
Electric Cars in the Rural Context

Developments in Wales*

Daniel Newman
Cardiff University, UK

Peter Wells
Cardiff Business School, UK

Paul Nieuwenhuis
Cardiff Business School, UK

This paper considers the transition from internal combustion engine cars toward electric cars, deploying case studies of the use of these vehicles within the UK. It uses socio-technical transitions theory to highlight how such new technologies break through from disparate niches into the mainstream. At the present time, perhaps academic and policy focus appears to be placed upon the prospect of electric cars fulfilling an urban niche—as city cars, largely in recognition of their limited range. In contrast, the paper uses a case study of various electric car applications in the Welsh countryside to suggest that existing rural niches may offer beneficial insights into the use of the technology. The paper concludes with the contention that more attention should be given to electric cars in rural settings, with a need for future research to explore the little heralded potential that seems to be promised by such niches.

- Electric cars
- Transitions theory
- Rural transport
- Car sharing
- Co-operative ownership

Dr Daniel Newman is a research assistant at Cardiff University's Sustainable Places Research Institute, leading the transport element of their mobility theme. He is focused on the environmental and social impact of sustainable transportation. In particular, he is interested in electric vehicles and their application in rural locations, as well as usage in co-operative car sharing schemes. Previously, he was a research assistant at Cardiff School of Psychology studying ecological driving habits and a research assistant at Cardiff Business School investigating market drivers for e-mobility. He also works in criminal justice and recently released the book, *Legal Aid Lawyers and the Quest for Justice*.



✉ Room 2.09, Sustainable Places
Research Institute, Cardiff
University, 33 Park Place, Cardiff
CF10 3BA, UK
newmandc@cardiff.ac.uk

* This work was supported by funding from the European Union INTERREG IVb project ENEVATE.

Professor **Peter Wells** is Professor of Business and Sustainability at the Cardiff Business School, and heads the Centre for Automotive Industry Research. He has vast experience of research into the global automotive industry around which he has developed his academic and theoretic interests in socio-technical transitions, business models, cultures of automobility and sustainability. Peter is leading a research project on “Best Environmental Management Practice” in car manufacturing; and has recently led “Economic impacts of decarbonizing light duty vehicles” with Cambridge Econometrics; “Assessing the R&D and economic performance of key industries: The automotive sector” and “Effect of regulations and standards on vehicle prices” with AEA.



✉ Cardiff Business School, Room B45,
Cardiff Business School,
Aberconway Building, Colum Drive,
Cardiff CF10 3EU, UK
wellspe@cardiff.ac.uk

Dr **Paul Nieuwenhuis** is senior lecturer in Logistics and Operations Management and Co- Director of both Centre for Automotive Industry Research and Electric Vehicle Centre of Excellence. After a spell in consultancy, carrying out projects for most of the world’s car and truck makers and acting as a special advisor on state aid in the automotive industry to the European Commission, he joined Cardiff University in 1990. In 2001 he became a founder member of the ESRC-funded Centre for Business Responsibility, Accountability, Sustainability and Society. He is a partner in the INTERREG project ENEVATE.



✉ Cardiff Business School, Room B49,
Cardiff Business School,
Aberconway Building, Colum Drive,
Cardiff CF10 3EU, UK
nieuwenhuis@cardiff.ac.uk

OVER RECENT YEARS, MOBILITY HAS become an important social scientific concern, especially with regards to matters of sustainability—there has been a heightened move to consider the challenges posed by contemporary transportation habits for environmental health (Featherstone, 2004). To these ends, Beckmann (2004: 81) has cast mobility as a ‘cardinal concept in contemporary social science’. One of the core issues in mobility today must be the culture of automobility that seems to define the modern age. That is, the rise of a now ubiquitous *car system*—an assumption towards the inherent primacy of the car (Dennis and Urry, 2009). The twentieth century was undoubtedly the century of the car, and the technology’s central position has become duly locked-in so that it presents as the de facto mobility leader for the twenty-first century. It is increasingly hard to see beyond the car—it has become firmly enmeshed as part of the socioeconomic fabric of consumer capitalist society (Newman, 2013). There are over a billion cars on the world’s roads—that figure doubling over the past 25 years (Sousanis, 2011). These figures are only likely to swell with increases in car ownership across emerging economies such as Brazil, China, India and Russia.

This trend is a problem as the ever-growing number of cars is environmentally destructive in the extreme. One-fifth of global oil usage comes from transportation (primarily road transportation), producing a quarter of all energy-related carbon dioxide emissions, largely from passenger vehicles (International Energy Agency, 2012). While vehicular transport is not the largest source of emissions, it is forecast to be the largest source of future emissions growth. Cars are at the vanguard of oil usage and carbon dioxide emissions. As oil is a finite resource and carbon dioxide contaminates the atmosphere, the current car system cannot deliver sustainable mobility—the needs of future generations are being compromised and the present ways cannot go on, meaning the car-dependent legacy of the last century must be reformed. Though advances are being made in making internal combustion engine cars more efficient (for example stop-start engine technology), since the turn of the century, there has been renewed interest in the use of the electric car as a means to reach toward a more environmentally friendly means of personal mobility that, comfortingly, adheres broadly to the recognisable automobile model so many feel they cannot do without. This transition involves a simple substitution of one powertrain for another that provides the outward appearance of the cars most drivers are comfortable with, yet offers the opportunity to do so in the hope of reducing some of the negative ecological impacts presently produced. These developments include hybrids such as plug-in hybrid electric cars with two engines, which switch from electric to petrol/diesel a certain distance into the trip (meaning the most polluting process of starting the engine is alleviated by using the electric motor), like the iconic Toyota Prius. However, unlike that situation where one particular brand led the way and gained significant levels of attention, the rise of battery electric cars augurs the prospect of a more dramatic change as a whole host of competing models are being launched at the same time, all competing for attention and, in so doing, holding out the prospect of greater sustainability gains from an all-electric drivetrain.

The paper looks at the position of these battery electric cars in the UK. It begins by outlining the present situation of the vehicles in the region before outlining the relevant theory of socio-technical transitions and considering the contribution of academic research to understanding (and, thereon, facilitating) the potential for these cars. Highlighting that there has thus far been something of a focus on the urban usage of electric cars, it moves on to highlight some rural applications of electric cars in one area of the UK, Wales. In so doing, it poses the question: is the present presumption that electric cars represent a primarily urban mobility choice the correct one? It is determined that the rural experience might be a fruitful area for further attention.

Electric cars in the UK

The UK government declared 2011, *the year of the electric car*. This grand epithet for the apparently imminent ascendancy of the technology was offered to coincide with the introduction of their plug-in cars grant in January of that year. The plug-in car grant allows buyers to claim back 25% of the value of a new electric car, up to a limit of £5,000. The incentive was designed to encourage sales of zero-emissions cars (zero in terms of tailpipe, not construction and energy production) in the UK. It covers electric cars with a maximum speed of at least 60 mph and a minimum 70 mile range—excluding quadricycles but also allowing provision to include some plug-in hybrid electrics. Altogether, the government estimated that the scheme would fund savings on around 8,600 cars. Electric cars are also exempt from vehicle excise duty, congestion charging in London and some free parking spaces are provided across the country. A plethora of electric cars duly launched in the following year, meaning consumers could pick from major manufacturers such as Nissan, Vauxhall, Peugeot, Mitsubishi and Citroen.

However, electric car prices are still notably more expensive than their petrol and diesel equivalents even after the purchase cost reduction. The UK incentives do not match, for example, those offered by some European countries where electric cars are more successful, such as Norway (Draegni, 2012). There, internal combustion engine cars are heavily taxed, while electric cars benefit from an extremely generous combination of exemptions from non-recurring costs such as sales tax, which actually give electric cars parity so that they cost similar amounts to those powered by petrol or diesel. Alongside these, other factors such as road tax and toll payments are covered so that the initial outlay on purchasing the vehicle should be returned over its lifetime. Crucially, these financial inducements are implemented alongside other more structural incentives such as extensive free parking, ferry transport and the ability to drive in bus lanes. Thus the UK seems to lag behind because its attempt to promote electric cars is largely dependent on relatively less significant financial incentives while also providing less attractive structural factors (the charging network

back on the expensive up-front price of an electric car in an urban area where average distances travelled are not high enough to accrue fuel usage savings.

In contrast, rural commuter ranges may be better suited to efficiently utilising an electric car. While rural journeys are longer, they are typically not so much longer that they create significant range concerns. Longer distances travelled mean that the operational cost advantages of electric cars are greater relative to the purchase cost, thereby making the total cost of ownership a more attractive proposition. The electric car becomes value for money in a way not readily obvious in a dense city. Outside urban areas, households are more likely to have gardens and garages for domestic recharging. These households might also be expected to have second cars already—meaning the electric car could supplant not merely augment an existing conventional vehicle. Finally, less congestion outside of the city ensures that journey times are more predictable meaning that charging opportunities can be properly planned en route, downplaying the effect of range anxiety even for these longer distances. In terms of the impact on range, there are trade-offs to be made. While the hilly terrain that might be more associated with the rural area or the greater opportunities to increase speed (and therefore drag) on open country roads would be more likely to drain the battery, less necessity to stop–start in urban traffic would markedly improve the efficiency of the electric cars. It is important to note, though, that many urban areas also have steep gradients and associated motorways, which means that average vehicle ranges may be optimised for rural driving despite conventional wisdom, which has tended to suggest that the hybrid electric is the only viable means of implanting sustainable personal mobility outside towns and cities.

Wales: a case study

Despite the attendant advantages of rural electric cars, there has been little concerted effort to capture their application. As a particular case study, then, it seems worth briefly considering the case in Wales. Wales is a largely rural country, much of it mountainous and with extensive coastline, hosting three national parks within its relatively small geographical area. The bulk of urban activity is located along the sole stretch of motorway in the south of the country, the M4 corridor—particularly the cities of Cardiff, Newport and Swansea as well as the concentration of towns in and around the Valleys. Beyond this, Wales has large areas of open space with often isolated and spread out communities which, by conventional thinking, would not be conducive to the deployment of electric cars. In reality, there are numerous schemes under way and these take three main forms: local authority fleets; local community car-sharing; and tourist opportunities. They meet particular needs: public transport is sparse (and in the process of becoming highly centralised—subject to imminent swingeing cuts by local councils reacting to a national government austerity drive) in rural Wales, with many residents living further than walking distance from a bus

niches outside towns and cities. Those interested in pursuing the electric car as a means of environmental sustainability would do well to consider these niches and it is hoped that this paper might help to draw attention to this area and encourage others to develop future research considering the implications of such activity. This learning could act to inform this socio-technical transition and facilitate the supplanting of the internal combustion engine, in situations in which it is deemed appropriate by the ordinary drivers who would need to use them.

References

- Ajonovic, A. (2011), 'Biofuels versus food production: Does biofuels production increase food prices?', *Energy*, 36, 4, 2070-2076.
- Aultman-Hall, L., Sears, J., Dowds, J. and Hines, P. (2012), 'Travel Demand and Charging Capacity for Electric Vehicles in Rural States', *Transportation Research Record: Journal of the Transportation Research Board*, 2287, 27-36.
- Automotive Industry Digest (2012), 'Agonisingly slow start from electric cars', *Automotive Industry Digest Newsletter*, February 8th.
- Beckmann, J. (2004), 'Mobility and Safety', *Theory, Culture and Society*, 21, 4-5, 81-100.
- Davies, H., Nieuwenhuis, P., Wells, P., Newman, D. and Donovan, C. (2012), 'ENEVATE Project—Electric Vehicles Market Drivers and E-Mobility Concepts', paper presented at the *European Electric Vehicle Congress*, Brussels, November 19–22.
- Delang, C. and Cheng, W. (2012), 'Consumers' attitudes towards electric cars: A case study of Hong Kong', *Transportation Research Part D: Transport and Environment*, 17, 6, 492-494.
- Dennis, K. and Urry, J. (2009), *After the Car*, Polity Press, Cambridge.
- Department for Transport (2013), *Cars licensed by propulsion*, Department for Transport, London.
- Draegni, R. (2012), 'The Norwegian Case', paper presented at the *Cardiff University Electric Vehicle Summit*, Cardiff, June 27.
- Everett, A., Burgess, M., Harris, M. Mansbridge, S., Lewis, S., Walsh, C. and Carol, S. (2011), *Initial Findings from the Ultra- Low Carbon Vehicle Demonstrator Programme: how quickly did users adapt?* Technology Strategy Board, Swindon.
- Featherstone, M. (2004), 'Automobilities: An Introduction', *Theory, Culture and Society*, 21, 4-5, 1-24.
- Foy, C. (2013), 'Spending to encourage use of electric cars falls flat', *Financial Times*, December 15th.
- Geels, F. (2002), 'Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study', *Research Policy*, 31, 8-9, 1257-1274.
- Geels, F. (2005), *Technological Transitions and Systems Innovations*, Edward Elgar Publishing, Cheltenham.
- Geels, F. (2006) 'Major system change through stepwise reconfiguration: a multi-level analysis of the transformation of American factory production (1850-1930)', *Technology in Society*, 28, 4, 445-476.
- Genus, A. and Coles, A. (2008), 'Rethinking the multi-level perspective of technological transitions', *Research Policy*, 37, 9, 1436-1445.

- Graham-Rowe, E., Gardner, B., Abraham, C., Skippon, S., Dittmar, H., Hutchins, R. and Stannard, J. (2012), 'Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations', *Transportation Research Part A: Policy and Practice*, 46, 1, 140-153.
- Hawkins, T., Singh, B., Majeau-Bettez, G. and Hammer Stromman, A. (2012), 'Comparative environmental life cycle assessment of conventional and electric vehicles', *Journal of Industrial Ecology*, 17, 1, 53-64.
- Hoogma, R. (1999), *Strategic Niche Management as a Tool for Transition to a Sustainable Transport System*, Final Report, EU Commission DGXII.
- Hoogma, R. (2000), *Exploiting Technological Niches*, Enschede: Twente University Press.
- Hoogma, R., Kemp, R., Schot, J. and Truffer, B. (2002), *Experimenting for Sustainable Transport: The Approach of Strategic Niche Management*, Spon Press, London.
- Howarth, C., Kenway, P. and Palmer, G. (2001) *Responsibility for All: A National Strategy for Social Inclusion*, the New Policy Institute and the Fabian Society, London.
- International Energy Agency (2012), *EV City Casebook*, Organisation for Economic Cooperation and Development, Colorado.
- Joseph Rowntree Foundation (2000), 'Exclusive countryside? Social inclusion and regeneration in rural areas', *Foundations*, July.
- Kemp, R., Schot, J. and Hoogma, R. (1998), 'Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management', *Technology Analysis and Strategic Management*, 1, 2, 175-95.
- Mikkelsen, M. and Jensen, A. (2009), *The Status Seeker//The Pragmatist//The Rationalist//The Design Lover//The City Bohemian//The Environmentalist//The Technology Enthusiast—A design manual for the electric car market*, E-trans, Kolding.
- Monbiot, G. (2007), *Heat*, Penguin, London.
- Newman, D. (2013), 'Cars and consumption', *Capital and Class*, 37, 3, 454-473.
- Nieuwenhuis, P. (2011), *ENEVATE WP3 Niche Typology*, available at www.enevate.eu, accessed 22/12/2013.
- Nieuwenhuis, P. (2013), 'UK lags behind as Europe adopts electric vehicle', *The Conversation*, October 11th.
- Office for National Statistics (2012), *2011 Census, Key Statistics for England and Wales, March 2011*, Office for National Statistics, Newport.
- Peters, A., Popp, M., Agosti, R. and Ryf, B. (2011) 'Electric Mobility—a survey of different consumer groups in Germany with regard to adoption', *ECEEE 2011 Summer Study*, 983-994.
- Pol, M. and Brunsting, S. (2012), 'Percepties en attitudes van autobezitters over innovatieve auto's', *Energy Research Centre of the Netherlands Report*, ECN-E-11-068.
- RAC Foundation (2012), '21 million households in transport poverty', *RAC Foundation Press Release*, February 29th.
- RAC Foundation (2013), *Keeping the Nation Moving: Facts on fuels, cars and drivers*, RAC Foundation: London.
- Shove, E. and Walker, G. (2007), 'Caution! Transitions ahead: politics, practice, and sustainable transition management', *Environment and Planning A: Policy and Practice*, 39, 4, 763-770.
- Skippon, S. and Garwood, M. (2011), 'Responses to battery electric vehicles: UK consumer attitudes and attributions of symbolic meaning following direct experience to reduce psychological distance', *Transportation Research Part D: Transport and Environment*, 16, 7, 525-531.
- Society of Motor Manufacturers and Traders (2012), *Motor Industry Facts 2011*, Society of Motor Manufacturers and Traders, London.
- Society of Motor Manufacturers and Traders (2013), *December 2012 EV and AFV registrations*, Society of Motor Manufacturers and Traders, London.
- Sousanis, J. (2011), 'World Vehicle Population Tops 1 Billion Units', *Wards Auto*, August 15th.

- van Wee, B., Maat, K. and de Bont, C. (2012), 'Improving Sustainability in Urban Areas: Discussing the Potential for Transforming Conventional Car-based Travel into Electric Mobility', *European Planning Studies*, 20, 95-110.
- Xenias, D. and Whitmarsh, L. (2013). 'Dimensions and determinants of expert and public attitudes to sustainable transport policies and technologies', *Transport Research Part A: Policy and Practice*, 48, 75-85.
- Yin, R. (2009), *Case Study Research: Design and Methods*, California, Sage.



SOL

Supporting your sustainable growth



The Sustainable
Organization Library (SOL)
An investment in sustainable growth

“ Permissible growth in the future has to be based on sustainable and equitable models ”

Paul Polman, CEO, Unilever

www.gseresearch.com/sol
sales@gseresearch.com

