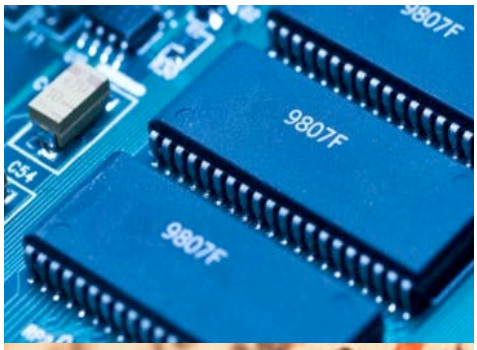

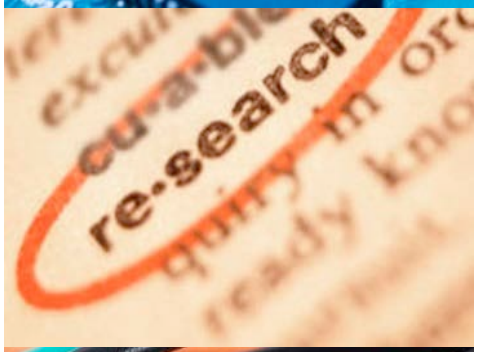

AUSTRALIAN ALLIANCE TO SAVE ENERGY

Creating an Energy-Efficient Australia

The energy productivity roadmap: Re-shaping passenger transport

Doubling energy productivity by 2030 to improve the competitiveness of the passenger transport sector

9 June 2015

Draft Version 1.3

Discussion Paper
Executive Summary Only

The full text of this paper, including references, is available at 2xEP.org.au

2XEP
Doubling Australia's Energy Productivity

Thanks

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The views expressed in this text are those of A2SE and are not necessarily those of our supporters and partners. We have taken all care to ensure that data is correct. All responsibility for the text rests with us.

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Executive summary

> *… we traditionally value the construction of a road between two cities based on the reduction in transport costs that it yields for households and businesses, and we set this against the cost of construction. However, the predominant benefits may arise from dynamic productivity gains, including the economies of scale to which transport costs are subject, and the integration of two connected markets across which goods can be traded… In this paradigm, governments can play an important role in the wealth creation process, facilitating productivity growth through creating the conditions for integration and specialisation, by getting infrastructure and planning decisions right.*
>
> *(Henry, 2010)*

In July 2014, the Australian Alliance to Save Energy (A2SE) commenced the Australian Energy Productivity (2xEP) Roadmap initiative with the support of governments, businesses, industry associations and thought leaders from a range of institutions. "2xEP" (two times energy productivity) refers to the initiative's aim, which is to double Australia's energy productivity by 2030.

Energy productivity is a stated policy priority for federal, state and territory governments. Improving energy productivity is about increasing the economic value created per physical, as well as monetary, unit of energy consumed. In a period of rapidly increasing electricity and gas prices in Australia, in addition to volatility in the global oil market, a holistic approach to energy productivity can make a major contribution to Australia's overall productivity and hence competitiveness.

Other major economies are well ahead of Australia in increasing their energy productivity. Not only is the mean economic value per unit of energy consumed by the Group of 20 (G20) countries higher than for Australia, so too is the G20 mean growth in energy productivity. Australia must act to keep pace so that it avoids entrenching the competitive disadvantage whilst G20 peers are accelerate away from us (A2SE, 2014a).

Australia is coming from a relatively low productivity base, coupled with relatively high real energy prices, so the potential contribution of energy productivity improvement to Australia's overall economic productivity is now at an historic high. This means that the productive use of energy, as a production input, now has a more material impact on the profitability of businesses and Australia's economic growth than in previously.

This discussion paper provides an overview of issues that need to be addressed to substantially enhance energy productivity in the passenger transport sector. It also provides a starting point for discussions with stakeholders and development of a 2xEP Roadmap for the passenger transport sector.

Why focus on energy productivity in passenger transport?

The passenger transport sector supports and underpins Australia's economic prosperity by connecting people, businesses and cities. By providing access to markets, employment, recreation and services, it facilitates economic exchanges. Passenger transport is an essential service. Furthermore, it is a significant user of energy and at risk of compromise by disruption to the security of liquid fuels supply.

This report focuses on the domestic passenger transport sub-sector, excluding aviation, which is estimated to account for around 47% of energy consumed in

the transport sector as a whole (Che & Pham, 2012), or approximately 576 PJ in 2012–13. More than 90% of transport fuels are imported, with in-country stockholdings of crude and refined oils as low as 23–30 days of demand (Blackburn, 2014). This makes the sector vulnerable to potential disruptions in international supply.

For households, transport fuel cost represented 60% of spend on energy in 2011–12, or $60 of the weekly household energy budget of $99 per dwelling (Australian Bureau of Statistics, 2013a, 2013c). Fuel price movement therefore has a greater impact on the average household budget than electricity and gas prices.

Yet Australia regularly ranks as one of the worst performers in surveys assessing energy efficiency of passenger vehicles and transports systems. It was also one of the few countries in which passenger transport efficiency had actually decreased since 1990 (International Energy Agency, 2011a; Young et al., 2014).

Close to 90% of urban travel is undertaken in light vehicles (Cosgrove, 2011). This dominance of private vehicles in the passenger transport mix, and the associated infrastructure investment in roads, bridges and parking to support private vehicle travel contributes to Australia's low ranking. This reliance on private road transport[1] comes at a significant cost to the Australian economy. For example:

- The 'avoidable' cost of congestion[2] for Australian capital cities was estimated at approximately $9.4 billion in 2005, and is predicted to deteriorate at 5.4% per annum to $20.4 billion by 2020 in AUS$2005 (Bureau of Transport and Regional Economics, 2007)

- The annual economic cost of road accidents in Australia is estimated at $27 billion, in addition to the devastating associated social cost (Australian Transport Council, 2011)

- Pollution from cars, trucks, and other modes of fossil-fuelled transport is estimated to cost Australia around $3.3 billion each year (Lindsay, Macmillan, & Woodward, 2011)

An energy productive domestic passenger transport system would underpin economic prosperity by providing high quality mobility services, whilst utilising resources more efficiently and reducing the negative impacts on the environment (e.g. air pollution and land use). This necessitates an integrated public and private transport system, with greater numbers of commuters using the most time- and cost-efficient combination of transport modes, with individual transport primarily used for final leg of journeys. Delivering on this goal will require a change in the prevailing urban and transport planning

[1] Use of road freight transport not in scope of this report although it is acknowledged as an additional influencing factor

[2] i.e. where the benefits to road users of some travel in congested conditions are less than the costs imposed on other road users and the wider community

paradigms.

The 2xEP initiative

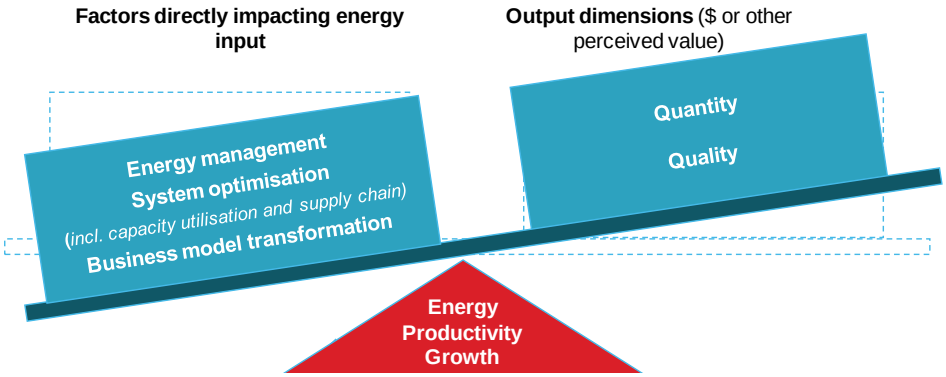
Against this background, the A2SE 2xEP initiative asserts that passenger transport can make a major contribution to the general aim of doubling Australia's energy productivity by 2030.

An appropriate and practical 2030 energy productivity target for passenger transport could focus investment by the sector and individual operators on economically efficient opportunities. A2SE proposes to consult with a diverse range of stakeholders about what this target should be, the optimal pathways to follow for different sub-sectors to reach the agreed voluntary target, as well as how improvement in the energy productivity of the passenger transport sector could be tracked.

Consultation will canvass collaborative action that the industry could take to support a significant improvement in energy productivity and recommend actions required by governments to reduce or remove barriers to achieving such a target.

Potential strategies for improving energy productivity.

Energy productivity is typically expressed as the real economic output per unit of energy (usually primary energy). Consequently, the potential to achieve a voluntary energy productivity target could be influenced by adopting complementary strategies that could either increase economic output or reduce the relative energy consumption per dollar output. Energy productivity is not energy efficiency by a different name. Energy efficiency, which generally focuses on using less energy to deliver the same service is, however, an important part of one the four key strategies, as illustrated below.



The key strategies to enhance energy productivity are summarised below:

- ***Strategy area 1:*** 'Traditional' energy management – improving energy efficiency through better management of energy use, including the implementation of innovative technologies, best practice data-management and benchmarking energy management to facilitate energy-productivity decision making.
- ***Strategy area 2:*** Systems optimisation – focusing on energy-related aspects of the passenger transport system, including integrated urban infrastructure planning and design to optimise asset utilisation, including reducing congestion. These changes may be implemented for reasons of broader productivity improvement, but greater value can be realised

by bringing to them a deliberate focus on energy productivity.

- ***Strategy area 3:*** Business model transformation – focusing on the energy-related aspects of fundamental longer-term change in the provision of public and private passenger transport solutions. This relates to the design, development and operation of passenger transport assets (including private vehicles) and infrastructure.
- ***Strategy area 4:*** Value creation or preservation – a focus on quantitative, as well as qualitative aspects of passenger transport from the perspective of individual operators, passengers and society in general. This includes agglomeration benefits of public transport interchanges, increasing opportunities for economic exchange and increased health benefits from active transport.

Opportunities to improve energy productivity in the passenger transport sector

In the passenger transport sector there have been some positive steps in recent years in relation to energy productivity, particularly significant investment in public transport systems such as heavy and light rail in Sydney and light rail on the Gold Coast. However, an energy productive passenger transport sector is at the intersection of urban design, infrastructure investment, technological advances and socio-economic development trends. Isolated investments are therefore unlikely to deliver an energy productive transport system. The productivity of such a complex system will require co-ordinated action. However, there are many more opportunities across the strategic areas highlighted above:

- Australia does not yet have a minimum fuel efficiency standard for light vehicles, which puts it out of step with many developed countries and means that the light vehicle fleet continues to be unnecessarily inefficient. Increasing fuel efficiency of light vehicles could reduce fuel costs by up to $7.9 billion annually by 2024 at an average pump price of $2.10 / L (ClimateWorks, 2014b).
- There is no fuel efficiency labelling system for tyres in Australia, although tyres account for 20 to 30% of a vehicle's fuel efficiency (European Commission, 2015). Tyre inflation management systems that monitor and automatically inflate tyres can lead to 1%-4% fuel savings for bus operators (Department of Resources, Energy and Tourism, 2012). The installation of low rolling resistance tyres are however recognised as an eligible activity by the Commonwealth's Emissions Reduction Fund (ERF) methods (Department of the Environment, 2015a).
- Alternative drive train technologies have the potential to reduce energy consumption in both the road and rail sector. South West Trains in the UK invested £2.2m in regenerative braking systems for more than 200 trains and anticipates energy savings of up to 20% (South West Trains, 2013).
- Vehicle operation and management at both fleet and private level can be improved. Changing driver practices or adopting 'fuel efficient' driving techniques[3] could reduce fuel consumption of private vehicles by 4.6%

[3] Typically includes smoother driving, slower driving, less idling, and the prediction of traffic flow to obtain better fuel economy

(Graves, Jeffreys, & Roth, 2012). For rail operators, driver assistance software can help to optimise driving techniques based on detailed data about location and conditions, resulting in potential fuel savings of 5 to 20% (Department of Resources Energy and Tourism, 2012).

- New business models such as car and bicycle sharing schemes, and smart hubs for teleworking can make a contribution to optimising existing passenger transport infrastructure. Less than 50% of Australia's high definition video conferencing market potential and less than 40% of the potential for decentralised working in Australia have been realised to date (ClimateRisk, 2014)
- Integrated urban design results in co-location of employment opportunities, residences and services with public transport and walkable urban form. If executed with appropriate consideration to energy productivity, the benefits to individuals and the economy as a whole is likely to be significant – measured in dollars, health and liveability of cities. Initiatives such as the NSW Green Grid is a good example of a spatial development strategy that has as a central tenet the encouragement of shifts to less energy intensive modes of transport, particularly active transport (walking and cycling) and public transport (Government Architect's Office, n.d.). Coupled with concepts such as smart hubs, it could also reduce the scale of the transport task by reducing the need for travel or the distances travelled, particularly distances travelled in private vehicles
- Optimising existing infrastructure through congestion management and demand management or mode shifting. Technological innovation now enables commuters to track traffic data remotely and make independent plans to avoid congestion, whilst vehicle-to-vehicle communications likely the next frontier. Such systems could be capable of collision avoidance, automatic road rule enforcement, or enhancing the control of traffic through intersections (Ball & Dulay, 2010).
- Electric vehicles (EV) also present significant opportunities, as well as challenges to infrastructure planners. If not proactively addressed, Australia risks lagging behind developments, or EV could also become a disruptive force with potentially negative impacts on energy markets.

Exploiting the above opportunities requires a proactive and long-term perspective to yield the benefits on an economy wide basis. Measures are needed across the spectrum of policy, investment decision-making, technology, infrastructure and urban planning.

Urgent action is required as the useful life of transport assets (i.e. infrastructure, vehicles, ferries and trains) are more than 20 years[4] (Australian Bureau of Statistics, 2014d). Today's transport and urban planning decisions could therefore lock in energy-intensive modes of transport for many years (Department of Climate Change and Energy Efficiency, 2010). However, not all actions are capital intensive. This transition can be facilitated by a range of

[4] BITRE calculation from ABS, Motor vehicle census, cat. no. 9309.0

strategies, including:

- Pricing strategies that in time will enable full cost recovery to support ongoing investment in public (and where applicable active) transport options that are safe, accessible, affordable, fast, frequent and reliable
- Introduction of minimum fuel efficiency standards and efficiency labelling of non-engine components
- Land use planning and spatial development practices that reduce the demand for travel
- Removal of tax incentives and employee benefits that in isolation may be desirable, but when viewed within the context of an energy productive passenger transports system can contribute to unintended outcomes
- Incentivising more energy efficient private and fleet vehicle purchases through, for example, the ERF, as well as preferential stamp duty and registration charges
- Investing in congestion management and travel planning technologies that supports real time decision making by travellers, thus extending the life of existing public transport assets
- Introducing benchmarking tools for fleet efficiency and raise awareness amongst operators of unexploited opportunities
- Enhance integration and oversight between government agencies accountable for urban and transport planning to ensure integrated public and private transport systems for the near term and a future system able to optimise new technology, including EVs

Benefits from 2xEP for passenger transport

The benefits of a significant improvement in energy productivity in the passenger transport sector will depend on new regulations, and the voluntary target and actions agreed by the sector, but could include:

- Energy efficiency improvements and cost savings for transport users through fuel economy standards and transport systems through new technologies and practices; this will reduce public and private costs, and also reduce greenhouse gas emissions cost-effectively.
- Avoided and reduced energy use through a shift to less energy intensive transport modes and reduced vehicle kilometres travelled.
- Optimisation of passenger transport systems (i.e. capacity utilisation) and agglomeration impacts of increased opportunities for economic exchange.
- Multiple dividends in terms of improved fuel security, balance of payments, reduced congestion costs, reduced health costs, and improved accessibility, amenity and equity.

Passenger transport program objectives

A successful outcome from the A2SE 2xEP Roadmap process will be a realistic but challenging energy productivity target and a plan developed by the sector, supported by a broad spectrum of industry constituents, to lead changes in the sector and their individual businesses to achieve the target. It is envisaged that outcomes of the A2SE 2xEP Roadmap may include:

- A definition of pathways to significantly enhance energy productivity,

with reference to the different sub-sectors and scale of operations.

- Mechanisms to create greater awareness and adoption of emerging innovations that can help passenger transport sub-sectors achieve a step change in energy efficiency.
- Strategies to overcome barriers to the adoption of new, more efficient light vehicle and public transport technologies.
- Strategies to overcome barriers to integrated urban planning.
- Prioritisation of cost-effective measures to achieve 2xEP in the sector.
- New programs, or the strengthening of existing programs, to support the passenger transport sector to achieve 2xEP.
- Recommendations to federal, state, territory and local governments for policy changes to facilitate these activities and support 2xEP in passenger transport.

Such changes could be achieved through a collaborative process, involving passenger transport businesses and providers, researchers and industry associations, with government engagement to accelerate innovation, transformation and value adding in the sector.