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# Electric Vehicles and the UK Energy System:
# Consumers, Vehicles and Energy Integration (CVEI) Project

## Project aims

- Investigate challenges and opportunities involved in transitioning to a secure and sustainable low carbon vehicle fleet for cars and light duty fleets.
- Explore how the integration of vehicles with the energy supply system can benefit vehicle users, vehicle manufacturers and those involved in the supply of energy.
- Inform UK Government and European policy and help shape energy and automotive industry products, propositions and investment strategies.

## Stage 1 overview

- Analysis to characterise market and policy frameworks, business propositions, the integrated vehicle and energy infrastructure system and technologies best suited for a cost-effective UK energy system for low-carbon vehicles.
- Research activities were conducted to provide data and test assumptions for use in the analytical tools developed:
  - Literature review of consumer demand for EVs and consumer acceptance of demand management.
  - Interviews with consumers and fleet managers to explore EV adoption and acceptance of demand management when charging.
  - Assessment of vehicle energy supply management systems and battery technologies.
  - Exploration of energy infrastructure management systems and technologies to aid development of a market framework.
- Key knowledge gaps and limitations of the analytical tools and the most relevant market and policy scenarios for future testing were identified.

## Stage 2 overview

Will address the gaps in knowledge, and test and validate solutions through:

- Unique field trials with mainstream (mass-market) private vehicle consumers driving widely-applicable plug-in vehicles
- In-depth case studies with business fleets
- Updates to system design and analysis using state-of-the-art understanding

## Key findings from Stage 1 - Research with consumers and fleets

- Charging by existing consumer EV users is mostly done at home, usually overnight, with most preferring to fully charge whenever possible.
- High purchase costs and limited range of BEVs are significant disadvantages even for EV innovators.
- Few existing consumer EV users made use of available Time of Use tariffs to reduce charging costs.
- Uptake of EVs by fleets is lower than predicted if choice is based on total cost of ownership; understanding of why this is so remains limited.
- Most fleets with EVs remain cautious as yet and see them as an exploratory “toe in the water”.

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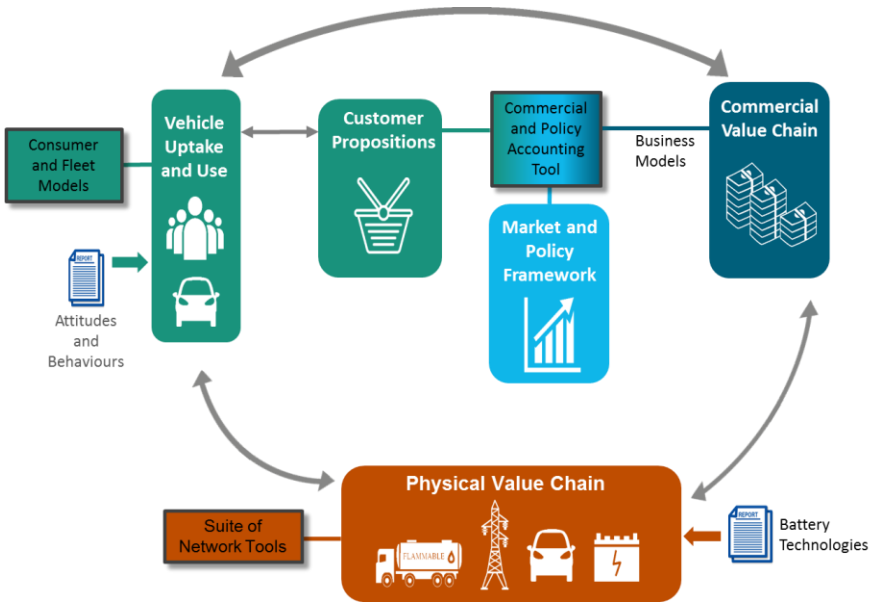
# Key findings from Stage 1 – System analysis and design

Analysis to model market scenarios, to test the impact of future policy, industry, technology and societal choices, and to identify the most relevant market and policy scenarios for testing

A number of key elements were identified that appear to be essential to support large-scale deployment of low carbon vehicles:

- Overcoming upfront cost of ULEV ownership in medium term essential. Encouraging faster uptake in the short-term is costly compared to the carbon saving benefits.
- Some de-risking and direct support for new infrastructure to encourage investment is important. This is significantly smaller than the direct subsidies for the vehicles themselves. For charging points this is more important in the nearer term, and rapid charging development is a priority.

## Modelling Framework




- Fiscal mechanisms are important, but also lead to a sizeable gap in net government revenue, which would need to be filled through use of technology-neutral mechanisms such as road pricing in the order of 1-2p/km.
- Demand Management of EVs is important for reducing overall system costs, in particular balancing and network reinforcement costs, and appears to allow for a viable aggregator business model. This must be tested in Stage 2. 'Modest' customer response to Static Time of Use tariffs leads to a sizeable reduction in system costs. Even larger reductions can be achieved using Supplier Managed Charging tariffs.
- A significant uptake in car-sharing (where individuals no longer own private vehicles, but access one when required) can materially reduce costs.

## Stage 2

- Will address the gaps in knowledge identified in Stage 1 by conducting scientifically robust research, including real-world trials with mainstream consumers (rather than innovators/early adopters) to understand EV uptake and charging behaviours, and in-depth case studies of business fleets.
- The results from Stage 2 will be used to update and improve the modelling framework and analytical tools developed in Stage 1.
- The outputs of this project will highlight prominent policy and industry strategies to enhance energy integration between consumers, vehicles and energy systems in the future.

## Further information

For further information about this project, please visit:

www.cveiproject.trl.co.uk
www.eti.co.uk/project/consumers-vehicles-and-energy-integration-cvei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