometers as a backup in case telematics or hubodometers cannot be procured.</li> </ul>
Only one out of 12 trial participants was able to collect data showing a change of vehicle configuration.	Investigate options to obtain vehicle configuration details via API. This could potentially involve access to the National Heavy Vehicle Regulator (NHVR) database, to automatically obtain equipment configuration details.
It was difficult to collect live fuel data to estimate a PAYGO charge.	Investigate options to obtain fuel data via API. One option could be getting API access to major oil companies, which would address the fuel data problems identified above. Doing this would be an opportunity to solve the industry-wide issue of fuel data availability.
Devise a method to better manage large volumes of data.	Use a relational database for data storage further analysis. This would result in a single source of data, making it easier to manage large volumes of data, which could be optimised to analysis.

Improve data quality and assurance.	Develop a robust process for data quality and assurance. Depending on scale, this would require a combination of automatic data quality checks, together with manual exception management and sample checks.
Line haul operators found they may pay more under a mass-distance charge than under PAYGO.	Develop a demand-responsive charge rate schedule for line haul operators for the large scale trial.
Operators of more fuel efficient bus fleets found they may pay more under a mass-distance charge than under PAYGO.	Factor fuel efficiency into the charge rate schedule for bus fleets in the large scale trial.

**Objective 3: Build capability within the Department for trial administration**

<b>Findings</b>	<b>Recommendations for large scale trial</b>
Large scale trial will need to represent composition of Australian heavy vehicle industry.	Devise participant recruitment strategy to target small to medium sized operators with rigid vehicles from all states and territories and a variety of industries.
Small scale trial procurement model will not be transferable to the large scale trial.	<ul style="list-style-type: none"> <li>• Ensure the large scale trial procurement plan represents the complexity of the Australian heavy vehicle industry and tests a variety of technology and data collection methods and suppliers.</li> <li>• Develop a probity plan and engage an external probity adviser to provide advice on all large scale trial probity matters.</li> </ul>
Face-to-face or individualised engagement with stakeholders and seeking regular feedback from industry was proven to be the most effective way to engage with the heavy vehicle industry.	Continue to engage comprehensively with heavy vehicle industry stakeholders in the lead up to and during the large scale trial.

## List of abbreviations/glossary

API	Application Programming Interface – a cloud-based data collection system
Articulated truck	Truck with one or more trailers
COAG	Council of Australian Governments
Department	Department of Infrastructure, Transport, Regional Development and Communications
HVRR	Heavy Vehicle Road Reform
IAP	Intelligent Access Program – a national program that allows participating heavy vehicles more access or increasing allowable mass in exchange for compliance
Large scale trial	Large Scale On-Road Trial
Line haul	Long distance
LTMR	Land Transport Market Reform
National Pilot	National Heavy Vehicle Charging Pilot
NHVR	National Heavy Vehicle Regulator
OBU	On-Board Unit – in-vehicle telematics device that records distance travelled and the configuration of a vehicle, among other data
Participants	Heavy vehicle operators who participated in the Small Scale On-Road Trial
PAYGO	Pay-As-You-Go – the current national heavy vehicle road user charging system (annual heavy vehicle registration and fuel-based road user charges)
Prime mover	The engine and driver’s cabin of a truck
Rigid truck	Cargo truck where the cabin and load body are connected in a single unit
SLS	Service Level Standards – defined categories and levels of service for public roads, as agreed by jurisdictions



Small scale trial	Small Scale On-Road Trial
Third party invoicer	A service provider employed by the Department to collect telematics data and generate mock invoices for participants whose telematics service provider was not involved in the small scale trial
TIC	Transport and Infrastructure Council

## Appendix A

### Small Scale On-Road Trial participants

Participants	Number of vehicles
Buslines	55
Nuline Charter	39
Blu Logistics	4
Bridgestone	14
Conroy Removals	5
Coolibah Quarries	3
De Bruyen	12
John West Logistics	35
Quinn Transport	26
Simon National Carriers	20
Smith Haulage	26
Toll	20

### **TOTAL VEHICLES: 259**

**Note:** Quinn Transport joined the trial in November 2019, contributing 27 vehicles. Coolibah Quarries withdrew from the trial in late 2019 due to the sale of the business.