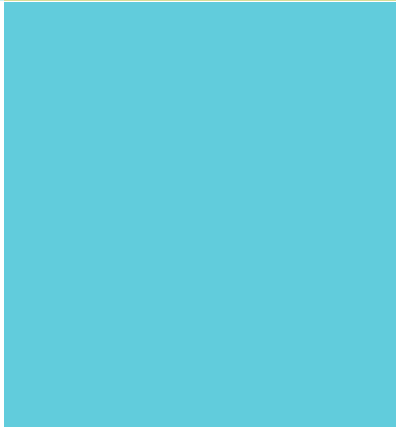
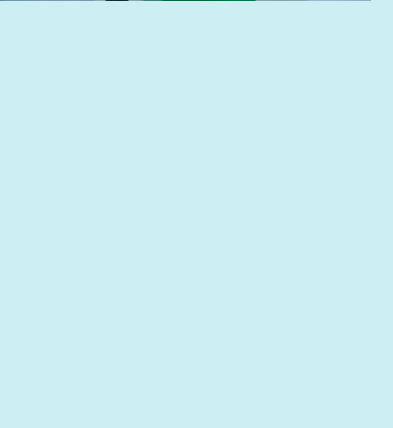




EVALUATION OF THE WARWICKSHIRE RURAL ELECTRIC VEHICLES (WREV) TRIAL

Executive Summary

October 2016



1: Introduction

The 'Warwickshire Rural Electric Vehicle' (WREV) trial was designed to support small and medium enterprises (SMEs) in rural Warwickshire in examining their options for switching to electric vehicles (EVs)¹. Through switching to EV technology it was hoped that these businesses would be able to counter increasing fossil fuel costs, improve their carbon footprint and stimulate business development. For each participating business, the trial included:

- A feasibility study to assess the practicality and viability of switching to EV technology
- £2,000 in grant funding towards the lease of an electric vehicle for up to a two-year period
- Installation of a free charging unit at a location suitable for the business
- Monthly Reports on cost savings, usage, and emissions
- Free EV eco-driving session
- Technical and project management support for business

WREV was funded by the Department for Environment Food and Rural Affairs (DEFRA) and led by Warwickshire County Council on behalf of the Coventry and Warwickshire Local Enterprise Partnership (CWLEP). The project was managed by Greenwatt Sustainable Solutions, a sustainable technology consultancy based in South Warwickshire, with research and evaluation support from Coventry University's Centre for Business in Society (CBIS).

2: Trial Participants

A total of seventeen businesses adopted EV technology as part of the trial. These organisations were required to meet the following Regional Growth Network (RGN) conditions:

- The business must be in a rural postcode on the RGN post code checker
- The business must be an SME (Less than 250 employees)
- A proportion of the selected firms must be led by women
- The businesses must come from different sectors
- The business must have the potential to create jobs or safe guard jobs as a result of 'added value' provided by the project
- The businesses must provide evidence of belonging to local networks to which the benefits of EVs could be promoted to add value to WREV

The participating businesses were from multiple different industrial sectors in rural Warwickshire. These SMEs included traditional rural enterprises operating in agriculture and food retailing, plus those operating in newer economic sectors such as information technology and renewable energy. In addition to these sectors, companies from healthcare, events, construction, and vehicle repair were also involved in WREV.

3: Vehicles in WREV

The vehicles used in WREV have an all-electric drivetrain powered by an electric battery which is recharged through the electricity supply. The majority of businesses in WREV adopted a Nissan model, and a brief outline of the EVs is shown in Table 1:

Table 1: WREV Vehicles

Vehicle	Nissan Leaf	Nissan e-NV200	BMW i3 ²
Number of Users	Nine	Six	Two
Battery	24 kWh	24 kWh	19 kWh
Estimated Range (EU Test)	124 miles	106 miles	118 miles
Estimated Range (Realistic)	95 miles	82 miles	100 miles

4: Data

Between May 2014 and June 2016, CBIS was responsible for evaluating and monitoring WREV trial participant feedback and vehicle performance. Users were asked to complete a short survey after joining WREV, designed to capture their motivations for participation in the trial and early usage habits. Towards the end of the trial, the businesses were asked to take part in an in-depth interview in order to collect a more detailed overview of their experiences. Throughout WREV, vehicle performance was monitored with SMEs receiving a monthly technical report on usage and savings relative to an internal combustion engine (ICE) alternative. Data for the technical report was taken from a logger fitted to the vehicles. Data taken from the loggers included the number of trips, mileage, and time. This information was then used to calculate financial savings and emissions.

¹ The term EVs refers to a wide range of technologies including; battery electric vehicles (BEV), extended range electric vehicles (EREV), plug-in hybrid electric vehicles (PHEV) and fuel cell electric vehicles (FCEV). Hybrid electric vehicles (HEV) that use an e-motor as their secondary rather than primary means of propulsion are not classified as EVs in this report

² There are two versions of the BMW i3 available. There is the 'pure' EV with an all-electric drivetrain plus a range-extended version which uses a 2-cylinder petrol engine to feed the batteries meaning that the car never solely operates on electric power

5: Key Findings

In assessing the motivations held by users, the key aspects were broadly technological, environmental, and financial. Across the participants there was a high level of interest in alternative technologies, with four respondents, mostly in agriculture, stating that they had installed solar panels. Whilst this interest in renewable technologies was influential in their decision to adopt an EV, the reality was that for many businesses, the financial support offered by WREV and the prospect of lower vehicle operating costs were the decisive factors. Due to the high lease cost of EVs, the subsidised lease was crucial in overcoming financial barriers to adoption. However, even with this additional support, some businesses still found the cost of leasing a vehicle expensive. Furthermore, leasing a vehicle was a new model of ownership for several SMEs involved in the trial.

In using the vehicle, the majority of participants found that the EV was well suited to their short journey requirements, with 93% of survey respondents expressing this opinion. The type of travel undertaken by users was generally localised, with vehicles used for deliveries, visiting potential customers, exhibitions, and general 'shuttle' work. For example, one organisation stated that they used their vehicle to transport staff:

"From here [the business], the journey's that we do are quite short, and we do a lot of them....We bring staff in from Rugby that's a 6 mile journey, so that happens three times a day. Then the Lodge...we use it for that in between"

This short distance travel was underpinned by the average mileage per-trip being calculated at six miles for the Nissan vehicles. Even through driving distances were generally short there were still range anxieties expressed by several users. This was caused by two principle factors, one of which was a lack of confidence in the vehicle to deliver the required range, and the second being the shortage of public charging infrastructure in rural locations. In addition to this shortage of charge points in rural locations, evidence was also provided which suggested charging stations in urban areas were not being maintained or used correctly. This provided a deterrent to users attempting longer distance travel as they did not trust the charging infrastructure to be available when required. Charging stations provide an important psychological crutch

to motorists, helping to lessen range anxieties and providing reassurance when undertaking longer journeys. For some of the businesses these concerns have 'pushed' them away from electric technology in the short-term.

Although there were concerns surrounding range, the businesses in WREV made extensive use of their vehicles. The fifteen Nissan users completed 35,814 trips with their vehicle during the trial, with these journeys equating to over 322 days of driving. For the entire WREV vehicle fleet, 211,934 miles were driven, with three businesses recording mileages of over 20,000 during their involvement in the trial. In a single year, one organisation recorded 15,966 miles of driving suggesting that some users were confident in the performance of technology immediately. Through calculating the usage of the vehicles, it was estimated that £21,828 was saved by the fleet on fuel expenditure, with one participant generating estimated savings of £3,226 during their involvement in WREV. In addition to savings on fuel expenditure, the participants also recorded reduced emissions. The fleet saved an estimated 41,994,051 g/mile of CO₂ by switching to EV technology.

Aside from financial and emissions savings, the businesses stated that there were additional advantages from adopting EV technology. For example, organisations in the events and renewable technologies sectors found that using an EV was beneficial in promoting their business. For these organisations it was important to 'practice what they preach':

"I do a fair bit of sustainable development work and helping SMEs, not on a particular technology, but doing assessments to see what technologies might be appropriate for them. Therefore, turning up in an electric vehicle reinforced my message. I was living it, not just telling someone else to do it"

Alongside these marketing benefits, another participant suggested that there were other hidden advantages from adopting EV technology. As this SME could now offer employees an affordable transport solution, the business was able to recruit non-agency staff which reduced overheads:

"We were using a lot of agency staff, because for staff from Rugby, even though its only 6 miles [away], there are no buses. You can see we are out of the way. That means that we don't need to use as many agency staff who are more expensive than our own staff. We have saved some money in that way"



6: Recommendations

On the basis of these research findings there are five key recommendations:

Recommendation 1:
Increase the level of public charging infrastructure in rural locations

One of the key concerns highlighted by many participants was the shortage of public charging infrastructure in rural locations. This deficiency in charge points increases range anxieties, and deters motorists from making longer distance trips. The creation of new rural infrastructure, plus effective maintenance of existing stations, will help to reduce some of the apprehension surrounding range.

Recommendation 2:
Consider EV car share schemes as an ownership model

The adoption of new vehicle technologies provides an opportunity to modify patterns of behaviour in relation to ownership and usage. Car share schemes or clubs are becoming increasingly common, and for new technologies these arrangements allow potential adopters to sample the innovation without having the cost of using the vehicle on a full-time basis.

Recommendation 3:
Improve information availability on EVs and ensure technical support is offered to users

The vast majority of WREV participants stated that they had interest in sustainable technologies or electric vehicles prior to joining the trial. This is not necessarily reflective of the wider public or business community, and a lack of knowledge or experience in using these technologies can negatively impact upon consumption decisions. Thus, it is crucial to offer users the requisite level of information and support before making the decision to adopt an EV.

Recommendation 4:
Ensure that any future trial comes with charge-point installation

Feedback from the respondents suggested that there were some initial concerns surrounding charging at home, particularly during the 'pre-trial' phase where the demonstration vehicle was charged through a 13A standard socket. Whilst the logistics of this 'pre trial' phase are difficult, it is imperative that the WREV

experience of including a subsidised charge point installation for full-time users is adopted in future trials. Through being able to access an installed charge point at home or work, users have more confidence in the charging process as they have more faith in the technology being deployed to charge the vehicle.

Additionally, with the existing weaknesses in public infrastructure, users must have confidence that they can charge successfully at home or work. Also by providing some financial support for the charge point installation, there is less of a burden being placed on the shoulders of users who would otherwise have to invest in a charge point installation which they could remove at the end of the trial should EVs have not met their business requirements.

**Recommendation 5:
Target EVs at rural businesses/motorists with consistent travel patterns**

From this trial it became evident that the majority of businesses mostly undertook short journeys, but there was some difference in the types of routes which were followed. Some organisations had a regular route, whilst others had more flexibility in their travel patterns. In the latter case, the variance in routes can lead to challenges in charging the vehicle due to the shortage of rural infrastructure. If a user has a consistent travel pattern using similar routes then journeys can be pre-planned effectively. More flexible travel patterns are harder to plan, and with range and charging concerns this creates more difficulty for the user.

Until issues with range and charging are overcome, perhaps the greatest opportunity should be targeted EVs towards those companies with short and regular travel patterns.



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