[*CAN SPENDING TO UPGRADE ELECTRICITY NETWORKS TO SUPPORT ELECTRIC VEHICLES (EVS) ROLL OUT UNLOCK VALUE IN THE WIDER ECONOMY?*]

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Overview

The UK and Scottish Governments have set ambitious targets for the roll-out of electric vehicles (EVs) by 2040 and 2032 (DEFRA 2017; Scottish Government (2017). As with any solution involving large scale infrastructure development, the cost and consumer price implications involved are likely to have a wider set of both direct and indirect economic impacts and raise a broader set of public policy challenges. The most direct public policy concern are be in terms of current electricity consumers (including those in ‘energy poverty’) facing the near term costs of system development to enable future consumption of electricity for transport purposes, particularly where EVs are (a) currently unaffordable to many and (b) the social benefits of their use (through reduced pollution) are not fully valued by private actors. In addition, the economic system is complex and the ultimate distribution of costs will depend on a wider range of often indirect and potentially unanticipated impacts as other markets are affected. For example, depending on labour market conditions, any impacts on domestic electricity bills on the cost of living may impact wage demands and, thus, costs of labour in sectors producing a range of goods and services. Similarly, system development costs impacting electricity bills of commercial/industrial users will in turn impact production costs, thereby introducing a range of price pressures across the economy.

This paper addresses the question of ‘who ultimately pays’ for the costs of upgrading the power network to facilitate the intended roll out of EVs. It incorporates consideration of how electricity users may respond to changes in costs (and benefits), for example, by attempting to offset their losses via the prices they charge in other goods, service and factor (e.g. labour) markets. Where ‘who ultimately pays’ may shift, making it crucial to analyse the wider economic system impacts of costly energy system developments. The paper also incorporates consideration of the complexity of how and when corresponding benefits of switching to EVs may be recognised. A fundamental issue, common to consideration of most environmental policy actions, lies in the fact that the policy motivation for a shift to EVs is realising a range of social returns via reduced emissions of a range of pollutants. With EVs, the challenge is exacerbated by the complexity of when and by whom changes in private economic costs and benefits are likely to be achieved. That is, the new (transport) services (potentially with lower transport service prices over time) being enabled by electricity network development may not be enjoyed, at least for some time, by many current system users (particularly those viewing EVs as unaffordable).

Methods

The approach emoployed in the paper involves two steps. First,an energy system model (UK TIMES) is used to simulate scenarios involving electricity network upgrades to support a range of charging scenarios involving different assumptions informed by Calvillo and Turner (2019). Secondly, the outcomes of the UK TIMES on the required investment costs and efficiency gains realised through using EVs for private transport is used to inform the economy-wide UK ENVI Computable General Eqilibrium (CGE) model introduced by Figus et al.(2018) with adjustments to permit the adoption of EVs. Two main scenerios are investigated.

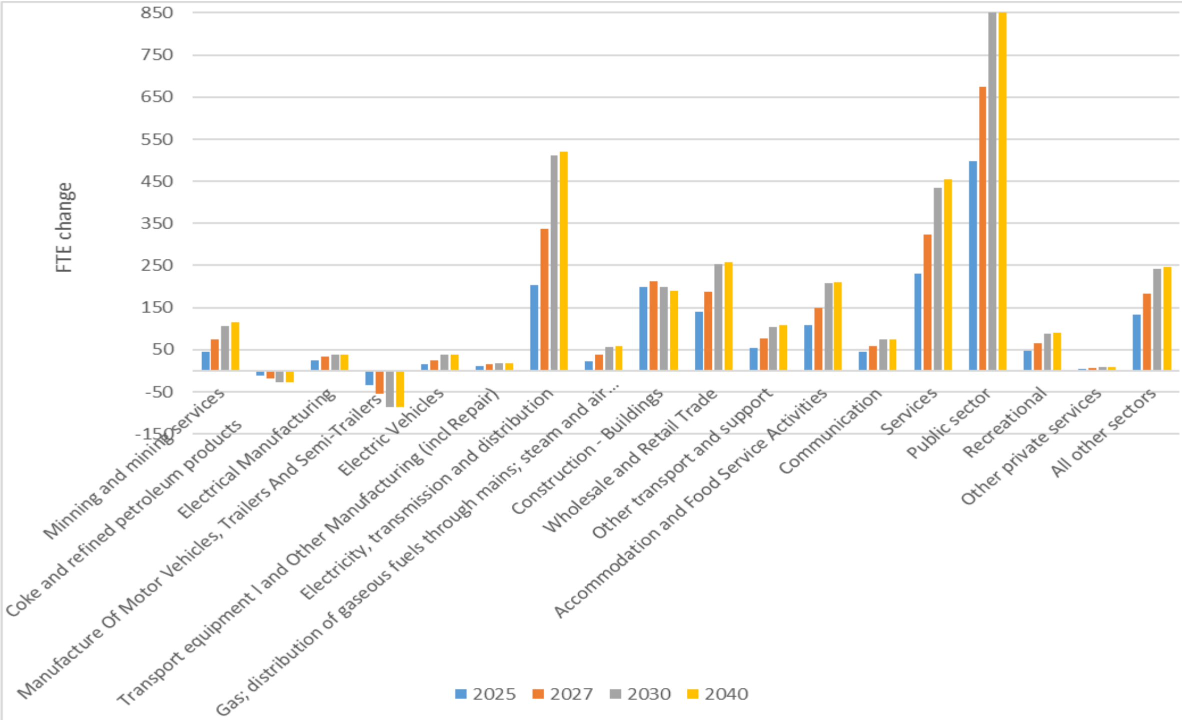
Scenarios 1, captures only on the impacts of the spending on electicity network upgrade that is required to support 20% EV penetration across the UK private transportation fleet. This is without the associated uptake of EVs taking place. The level of investment spend is simulated on a mixed charging scenario on the assumption that 60 % of EV charging is decentralised and there is the need for more extensive distribution network, while 40% of charging is centralised and therefore the need for distribution network is limited. The mixed charging system is estimated to require £2.7bn network investment spending to enable the EV roll-out to 2030. Recovery of the total investment costs is spread over the lifetime of the network assets and reclaimed through electricity bills.

Scenario 2 introduces consideration of how the roll-out of EVs affects the anticipated impacts. For this scenario, a gradual increasing percentage of EVs is used to meet the private transportation needs, replacing the conventional internal combustion engine vehicles fuelled with petrol or diesel. The EV penetration is assumed to start at 2% in 2021 and expand by 2% each year until it reaches 20% in 2030. This scenario also captures increasing efficiency in the EV fleet, such that by 2030 EVs will be able to cover a 20% longer distance per unit of energy compared to current distance/mileage levels..

Results

The headline results show that investment spending to ugrade the electicity network to support EVs roll out can unlock value in the wide economy. For example, Figure 1, shows the change in full time equivalent (FTE) employment across sectors in the UK economy. The largest gain in total employment (3071 jobs) is observed in 2040. The biggest employment gains are in the wider public service esector, which includes research, education, health and other public servicesand gains a sustained increase of 874 jobs by 2040. The electricity generation, supply and distribution industry gains 512 jobs by 2040. The wider private service sector,which includes finance/insurance, legal and real estate activities etc ultimately gaisn and sustains and additional 430 jobs.

Figure 1.Net impact on sectoral employmentof 20% EV penetration by 2030 and required network investment of £2.7bn



The number and distribution of net jobs gained demonstrates the strength of the domestic electricity sector's supply chain. This is particularly in terms of the UK electricity industry's (direct and indirect) reliance on UK service activities. The only two net losers are 'Coke and Refined Petroleum'(but only 29 job losses by 2040) and'Manufacture of Motor Vehicles sectors'(86 job lossesby 2040).

Conclusions

A key conclusion from this paper, is the need to considers how EV (and other low carbon) development may be framed not only in terms of delivering climate change objectives, but also economic returns that are valued by society. This is crucial in the context of the 'Just Transition' framing of policy (which the Paris agreement explicitly sets in terms of national priorities for jobs. The analyses in this paper will be extended to consider the economy wide impacts of the investment spend for network upgrades to enable 99% EVs penetration to 2050 under current national priorities for decarbonisation and net zero transition.

References

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