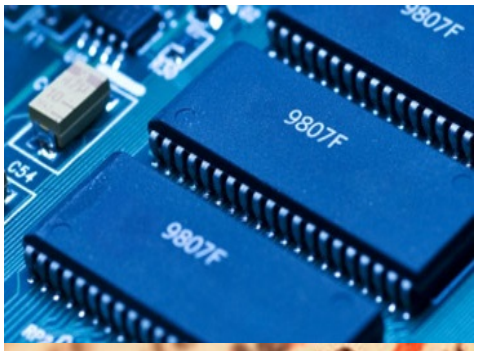

AUSTRALIAN ALLIANCE TO SAVE ENERGY

Creating an Energy-Efficient Australia

2XEP – Australia's Energy Productivity Opportunity

The Australian Energy Productivity Roadmap

Foundations: An introduction to concepts, realities and opportunities

September 2014

2XEP

Doubling Australia's Energy Productivity

Thanks

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'... 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

The Australian Alliance to Save Energy (A2SE) recently commenced the Australian Energy Productivity (2XEP) Roadmap project with the support of governments, business, industry associations and thought leaders from a range of institutions. Energy productivity is not energy efficiency by another name. Energy efficiency is only one of many strategies to optimise the returns from energy used.

Energy productivity incorporates a wide range of strategies that can both increase economic output and reduce the relative demand for energy. This report provides an introduction to the rationale for a significant improvement in the economic value created from the energy consumed in Australia. It further highlights the multiple dividends from investing in energy productivity, possible measurement approaches and the step change required to double energy productivity by 2030.

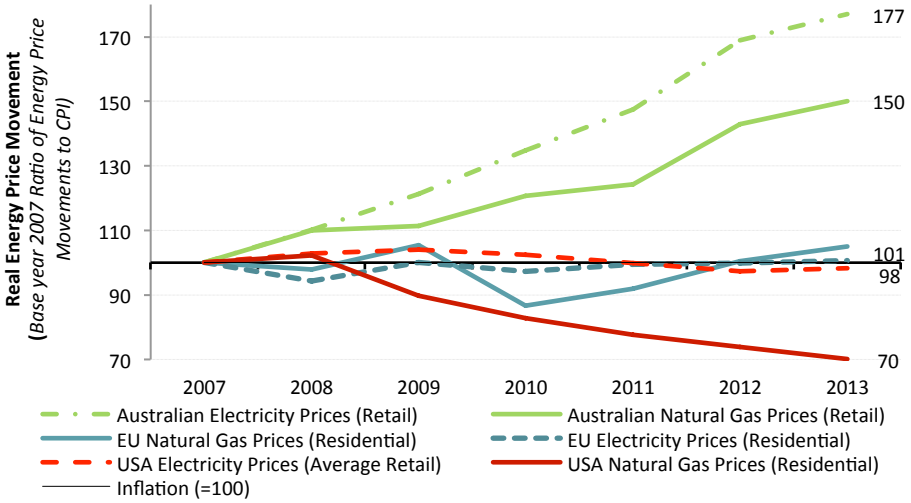
Productivity is the driver of international competitiveness and economic growth

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 this is having 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 decline. 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 a competitive advantage for the Australian economy. For large, energy-intensive businesses that established here, low-cost energy was just 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 increased well above domestic inflation and at a much faster pace than those in the United States of America (USA) and Europe.



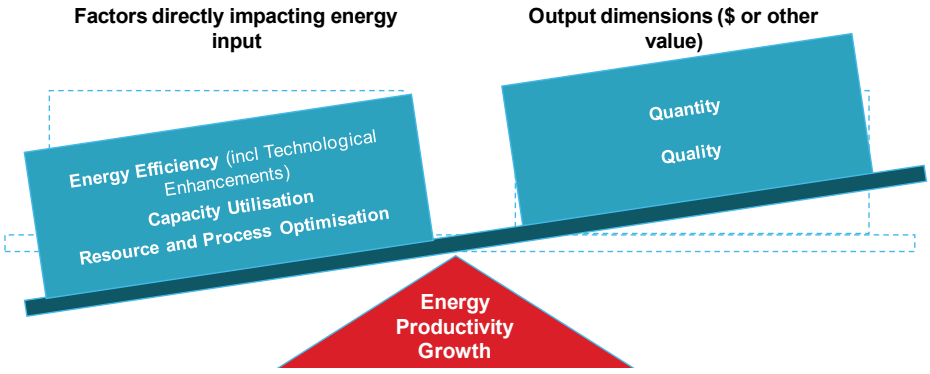
By 2015, natural gas prices on Australia's east coast are expected to have nearly doubled compared to 2007 levels. The Commonwealth Government has targeted escalating energy prices, intending to attract business to Australia with abundant and affordable energy as we did in the recent past. Action has included removing the carbon price. However, most of the increased energy-supply costs result 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).

The Australian Energy Market Operator (AEMO) continues to forecast surplus capacity in the NEM for the medium term due to the current fall in electricity demand and low annual growth for the forecast period ending 2022 (AEMO, 2014a, b). 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 consumers responding to increased prices by implementing energy efficiency measures. For them, energy is no longer a small fixed overhead cost, but a rapidly increasing cost to be actively managed.

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

Energy costs to business and consumers now equate to approximately 7.4% of Gross Domestic Product (GDP); at $109.4bn in 2011–12 (ABS, 2013a, 2014a). 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 (and energy dollar). Energy efficiency is just one of three strategies on the input side of the productivity equation (i.e. ratio of Economic Output to Energy Input). Other strategies to reduce absolute and relative input cost include resource and process optimisation, both at facility level and across industry value chains, as well as capacity utilisation, as illustrated below.



The 'input 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 an interplay between the three input strategies. For example, considering energy as a key element in integrated urban transport planning could 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.

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). Conversely, excess capacity in the electricity supply sector, as discussed earlier, has led to the long term decline in this sector's productivity (ABS, 2013b). The sub-optimal allocation of capital in this sector has had a negative impact on energy price competitiveness (Productivity Commission, 2014).

Energy investments contribute directly to job creation in the energy services sector, improving the labour participation rate. However, they also impact labour productivity in other sectors, with reported improvements of up to 23% (World Green Building Council, 2013).

A reduction in energy cost, as a production input, directly impacts MFP. The

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

effective use of energy may also impact the effective use of other production inputs. A recent World Bank report estimated the multiplier effect of energy savings to other resource inputs of 0.5 to 2.5 times (International Energy Agency, 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).

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 had a very meagre energy productivity improvement of 1.1% 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 has 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 – and initially A2S proposes doubling our energy productivity by 2030 as an initial 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 US target. It will be tested at a sectoral and aggregate level as the program continues over the next 12 months.

Our preliminary high-level estimate of the magnitude of the change required for doubling energy productivity implies a 4.2% per annum improvement in energy productivity (i.e. 2013 to 2030).[3] This measure translates to an increase from $255 real GDP (2013$) per unit of energy input (measured in GJ) in 2013 to $511 in 2030. Based on our preliminary assessment, about two thirds of the improvement will be driven by economic output growth and structural changes in the sectoral composition of the Australian economy.

The remaining 1.4% per annum improvement will be required from improvements in the *energy efficiency*[4] of 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 large industry, including the Energy Efficiency Opportunity program (EEO), the NSW Energy Savings Scheme and the Clean Technology Investment Program (CTIP).

The potential benefits of improved energy productivity will be elaborated as the Roadmap project continues, including through commissioning independent economic modelling. 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 2.2% increase in GDP by 2030, equivalent to a $57.5bn GDP (2013$) gain in that year, assuming all else being constant. This is a significant contribution to GDP, given that the G20 nations will aim to lift their 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, 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 future iterations of the analysis.

[2] Base year set for illustrative purposes as 2013, 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 (see footnote 7).

[4] 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).

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 40% (or 469 PJ) of the required 1184 PJ final energy-demand reduction required to reach the 2XEP goal of $511/GJ by 2030. This would leave a shortfall of 715 PJ in the energy savings required. Only 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 resource and process optimisation, and capacity utilisation.

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 towards 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 independent 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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