Introduction to Panel 4 Transport and mobility: How to deliver energy efficiency and cut carbon emissions

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Introduction

Despite accounting for around a third of final energy demand in most European countries, transport and energy policy have traditionally occupied separate government departments, utilised separate models and analytical approaches and aired its debates at separate conferences. The eceee summer study is a rare and very welcome exception to this norm.

This lack of integration is increasingly problematic given the all encompassing policy imperatives of climate targets and energy security. The transport sector is currently 98 % fuelled by oil. It is responsible for around a quarter of EU greenhouse gas emissions making it the second biggest greenhouse gas emitting sector after energy. Road transport alone contributes about one-fifth of the EU's total emissions of carbon dioxide (CO_2). While greenhouse gas emissions in other sectors decreased 15 % between 1990 and 2007, emissions from transport increased 36 % during the same period, with particularly rapid increases from the aviation and maritime sectors. This increase occurred despite improved vehicle efficiency because the amount of personal and freight transport has risen.

The recent dominant response to these policy imperatives is the push for the mass electrification of individual road passenger transport. Such a response will inevitably lead to greater integration across policy domains as transport becomes linked in to the national and local (smart) electricity grid, transport users become part of the solution to energy storage, and new infrastructure and suppliers are brought in to the transport arena.

Yet energy efficiency in transport, and the achievement of a low carbon and resilient transport system, requires more than the development of alternatively fuelled vehicles. The reframing of the debate in terms of access to goods and services as the energy service being demanded leads to a fundamental rethink about the dispersal of activities, the social organisation of daily life and the role of individual behaviour change versus the changes needed to social practices in which much of our mobility behaviour is embedded. The debate also needs to be broadened out to include maritime and aviation passenger and freight transport. The potential for technical solutions for delivering emissions reductions in these sectors is generally less (barring unforeseen technical breakthroughs) and, consequently, their share of total transport emissions has been rising.

The EU has a range of policies in place aiming to lower emissions from the transport sector. For example:

- Aviation's inclusion in the EU Emissions Trading System (ETS).
- The 'Cars and CO_2' strategy which sets mandatory emissions targets for new cars. Targets for vans have also recently been introduced and the Commission is now beginning to focus on the freight sector.
- Targets to reduce the greenhouse gas intensity of transport fuels, including the obligation for minimum quantities of biofuel to be added to conventional fuels under the European Union Biofuels Directive.
- Rolling resistance limits and tyre labelling requirements have been introduced and tyre pressure monitors made mandatory on new vehicles.
- Public authorities are required to take account of lifetime energy use and CO_2 emissions when procuring vehicles.

There are a wide range of measures designed to tackle greenhouse gas emissions from transport in place in the individual member states of the EU. Many of these focus on technology – such as policies to support the introduction of electric and plug-in hybrid vehicles – but some measures aim to reduce the need to travel (environment-focused land-use planning, promoting tele-working etc), to encourage behaviour change (shifts to cycling, walking, eco-driving, speed reduction) and to hasten modal shift to less polluting transport options such as buses and trains.

Panel 4 at eceee 2011 showcases a range of technical, behavioural, fiscal and other proposals covering different aspects of the gamut of policies, innovations and initiatives in this challenging area for policy makers.

Overview of the papers

The 16 papers and 5 posters put forward for this year's eceee Summer Study range from those attempting to analyse or model the 'big picture' of energy system change and potential carbon reductions, to others aimed at enhancing understanding of specific and, often, particularly challenging areas of policy with respect to both passenger and freight movements.

Among the 'big picture' papers, for example Brand et al (4-329) provide some early analysis of the potential for low carbon vehicle taxation to accelerate the energy efficient/low carbon transition. Meanwhile, Raimund (4-195) presents a paper which identifies policies which have been successful in accelerating desired fuel, technology and behavioural changes under a six-year programme to encourage lower carbon transport in Austria. Another paper from Austria (Köppl et al, 4-143) use an innovative approach incorporating 'technology wedges' to analyse the most promising technologies for promoting energy efficient mobility.

Also looking at the 'big picture', Ajanovic et al (4-135) use the results of the EU ALTER-MOTIVE project to identify insights in terms of the introduction of alternative vehicle technologies and alternative fuels. Meanwhile Böhler et al (4-227) review the effectiveness of policies designed to promote energy efficient transport in urban areas of developing and emerging countries and Daly and Ó Gallachóir (4-219) present a car stock simulation model and a energy systems optimisation model for forecasting private car energy demand in Ireland giving insights into the likely outcomes of current transport and carbon reduction policies.

There are a slew of papers which focus on different aspects of the drive to introduce electrification in the road vehicle market, reflecting the greatly increased interest in this area since the 2009 Summer Study. Many, if not most countries in Europe, now have programmes designed to encourage the sale and supply of battery electric vehicles (BEVs) or plug-in hybrids (PHEVs). Three papers adopt a consumer oriented approach to the topic of electric vehicles. Anable et al (4-560) provide a sophisticated approach to segmenting the market for EVs with a primary focus on the UK, identifying likely early adopters, while Peters et al (4-435) survey the attitudes of German consumers in terms of EV adoption, also offering some insights into consumer segmentation. Toftaker (4-490), on the other hand, offers a user oriented approach to EV adoption and emphases the need for stakeholders and policy makers to incorporate understanding about the meanings attached to new technology and how this is incorporated into daily life in order to accelerate its development and implementation.

Two further papers provide a more technical approach to the development and uptake of electric or alternatively fuelled vehicles. Karlsson and Jonson (4-552) examine the implications for design strategy and energy efficiency policy of the effect of PHEV battery range distributions on competitiveness. Pfaffenbichler et al (4-232) use a dynamic fleet model to analyse some of the key factors determining the successful introduction of vehicles running on alternative fuels and, particularly, electricity. In addition, Praetorius (4-174) cuts across the technical and consumer domains by using a technological innovation system perspective that offers a way of looking at the dynamics, barriers and success factors for EVs.

Taking a different approach, and not focusing exclusively on EVS, Ménard (4-165) focuses on land-use policy to limit the impacts of mobility on energy use and climate change. He analyses the interaction between urban density, new vehicle efficiency and technology and renewable energy and concludes that the decentralised storage capacity of EVs and the production capacity of renewable energy may mean that, by 2050, the energy balance may be more favourable in lower density developments.

Other contributors take on the challenge of behaviour change to promote lower carbon/energy efficient mobility. Wappelhorst (4-114) presents a review of a survey of home movers in Germany, attempting to identify how 'mobility packages' might reduce the demand for energy for transport uses. Shafiq-Ur Rahman (4-163) investigates the important topic of the integration between non-motorised modes and public transport in Asian cities. Schewel and Schipper (4-124) present a detailed analysis of a particular aspect of vehicle use; based on a study of driving for shopping in the USA. In the same area, Wallis (4-418) reviews the effectiveness of UK interventions to encourage consumers to adopt lower carbon cars.

Also in the area of behaviour change, Thomsen and Löfström (4-390) look at the potential for promoting walking, cycling, and improved public transport and reducing the amount of motorised transport. The background is the ongoing research project "Brøset, towards carbon neutral settlements" in Trondheim, Norway. Waygood et al (4-047) introduce the evaluation of an online portal to increase awareness of the impacts of travel behaviour and the lessons learnt for the effectiveness and framing of messages used in such tools.

One paper (Eom et al, 4-215) looks at an area which is becoming an increasing focus for public policy around Europe – freight. The authors identify trends in freight energy use and carbon emissions in 10 IEA countries. In a related area for policy, focusing on modal shift, Pritchard (4-244) provides an analysis of the potential of the railway to reduce greenhouse gas emissions and fossil energy dependency.

Overall, the papers reflect a mixture of traditional top-down and bottom-up modelling approaches to energy use and carbon emissions from the transport sector as well as emerging areas of technical development and demand reduction strategies in the passenger demand sector. In addition, a few papers begin to make the connections between the production of renewable energy and technical developments in the transport

sector. However, as has been the case in previous years, there is a lack of emphasis on aviation and maritime transport despite their increasing contribution to energy demand and carbon emissions. In addition, the freight sector, including the need to understand the potential to reduce the energy intensity of movement by light and heavy goods vehicles, is underrepresented again this year. Nevertheless, there is a good mixture of empirical and theoretical insights, with some pleasing emphasis on the need to understand and incorporate social meanings and social practice into forecasting and policy design with an emphasis on understanding the drivers of energy demand in the transport sector.