



## Highways England

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# MOTORWAY FUEL PRICE TRIAL

## Final Report







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Final Report

**(VERSION 2) PUBLIC**

**PROJECT NO. 604 4/45/12 WSP  
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# 1 INTRODUCTION

## 1.1 BACKGROUND TO THE PROJECT

WSP was commissioned by Highways England to implement, operate and evaluate a trial for 18 months following the installation of four new electronic message signs on the M5 motorway, displaying live fuel prices between Bristol and Exeter.

The new electronic fuel price signs would enable motorway users to view and compare prices before they have pulled off the motorway and into the Motorway Service Area (MSA). This would allow motorists to make a more informed decision about where to refuel.

The trial included a measurement of the potential for increased competition between MSA's. Additionally, Highways England wanted road users to be more informed and in better control of their journeys. This means they would be better prepared, more inclined to plan breaks, have sufficient fuel, and have an overall more positive driving experience.

The Critical Success Factors (CSFs) of the trial were:

- Safety - Having no discernible impact to safety for all road user groups;
- Customer - Providing a useful and effective information service to the customer;
- Economic - Cost/benefit analysis of providing motorists with price transparency;
- Performance - Providing a high performing and accurate messaging system.

## 1.2 OBJECTIVES OF THE PROJECT

The primary objective of the project was to deliver a reliable, accurate and up-to-date information service. The output of the project was to identify the benefits of providing real-time fuel price information that would help Government and Highways England make decisions related to a future expanded roll-out of the service.

## 1.3 OVERVIEW OF THE TRIAL

The trial was implemented on the M5 Southbound between Junctions 18 (Bristol) and 30 (Exeter). The following five operators participated in the trial.

MOTORWAY SERVICE AREA	FUEL STATION OPERATOR	FUEL BRAND
Gordano	Welcome Break	Shell
Sedgemoor	Shell	Shell
Bridgwater	Moto	BP
Taunton Deane	Shell	Shell
Exeter	Moto	BP

**Table 1 - Participating MSAs and Associated Operators**

Four signs were installed, with each displaying unleaded petrol and diesel prices at the next three service areas along the route along with the respective distances to the relevant MSA.

See picture below. Please note the prices on the sign below are a representation and are not an indication of the prices during the trial.



## 2 SAFETY

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### 2.1 KEY FINDINGS

This section reports on the effect of the signs on safety.

#### Key Findings:

- The fuel price signs have had no adverse impact on road safety to motorists.
- The number of reported vehicles running out of fuel southbound between M5 junctions 18 and 30 during the trial period are consistent with those before the trial.
- Customers agreed that the signs were clear and easy to read, and in the main did not feel that they conveyed too much information.
- There was no evidence to suggest that the motorway fuel price signs had a negative impact in driving behaviour.

The safety performance was measured by:

**Vehicles running out of fuel:** There would be a safety risk presented by an increase in the number of hard shoulder stops as a result of running out of fuel.

**Frequency of incidents:** A measurement of incidents reported in the vicinity of the sign.

**User feedback:** Distraction reported by travellers and near misses reported by control room staff.

### 2.1 INTRODUCTION

Driver behaviour in response to the new fuel price signs was monitored to determine whether there were any adverse safety impacts. In particular, a potential hazard could be an increase in the number of drivers running out of fuel by trying to drive further to a cheaper fuel forecourt, rather than using the closest one.

In addition, the number of incidents occurring within the links where the four signs were located were monitored and compared with historical data.

The surveys carried out at MSA's included safety related questions.

### 2.2 NUMBER OF VEHICLES RUNNING OUT OF FUEL

Command and Control (C&C) data from Highways England was analysed to provide details of incidents on the trial route, including numbers of vehicles running out of fuel. Since the numbers of such incidents are low, the cumulative number of "out of fuel" incidents has been used. Please note that due to system upgrades at Highways England, the data for September 2016 to September 2017 is provided in a different format and may not be entirely comparable.

By the end of the trial in September 2017, the cumulative number of out of fuel breakdowns was below trend for the corresponding previous two years. There is therefore no evidence to suggest that there has been an increase in the number of breakdowns caused by out of fuel events.

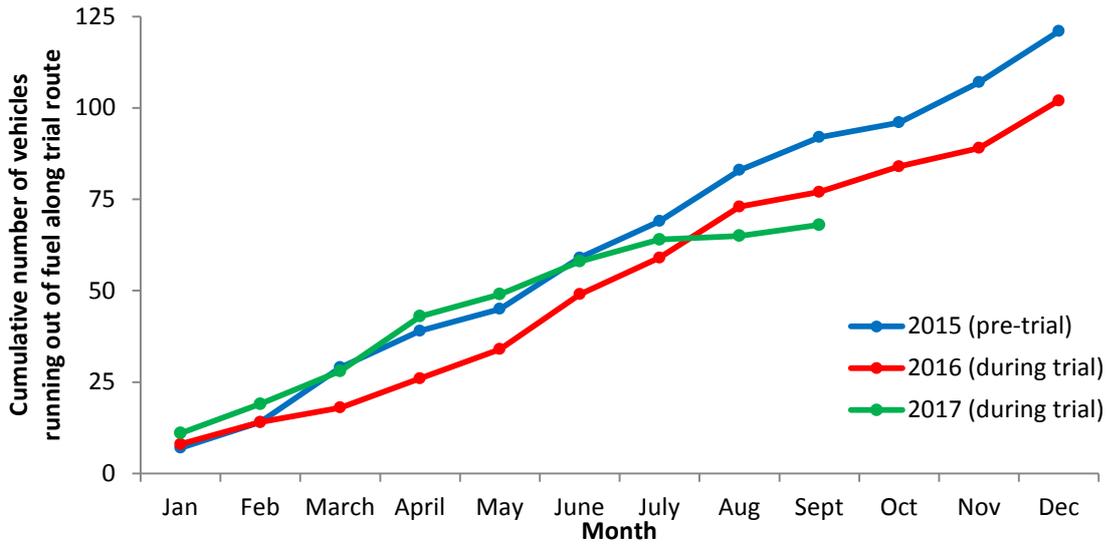


Figure 1 - Number of vehicles stopping due to running out-of- fuel

### 2.3 INCIDENT FREQUENCY CLOSE TO EACH SIGN

The Command and Control data identified where incidents had occurred on the trial route. This data was used to determine whether the fuel price signs had an impact on the safety of road customers in the immediate vicinity of the signs; comparing the data against a 2015 pre-trial baseline.

Only incidents that may be attributable to the signs were included within this comparison, omitting extraneous causes, such as an animal on the network or a tyre failure.

Please note in September 2016, the system used for reporting incidents changed, with subsequent data reports not providing comparability. However, data from the first nine months of the trial (Figure 2) showed that the number of recorded incidents along the trial site links had, for the most part, decreased relative to 2015, and therefore there were no indications that the fuel price signs were having a negative impact on motorists' safety.

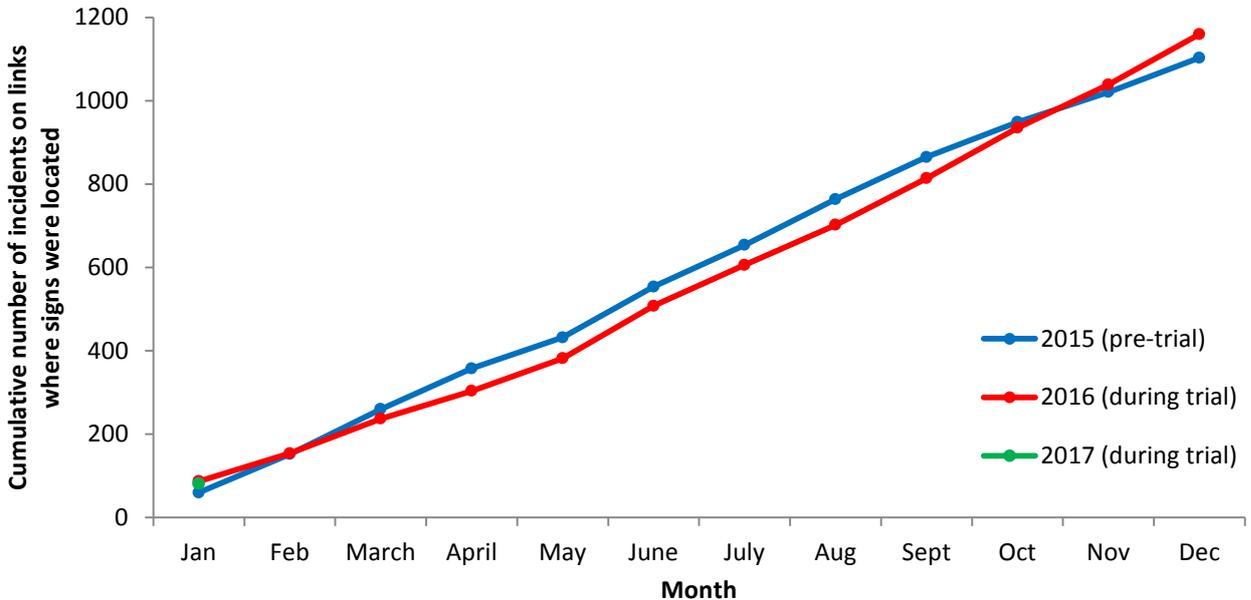


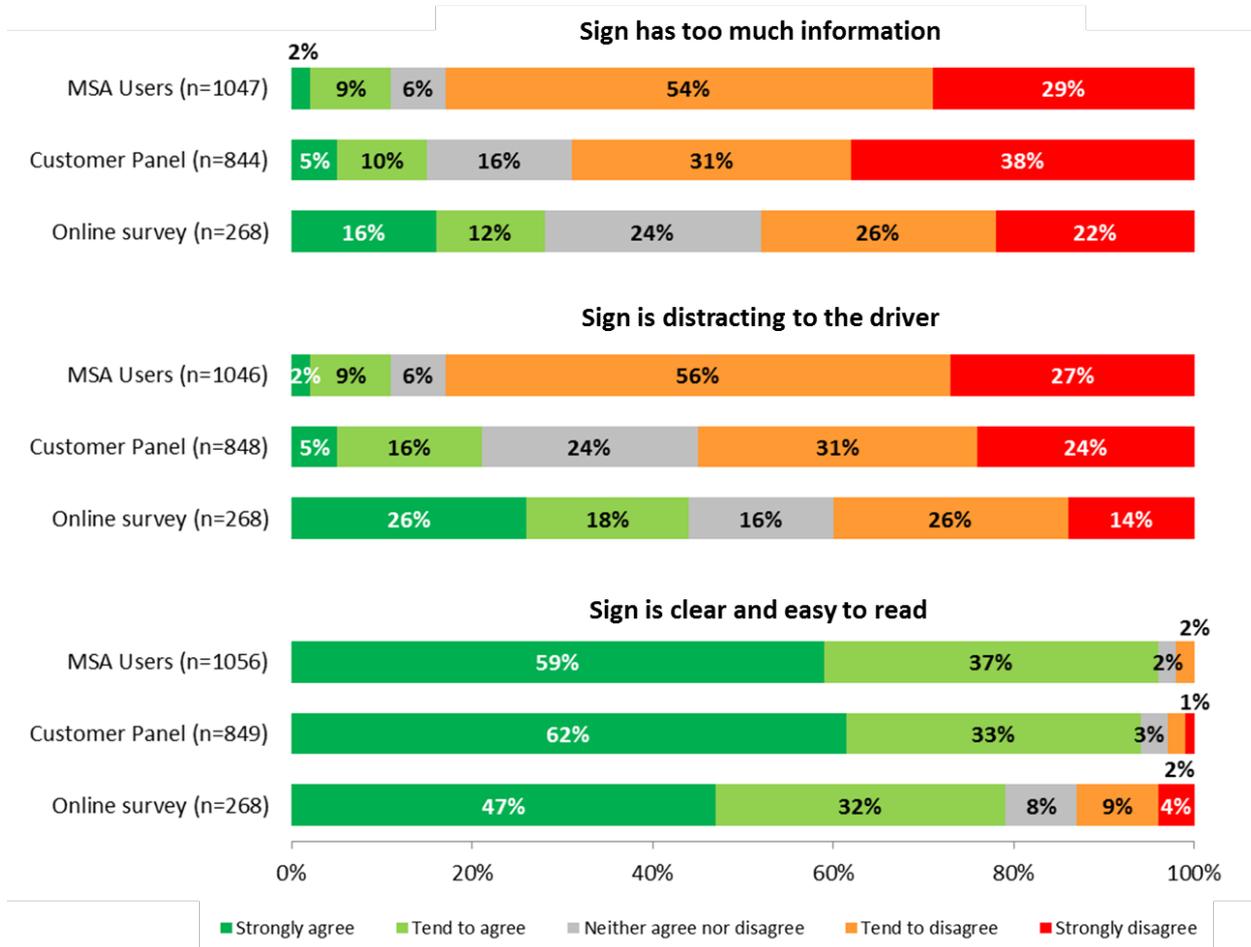
Figure 2 - Number of incidents pre-trial and during trial

## 2.4 SAFETY FEEDBACK FROM PARTNER ORGANISATIONS AND CUSTOMER INSIGHT

From monthly interviews with the South West Regional Control Centre (SWRCC), no reported observations had been noticed by Traffic Officers of perceived changes in motorist behaviour in lane discipline around the sign.

Findings from the two annual surveys conducted amongst trial MSA customers show that nearly all (96%) felt that the signs were clear and easy to read. However, a small minority (11%) believed the sign may be distracting to drivers, with a few (11%) raising concern that signs contained too much information.

Nearly all respondents to the Highways England Customer Panel Survey (95%) thought the sign was clear and easy to read, although 21% felt it may be distracting to drivers and 15% believed it had too much information. There were two calls to the information line noting that the signs were distracting. Similarly the majority of online respondents (79%) thought that the sign was clear and easy to understand. Over a quarter (28%) felt that there was too much information on the sign, with 44% saying the signs were distracting to drivers. Most of the respondents (93%) had seen the signs live.



**Figure 3 – Attitudes towards safety related issues of the signs**

The feedback results related to safety did not reveal any significant negative effect.

## 3 CUSTOMER

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### 3.1 KEY FINDINGS

This section reports on customer perception of the signs.

#### Key Findings:

- Awareness of the trial was high amongst those travelling along the trial route but much lower amongst motorists nationally.
- The vast majority of customers noted that the sign was clear and easy to read.
- Opinion varied across the different survey profiles, with trial MSA customers and Highways England customer panellists being more positive towards the trial than those providing online feedback via the trial webpage. Just over half of surveyed respondents felt the sign would be helpful if considering to refuel, compared with just a quarter of those responding to the trial webpage.
- The main criticism expressed by respondents was that the trial did not provide good value for money, since motorist expectation was that fuel prices at motorway services were more expensive than off the motorway network.

The fuel price system performance was measured by:

**Awareness and support:** A number of surveys gauged customer support for the initiative.

### 3.2 INTRODUCTION

A key objective of the electronic fuel price signs was to provide a useful and effective information service about MSA fuel prices to motorway customers, providing information so customers were better informed. Three methods of data capture were used to obtain as wide a view as possible amongst both those travelling the trial route and amongst motorway drivers more widely:

- Two face to face surveys( July 2016, 2017) conducted at each trial MSA - 1051 respondents
- Annual Highways England's customer panel survey ( June 2016, 2017) – 852 respondents
- Online survey during trial via webpage – 268 respondents

The evaluation quantified whether motorway customers found the service useful, plus the extent to which they felt it would influence their stopping behaviour, using the following criteria as customer critical success factors:

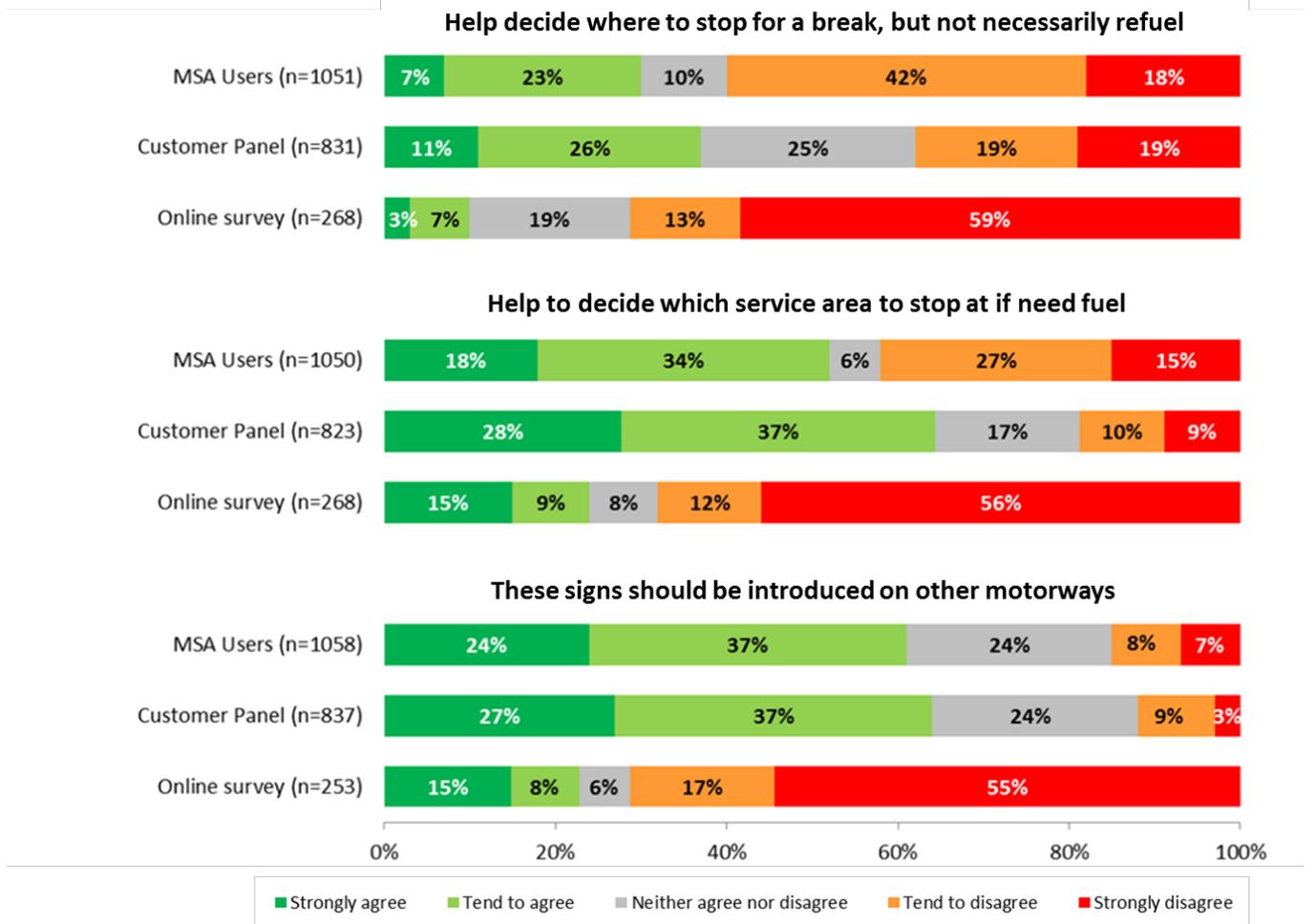
- Awareness and level of support for trial by motorway customers
- Whether the trial has provided a useful service to motorway customers
- Feedback from customer reaction to the trial provided by participating MSAs

### 3.3 AWARENESS AND LEVEL OF SUPPORT FOR THE TRIAL

Given the localised nature of the trial, general awareness was low across motorists nationally, as provided by the Highways England Customer Panel (18%), rising to 93% among online respondents to the Highways England webpage and 89% among those interviewed at MSAs on the trial route in 2016 and 2017 .

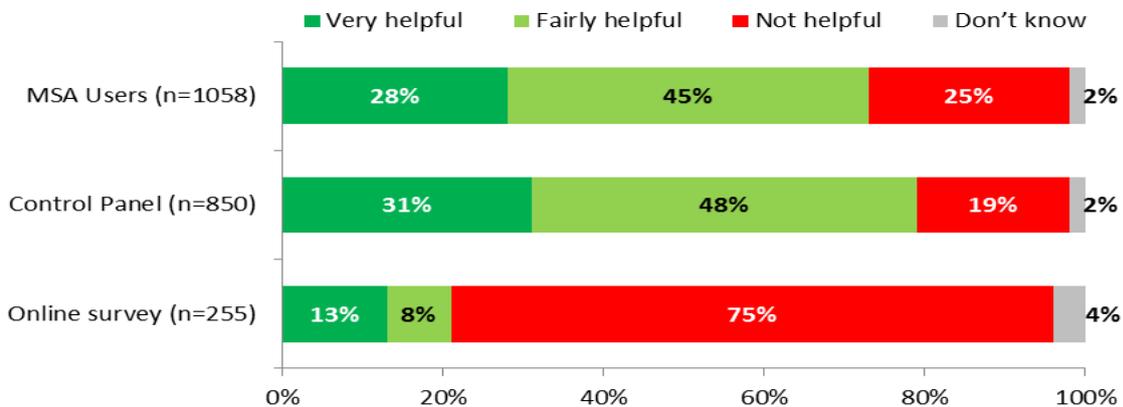
Opinion varied greatly across the different survey samples, with trial MSA customers and Highways England customer panellists being far more positive towards the trial than those providing online feedback via the trial webpage. A majority of customers interviewed at the trial MSAs and from the Highways England customer panel supported further roll-out of the signs across other parts of the motorway network (61% and 64% respectively). Just quarter (23%) of those completing the online survey supported further roll-out, with 72% against.

Nearly two-thirds of respondents (65%) to the Highways England customer panel survey and half of MSA customers (52%) believed the new signs would help them to decide which service area to stop at if they needed to refuel; compared with a quarter (24%) of online respondents.



**Figure 4: Attitudes towards the Fuel Price Indicator sign**

The majority of Highways England's customer panellists (79%), thought the motorway fuel signs were helpful or very helpful along with 73% Trial MSA users. In contrast, just a fifth of those responding to the online survey found the signs helpful, with three-quarters responding that they were not helpful.



**Figure 5: Opinion on overall helpfulness of Fuel Price Indicator sign for motorists**



A common criticism expressed by respondents across the three surveys was that the trial did not provide good value for money. In particular, some did not perceive any personal benefit of the signs, stating that they never buy fuel from MSAs because it was always expensive compared to filling stations away from the motorway.

## 4 ECONOMICS

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### 4.1 KEY FINDINGS

This section reports on the effect of the signs on the price of Diesel and Petrol at MSA participating in the trial.

#### Key Findings:

- There is no statistical evidence that the introduction of fuel price signs has reduced the fuel prices at the trial MSAs. Comparison with prices before the trial suggest that many factors affect the price of fuel resulting in variations that cannot be attributed to the introduction of the signs.
- There is no evidence to suggest that the addition of fuel price indicator signs has influenced the volume of fuel sold.

The effect on price was measured by:

**Price Comparison:** Prices were compared with local forecourts, all English MSAs and the national average price of fuel.

**Volume of Sales:** Fuel volume was compared with similar periods of time from the year previous to the trial.

### 4.2 INTRODUCTION

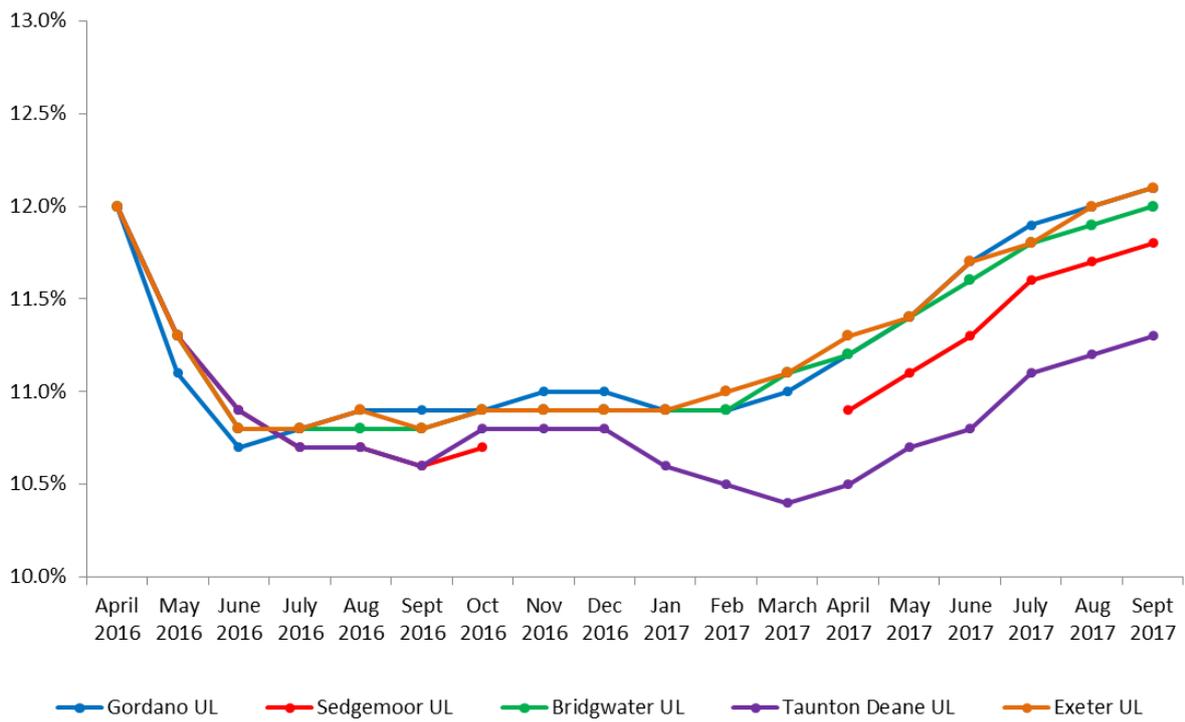
Evidencing the impact of fuel price transparency for motorists required comparison of fuel prices against a baseline (covering the counterfactual of the local route, wider comparison relative to the MSA network and national average for unleaded and diesel fuel). The following criteria were measured:

- Comparison of fuel prices at Trial MSAs against others in the M5 route corridor
- Comparison of fuel prices at Trial MSAs with English MSAs overall
- Comparison of fuel prices at Trial MSAs with the national average fuel price
- Fuel volume sales at fuel forecourts involved with the trial (by fuel type)

Note. The fuel forecourt at Sedgemoor MSA closed at the end of October 2016 and re-opened in April 2017.

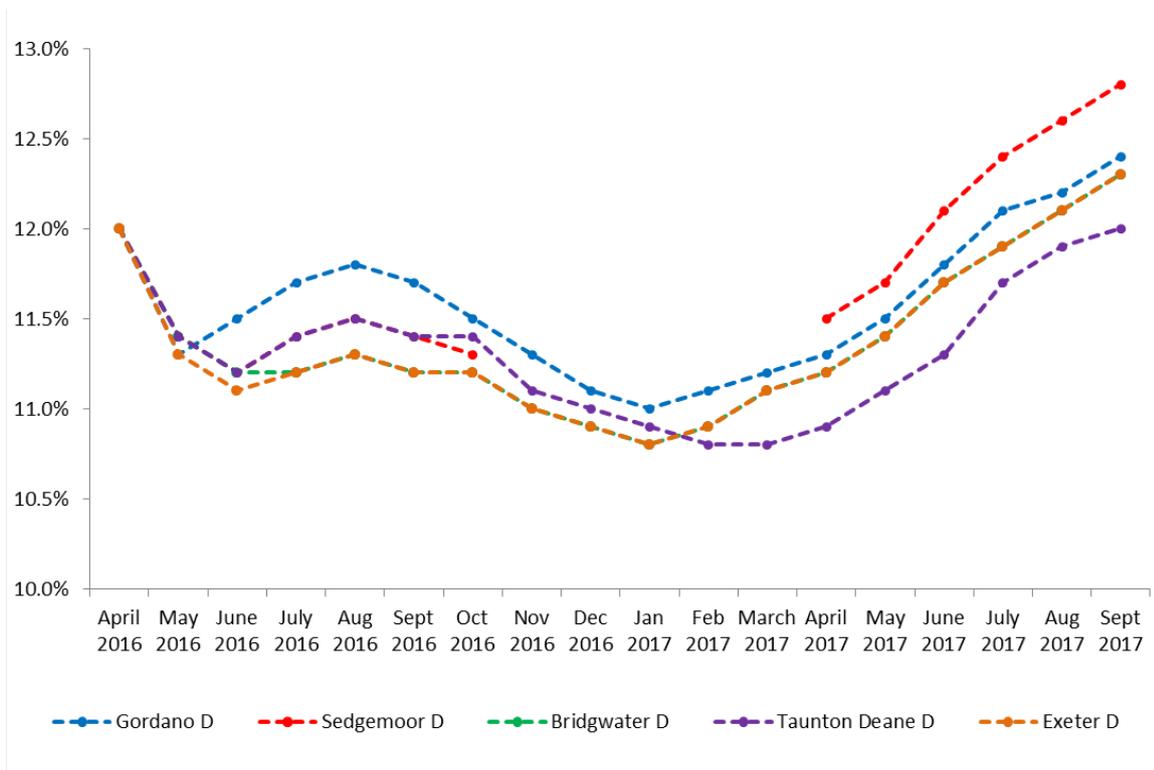
### 4.3 FUEL PRICE COMPARISON OF TRIAL MSA AGAINST LOCAL CORRIDOR

The price of unleaded fuel at the trial forecourts was 12% higher at the beginning of the trial compared to services stations within a 25 mile corridor of M5, falling back to below 11% by June, where it remained until January 2016 with fuel prices at all trial MSAs were very consistent with each other. However this decrease proved temporary with an upward trend and prices becoming less aligned across the five trial MSAs (Figure 6).



**Figure 6: Average monthly fuel price change - Trial MSAs v local corridor (Unleaded)**

Figure 7 shows the data for diesel fuel which demonstrates a similar pattern to that of unleaded.



**Figure 7 - Average monthly fuel price change - Trial MSAs v local corridor (Diesel)**

## 4.4 FUEL PRICE COMPARISON WITH ALL MSA

Before the trial there was variation in the price of just over 1% and during the trial there was variation in the price of just less than 1% compared to that of the England MSA average.

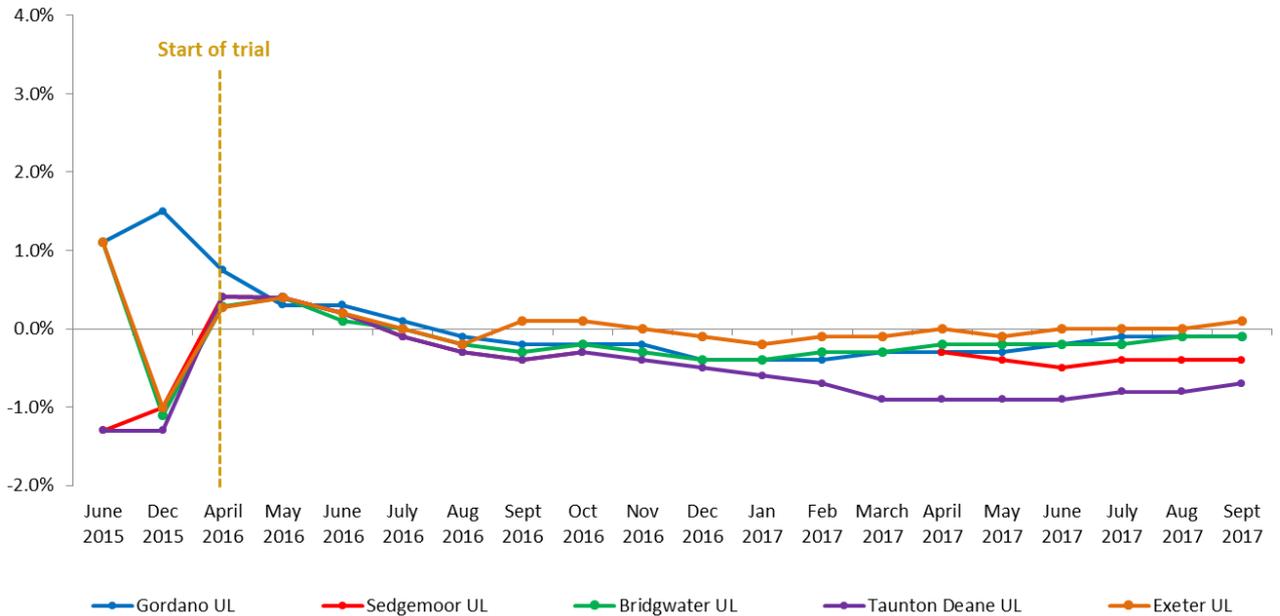


Figure 8 - Average monthly fuel price change - Trial MSAs v Other English MSAs (Unleaded)

Immediately after the start of the trial in April 2016, unleaded petrol prices at the trial MSAs fell closer to the national average. The variations were all within 2% of the average and no particular effect can be attributed to the fuel signs. For diesel fuel (Figure 9) a similar trend can be seen as for unleaded.

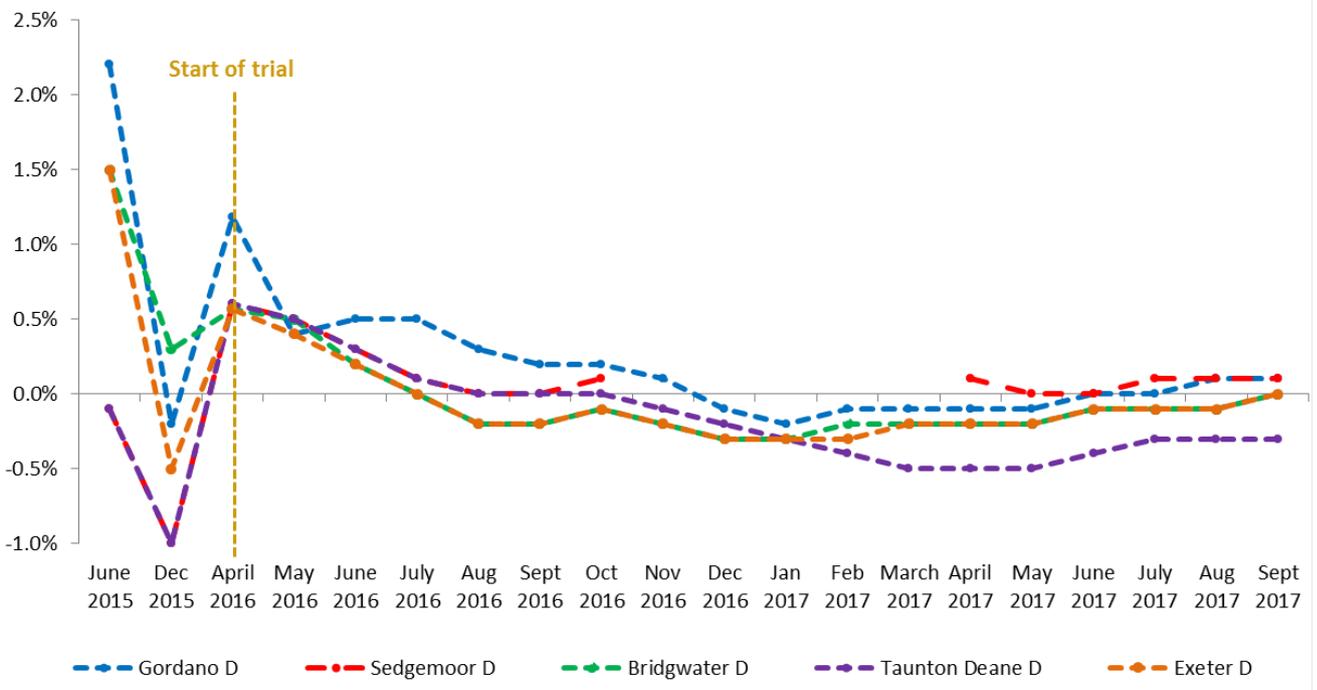


Figure 9: Average monthly fuel price change - Trial MSAs v Other English MSAs (Diesel)

## 4.5 FUEL PRICES COMPARISON WITH THE NATIONAL AVERAGE

From Figure 10 it can be seen that the difference in average price between the trial MSAs and the national average for unleaded petrol fell from 12% higher in April 2016, to 11% higher in January 2017. From the start of 2017 the difference increased back towards the 12% difference level seen at the start of the trial.

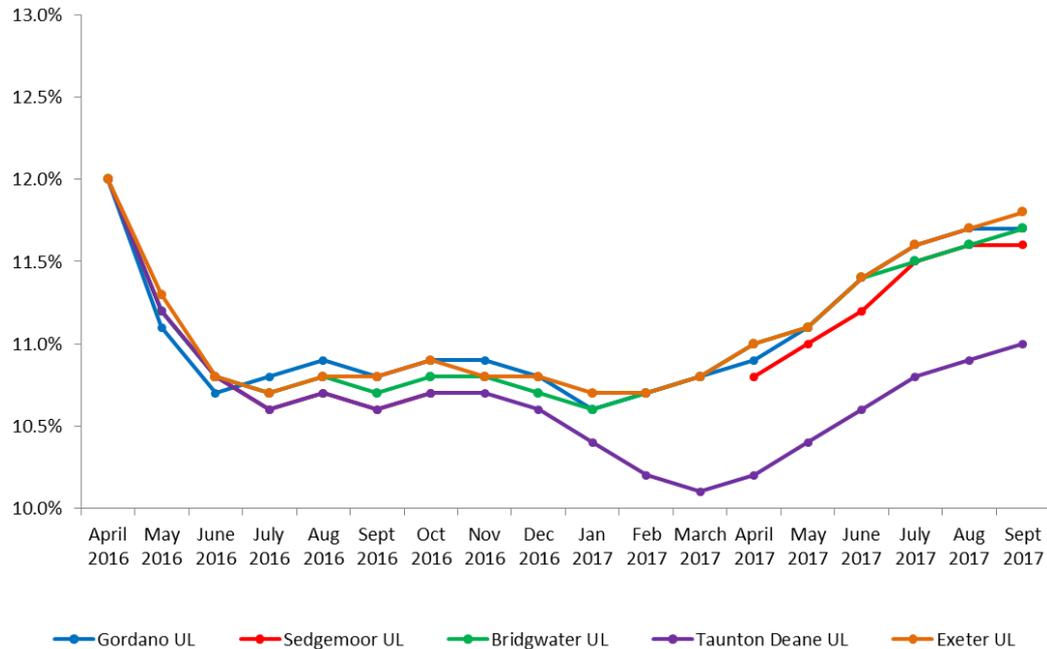


Figure 10 - Average monthly fuel price change - Trial MSAs v National Average (Unleaded)

Diesel prices dropped from 11% higher in April 2016 to 10.5% higher in December 2016. After January 2017 the difference increased again.

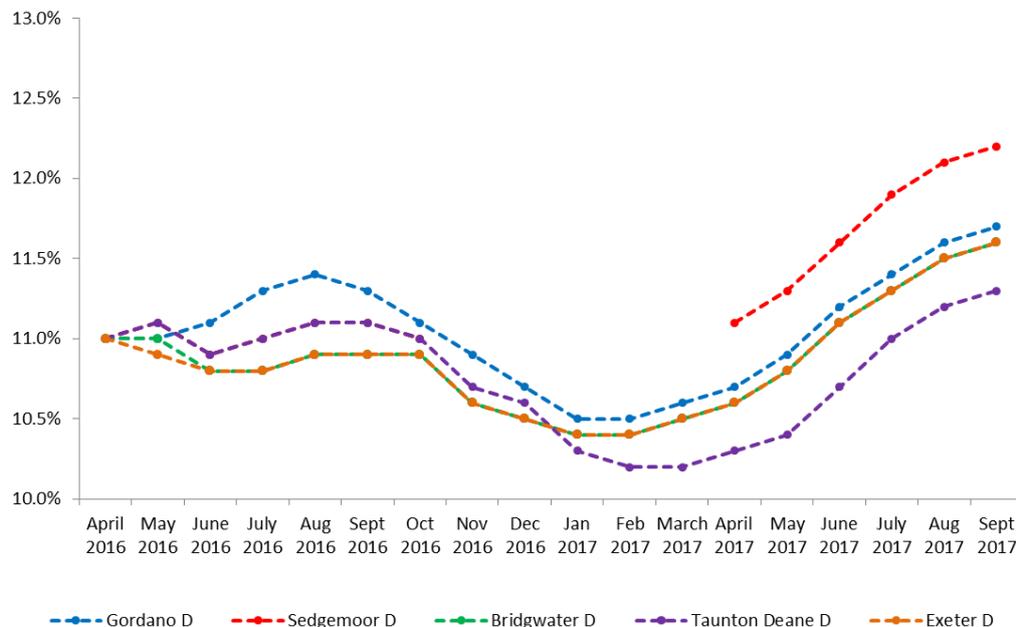


Figure 11: Average monthly fuel price change - Trial MSAs v National Average (Diesel)

Statistically there is no evidence to suggest that the trial has altered fuel prices at MSAs either up or down.

## 4.6 FUEL VOLUME SALES

A comparison of change in fuel volume sales compared to the same week the previous year was used to examine any potential increases in sales as a result of providing real-time fuel price information to motorway customers. In order to assess volume changes in the amount of fuel sold while protecting commercially sensitive information from each fuel provider, the values were provided as an index value rather than absolute volumes of fuel sales in litres.

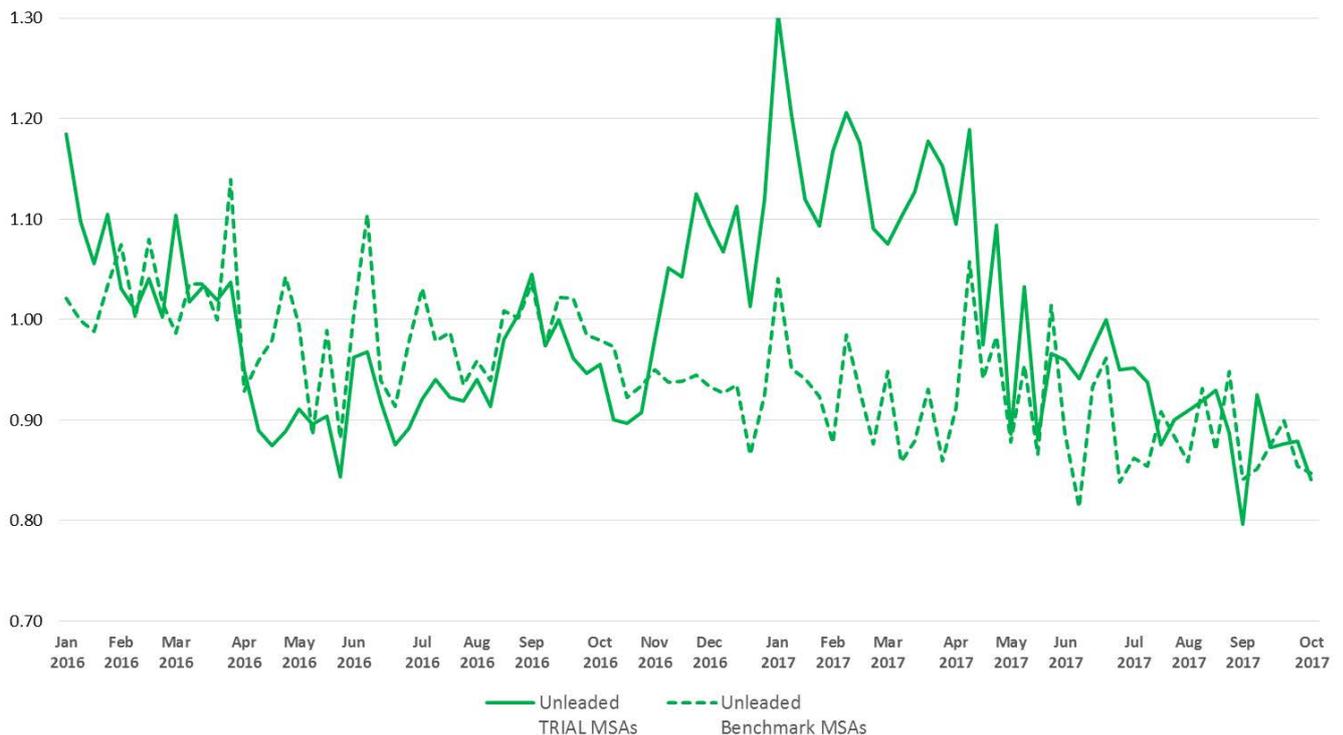
The indexed value was obtained for each week throughout the trial, by comparing the volume of fuel sold that week against the volume of fuel sold in the same week the previous year. For example where an index value exceeding 1.0 was obtained (e.g. 1.15), this meant that more fuel was sold that week compared with the same week in 2015, while a value below 1.0 (e.g. 0.85) meant that less fuel was sold compared to the same week in 2015. An index value of 1.0 meant that the same volume of fuel had been sold in the equivalent week in 2015.

Unleaded and diesel fuel volumes were obtained for the five trial MSAs, as well as three comparator 'benchmark' MSAs with the same fuel brand.

Note, Sedgemoor forecourt underwent refurbishment including a period of closure which meant that the volume sales of at two nearby MSAs increased dramatically compared to the values in 2015. This explains the period at the end of 2016 and beginning of 2017 where the volume indexes were much higher compared to the benchmark MSAs.

### Unleaded

The volumes of unleaded fuel sold fluctuated throughout the trial compared to those sold pre-trial in 2015. For much of 2016, the volume sales of unleaded fuel were broadly the same as in 2015.

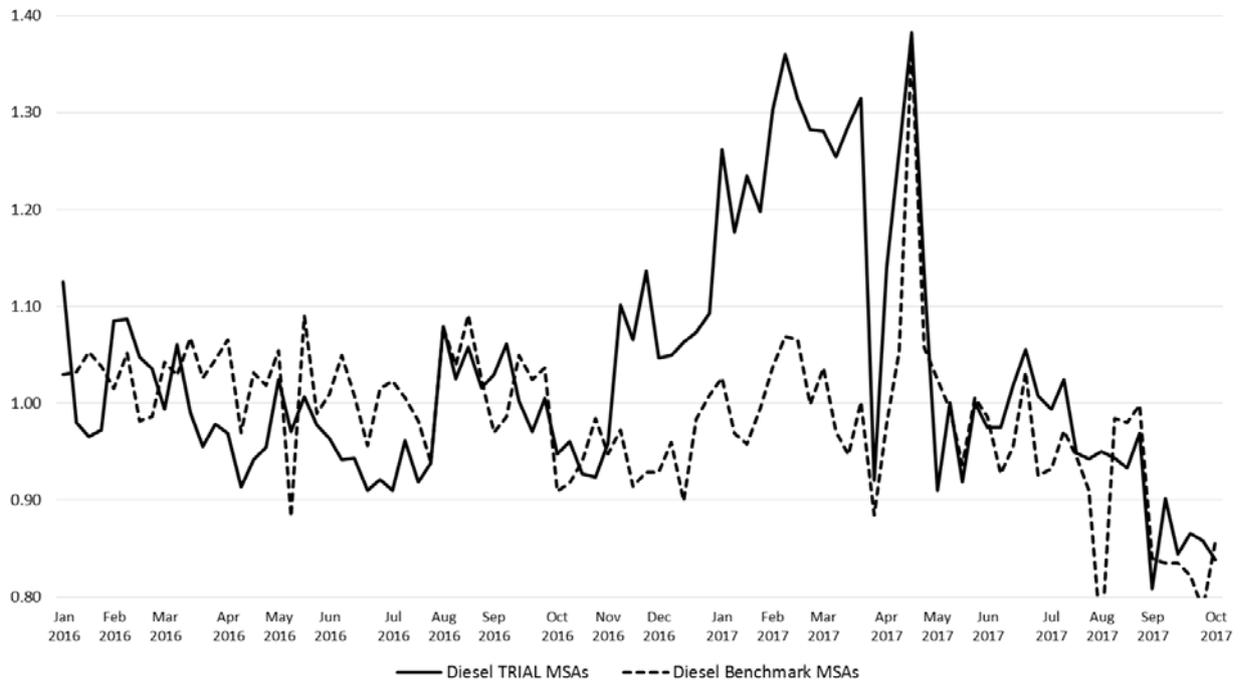


**Figure 12 - Indexed Volumes of Unleaded Sales**

There was little change in relative petrol volume sales between the start and end of the trial.

## Diesel

For diesel fuel, a similar pattern emerged. Throughout the trial, the volumes of diesel sold at the trial MSAs and the benchmark MSAs followed a broadly similar pattern of variation.



**Figure 13 - Indexed Volumes of Diesel Sales**

Overall, there was no significant impact on the volumes of diesel sold from the trial MSAs throughout the trial as a result of the fuel price signs introduction compared with other MSAs.

## 5 SERVICE DELIVERY

### 5.1 KEY FINDINGS

This section reports on the quality and reliability of the service delivery over the trial period.

#### Key Findings:

- The availability of fuel prices displayed on the roadside signs was better than the required specification for 16 months' of the 18 month trial. In all months the availability of prices displayed on the signs was better than 96%.
- The time taken for a change in price to appear on the message sign was better than two minutes, affecting an average of four vehicles per price change which was within the target specification.

The fuel price system performance was measured by:

**Availability:** The percentage of time that the signs were showing the correct fuel price.

**Latency:** The average time taken for a price change at the MSA to be displayed on the roadside signs.

### 5.2 AVAILABILITY

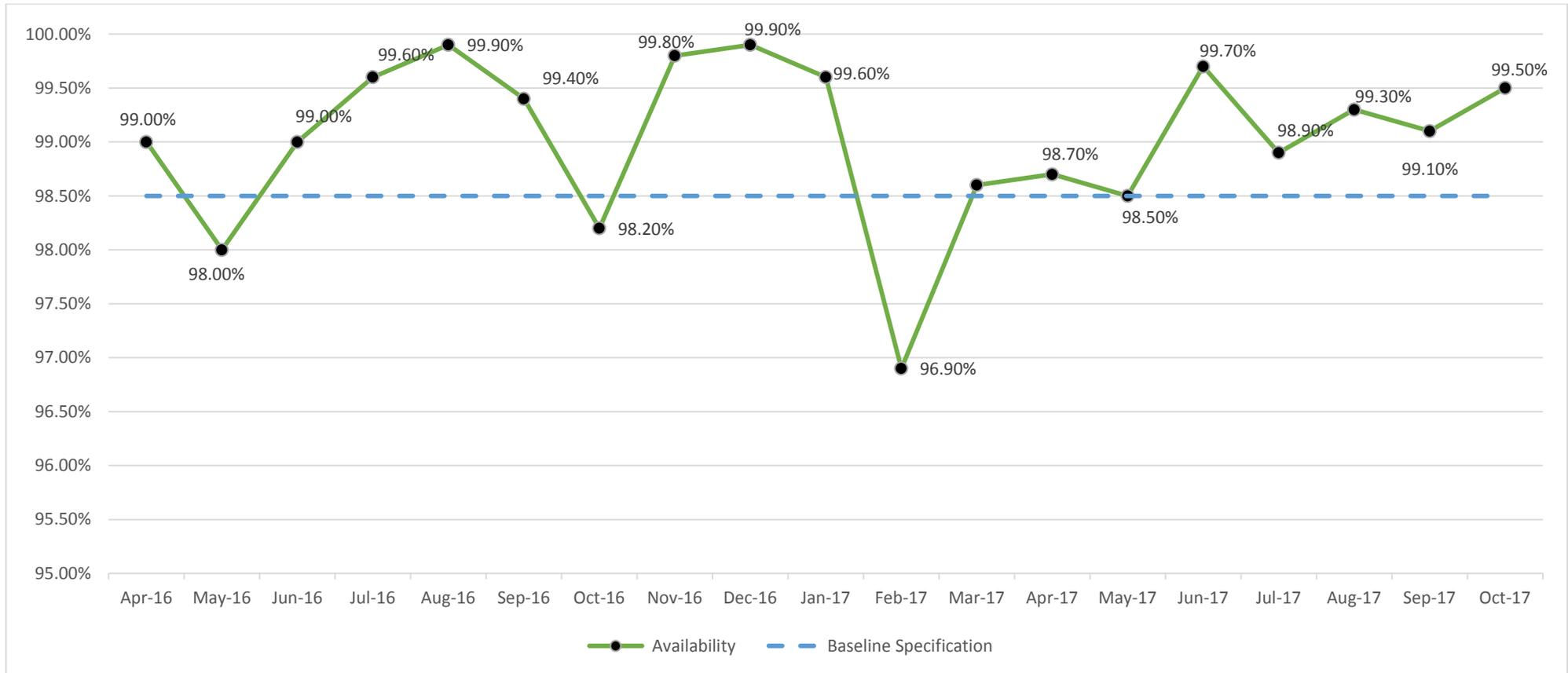
The system performance specification called for:

Performance Parameter	Performance Requirement
Availability	Better than 98.5%

The design of the fuel price system allowed manual intervention to set prices when the system was unable to display accurate prices. Some fault conditions such as loss of communications with the roadside equipment or a roadside power fail, meant that the prices could not be set manually. This meant that there were some periods of time when the signs were not displaying prices.

Graphical representation of the Availability is compared with the design specification in Figure 14 below. There were four months when the availability failed to meet the specification. These occurrences were caused by specific technical failures in external systems:

- May 2016 (98% availability) – An upgrade to equipment at two of the MSAs caused a failure to collect prices automatically.
- October 2016 (98.2% availability) – A mobile telecommunications upgrade to 4G platform initially caused significant connectivity issues to Signs 2, 3 & 4.
- February 2017 (96.9% availability) – Equipment at one of the MSA's was developed a fault, stopping the price being communicated automatically.



**Figure 14 - Availability**



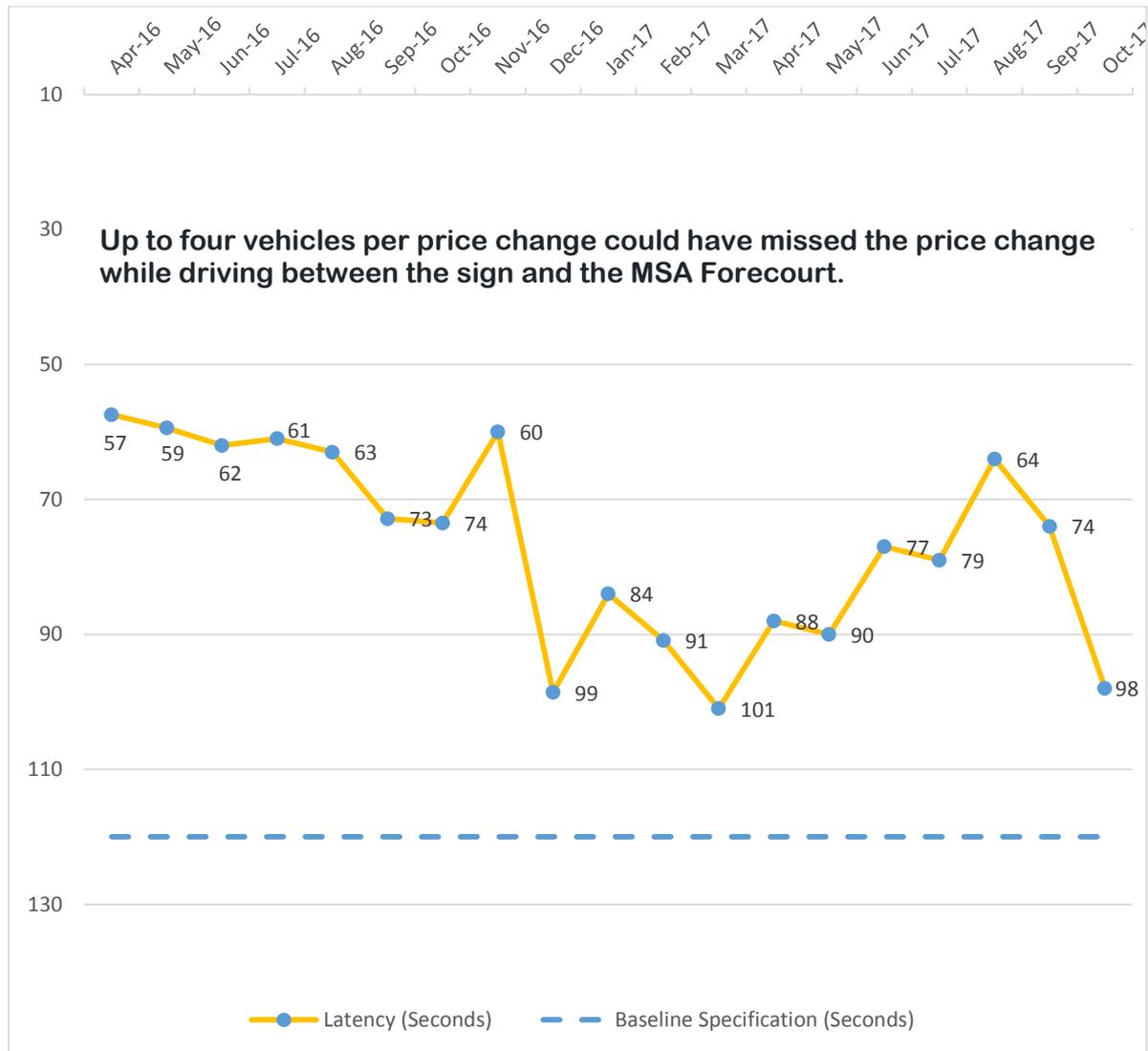
### 5.3 DELAY IN SIGN SETTING

The system performance specification called for:

Performance Parameter	Performance Requirement
Delay in Sign Setting (Latency)	Better than 2 Minutes

Delay in sign setting is the measurement of the average time taken for a price change at the MSA to be displayed on the roadside signs. The delay was within the specified requirement throughout the trial.

The average latency across the trial is displayed in Figure 15 below.



**Figure 15 – Delay in Sign Setting**

An average of 1-4 vehicles arrive at an MSA unaware of a price change because when a price change occurs, there may be some vehicles travelling the two mile distance between the Sign and the MSA. The longer the delay between changing the price of fuel and the sign being set the more vehicles would be affected.

## 6 FINDINGS, CONCLUSIONS AND RECOMMENDATION

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### 6.1 FINDINGS

The trial evaluation criteria were based on the following Critical Success Factors (CSFs):

Safety - Having no discernible impact to safety for all road user groups

- The number of reported incidents showed no significant difference between 2015 pre-trial and the same period 2016 post trial.
- Data from the first nine months showed that the number of recorded incidents along the trial corridor had decreased and therefore there are no indications that the fuel price signs had a negative impact on the level of recorded incidents.
- There was no qualitative data that suggested that the motorway fuel price signs have had any negative changes in motorist behaviour in lane discipline around the sign.

Customer - Providing a useful and effective information service to the customer;

- Customer feedback on the Fuel Price Signs was polarised

Economic – Benefits of providing motorists with price transparency

- Fuel prices at the trial sites changed during the trial operation.
- Causes of price variations could not be directly correlated with the installation of the signs.
- Fuel volume sales were unaffected by the trial.

Performance - Providing a high performing and accurate messaging system

- The Service Availability of the Fuel Price System was consistently at a level higher than the performance specification for the technology.
- Signs responded to price changes in less than the specified 2 minutes.

### 6.2 CONCLUSION AND RECOMMENDATION

The trial successfully investigated the criteria it set out to investigate. The results show that although the service was reliable, there has been no significant positive effect on the behaviour of the travelling public. Public opinion on the signs was polarised, safety was unaffected and there was no economic impact on the price of fuel or the volume of sales.

A feature of the signs is that they were focussed on the delivery of a single message to travellers related to the cost of fuel. The signs needed to be located close to the MSA's and could not be used for any other messages. Providing such signs two miles in advance of every MSA in the country would cost in the order of £50M. There is therefore no case that can be made to continue the roll out of the signs to other areas of the country.

A theme of the negative feedback from the public was that the signs were “a waste of money”. It may be worth considering other sign strategies designed specifically to promote safety and improve the service to motorists. Considerable savings would be made in the roll out cost if existing MS4s were to be used to encourage long distance travellers to break their journeys. New innovative sign messages could be tested on the engineering infrastructure that has been built for the Fuel Price signs by installing MS4s in their place.

MS4s would increase the standard communications with travellers on the M5 and provide a platform for new signs such as long distance journey times to Devon and Cornwall with a reminder that service stations are just a few minutes away.





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