AUSTRALIAN ALLIANCE TO SAVE ENERGY

Creating an Energy-Efficient Australia

2XEP – Australia's Energy Productivity Opportunity

Framing Paper - Summary

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2XEP

Doubling Australia's Energy Productivity

Thanks

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The views expressed in this text are those of A2SE and 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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Summary Overview

"sound energy policy is crucial to securing Australia's ongoing international competitiveness and long-term energy future."

The Hon Ian Macfarlane MP, Minister for Industry, 10 September 2014

In July of 2014 the Australian Alliance to Save Energy commenced the Australian Energy Productivity (2XEP) Roadmap initiative with the support of governments, businesses, industry associations and thought leaders from a range of institutions.

Energy productivity is a stated policy priority for Commonwealth and State governments. Improving energy productivity is about increasing the economic value added per dollar of energy spend. In a period of rapidly increasing energy prices in Australia, a holistic approach to energy productivity can make a major contribution to Australia's overall productivity and hence competitiveness.

Energy productivity utilises a wide range of strategies to both increase economic output and reduce the relative demand for energy per dollar output. It is not energy efficiency by another name. Traditional energy management, which generally focuses on using less energy to deliver the same service, is only one of three strategies to enhance the returns from energy used.

This report provides an introduction to the rationale for making a significant improvement in the economic value created from the energy consumed in Australia, as well as the determinants of energy productivity. It also demonstrates the multiple dividends from investing in energy productivity, as well as discusses potential metrics, and provides an initial estimate of the scale of the step change in performance required to double energy productivity by 2030.

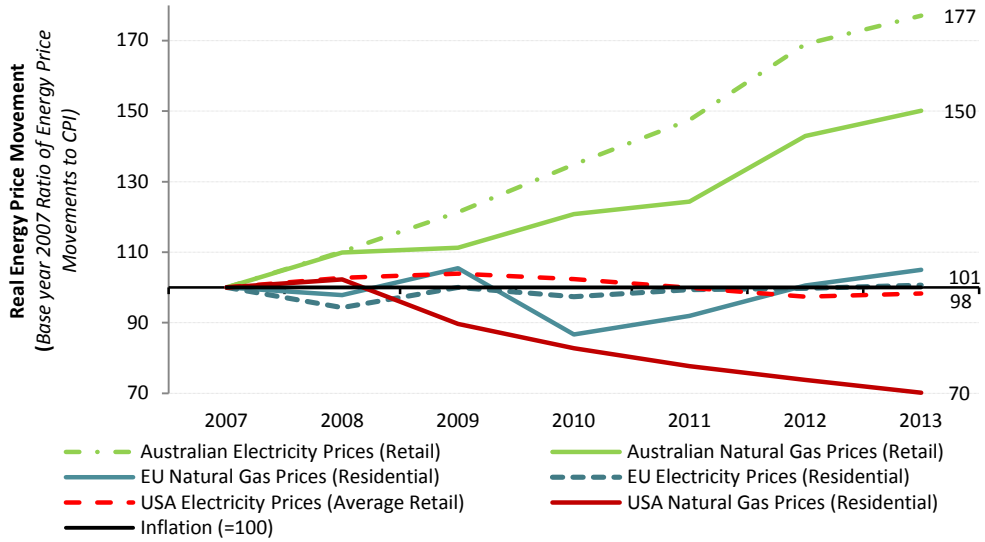
Productivity is the driver of international competitiveness and economic growth

Productivity in key sectors of the Australian economy has been stagnant or in decline for much of the last two decades. The long-term effect on the competitiveness of Australian industry and the living standards of Australians has been masked by the mining boom, but the cycle is now turning.

Australia's recent 'windfall gains' from improvement in our terms of trade are likely to reverse as prices for key Australian export commodities fall. Therefore, to sustain growth in national income we must improve the productivity of labour, capital and other production inputs (i.e. multifactor productivity or MFP).

Deteriorating energy-price competitiveness risks eroding Australia's traditional advantage

Energy is a key production input, and cheap energy once provided competitive advantage for the Australian economy attracting large, energy-intensive businesses to Australia. Businesses made investments in capital in an environment of low-cost energy, and energy costs were seen as a small fixed overhead. However, over the last decade, the rapid escalation of energy prices eroded that competitive advantage. As illustrated on the next page, with reference to residential prices, our energy prices have increased well above domestic inflation and at a much faster pace than those in the United States of America (USA) and Europe.



By 2017, natural gas commodity prices on Australia's east coast are expected to have doubled compared to 2012 levels as a result of the advent of the export liquefied natural gas industry and exposure to international pricing for gas.

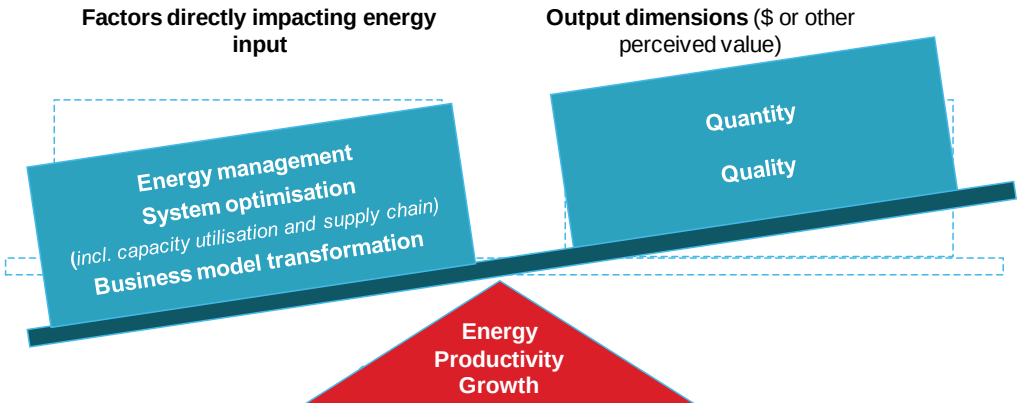
The Commonwealth Government targeted escalating electricity prices, recognising the importance of energy price competitiveness to Australian industry. Measures included removing the carbon price. However, most of the increased electricity supply costs resulted from 'locked in' infrastructure costs including $45 billion of investment in the national energy market (NEM) distribution networks during the last five-year regulatory period (ISF, 2013). With the decline in electricity demand, investments now have to be recovered by the electricity supply industry from a smaller than predicted consumption base. The subdued demand for electricity is in part the result of businesses and households responding to increased prices by implementing energy efficiency measures. For them, energy is no longer a relatively small overhead, but a rapidly increasing and significant expense, needing to be actively managed.

Transport and stationary energy costs to business and consumers equate to approximately 7.4% of Gross Domestic Product (GDP); at $109.4bn in 2011–12 (Australian Bureau of Statistics, 2013a, 2013b). This is a major cost to the economy, making energy productivity a key factor in driving Australian prosperity.

Energy productivity is a measure of the economic value created per unit of energy

Energy productivity is a measure of the economic value created per unit of energy (and energy dollar). As illustrated below, traditional energy management, including energy efficiency, is just one of three strategies on the input side of the energy productivity equation (i.e. ratio of Economic Output to Energy Input). Other strategies that could impact absolute and relative input cost include:

- system optimisation with an energy focus at both facility level and across industry value chains. This includes capacity utilisation.
- transformation of business models used by industry sectors, including government. It is recognised that energy is seldom the driver behind new business models. However, increased consideration of the energy implications of new ways of designing, developing and delivering services and products could have significant business and societal benefits.



The 'input side strategies' do not only target a reduction in energy inputs. For example improved capacity utilisation in the energy sector will result in improved capital utilisation, whilst in manufacturing it will translate directly into increased output. There is also interplay between the three input side strategies. For example, by considering energy as a key element in integrated urban transport planning, it is possible to reduce the energy cost of transport to the community and simultaneously improve users' experience (i.e. quality) of the urban built environment. Energy productivity is, therefore, not only about reducing energy input cost; it is as much about creating economic value and outputs value by the community or users.

Energy is an integral part of a national productivity strategy

Driving energy productivity improvement is not an alternative to pursuing labour, capital or broad-based MFP strategies. As an integral part of the way we live and do business, the mechanisms through which productive energy use translates into additional economic value directly touch all three elements of the productivity equation[1] and also have a multiplier effect.

Investment in energy-efficient equipment is embedded in capital input and is, therefore, one of the direct drivers of *capital productivity*. In addition, consideration of energy productivity as a key step in the design, investment and operation of infrastructure and productive assets, supports the optimal allocation of capital and enhances the return on assets. This is well demonstrated by higher returns on 'green buildings', as tracked by the Australian Property Council/IPD Green Property Index (IPD, 2014), whilst relatively short payback periods for investments in energy equipment (of between two and four years) are common (ClimateWorks, 2013). To the contrary, excess capacity in the electricity supply sector, as discussed earlier, has led to the long term decline in this sector's productivity (Australian Bureau of Statistics, 2013c). The sub-optimal allocation of capital in this sector has had a negative impact on energy price competitiveness (Productivity Commission, 2014).

Investment in energy equipment and services has a direct impact on job creation in the energy services sector, which has a high jobs to capital ratio compared to the centralised power generation sector (IEA, 2014). Furthermore, investment in energy efficient technologies could also boost labour productivity if it enables the same task to be done faster or with fewer people to operate and maintain the equipment (Smith, 2014). Considering energy productivity in the design of green buildings has also been

[1] $y = S^K k + S^L l + mfp$, i.e. improvement in productivity of capital, labour and use of other production inputs.

reported to impact labour productivity by between 3% and 23% depending on the specific measures adopted (World Green Building Council, 2013).

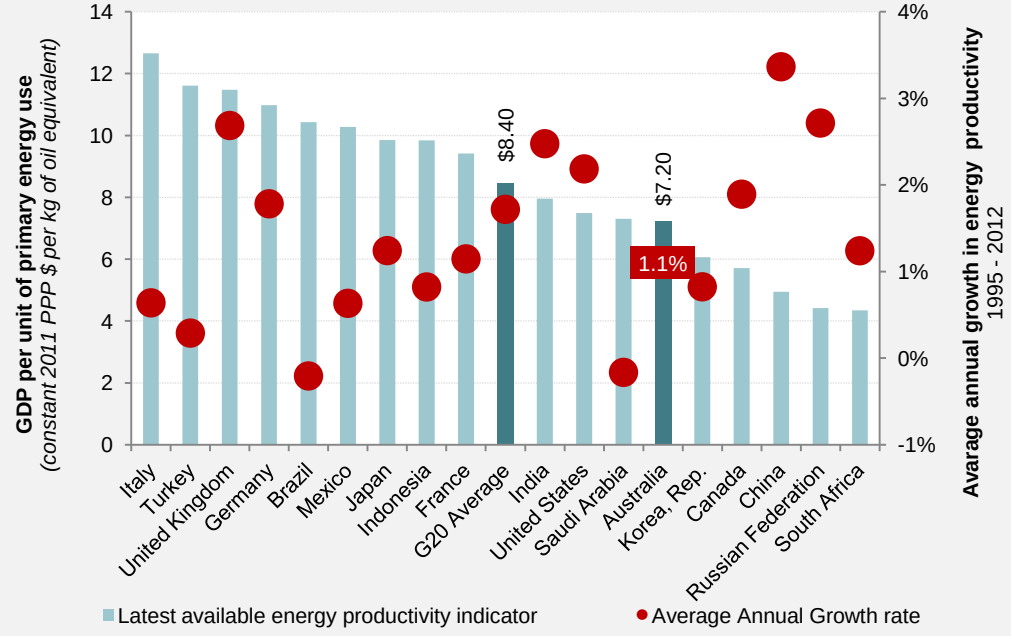
A reduction in energy cost, as a production input, directly impacts MFP. The effective use of energy may also impact the effective use of other production inputs. A recent International Energy Agency (IEA) report estimated the multiplier effect of energy savings to other resource inputs of 0.5 to 2.5 times (IEA, 2014 cited in Smith, 2014). In addition, a reduction in the use of non-renewable energy will, in the long term, further reduce the direct cost of energy as the world makes progress, albeit gradually, towards a decarbonised future.

Australia risks locking in a competitive disadvantage in energy productivity

Australia's energy productivity, measured as GDP per unit of energy input, is 14% lower than the average of the G20 countries in US$ purchasing power parity terms (World Bank, n.d.). Not only are the USA and Europe already adding more economic value per unit of energy, they have set aggressive improvement targets and, as a result, are accelerating away from us (at the same time as our energy prices are rapidly increasing and the prices in Europe and the USA are largely static or declining in real terms).

The European Union targets a 20% decrease in energy intensity compared to 1990 levels by 2020 and is now discussing extending that target to 30% by 2030, whilst the USA has adopted a target to double energy productivity by 2030 compared to 2005 levels (Alliance to Save Energy, 2013; European Commission, 2013). China, although currently still lagging Australia on this metric, improved its energy productivity by 153% between 1990 and 2009. China is targeting a further improvement in energy productivity of 16% between 2011 and 2015 (Institute of Industrial Productivity, 2011; World Bank, n.d.).

In comparison, Australia has improved energy productivity by a meagre 1.1% per annum over the period 1995–2012. This high level measure of productivity reflects efficiency gains, but it also includes the effect of shifts in the economic structure and increased economic output.



Large energy-consuming equipment and vehicles often have a useful life of between 10 and 25 years. Transport and built-environment infrastructure that impact the productive use of energy have an even longer life span. Failure to act now risks locking in competitive disadvantage for decades to come. With national income growth forecast to halve over the next decade, the continued deterioration in Australia's energy competitiveness will have implications for Australia's national income, job creation/retention and, ultimately, living standards.

2XEP is a definitive step towards closing the performance gap

The 2XEP Roadmap is working towards the development of a credible plan to substantially improve Australia's energy productivity. Initially, A2SE proposes doubling our energy productivity by 2030 as a straw-man target.[2] This has the benefit of being a stretch target that appears challenging but within reach, as well as aligning with the existing USA target adopted by the Obama administration last year. The feasibility of achieving this target will be tested at a sectoral and aggregate level as the program continues.

Our preliminary high-level estimate of the magnitude of the change required for doubling energy productivity implies a 3.5% per annum improvement in energy productivity (i.e. 2010 to 2030).[3] This measure translates to an increase from $219 real GDP (2010$) per unit of energy input (primary energy measured in GJ) in 2010 to $438 in 2030. Based on our preliminary assessment, about 60% of the improvement will be driven by economic *output growth and structural changes* in the sectoral composition of the Australian economy.

The remaining 40% (or 1.4% per annum) of the improvement will be required from enhancements in the *productive use of energy*[4] in the economy. This is more than three times the annual energy efficiency improvement at the current aggregate rate of 0.4%.[5] However, this is not dissimilar from the average annual energy efficiency improvement by Australia's industrial sector recorded between 2008 and 2010 (ClimateWorks, 2013), albeit that this period was characterised by major government energy-efficiency programs targeting improvements in energy performance in industry, including the Energy Efficiency Opportunity program (EEO) and the Clean Technology Investment Program (CTIP).

The benefits of improved energy productivity will be elaborated upon as the Roadmap project continues, including through a more in-depth empirical review of economic productivity in Australia and by commissioning economic modelling specifically for this initiative. However, based on recent studies that have drawn a link between the more efficient use of energy and economic growth,[6] doubling energy productivity would deliver a 2.8% increase in GDP by 2030, equivalent to a gain of $59.5bn GDP (2010$) in that year, assuming all else being constant. This is a significant contribution to GDP, given that the Group of 20 (G20) nations will aim to lift their

[2] Base year set for illustrative purposes as 2010, but still to be agreed in consultation with stakeholders.

[3] Based on the Bureau of Resources and Energy Economics (BREE) forecast for 2030 and the modelled improvement in economic output flowing from the annual improvement in energy efficiency.

[4] The efficiency effect, excluding structural effects.

[5] 2XEP Project modelling using BREE and ABS data.

[6] An empirical link of a 10% improvement in energy to a 1% gain in GDP per capita has been established (Vivid Economics, 2013).

collective GDP from all economic activity by more than 2% above the trajectory implied by current policies over the coming five years (G20, 2014).

In addition, as established by the American Alliance Commission on National Energy Efficiency Policy, a doubling of energy productivity also has the benefit of cost effectively reducing greenhouse gas emissions by 33% by 2030, compared to 2005 levels (Alliance to Save Energy, 2013). The impact of an Australian energy-productivity strategy on the country's emissions profile will be assessed in detail as part of future iterations of the analysis. However, A2SE's preliminary modelling suggests that doubling energy productivity by 2030 equates to an approximately 25% reduction in Australia's forecasted 2030 emissions (Department of the Environment, 2013).

Moving beyond a narrow energy efficiency focus

Pursuing a more holistic energy productivity strategy to ensure the competitiveness of Australian businesses and enhance the living standards of Australians is premised on the assumption that energy and economic growth can be decoupled.

Previous studies of the potential for energy savings have predominantly focused on energy efficiency opportunities for the period ending 2020. These studies identified an economic potential of about 47% (or 537 PJ) of the required 1147 PJ final energy-demand reduction required to reach the 2XEP goal of $438/GJ by 2030. This would leave a shortfall of 790PJ of energy savings. Targeting a reduction in inputs through energy efficiency will therefore not be sufficient.

Meeting this challenge necessitates a long-term perspective stretching to 2030 and beyond, and incorporating all the other energy productivity strategies, including system optimisation and transformation of the business models used by industry and government.

The next steps

The 2XEP Roadmap project has commenced. The paper from which this introduction was extracted is the first step in defining economical pathways toward a significant and sustained change in energy productivity. It forms a core element of the Foundations stage of the Roadmap project, along with Sectoral Overviews – high level introductions to the opportunities for lifting energy productivity in key sectors of the economy.

As part of the 2XEP Roadmap initiative, comprehensive economic analysis will be commissioned to determine the most cost effective and beneficial opportunities for each sector and across industry sectors.

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