Powering the Regions Fund

Consultation paper – January 2023

Response to issues and questions
Australian Alliance for Energy Productivity

> *Productivity growth relies on the generation and spread of ideas that enable businesses and other product and service providers to deliver more (in quantity, quality or variety), from less. Institutional and policy settings play a key role in providing the frameworks and capabilities that enable and support this process.*
> Productivity Commission, 5-year Productivity Inquiry: The Key to Prosperity, Interim Report
> Canberra, July 2022

Australian Alliance for Energy Productivity (A2EP) | a2ep.org.au
Level 10, UTS Building 10, 235 Jones Street, Ultimo NSW 2007, Australia
email: a2ep@a2ep.org.au, phone: +61 2 9514 4948

Australian Alliance for Energy Productivity (A2EP)

A2EP is an independent, member-based, not-for profit organisation. We're technology-neutral in our work except to the extent that we understand science-based decarbonisation targets and subscribe to the concept that greenhouse gases are an economic externality that should be factored into decisions by businesses. Decarbonisation is both an imperative and an opportunity.

The strength of our work is predicated on relationships with businesses and researchers. We aim to convert research to reality by testing technical and commercial feasibility in real-world contexts. Through our member network we reach over 1,000 of Australia's top manufacturers and energy users. From our work with feasibility studies and demonstration projects, we understand how energy is used and what for. We engage with businesses in conversations about how their sites work, how their organisations function and how decisions are made.

Over recent years, amongst others, we've worked for and with: the Department of Industry, Science, Energy and Resources; now the Department of Climate Change, Energy, the Environment and Water; the Australian Renewable Energy Agency (ARENA); the RACE for 2030 CRC; the Department of Environment, Land, Water and Planning (DELWP Victoria); Sustainability Victoria; the Department of Primary Industries (NSW) and the Office of Energy and Climate Change (NSW).

We've worked with a diverse range of public, private and not-for profit collaborators including Climate-KIC Australia, the Institute for Sustainable Futures at the University of Technology Sydney, ClimateWorks Australia, CSIRO, the Energy Efficiency Council, RMIT University, the Australian Hydrogen Council, numerous industry associations, consulting and contracting firms and suppliers of products and services.

Our recent projects have spanned themes including renewable heating (heat pumps, solar thermal, hydrogen, bioenergy), Industry 4.0 solutions, anaerobic digestion, on-farm energy productivity, flexible electricity demand and demand control and decarbonisation in practice. We've worked across the manufacturing, agriculture and transport sectors and more recently in commercial buildings.

A2EP is highly regarded for our stakeholder engagement and industry consultation with access to more than 1,000 manufacturers either directly or via the energy consultant and industry association networks we maintain. We're expert at facilitating information exchange. More information is available at https://www.a2ep.org.au

We're the builders and curators of futureheat.info, a globally recognised website dedicated to renewably fuelled heating. https://www.futureheat.info

Preface to A2EP recommendations for PRF

A2EP has long focussed on helping technology roadmaps become reality. We focus on supporting demonstration and deployment of new technologies such as renewable process heating technologies over the last 5 years. We understand adoption rates, barriers and what makes a new technology successful.

Energy productivity improvement is an essential contributor to decarbonisation. The reverse is true also. Efforts to decarbonise can drive energy productivity improvement.

Our work over recent years has focused on the "how to", particularly in the manufacturing, agriculture and transport sectors. We believe that the potential for energy productivity and decarbonisation - driven by better equipment, digitalisation and integration, appropriate regulation and new business models – is underestimated and undervalued. Energy productivity improvement is crucial to economical decarbonisation

- minimise CapEx and OpEx for energy-related infrastructure;
- secure local manufacturing and jobs;
- facilitate the transition from natural gas; and
- reduce emissions.

This submission is focused on the agriculture, industrial and commercial [buildings] sectors and on electricity and natural gas, the areas A2EP has focused on in its activities.

Executive summary

The Australian Alliance for Energy Productivity (A2EP) is an independent, not-for-profit coalition of industry and research leaders helping Australian businesses pursue a more successful future by producing more with less energy. An emphasis on energy productivity (performance) from businesses can deliver significant economic and environmental benefits, strengthen energy independence and increase global competitiveness.

The PRF is an opportunity to deliver both community and business transformation and secure the next generation of low carbon manufacturing industries. However this will only occur if eligibility and merit criteria for funding gives appropriate weight to regional community issues such as high quality local jobs, local infrastructure and local services rather than just the size of the emission reduction and cost.

The PRF is also an opportunity to deliver exponential uptake of emission reduction technologies and create tipping points for technology that is proven elsewhere but not had enough widespread adoption here to achieve critical mass. For example CSTR anaerobic digestion to produce biogas and industrial heat pumps.

To ensure the PRF delivers the best leverage for the funding, energy productivity measures must be a part of each project to ensure the least cost pathway decarbonisation pathway is achieved.

The consultation paper nominates four objectives for the PRF:

- Decarbonising Existing Industries
- Developing New Clean Energy Industries
- Workforce Development; and
- Purchasing Carbon Credits.

In our submission we acknowledge those objectives and offer the recommendations below to ensure these objectives are met and long term, transformative, community benefit is achieved.

A2EP recommendations for the PRF

- **Local content and community benefit** must be strongly weighted eligibility criteria for funding to ensure best leverage of funding and most transformative change
- **Sub-streams** must be used to ensure multiple sectors and multiple technologies receive funding not just large emitters and one or two technologies;
- **Commercially available technologies** that are adopted elsewhere in the world and needing support to reach critical mass should be prioritised (eg >80% of funding for technologies with CRI 2 to 4, inclusive) as they can achieve exponential rates of adoption;
- **Hard to abate** sectors should receive limited funding due to the many constraints in achieving exponential adoption of these technologies and they already have access to many other programs;
- **Energy productivity** measures must be incorporated with each project to ensure the least cost pathway to decarbonisation is achieved;
- **New industry support** should be for industries that align with Australia's strengths such as food and beverage manufacturing and mineral processing (alumina, aluminium, nickel, lithium etc), not labour intensive manufacturing industries where we have limited local expertise such as steel making

- **Knowledge sharing** – should be delivered with the support of research institutions to secure quality of reporting and to ensure maximal confidence in the technology and leverage on each $ of funding

Each of these recommendations is reflected in our responses to the consultation questions.

Finally, we offer three cautionary notes for the PRF. Firstly, the pitfalls of picking early development stage winners as demonstrated by the various clean industry project proponents having changed their proposals several times in just 2 years from exporting electricity via under water cable, to green hydrogen to green ammonia and now to green methanol. Secondly, if local content and community is not considered the PRF risks creating another east coast gas crisis as we have seen after the introduction of LNG facilities in Queensland which is impacting the profitability of local manufacturing. Finally, the implementation of a Renewable Energy Target which only supports renewable electricity and not renewable gases such as biogas / biomethane which has created market distortions where biogas producers are burning it to generate renewable electricity, which can be done far cheaper with solar PV and wind, rather than exporting the biomethane for energy users in hard to abate sectors who cannot electrify easily, eg cement, steel, brick making and glass.

Consultation questions part 1: Supporting regional Australia

Supporting Regional Australia's contribution to emissions reductions

Discussion Questions:

1. How should the PRF best be delivered with a regional focus?

The PRF is an opportunity to deliver both community and business support however this will only occur if eligibility and merit criteria for access to funds gives appropriate weight to regional community issues such as high quality local jobs, local infrastructure and local services rather than just the size of the emissions.

Energy users in Australia's regional areas are dominated by mining, oil and gas and the food value chain. Arguably, mining and oil and gas already received large concessions from government and have a natural business stabiliser through their dominant influence on the floating Australian dollar exchange rate whereas our food value chain does not have such automatic stabilisers to assist it during down cycles. Furthermore, our food value chain is also more exposed to the impact of weather extremes brought on by climate change. Sectors that are more impacted by exchange rate fluctuations and climate change should be prioritised, the food and beverage value chain.

As demonstrated in AMPC's annual report (infographic below), the ratio of local content for the food value chain is much more than for the mining and oil and gas industries which rely more heavily on the import of very large amounts of capital goods.
Research is needed to support under-utilised technologies such as bioenergy and heat pumps. See RACE for 2030 AD opportunity assessment.

From AMPC annual report 2022

2. If any regions are to be prioritised, what factors should be considered?

A2EP believes that regions with industries that are most exposed to the impacts of climate change, ie weather extremes, should be prioritised. This is largely going to be our agricultural food bowls which can be made more climate resilient with better energy infrastructure that allows them to use energy to improve yields during drought, have more reliability during times of flood and potential alternative income streams selling low carbon products.

3. What is the best way to design and deliver support within any prioritised regions, or otherwise achieve the objective of regional transformation?

Eligibility criteria must be employed to ensure proven, robust solutions are adopted that deliver maximal community benefit. Examples of eligibility criteria would be;
Community value of the operation – number of direct employment jobs for people living in the regional area
Community value of the project – Australian content >50%, regional content >20%
Climate exposure risk rating – is the operation already suffering from extreme weather events?
Technology availability – CRI or 2, 3 or 4 in an Australian context should be prioritised. Early stage (eg solid oxide electrolysers for hydrogen) and late stage (solar PV, LEDs etc) solutions should receive minimal support.

Consultation questions part 2: Decarbonising existing industries

Objective 1: Decarbonising Existing Industries

What we have heard so far

And, in green, some responses from A2EP

- Joint proposals and consortia projects that support investment in common use infrastructure (e.g. electricity grids, hydrogen pipelines, bioenergy plants) could drive decarbonisation much faster than focusing on individual facilities or projects.
  A2EP: agreed, except for hydrogen pipelines given the lack of clear demand coming from energy users.
- Funding towards regional and sectoral decarbonisation planning, roadmaps and coordination would benefit short and long-term targets.
  A2EP: agreed
- Regional decarbonisation projects should anchor to that region's existing strengths.
  A2EP: agreed, furthermore we should focus on sectors where we have global strength and strongly developed local capacity such as alumina refining and aluminium smelting. Australia has the capability and capacity to be the world leader in low carbon alumina and aluminium supply which will likely attract a premium over high embodied carbon supply from countries like China.
- Every facility faces its own challenges and opportunities. It is important to take a technology neutral approach to maximise opportunities when it comes to decarbonisation.
  A2EP: agreed but need to ensure the support is scaled according to the commercialisation level of the solution. For example, LEDs require minimal support to further adoption.
- Facility maintenance cycles means multiple funding rounds are required and should be repeated over several years.
  A2EP: agreed, support should run for at least 5 years.
- Public reporting on project outcomes is critical to knowledge sharing and diffusing technology and practices across sectors. The lessons learned from underperforming projects are often as useful as those from successful projects.
  A2EP: agreed and given the long time between funding and solution operation, knowledge sharing needs to be throughout project development so that the broader industry is not waiting 3 years before receiving the lessons learnt.
- Funding makes the biggest impact on decision making at the project planning stage and can leverage additional investment attraction.

A2EP: agreed, many opportunities are stuck in a project planning stage and in need of funding to develop the design to apply for bank funding.

- Higher benefits and outcomes will be realised with coordination between the Australian Government, state and territory governments, local governments and industry to support planning, infrastructure and supply chains.
  A2EP: agreed, especially by achieving harmonisation between states EPA's.
- Larger businesses and facilities find it easier to apply for funding. Decarbonisation opportunities in small to medium enterprises (SMEs) are often missed due to lack of resource and knowledge.

  A2EP: agreed and given the high percentage of Australian businesses in this category, it should not be ignored.

Discussion Questions:

1. **Is there an approach to funding that will best allow the PRF to be accessible to the depth and breadth of industry across Australia?**

Yes, by ensuring the eligibility for funding is not just based on total emissions or $ for abatement.
Community value of the operation – number of direct employment jobs for people living in the regional area
Community value of the project – Australian content >50%, regional content >20%
Climate exposure risk rating – is the operation already suffering from extreme weather events
Technology availability – CRI or 2, 3 or 4 in an Australian context should be prioritised. Early stage (eg solid oxide electrolyser) and late stage (solar PV, LEDs etc) solutions should receive minimal support.

2. **Do you have any concerns over recipients being required to monitor performance and report publicly on project outcomes (including total abatement achieved)?**

No. We believe that this is essential in driving wider adoption of technology and improving productivity. However, in cases where the technology is less developed (TRL 6 to 9) and in need of impartial verification of the performance results, we recommend support be given to research organisations such as the RACE for 2030 CRC to verify the performance and review the technology for further improvements.

Consultation questions part 3: Preliminary design considerations

Preliminary Design Considerations

Discussion Questions:

1. **What factors beyond emissions reduction should be considered when assessing projects?**

Technologies are available now to improve energy productivity and reduce emissions which should attract the majority of funding. These technologies can achieve exponential adoption rates as the supply chains are already developed. Hard to abate emissions such as high temperature process heat with hydrogen and displacing diesel in heavy machinery does not have readily available solutions or supply chains. High rates of adoption of new technologies for hard to abate areas will not occur as it take a long time to test the many alternatives that need to be explored. Too much funding in these areas will result in highly speculative investments or create inflationary pressure on immature supply chains. Furthermore, heavy machinery supply chains are nearly entirely offshore so funding first

movers in this area is funding overseas R&D and not delivering long term transformation for Australian communities.

Beyond emission reduction, we believe community and technology filters need to be applied such as:
Community value of the operation – number of direct employment jobs for people living in the regional area
Community value of the project – Australian content >50%, regional content >20%
Climate exposure risk rating – is the operation already suffering from extreme weather events
Technology availability – CRI or 2, 3 or 4 in an Australian context should be prioritised. Early stage (eg solid oxide electrolyser) and late stage (solar PV, LEDs etc) solutions should receive minimal support.
Regional / sectoral coverage – to ensure inclusivity, the PRF must take a diversified approach covering multiple regions, sectors, technologies and maturity of technologies.

2. Should the priority be emissions reductions at lowest cost?

Using this criteria for prioritisation will likely result in a narrow set of technology decisions and not help solutions that need to achieve critical mass to reduce costs, for example CSTR anaerobic digestion systems which are approximately 10x the cost to build in Australia vs Germany where they are widely adopted.

3. Should factors such as demonstration/technology potential, difficulty of abatement, electricity network or industry growth and community impacts be considered?

Yes, however areas with high difficulty of abatement should not receive a large portion of funding as excess funding may yield very little in emission reduction. The focus must be on technologies which are available here and now such as bioenergy, heat pumps, mechanical vapour recompression, chemical recovery systems etc..

4. Should a project that demonstrates an experimental technology or supports the establishment of a new industry and jobs be preferred?

Experimental technologies should not receive priority.
Priority must be given to existing industries. These industries have endured >20 years of outsourcing pressure from 'low cost countries' but have remained because of Australia's inherent qualities: a relatively small domestic market with abundant natural resources, skilled but limited labour resources and relatively long supply chains to elsewhere in the world.
Any support for a new industry needs to reflect Australia's strengths. For example, we have little experience and capability building steel mills nor do we have an abundance of skilled labour to operate them whereas we have depth of skill and capacity for resource extraction, mineral processing (titanium oxide, lithium, copper, zinc, lead, nickel, alumina etc), food production and forestry products.

5. How should risk of non-delivery or non-performance be assessed when considering demonstration projects?

Demonstration projects should be de-risked with thorough studies and independent assessment panels. The independent assessment panels must be filled by independent experts within the field of energy and within the specific sector that the demonstration project is going to.

If we assume the demonstration project is seeking funding because of the poor ROI or high risks associated with the project then there should be a clear path to higher ROI and lower risk presented with the funding request. For example:

i. Where else in the world is the technology or concept widely adopted?

ii. Why is this technology currently not attracting investment in the Australian market?
iii. How would funding for the demonstration project reduce costs for future projects? This should be supported with detailed calculations and cost breakdowns.
iv. How would funding for the demonstration project reduce risks for future projects?
v. What additional costs are incurred with this demonstration project compared to future projects when the technology has matured? Include a breakdown of costs (eg additional metering, commissioning, travel, over specified materials, amortisation of R&D costs, etc.) that will demonstrate how future projects will have lower costs.

The funding application should also request a plan on how the project will secure local content and community benefit as well as contingency plans in case of local supply issues.

In terms of specific legal protections for non-delivery or non-performance, A2EP is not an expert in this field so shall not provide any commentary.

6. Are there any other factors that should be considered?

Local job creation must be prioritised.
A worst case scenario for a poorly designed fund would support an industry which used mainly overseas sourced technology and equipment, employed staff mainly located overseas, directed energy supply away from local users, increased local energy prices and where the outputs are only exported securing minimal downstream value add opportunities. An overly supported green hydrogen / ammonia / methanol export industry risks these outcomes.

7. Should grants be open to individual facilities only, or should facilities be able to submit a joint application? For example, proposals to jointly develop common use infrastructure.

Joint applications should be supported. For several technologies such as CSTR anaerobic digestion and hydrogen electrolysers, scale is extremely important. Common use infrastructure is essential to achieving such scale however regulation often does not support this. Funding needs to be allocated to developing regulation to support such opportunities.

We recommend referring to the RACE for 2030 Anaerobic Digestion opportunity assessment by Griffith Uni et al, 2023 for more detailed information on regulation development.

8. Should there be any exceptions to the proposed joint contribution funding model?

Generally, no. Small to medium business may need assistance given the high base costs for such projects.

9. Should in-kind funding be counted towards an applicant's contribution?

Generally, no.

Consultation questions part 4: Industry decarbonisation stream

Industry Decarbonisation Stream

Discussion Questions:

1. Should the IDS support both capital and non-capital investments?

Yes. A2EP has determined that non-capital investment are a major barrier to change for industry as their budgets for such investments are limited given the uncertain nature of the outcome. For example; creating an energy metering plan will typically cost $10-20k for a large facility (>50,000 GJ pa). This essential first step is often overlooked because of the lack of awareness of the criticality and the poor results in a traditional Cost Benefit Analysis given the benefit cannot be easily defined until the metering is in place. Similarly, pre-feasibility studies that assess different decarbonisation technologies are not readily funded by organisations due to the uncertain nature of the outcome. Both need funding support to kick start an energy transition.

2. Does a matched funding model work for the IDS? Should there be any exceptions?

Generally yes the matched funding model will work. However there should be exceptions, for example; pre-feasibility and feasibility studies for small to medium enterprise need to be fully funded as the cost for such studies are excluding them from the energy transition. Furthermore, small emitters sch as dairy farms, wineries, craft breweries need more than 50% support for newer technology given the potential risk for non-performance which may create financial ruin for them.

3. Should the IDS offer grants or another type of financial incentive?

As outlined in A2EP's submission to the National Energy Performance Strategy consultation paper, a framework of long term incentives needs to be developed. Broadly these would be:

a. Rewards for design competitions to kick start innovation in selected areas, eg compressed air alternatives, HVAC for commercial buildings starting with aquatic centres.
b. Grants for pre-feasibility and feasibility studies and decarbonisation planning to help companies assess energy productivity and renewable heating alternatives which will reduce barriers and gain momentum for change
c. Rebates for metering to subsidise the cost of metering and monitoring solutions
d. Grant funding to support first movers of new technology to overcome the 50-200% premium paid by first movers to implement new technology.
e. Accelerated depreciation for energy productivity investments to help business cashflow for such investments. The COVID stimulus measure of accelerated depreciation has been enthusiastically utilised over the last 18 months indicating that this can be an excellent method to stimulate investment.
f. Finance of energy productivity projects which will typically range from $1-10M via low cost loans from the CEFC.
g. Funding for research CRC's to validate performance and provide knowledge sharing of new technologies and processes supported by grants.
h. Performance standards development and implementation

4. Would multiple, targeted rounds of funding support project development?

Yes, however, many organisations are disengaged with government programs due to previous unsuccessful applications for funding. We recommend funding industry associations to help applicants make submissions and give feedback.

5. Would the development of IDS sub-streams benefit project development?

Yes, this would aid in a fairer distribution of funding. Again, we believe that funding be allocated according to community benefit such as regional jobs and local content.

Sub-streams could also be used to ensure that the fund is not just used for a single technology or concept so spread among a range of TRL's and CRI's.

6. What categories of sub-streams should be considered?

A simple method could be the allocation of funding according to direct employment numbers per ANSIC manufacturing codes.

7. What assessment criteria should the IDS use to select projects?

The criteria nominated for the STS are largely appropriate and we believe the following prioritisation should be applied:

1. Commercial readiness level so that here and now technologies are supported first rather than technologies under development which have a high level of uncertainty for delivery of emissions reduction. Furthermore, highly commercialised solutions which already have industries of critical mass such as solar PV and LED's should be de-prioritised.
2. Broader regional economic and social benefit or community benefits including; jobs, impact on local energy prices, impact on local services.
3. Workforce development;
4. Value for money (i.e. emission reduction per dollar of public funding
5. emission reduction (i.e. scope 1 emission abatement to 2030 or 2050);
6. demonstration potential;
7. the capacity of the facility to implement the project and likelihood of it would be implemented without the funding.

8. Should the assessment criteria differ from those proposed for the STS?

Generally, no.

9. Should joint proposal for common use infrastructure projects be given priority?

Generally, no. The correct assessment criteria should deliver the required outcomes.

10. Do SMEs and small-scale projects require additional support?

Yes, especially the pre-feasibility and feasibility study phases as well as the energy metering which is fundamental to securing the most economical energy transition.

11. Should any specific regions be prioritised for the IDS?

A2EP has no input for this question.

Consultation questions part 5: Developing new clean energy industries

Objective 2: Developing New Clean Energy Industries

What we have heard so far

And, in green, some responses from A2EP

- Australia has a unique opportunity to use its competitive advantages to create world leading clean energy, low carbon resources and green metals industries.
  A2EP: agreed, except for green steel which is not aligned with Australia's inherent strengths.
- Many businesses are already moving towards clean energy industries such as green hydrogen, bioenergy, alternative fuels including sustainable aviation fuel, energy storage and firming, green metals, critical minerals, solar and wind.
  A2EP: we disagree. Our research has shown that little movement is occurring towards green hydrogen and bioenergy. Some movement towards electrification is being observed.
- Existing Commonwealth, State and Territory funding measures are already providing significant and effective support for clean energy industries. PRF support should either target residual gaps or flow through existing programs.
  A2EP: we somewhat agree. Current funding measures do support renewable electricity supply but do not support energy productivity measures or bioenergy or electrification. The 'residual gaps' are very large.
- A one size fits all approach to supporting new clean energy industries is not appropriate. Every region, technology and industry has unique advantages and challenges. PRF support should target specific barriers and priorities. For example:
- Australia's regions are at different stages of developing and implementing plans for decarbonisation and prosperity under net zero. In some locations developing a plan for net zero is the highest priority, while in other locations the priority is supporting implementation of an existing plan or accelerating investment already underway.
  A2EP: agreed
- The technologies required to support clean industries are at varying levels of readiness. Early stage, high risk and emerging technology projects require different forms of support to technologies that are approaching commercial readiness.
  A2EP: agreed.
- Existing and emerging clean energy industries are at different stages of development. The financial support needed to accelerate industry growth is sector specific. For example, the incentives required to accelerate the hydrogen industry are different to those required by the offshore wind or green steel sectors.
  A2EP: agreed, however we should prioritise areas related to Australia's strengths which is not steel making.
- Investment is needed at the early-stage testing and demonstrating of different technologies as this is the highest risk stage. If these projects are not successful, the lessons learnt are still beneficial.
  A2EP: agreed, however a lot of technology to decarbonise is already available.
- Many of the barriers to investment in regional clean energy industries are not financial, but relate to land and planning, regulatory approvals, workforce skills and housing availability.
  A2EP: agreed, as well as missing regulation for biogas / biomethane and hydrogen covering specifications, hazardous facility requirements etc.

- Opportunities that onshore processes, reduce supply chain risks and enhance energy security and sovereign capability should be prioritised.
  A2EP: agreed, however each of the above criteria should be considered in isolation and with careful consideration. An argument for energy security should not create a blanket opportunity to onshore industries that do not align with Australia's strengths, for example the automotive industry. The need for energy security is best demonstrated with the east coast prices seen through 2022 which have not manifested in Western Australia largely due to the gas reservation policy. Similar local protections need to be support for a hydrogen export industry.
- Joint proposals and consortia projects with a focus on supporting common use and enabling infrastructure will help contribute to national targets.
  A2EP: agreed.

Preliminary Design Considerations

Discussion Questions:

1. **Should support for the development of new clean energy industries be targeted towards specific sectors, regions, or stages of technology development?**

Yes. Given the increasing global demand for materials required to build new energy systems (lithium, nickel, aluminium, graphite, zinc etc), priority needs to be given to supporting decarbonising production of these minerals with existing technologies to achieve early wins.

Priority should also be given to sectors that will achieve community benefit through cost of living relief such as the food value chain.

2. **How should regions be defined or delineated to provide clarity to applicants?**

A2EP has no input for this question.

3. **What forms of coordination and planning should the PRF support?**

Industry associations should be funded to coordinate studies for best practice and knowledge sharing for newly implemented energy productivity and decarbonisation solutions. Given that most industry associations do not have extensive energy teams, they should be supported by universities and industry associations which specifically work with energy, eg the Institute for Sustainable Futures, RACE for 2030 CRC and the Australian Alliance for Energy Productivity.

Planning should consult various industry associations in the energy space and consider specific reports to support optimal roll out of technologies.

4. **How can the PRF avoid duplicating existing coordination mechanisms in particular regions, industries and for particular technologies?**

Industry associations can be employed to provides these links and convene necessary forums.

5. **How can the PRF complement existing funding for clean energy industries?**

A2EP has no input for this question.

6. **Should PRF funds be allocated to existing initiatives? If so, please specify which ones.**

We believe that PRF funds for large emitters should be directed to or via ARENA who can utilise their ARP methodologies for administration.

However, we do not support the funding of more solar PV, wind, batteries as these industries have already reached critical mass and have sufficient existing policy support. We also do not support of hydrogen electrolysers given the extremely long lead time and the poorly developed model for local demand.

7. What types of financial support should the PRF offer to support new clean energy industries? For example, grants, tax deductions, equity, concessional loans, subsidies, etc.?

As outlined in A2EP's submission to the National Energy Performance Strategy consultation paper, a framework of incentives needs to be developed. Broadly these would be:

a. Rewards for design competitions to kick start innovation in selected areas, eg compressed air alternatives.
b. Grants for pre-feasibility and feasibility studies and decarbonisation planning to help companies assess energy productivity and renewable heating alternatives which will reduce barriers and gain momentum for change
c. Rebates for metering to subsidise the cost of metering and monitoring solutions
d. Grant funding to support first movers of new technology to overcome the 50-200% premium paid by first moves to adopt a new technology.
e. Accelerated depreciation for energy productivity investments to help business cashflow for such investments. The COVID stimulus measure of accelerated depreciation has been enthusiastically utilised over the last 18 months indicating that this can be an excellent method to stimulate investment.
f. Finance of energy productivity projects which will typically range from $1-10M via low cost loans from the CEFC.
g. Funding for research CRC's to validate performance and provide knowledge sharing of new technologies and processes supported by grants.
h. Performance standards development

8. How should the impact of PRF support for new industries be measured and assessed?

A carbon emissions productivity measure should be used next to an energy productivity measure.

Criteria for community impacts (economic, social) should also be assessed.

Numbers of personnel trained (Cert III or higher) and jobs created

Knowledge sharing activities planned and completed such as:

Number of attendees at knowledge sharing webinars

Number of videos uploaded to YouTube

Short training courses developed

The number of indigenous people trained (Cert III or higher) and employed to support the technology, directly or indirectly.

Consultation questions part 6: Workforce development

Objective 3: Workforce Development

What we have heard so far

And, in green, some responses from A2EP

- There is workforce and skills shortage across many industries and regions that will impact on industry growth.
  A2EP: agreed, especially for electricians and skilled tradespeople
- Larger businesses are already integrating workforce development and upskilling into new projects and business plans. However, SMEs do not have the same capacity.
  A2EP: agreed, hence the need for additional support beyond just co-funding.
- Major decarbonisation projects and the creation of new clean energy industrial facilities do not happen in isolation, they create a network of suppliers, subcontractors and associated industries that work together.
  A2EP: agreed, provided local content is a major eligibility requirement
- Workforce support could be linked to projects that contribute to decarbonising existing industries or developing new clean energy industries.
  A2EP: agreed. New courses and support for regional apprenticeships need to be developed.
- In many regional areas social infrastructure such as housing, education and health care needs to be developed to support workforce participation and retention.
  A2EP: agreed, therefore local content and community impact needs to be considered with funding.

Discussion Questions:

1. **What are the main challenges when it comes to workforce development?**

Not our area of expertise.

2. **Are you currently experiencing any skills shortages that impact your ability to develop or deliver a potential project?**

Yes, we are struggling to find energy professionals that understand energy usage across a wide range of industries.

3. **How should the PRF support workforce development?**

Using local content and community impact as eligibility criteria

4. **Should additional funding be offered to projects that deliver greater workforce development and participation?**

Yes, if this can be demonstrated.

5. **Should workforce development be an eligibility requirement?**

   Yes by using a local content and community impact measurement.

6. **How should workforce development impacts be measured and assessed?**

The number of people who contributed more than 10% of their time to the project from inception to practical completion

Personnel trained (Cert III or higher) and jobs created

Knowledge sharing activities planned and completed such as:

Number of attendees at knowledge sharing webinars
Number of 'how to' videos uploaded to YouTube
Short training courses developed

7. Should applicants be required to estimate the number of workers required for construction, maintenance and ongoing operation? How should temporary and permanent roles be compared?

Generally, yes, however this is not our area of expertise

8. Should applicants be required to identify the potential for existing workers and job seekers in the region to be engaged under their project?

Generally, yes, however this is not our area of expertise

Energy productivity – The first fuel

Leadership for transformation

If energy performance improvement – for end-use and supply – is to deliver its potential for economic and emissions outcomes, leaders in government will need to make clear that the 'energy transformation' begins with a reframing. The future of energy is fundamentally about the services it enables, rather than methods and markets for delivery.

The recently established Energy Ministers' Meeting, the premier forum for federal, state and territory energy ministers to collaborate, has created a National Energy Transformation Partnership. A statement about the Partnership notes that it

> *"… is a framework for national alignment and cooperative action…*
>
> *"…in a new era of cooperation and collaboration, the time is right to work together on a new agreement to set the vision for Australia's energy sector transformation to net zero.*
>
> *"… aims to provide additional certainty to support investment in renewables, storage and transmission…"*

One of seven principles for collaboration is to "recognise the role electricity networks and demand side participation will play in delivering the energy transformation". And one of the six initial priority themes is to "understand demand evolution", to

> *"cooperate on demand evolution and regional-level scenario planning, in the light of increasing electrification and demand management opportunities (including energy efficiency, distributed energy resources, electric vehicles and demand response).*

These are the only direct references to energy use, demand, consumption. There is no reference to the services powered by energy, to energy performance or productivity, or to the integration of 'prosumption' with consumption. If the NEPS is to succeed, energy ministers and the Transformation Partnership will need to address energy performance as a priority in its charter.

Design and regulate for the realities of consumers and consumption

Australia's energy market frameworks and institutions are dedicated to supply-side matters. This starts with the National Energy Objectives, which refer to 'price' instead of 'cost'. Energy productivity improvement may not reduce energy prices – indeed it may increase them but reduce overall costs to consumers or deliver improved services that have value. The focus of much energy market activity relates to short-term demand management focused on actions that will benefit market participants or deal with short-term transients, often at long-term cost to consumers. There is a near total absence of understanding of demand-side fundamentals resulting in a sustained failure to meet any the of the three Objectives, exemplified by the consumer-focused National Energy Retail Objective:

> *"to promote efficient investment in, and efficient operation and use of, energy services for the long term interests of consumers of energy with respect to price, quality, safety, reliability and security of supply of energy."*

The Energy Security Board (ESB) brings together the heads of the three national energy market institutions, the Australian Energy Market Commission (AEMC), the Australian Energy Regulator (AER) and the Australian Energy Market Operator (AEMO) and "provides whole of system oversight for energy security and reliability to drive better outcomes for consumers". The ESB operates between ministerial masters on one hand and institutional interests on the other. The ESB should be

tasked to ensure that "security and reliability" are better informed by energy use-data and balanced by assessments of innovation and performance. The ESB could be tasked with a "whole of system" emissions reduction target.

Even allowing for the statutory constraints under which it operates, the AEMC continues to undervalue demand-side interests in its deliberative processes. This is well illustrated by a recent publication, *How the national energy objectives shape our decisions*. [1] The AEMC "undertakes reviews and provides advice to governments on improvements to current regulatory and market arrangements… monitors and reports on matters such as the level of competition in energy retail markets, future price trends and energy market performance". Monitoring and reporting by the AEMC should better account for the demand side of energy markets including the energy performance of centralised generators and network systems.

The AER makes determinations that structure energy supply systems and contribute to energy prices for the very long term "in the interests of consumers". The AER continues to sanction the investment of billions of dollars for electricity and gas networks based on demand forecasts that draw on superseded consumption patterns, poor quality data and flawed econometric modelling. Even allowing for 'uncertainty' [2] the AER could better accommodate models for energy consumption that are aligned with significantly improved energy [use] performance.

We acknowledge that reliability of energy supply is critical for households and businesses. However, it is also the case that forecasts of demand drive significant investments in the energy value chain that are eventually paid for by those households and businesses. This is the case regardless of whether energy is grid-supplied or locally produced. It is essential that forecasts of demand, across supply systems and at the consumer level, are realistic. And it is essential that investment decisions are based on assessment of optimised demand rather than on inflated or worst-case expectations.

The 2022 Integrated [electricity] System Plan (ISP), developed by AEMO, canvasses four scenarios for development of the National Electricity Market (NEM) to 2050. The 2022 ISP notes that the

> *decarbonisation of the NEM is a key pillar, which influences, and is influenced by, shifts in the other three:*
>
> - *Electricity sector decarbonisation, being the speed at which the carbon intensity of electricity generation approaches zero.*
> - *Fuel-switching from fossil fuels to zero or near-zero emissions alternatives, including electrification.*
> - *Energy efficiency through improved energy productivity and waste reduction.*
> - *Carbon offsets through non-energy emission reductions and sequestration, with technology-based carbon sequestration likely accounting for 3-10% of all sequestered carbon (depending on the scenario).*

For an illustration (literally) of the invisibility of end-users and the demand-side, see the ISP graphic reproduced later in this submission.

Also developed by AEMO, the 2022 Electricity Statement of Opportunities (ESOO) describes the Step Change Scenario (the ESOO Central Scenario) for development of the national electricity market, which involves rapid consumer-led transformation of the energy sector and co-ordinated economy-

[1] AEMC, How the national energy objectives shape our decisions, October 2022

[2] AER, Regulating gas pipelines under uncertainty – Information paper, November 2021

wide action. In this scenario "… energy efficiency is as important as electrification…" [3]. The 2022 ISP, developed with the same forecasts and modelling, assumes that in 2030 energy efficiency savings across the NEM total 22TWh and electrification of the industrial and residential sectors boosts demand for electricity by 31TWh. [4]

The 2022 ESOO notes that "[m]itigating a significant portion of … forecast growth in consumption for the business sector is the projected rise of energy efficiency ... Reduced energy consumption from increased energy efficiency is forecast to save between 4 TWh and 15 TWh by 2031-32 across the scenarios".

The NEPS could usefully unpack the assumptions behind these forecasts, along with what is required to achieve and exceed them, and then put in place tracking and mechanisms to ensure outcomes are delivered.

[3] AEMO, 2022 ESOO, p21

[4] AEMO, 2022 ISP, p31

Appendix 1: Further reading for key Issues

To achieve economical emissions reduction we need to fix energy data

It is widely acknowledged that energy-use data, from individual facilities to the national economy, is inadequate and unreliable. Information on the fundamental energy requirements of delivered services is almost non-existent. The increased uptake of 'smart' electricity metering has begun to address this issue, but inconsistently. It is critical that the right data is captured and translated into useful information for consumers and beyond, for policy makers, system designers and market regulators. It is important to access much improved data on the efficiency of gas use, not only to support gas efficiency improvement, but also to underpin informed costing and design of efficient and cost-effective electric alternatives.

If the National Energy Performance Strategy does not include a program of targeted investment in: metering equipment; cloud-based systems for analytics, monitoring and automation; data aggregation, analysis and reporting, then the PRF should include this. Energy analysis should utilise multiple data streams such as weather, production, occupancies, etc so that useful, timely, actionable insights can be provided to decisionmakers.

Much of the data input to models used for significant policy and investment decisions is at best incomplete and inconsistent. By way of example, recent analysis undertaken for the federal government notes that

> *as with the … [business mass market] commercial sector, literature quantifying the rate of market-led, or autonomous, energy efficiency improvement in the … industrial sector in Australia is limited.*
>
> *… energy efficiency improvement in the … industrial sector is inherently more challenging to quantify than for other sectors, due to the significant data limitations that characterise this sector*
>
> *it is not feasible to assess total energy efficiency change in the … industrial sector. As a result, the market-led component of change is also not known.* [5]

The PRF should work with the NEPS to include measures to address and improve data quality. And in developing a NEPS, the limitations in data quality and biases inherent in assumptions that inform policy should be acknowledged. By way of example,

> *the Monash Multi-Regional Forecasting (MMRF) model incorporates an Autonomous Energy Efficiency Improvement (AEEI) parameter, which specifies the rate of annual energy efficiency improvement but not its source. In the long run, the AEEI parameter is assumed to be 0.5 per cent per year. The parameter is higher in the near term, averaging 0.8 per cent per year to 2025, to reflect a range of policies from the Australian and State Governments that drive improvements in energy efficiency.* [6]

Assumptions such as the AEEI parameter inform modelling and policy. They should be tested against reality and corrected as needs be.

[5] Strategy.Policy.Research, Energy Efficiency Forecasts 2021 – Final Report, July 2021 p46

[6] Climate Change Authority, Climate Change Mitigation Scenarios**,** Modelling report provided to the Climate Change Authority in support of its Caps and Targets Review, Appendix A Modelling framework and assumptions

Identify sweet spots and outliers

A2EP is concerned that economy- or sector-wide targets for energy performance might mask some opportunities for improvement. The sheer diversity of businesses and energy needs within a sector described as "industry" or "manufacturing" suggests an approach that looks for proven prospects while encouraging innovation. It would be possible to assess potential through any one or a combination of these filters:

- Sectors: eg manufacturing
- Sub-sectors: eg food and beverage
- Processes: eg heating, cooling
- Equipment and facilities
- Supply or value chains
- Comparisons of energy intensities of similar businesses: typically there is a broad distribution, and the outliers can be usefully targeted if they are identified.

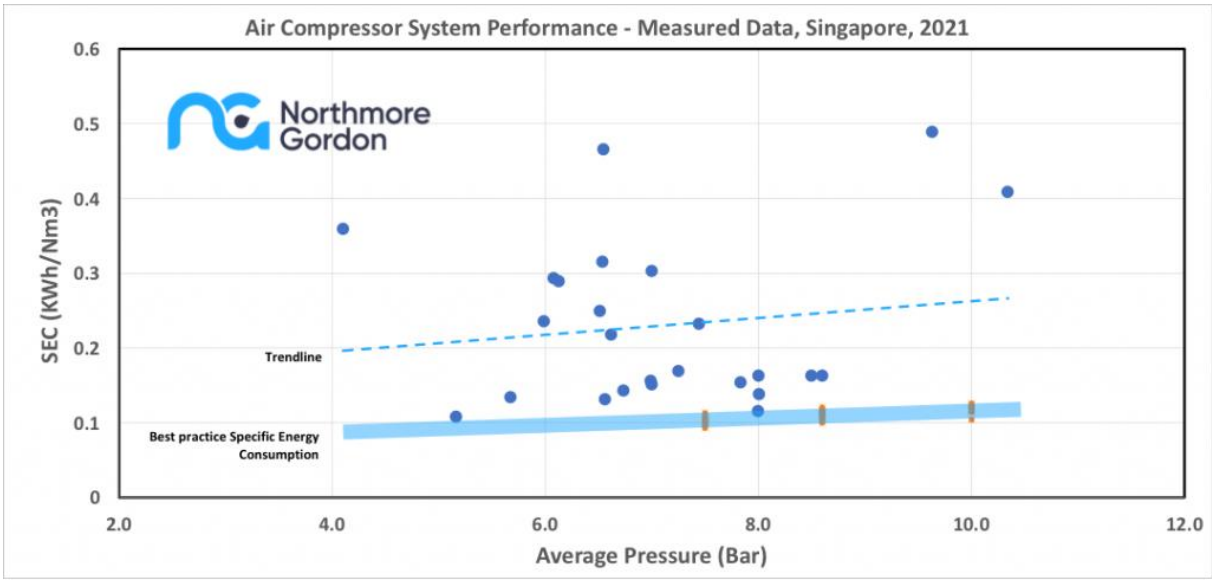
International experience should inform decisions about how to focus the NEPS and measures that derive from it. For example, and perhaps surprisingly, the IEA observes that

> *... more than 90% of heat demand in light industry is low- and medium-temperature… despite having a lower energy footprint, light industry has a higher energy-saving potential than heavy industry, accounting for 70% of total energy savings of the industrial sector. These savings could help manufacturers produce twice as much value for every unit of energy consumed, along with many other benefits, including increasing competitiveness…significant employment.* [7]

By way of example, and with a view to 'equipment and facilities' a recent article authored by Northmore Gordon observes that "implementing effective solutions first requires good data. Utility benchmarking should be a top priority for all companies and organisations who wish to advance their decarbonisation efforts and take greater control of their own energy security". [8]

[7] International Energy Agency, Energy Efficiency 2021, pp76-77

[8] https://northmoregordon.com/articles/why-benchmarking-of-factory-utilities-is-key-to-unlocking-potential-of-energy-efficiency/?utm_medium=email&utm_campaign=December%202022%20Northmore%20Gordon%20Newsletter&utm_content=December%202022%20Northmore%20Gordon%20Newsletter+CID_05750414a8b6d7e0bd90794898949076&utm_source=Email%20marketing%20Campaign%20Monitor&utm_term=Click%20here%20to%20read%20the%20full%20article#gsc.tab=0



NEPS policies need to compliment the PRF

- Harmonise and extend nationally energy savings or emissions reduction programs such as the NSW Energy Savings Scheme, the Victorian Energy Upgrades program, the SA Retailer Energy Productivity Scheme and the ACT Energy Efficiency Improvement Scheme
- Expand the Renewable Energy Target to include bioenergy
- Provide incentives for early adoption of energy productivity improvement technology to overcome first mover risk premium and encourage wider adoption through knowledge sharing
- Make permanent the instant asset write-off tax benefit for investments in energy productivity improvement
- Implement a nationwide compressed air system (CAS) innovation program such as that as developed by NSW OECC (previously DPIE), expanded to include demonstrations of high efficiency alternatives to compressed air
- Implement a nationwide energy metering/sub-metering and data analytics program to create the ability to match energy to output, assist in identifying energy savings opportunities and optimising maintenance and investment
- Develop a program for energy productivity improvement across value chains to ensure that a focus on (and investments in) energy performance identifies inefficiencies at interfaces between businesses and distributes benefits fairly between participants
- Establish a research, development and deployment program for low cost, high impact, easily installed retrofits for businesses and buildings in a range of priority sectors such as, for example, food and beverage manufacturing
- Launch a heat pump innovation centre and program with ongoing capability and substantial resources, and links to international development activity. It should cover commercial, industrial and residential issues and address the low level of competence at universities, trade training, consultants and supply chains.
- Funding industry associations to provide on-going training and knowledge sharing for energy productivity and decarbonisation technologies

Understand how businesses get information and make decisions

The success of any strategy to improve energy productivity in industry is utterly reliant on an understanding of the ways in which firms are motivated to seek information, consider options for action (and inaction), understand benefits and costs, and make decisions. A strategy for change should account for the practical and cultural dimensions of transition from business as usual (inertia) and be cognisant of competition for attention, priority, capital.

A business might respond to regulatory necessity, financial opportunity, reputational risk or some combination of factors. Information can be obtained from a variety of sources including internal experts, peer organisations and industry associations, contractors and consultants, government agencies, independent experts including academia and non-government organisations. The strategy should be considered and deliberate about communications channels.

A business case for change can be relatively pro forma (allowing for scale). But a business case for energy productivity improvement and investment should be complete; it should account for all benefits and costs – energy-specific, collateral (non-energy), environmental and carbon-related – with financial values attributed to each. The strategy should be alert to how firms make decisions and facilitate decision making.

By way of example, A2EP recently reviewed data output from the Agriculture Energy Investment Plan, a large scale AgVic project. It is clear that farm businesses rely heavily on information and advice provided by accountants and financial advisers. These communications channels are not well understood, not well utilised; they have great potential.

Recent research undertaken by Business NSW, involving the survey of a wide range of SME nationally, found that

> *The most used sources of advice to business were among those they found least useful, while the most useful sources of advice were among the least used. Business/engineering consultants and peak bodies were seen as being the most useful sources of advice (>50per cent report them being very or extremely useful), but fewer than 15 per cent of businesses had sought advice from those sources. In comparison, although energy companies and online research were identified as the least useful sources of advice (<40 per cent report them being very or extremely useful) these were by far the most commonly used sources of advice.*
>
> *Expanding businesses' access to advice from trained engineers or peak bodies with industry sector expertise potentially offers a significant improvement in the value businesses place on the advice received. As a peak body which has provided expert energy consultancy to businesses over recent years, Business NSW is certainly supportive of efforts to expand this model of advice delivery to SMEs. To reach more businesses in the years ahead requires a new program with an expanded remit and with resourcing to maintain advice that is free and independent.*[9]

[9] Business NSW, Unfinished business – Putting small business energy policy back on the table, December 2022

Peak organisation body: useful advice but rarely utilised

Source: *Unfinished Business – Putting small business energy policy back on the table, Business NSW, 2022*.

Appendix 2: Energy productivity case studies

Using energy to improve productivity and profit is a great thing, however it needs to be coupled with an energy productivity mindset and goal to decarbonise. A2EP has worked on many cases where energy performance and decarbonisation has been achieved whilst also increasing overall Net Present Value, ie creating additional profit not additional cost. Below are six such examples.

1. **Compressed air systems (CAS):** compressed air is understood to account for around 10% of industrial electricity consumption, although there is insufficient data to support this number. CAS are inherently inefficient and typically waste 90% of input energy (electricity). A2EP recently worked with the NSW Government on a program that involved subsidised assessments for more than 100 manufacturing sites, for which CAS typically consumed 15% of electricity. The assessments identified interventions with average potential CAS-related electricity savings of 50% and an average payback period of 1-2 years. Most of these savings came from fixing leaks, rescheduling compressors and cleaning dryers and filters. A2EP prepared an extensive (world-leading) report [10] on alternatives to CAS that could achieve far bigger energy savings and integrate smart, flexible, connected electronic replacements that could significantly enhance business productivity.

   Lessons: There has been little interest in basic maintenance and monitoring of CAS or adoption of the transformative options identified by A2EP. Low awareness, lack of an integrated alternative supply chain, perception of risk in change and lack of demonstration projects have undermined progress.

2. **Aquatic centres:** Aquatic centres in Australia are mainly heated with gas and they are very inefficient compared with global best practice. This is a system-level problem that begins with thermally poor buildings (with corrosion, condensation, unhealthy air quality and high maintenance costs) designed by architects and builders with little understanding of physics (in contrast to German architects) resulting in extremely inefficient heating systems that poorly utilise large amounts of input energy and waste heat. Attempts to introduce improved approaches met surprisingly strong opposition from designers and engineers. Efforts by A2EP, some councils and some consultants now seem to have begun a transition, but there is a long way to go.

   Lessons: Integrated approaches to design of the building and pool system is fundamental, as the building thermal performance and layout, management of waste heat (hot humid air) and pump/fan energy systems dominate energy waste. Lack of familiarity among designers and engineers, established supply chains, gas industry influence and broad ignorance among councillors and council staff were key issues. Lack of suitable products and design guidelines, challenges in getting demonstration projects in place, and lack of energy (especially gas) and water monitoring and data analytics all contributed to the barriers. There is potential to retrofit existing facilities for significantly improved performance as highlighted in a recent project reported online here: https://c9cdneca.azureedge.net/media/3160/ceo21021-a2ep-optimising-energy-use-in-swim-schools-negawatt-projects.pdf?rnd=133126021550000000

[10] A2EP, Compressed air systems, emerging efficiency improvements and alternative technologies: Review, background research and examples, August 2020 (https://022fdef7-26ea-4db0-a396-ec438d3c7851.filesusr.com/ugd/c1ceb4_d266b903584b49879de7ecfbe8b70b5e.pdf?index=true)

3. **Product recovery**: for most manufacturing facilities, yield is king. Every kilogram of lost product is money, energy and embodied carbon going down the drain. Solutions exist to recover lost product such as centrifuges used to recover beer from yeast or membranes to regenerate chemical cleaning streams. Each of these solutions require energy to recover lost value but overall provided additional added value and lowered embodied carbon

   Lessons: a pure energy efficiency approach to energy performance will not deliver the best possible outcomes. A productivity approach that considers an entire value chain must be prioritised over a simple energy reduction approach.

4. **Commercial and industrial heat pumps:** A2EP has been an Australian leader in educating and engaging across industry on heat pumps. A2EP has worked with ARENA, state governments, AiGroup and the Energy Efficiency Council (EEC) to drive change. A2EP partnered with EEC to produce a recently released report commissioned by the federal government, *Harnessing heat pumps for net zero – The role of heat pumps in saving energy and cutting emissions*. This research explores the potential for heat pumps in a wide range of applications. Australia has very limited academic, technical and professional capability to drive innovation in this area. Yet the world leading Powerpax chiller was developed in Melbourne.

   Lessons: We need a national heat pump innovation centre and program with ongoing capability and substantial resources, and links to international development activity. It should address commercial, industrial and residential issues. The level of competence at all levels, including universities, trade training, consultants and supply chain is weak. There is a need to engage with ongoing rapid innovation in technologies, and to develop commercially suitable products and services.

5. **Dairy and agriculture:** A2EP has worked with several state government agencies in this sector. While reliability and costs associated with energy systems are considered important, they are not top priority for most farmers. The multiple benefits of energy productivity are not well understood, and supply chains are weak.

   Lessons: Farmers are concerned about risk. Past unfortunate experiences such as poor-performing heat pumps as well as lack of recognition of the business development potential of innovations support reluctance to adopt. In some programs, lack of expertise of energy assessors has limited the range and perceived practicality of recommendations. In one program, field staff spent substantial time engaging with farmers and their financial advisers. The latter can play a powerful role in encouraging farmers to act. Some pilot projects have lacked strong technical support, so implementation problems have not necessarily been dealt with effectively. Emerging technologies such as robotic milking, low carbon tractors, heat pumps and digitalisation require ongoing innovation to address field issues, but Australia has limited capability. Recent work by A2EP and others has demonstrated both potential and pitfalls. Further investment in development, demonstration and deployment is required.

6. **Value Chains:** A2EP has been evolving its approach to applying Value Chain thinking to production, supply and use of products and services since its first *Next Wave – Innovation* report of early 2017 [LINK]. This very powerful approach emphasises the interdependence of supply chain participants, the economic and energy inefficiencies that occur at interfaces between participants (eg due to conflicting priorities and perceptions of value), the reality that all the

money comes from the end consumers, and exploration of perceptions and preferences about the services provided to open up disruptive alternatives.

Lessons: The approach meshes well with digitalisation, circular economy and increasing focus on scope 3 carbon emissions. Several reports have been published and an innovative RACE for 2030 study on Industry 4.0 (digitalisation) and Energy Productivity has been completed: this highlighted the knowledge gaps between I4.0 and energy efficiency consultants, and potential synergies between digitalisation, improving energy productivity and business innovation. A RACE project focusing on the animal products and fruit&vegetable sub-value chains is under way at present. It has highlighted inefficiencies at business interfaces and a failure to incorporate consideration of energy productivity in a strong focus on managing food waste within the supply chain. Even though half of food waste occurs beyond the supply chain (ie with consumers), there is limited focus on this, possibly because reducing consumer food waste may reduce revenue and place pressures on the supply chain.

7. **Value chains and digitalisation:** Based on earlier analysis in *Next Wave-Innovation*, A2EP worked with FIAL and a supermarket chain to place real time temperature sensors in food at the farm, and track it along the path to the food retailer. Substantial work is now occurring within industry associations and businesses to commercialise this approach. This project highlighted the deep lack of quality real time data AND expert analytics and communication systems to convey the value to the many individual businesses involved, many of which are SMEs or MicroSMEs. The approach identified inefficient, faulty and inflexible equipment where RDD&C action could be focused, including refrigeration, refrigerated trucks.

   Lessons: This project highlighted the many energy and productivity inefficiencies and opportunities for innovation. They also flagged a need for greater cooperation along the Value Chain [a RACE for 2030 project is presently exploring this for the animal products and fruit and vegetable value chains]. A key challenge is to build understanding of the benefits to each participant from innovation, and to introduce effective mechanisms to fairly share costs, benefits and change.

References

Australian Energy Market Operator, 2021 Inputs, Assumptions and Scenarios Report – Final report for use is Forecasting and Planning studies and analysis, July 2021

Australian Energy Market Operator, Forecasting Approach – Electricity Demand Forecasting Methodology, September 2021

Australian Energy Market Operator, 2022 Gas Statement of Opportunities – A report for eastern and south-eastern Australia, March 2022

Australian Energy Market Operator, 2022 Integrated System Plan for the National Electricity Market, June 2022

Australian Energy Market Operator, 2022 Electricity Statement of Opportunities – A report for the National Electricity Market, August 2022

Australian Energy Market Operator, 2022 Forecasting Assumptions Update – For the 2022 National Electricity Market Electricity Statement of Opportunities and its Reliability Forecast, August 2022

CSIRO and ClimateWorks, Multi-sector energy modelling, July 2021

CSIRO, GenCost 2021-22 – Final report, July 2022

Climate Change Authority, Climate Change Mitigation Scenarios - Modelling report provided to the Climate Change Authority in support of its Caps and Targets Review Appendix A Modelling framework and assumptions, 2013

Energetics, Modelling and analysis of Australia's abatement opportunities Meeting Australia's 2030 emissions reduction targets – Report to the Department of the Environment, May 2016

Northmore Gordon, *Why Benchmarking of Factory Utilities Is Key To Unlocking Potential of Energy Efficiency*, published online 19 December 2022

Strategy.Policy.Research, Energy Efficiency Forecasts 2021 – Final Report, July 2021