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Budget Policy Division  
Department of the Treasury  
Langton Crescent  
PARKES ACT 2600

Email: [prebudgetsubs@treasury.gov.au](mailto:prebudgetsubs@treasury.gov.au)

**RE: 2020-21 PRE-BUDGET SUBMISSION – NERA (NATIONAL ENERGY RESOURCES AUSTRALIA)**

## 1. Executive Summary

Despite developing one of the strongest energy resources sectors in the world, today Australia's \$55 billion GVA per annum energy industries are being challenged on the local and global stage. Conversely, Australia faces a unique set of challenges to deliver a clean, affordable and reliable energy future that is in turn supporting a growing, globally competitive economy and delivering jobs for all Australians.

As the country's Industry Growth Centre for energy resources, NERA presents this 2020-21 Pre-Budget submission to identify the challenges and opportunities facing our sector and highlight the significant trends and priorities that can drive long term economic growth and jobs through the discovery, commercialisation, transfer and deployment of advanced technologies across sectors of competitive or strategic advantage to the nation.

**To help realise this opportunity**, this Pre-Budget submission highlights the following priorities for funding:

- Additional resources for NERA to work with Australia's energy resources sector to support, accelerate and invest in new energy and advanced and low emissions technologies that will be required for Australia to address climate change and meet its carbon emissions reduction targets. Specifically, NERA will be seeking additional funding from the Australian Government for:
  1. **Operational and project funding of \$2,000,000** to support the first four years formation period for a new NERA Hydrogen Technology Cluster – as set out in COAG's 2019 National Hydrogen Strategy. The aim is to establish a member-based organisation that will drive economic opportunities for SMEs, identify efficiencies, regulatory barriers, work skills and accreditation in collaboration with education establishments. The Hydrogen Technology Cluster will create a technical forum for

high value technology development cities and regional hubs. Matched funding will be sought from the states/territories and from industry and research partners.

2. **Operational and project funding of \$5 million** over three years for the Australian Ocean Energy Centre (AOEC) to specifically catalyse the development of internationally competitive ocean energy technologies and capabilities to deliver resilient coastal and island communities, including faster disaster recovery capabilities through integrated micro-grid systems. Integrated micro-grid systems utilising ocean energy can deliver multiple benefits including more stable and predictable energy, integration with other renewable sources (solar/wind), fresh water for human and animal consumption, small-scale hydrogen for fuel replacement, oxygen for waste treatment systems and night-time recharging of batteries if required. Further details are provided in this submission.
- That the government establishes a scheme to provide loans to allow Australian hardware technology companies to finance the growth of their business. NERA's industry consultation has identified that access to affordable long-term working capital is one of the critical barriers to substantial and sustainable growth for many companies across the energy resources sector. The scheme could be administered by NERA on behalf of the Federal Government, with clearly defined criteria that would allow Australian scale up companies with market ready technologies to access much needed equity to allow for the fabrication of products and technologies without having to pursue high cost equity through either bank finance or venture capital markets. Such a scheme could be modelled on the regional investment corporation farm investment loans scheme<sup>1</sup>.
  - Ongoing support and resourcing at or above the current levels for the Industry Growth Centres as a central program in the Australian Government's industry and export policy and action plan, with the strategic goal of building a resilient, diverse, low emissions and advanced technology-based economy over a long-term horizon.
  - Support the \$51 million funding proposal submitted in December 2019 by C02CRC Ltd to the Minister for Energy and Emissions Reduction, Hon Angus Taylor MP and the Minister for Resources and Northern Australia, Senator the Hon Matthew Canavan. The proposal is for \$51 million over the period July 2020 to June 2025 (to be matched) to drive a viable ongoing future for carbon capture, utilisation and storage (CCUS) research, demonstration and innovation.
  - Provide support to the identification and development of skills delivery mechanisms to facilitate the deployment of emerging automation and robotics technologies into regional and metropolitan Australia. This could include development of national VET curricula around industrial applications of field robotics and industrial internet of things (IIoT) technology.

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<sup>1</sup> For more information see: <https://www.ric.gov.au/farm-investment>.

## 2. Background to Industry Growth Centres

NERA is the national Industry Growth Centre for Australia's energy resource industries. We are one of six Industry Growth Centres set up by the Australian Government to drive long term economic growth and jobs through the discovery, commercialisation, transfer and deployment of advanced technologies across sectors of competitive or strategic advantage to the nation. The Industry Growth Centres are match funded by the Australian Government and industry stakeholders, with additional funding provided by some state governments. The six Industry Growth Centres are:

- Advanced Manufacturing Growth Centre (AMGC)
- Australian Cyber Security Growth Network (AustCyber)
- Food Innovation Australia Limited (FIAL)
- Mining Equipment, Technology and Services (METS Ignited)
- MedTech and Pharma Growth Centre (MTPConnect)
- National Energy Resources Australia (NERA).

The six Industry Growth Centres, alongside the Defence Capability Network and the recently established Australian Space Agency, are collectively building up technological innovation systems and provide a vital cross industry network of domain expertise and knowledge, demand driven technological innovation and research, and a growing network of Export Hubs.

Sharing knowledge, technologies and innovative solutions across leading industries such as space, energy, emergency services, mining, agriculture, advanced manufacturing, medical and defence, is critical to Australia's global competitiveness, creating market scale for local supply chains and long-term prosperity for all. The transformation of Australia's economy requires a national strategy that does not back 'winners' but rather supports collective experimentation, continuous learning and adaptation and a multi-pronged approach across key sectors.

## 3. NERA Impact and Value

NERA operates as an independent and trusted source of information and insight into the energy resource industry's challenges and opportunities, and a national focal point for connection to the technology solutions that will ensure Australia maximises its huge energy advantage.

NERA vision for our sector is

***'Australia as a global energy powerhouse, a sought-after destination for investment and the leading source of knowledge and solutions.'***

Since our inception in 2016, NERA has worked to maximise the value to the Australian economy by supporting the energy resources sector to be globally competitive, sustainable, innovative and diverse.

NERA's 10 Year Sector Competitiveness Plan benchmarked the Australian's energy resource industry's competitiveness performance against a global peer set, and identified a prize of **\$10 billion** value add to the economy each year through improvements in four priority areas:

- Supply chain.
- Research and innovation.
- Workforce skills – particularly in maintenance and technical operational knowledge and including new skills for advanced technologies.
- Regulatory reform.

Our primary stakeholders are from across the oil and gas sector; however, NERA is playing an increasing role in supporting new energy solutions such as hybrid solar, gas, ocean energy and battery projects and low emissions technologies, including enhanced oil recovery through carbon utilisation. In addition, NERA is working on the formation of a national Hydrogen Technology Cluster as part of the COAG National Hydrogen Strategy<sup>2</sup>. The focus is on 'clean' hydrogen but is inclusive of coal and gas as sources of hydrogen production combined with carbon capture, utilisation and storage (CCUS) technologies, as well as renewable energy.

With over 160 project partners from industry operators, supply chains, SMEs and innovators, research organisations and governments, NERA's project fund of \$15.6 million is creating a x2.5 multiplier for the energy resources sector that is leveraging additional project investment from industry.

NERA's strategic activities target the collaboration, R&D, commercialisation, skills and regulation required to understand and support:

- improved efficiency across the whole value chain and the lifecycle of assets, through accelerating the deployment of new technologies and improving operating practices;
- developing and using intelligent assets to unlock productivity gains from next generation sensors, field robotics, data analytics tools and machine learning, including identifying the skills required to develop, operate and maintain the technology;
- the commercialisation and adoption of clean technologies to reduce waste and lower emissions;

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<sup>2</sup> COAG, (November 2019), National Hydrogen Strategy, <https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy>.

- the energy resources sector’s plans to manage the energy transition e.g. develop alternate energy such as hydrogen (leveraging the LNG industry’s experience in cryogenic process plant) and CCUS; and
- independent research, science and data on industry performance and environmental impacts.

#### **4. Supporting Australia’s Energy Resources**

Australia has developed one of the strongest energy and resources sectors in the world, built on world-leading innovation and creating and sustaining over 230,000 direct jobs.<sup>3</sup> Ten times the number of direct jobs are created in the rest of the economy as a result of investment in Australia’s oil and gas industry<sup>4</sup> – highlighting that sector’s long investment in leading technology and its high value, but also critically, the huge opportunity and threat that will arise from the growth or decline in further investment in the sector and in leading technologies.

To address this threat Australia must both support investment in the vital energy resources needed to power the economy, but also support, accelerate and invest in advanced technologies and across industries where it has a competitive or strategic advantage. Support for and investment in low emissions technologies will also be required to address climate change and assist Australia meet its carbon emissions reduction targets.

#### **5. Resources Technology Loans Scheme**

From extensive consultation with Australia’s resources technology development sector it has become increasingly evident that one of the critical barriers to meaningful and rapid growth for many scaling up businesses is access to affordable capital. The majority of emerging businesses in the sector with new technology struggle to secure affordable equity over sensible terms that align with the lengthy development cycles of their new products. Consequently, technology either takes longer to develop, fails to be commercialised or is financed from overseas with the corresponding loss of opportunity for Australia.

NERA is proposing the consideration of the development of a government backed loan scheme, administered by NERA on behalf of the Federal Government, that would provide suitably qualified and evaluated organisations with access to the capital they need to underpin and accelerate their growth. It is believed that such a scheme could double or more the rate of growth of a number of businesses, increasing employment, growing exports and contributing

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<sup>3</sup> Office of the Chief Economist, December 2019, “Resources and Energy Quarterly”, <https://www.industry.gov.au/data-and-publications/resources-and-energy-quarterly-december-2019>.

<sup>44</sup> National Energy Resources Australia, AlphaBeta Report 2018, “Preparing Australia’s future oil and gas workforce”, <https://www.nera.org.au/Publications-and-insights/Workforce-report>.

greater levels of revenue to the national economy through both domestic and international sales.

## 6. Key Challenges and Opportunities

Over the next decade, major sector challenges will transform the product and technology mix of successful energy and resource companies globally, particularly the need to invest in digital/data technologies, address climate change, reduce emissions and, increasingly, find competitive alternatives and renewable energy solutions. NERA is playing a key role in creating the collaboration and innovation connections essential to ensure Australia successfully navigates this transformation. These major challenges, and opportunities to tackle them, are listed below:

### A. Addressing Climate Change

It is broadly accepted by expert scientists and by society that the climate has changed and will continue to change globally and locally. The unprecedented scale of and environmental devastation caused by Australia's bushfires confirms what the energy resources sector and others have been saying and acting on for a while - the urgent need to focus on what we can all do collectively to address climate change and lower emissions whilst also ensuring we secure access to the affordable, reliable and clean energy that is so fundamental to every part of the Australian economy.

Making real progress to address climate change, build a resilient economy and communities and manage an energy transition, whilst balancing complex global and local social and economic justice issues, will require all parties to work collectively and constructively on a coordinated range of solutions.

Scenarios for global and local energy demand and supply trends vary widely depending on the assumptions made. However, some broad trends and challenges are identified in the International Energy Agency's (IEA) World Energy Outlook 2019<sup>5</sup>, including:

- Global greenhouse gas emissions data shows that energy-related emissions hit another historic high in 2018;
- Almost one billion people around the world do not yet have access to electricity;
- Cost reductions in renewables and advances in digital technologies are enabling the energy transition and the growth in electricity use, whilst also adding challenges to traditional energy systems that need to be addressed;
- The faltering momentum behind global energy efficiency improvements is cause for deep concern. It comes against a backdrop of rising needs for heating, cooling, lighting, mobility and other energy services;

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<sup>5</sup> IEA 2019 World Energy Outlook, 2019, <https://www.iea.org/reports/world-energy-outlook-2019>.

- There is a three-way race underway among coal, natural gas and renewables to provide power and heat to Asia’s fast-growing economies;
- But in all scenarios the role of gas continues to grow out to 2040. Demand for natural gas has spurred a worldwide wave of investment in new Liquefied Natural Gas (LNG) supply and pipeline connections, (see Figure 1 below); and
- Large-scale deployment of CCUS will be vital to reduce the world’s emissions and to secure the future of Australia’s existing energy and other industries. Existing power plants, factories, cargo ships and other capital-intensive infrastructure will also need to address emissions reduction.

APPEA, Australia’s peak national body representing upstream oil and gas explorers and producers, makes the key point in a 2019 submission to the WA Government on climate change that Australia’s gas industry, domestically and through exports of liquefied natural gas (LNG), contributes substantially to the economic development of the nation (Australia is currently the second largest LNG exporter after Qatar) and reduces global greenhouse gas emissions – particularly for our Asian trading partners across the Asia-Pacific<sup>6</sup>. This needs to go hand in hand with solutions to reduce local emissions at point of production but solutions must be cost effective and competitive in the context of the international energy market.

APPEA also highlights the deep experience and capabilities that the Australian resources sector has developed over decades from operating in remote and challenging environments, designing projects to take account of climate variability, building resilience into operations, and ensuring both preventative and mitigation protection measures are in place and continuously reviewed. Australia has demonstrated it has learned from previous natural disasters, particularly regarding protecting lives and homes, but there is much more to be done to prevent, adapt and mitigate such climate-induced disasters, and the resources sector is a natural partner.

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<sup>6</sup> APPEA, September 2019, Climate change in Western Australia Issues paper, <https://www.appea.com.au/wp-content/uploads/2019/12/APPEA-submission-Climate-change-in-Western-Australia.pdf>.

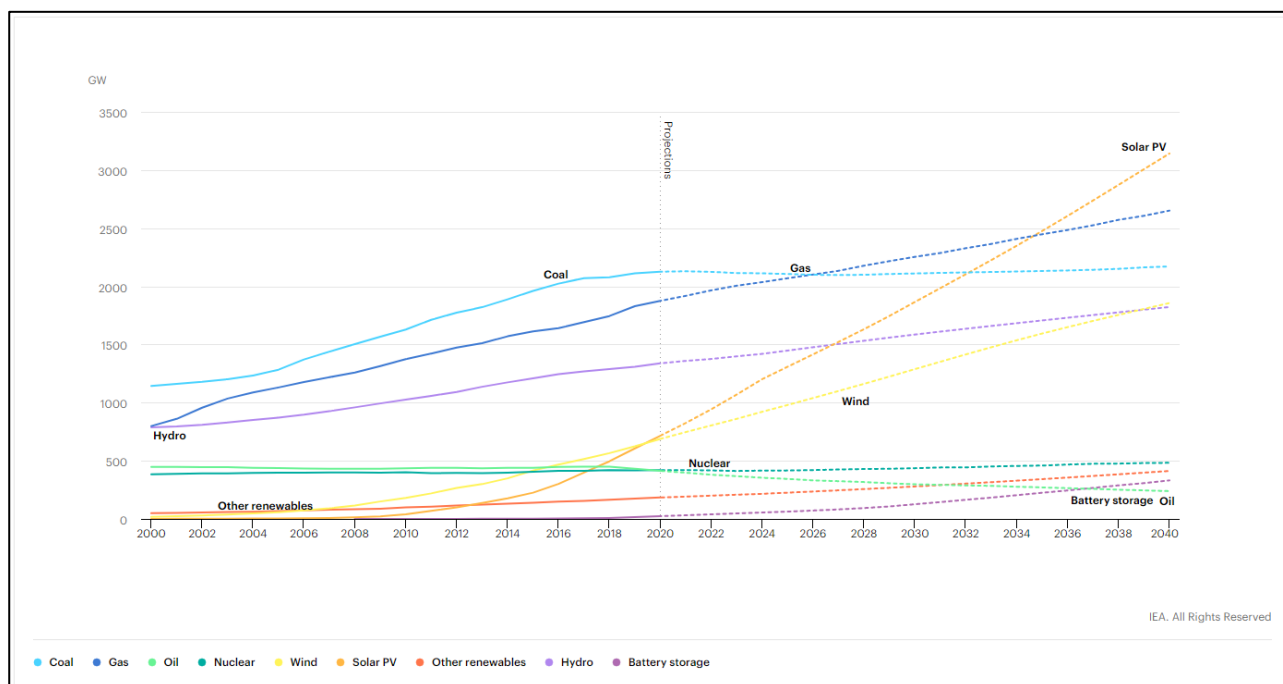


Figure 1: Installed power generation capacity by source in the IEA’s Stated Policies Scenario, 2000-2040

### B. Australia’s Global Competitiveness

While Australia earned a substantial \$50 billion contribution to the economy from exports of LNG in 2018-19, as noted above, the Australian oil and gas industry is facing increasing global competition and a changing global energy sector. There has been a rapid expansion in global LNG supply capacity over the last few years and the Chief Economist’s Office expect that to continue in 2020 although at a slower pace<sup>7</sup>. Qatar and the US are likely to surpass Australia’s LNG exports by the mid-2020s.

Against this backdrop, Australia remains a relatively high cost producer. Due to increased global competition, the sector is working individually and collaboratively (through for example a range of projects and strategic initiatives with NERA<sup>8</sup>, supply chains and other organisations such as universities, CSIRO, the WA Government’s LNG Jobs Taskforce, the C02CRC) to manage cost structures, improve efficiency and deploy advanced technologies to increase value.

NERA is also supporting a number of innovative and collaborative approaches to regulations that apply to Australia’s energy resources sector, including supporting a major drive by global

<sup>7</sup> Office of the Chief Economist, December 2019, “Resources and Energy Quarterly”, <https://www.industry.gov.au/data-and-publications/resources-and-energy-quarterly-december-2019>.

<sup>8</sup> For examples of some of NERA projects, see <https://www.nera.org.au/Publications-and-insights/Energy-futures-1>.



and local operators to align to international standards and reduce the costly burden on supply chains of individual operators requiring their own over engineered/ bespoke standards in contracts through harmonising industry requirements. In 2016, NERA supported the establishment of the Standards Australia mirror committee to ISO's global oil and gas standards committee and we are supporting the ongoing work of that committee and the equivalent mirror hydrogen technologies committee<sup>9</sup>.

Another example of an innovative, best practice approach to regulation is NERA's Collaborative Seismic Environment Plan (EP) to be submitted to the Commonwealth's offshore petroleum regulator NOPSEMA. For more information on NERA's collaborative Seismic EP Project see Appendix 2.

Action by industry to address cost structures and drive value creation needs to be supported by government policy and regulation that does not add disproportionately to doing business in Australia.

### C. Future Skills

Australia's energy resources sector has been at the forefront of operational excellence and technological innovation for decades, supporting huge export earnings, jobs and underpinning the country's prosperity. Employment across the sector increased by 15 per cent between 2017 and 2018, with a huge increase in pipeline and transport employment. The sector directly employs over 98,000 people, and up to five times that number are employed in the supply chain (technology, equipment and service companies). Up to 10 times that number are supported in the broader economy.

However, the rapid global development of digital and automation technologies and what is often called Industry 4.0 or the Fourth Industry Revolution, will reshape Australia's energy resources sector, revolutionising business and operating models. This needs to be supported by new skills and capabilities, including the vocational/trade skills to operate and maintain increasingly automated and smart assets. Future skills and jobs in the energy resources sector will have strong links to emerging technologies, increasingly requiring flexibility, problem solving, data and numeracy skills. Industry, education providers and governments need to intensify efforts to work together to build a pipeline of talent to meet the rising demand for skills and innovation

The sector will need to operate in the future in an open industrial interoperability ecosystem, with full enterprise level integration of systems and data and optimised performance. Digital twins will be critical as will common standards across the systems and data. This will also support new innovators and technology providers to enter the sector in an open ecosystem that is no longer dominated by a few large companies with proprietary technology that locks out new and smaller innovators.

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<sup>9</sup> For more information, see: <https://www.nera.org.au/News/StandardsShowcaseSuccess>.

Emerging innovations in automation are specifically related to the way that enabled and integrated digital technologies, including sensors, combined with ever more powerful data analytics tools, are providing industry with greater insights and improving asset utilisation and productivity.

NERA projects provide many examples of industry and innovators succeeding in commercial demonstration of these technologies and validating the significant impact/benefits that can be realised across all levels of the value chain<sup>10</sup>.

Converting existing and additional data into tangible insights and actions is, however, not straightforward. First, it requires development of the right tools and talent to obtain insights from data and determine the desired direction. Following this, safe environments to test innovation, including built or virtual environments, are essential.

The use of living labs, simulation technologies and digital twins is increasingly creating safe test environments to prototype and deploy innovation and technology and enabling developers to access and gain understanding about what industry genuinely needs, and form partnerships with operators and miners to collaborate, co-create and adapt solutions. Such test labs also provide ideal and safe future skills development environments.

There are several initiatives now underway in Australia to better coordinate Australia's R&D efforts and investment in automation technologies and in the future skills required to support those technologies. For example, CSIRO has established the Sixth Wave Alliance to bring together researchers and industry to accelerate the development and commercialisation of automation and autonomous systems. CSIRO has also established a Robotics Innovation Centre to empower greater collaboration across the robotics research sector, governments, industry and academia.

The Australian Federal Government has also established a series of industry 4.0 test labs to help bring researchers, industry, innovators and users together to gain the maximum benefits. These test labs are housed at the University of Queensland, University of Technology Sydney, University of South Australia, University of Tasmania, University of Western Australia and Swinburne University of Technology. To gain the greatest benefit for Australia, these test labs need to maintain a close link with and provide direct benefit to industry for both the development of technology and to ensure the Australian workforce is equipped with the skills to work with emerging technology. One example of where this is being accomplished is through the Open Process Automation Forum (OPAF) and Open Industrial Interoperability Ecosystem (OIIE) linkages to the WA based 4.0 test lab. These linkages are seeing the test lab become the home for the world's first OPAF certification facility, providing a training and testing facility

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<sup>10</sup> For examples of some of NERA projects, see <https://www.nera.org.au/Publications-and-insights/Energy-futures-1>

where personnel can learn how to deploy these emerging technologies directly into industry platforms.

In 2018, AlphaBeta and NERA released a joint report *'Preparing Australia's future oil and gas workforce'* outlining three scenarios for the potential trajectory of the oil and gas workforce to 2030. The report intends to enable industry, policy makers and training providers map and plan for workforce transition and future workforce skills for automation and digitalisation, whilst recognising the uncertainty of potential future scenarios and the need for adaptability. Doing so can add \$74 billion to the economy by 2030 and create over 82,000 jobs. To realise this, however, it is critical that Australia works to upskill current and future workers to adapt to this change.<sup>11</sup>

Building a strong basis for R&D and skills in emerging automation technologies is a priority if Australia's energy resources sector is to remain internationally competitive. This will involve developing new cross-industry and cross-community training programmes in data analytics, automation and robotics and business skills for start-ups and SMEs to commercialise innovation and scale up into global markets.

With much of the new automation and robotics technology being deployed across multiple sectors including resources, agriculture, health and defence, into remote and regional Australia, ensuring suitably skilled personnel are available in these locations to service and maintain them is critical.

The cross-industry use of similar technologies provides a critical mass that could sustain regional skills pools, but these personnel will require local access to training on an as needed basis, skills that can be provided though appropriately directed and supported VET facilities. For more information, see Appendix 3: Case Study on NEXXIS Robotics.

#### D. Domestic Gas

NERA's mandate and focus are to help the industry achieve greater efficiency, improve productivity and bring more reserves to market through collaborative and innovative solutions and supports the oil and gas sector's peak advocacy body, APPEA, and their position on domestic gas<sup>12</sup>.

A number of NERA's collaborative projects seek to secure the long-term supply of natural gas into the east coast market. These projects cover a range of critical areas including improving social license by increasing the sector's understanding of environmental impacts, improving

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<sup>11</sup> NERA, 2019, Preparing Australia's future oil and gas workforce, <https://www.nera.org.au/Featured-workforce-report>.

<sup>12</sup> APPEA, February 2019, 2019-20 Federal Pre-Budget Submission, [https://www.appea.com.au/wp-content/uploads/2019/02/APPEA-SUBMISSION-FEDERAL-BUDGET-2019-20\\_update.pdf](https://www.appea.com.au/wp-content/uploads/2019/02/APPEA-SUBMISSION-FEDERAL-BUDGET-2019-20_update.pdf).

success and efficiency of production drilling to reduce environmental impact and exploring new basins to increase reserves. By way of one example:

**Case Study: The Jundah Project: Unlocking the Toolebuc Formation<sup>13</sup>**

The Jundah Project seeks to prove the petroleum production potential of the highly prospective Toolebuc Formation. The Toolebuc Formation has the potential to supply natural gas to the east coast domestic market, helping to address energy security priorities. Key NERA project deliverables include:

- Improved understanding of the formation and the mechanisms that underpin petroleum release;
- Volume estimation of unconventional shale reservoirs; and
- Delineation and characterisation of the Toolebuc Formation shale play through the development of a regional basin and petroleum systems model.

E. Accelerating Innovation

Despite the realities of being a highly capital intensive and high-risk sector, the energy resources sector has undertaken a substantial level of technology innovation over the past decade – gas turbines, deep water and subsea engineering, LNG and horizontal drilling just to name a few. However, it can take decades to move innovation first from commercialisation of technologies to achieving a sustainable market share. Faced with global competition and the urgent need to discover, adapt and deploy advanced, cost effective and low emissions technologies, Australia and the sector need to find ways to accelerate this process.

For established technologies with high potential for innovation and where there is a clear line of sight to a long term and sustainable market, the private sector can generally take the major role, and will identify priorities and allocate finances and resources accordingly. Where however, the technologies are not yet commercial, the market is not established or its long term viability clear, the costs required to commercialise the technologies are high and/or societal factors such as global and national commitments to reduce carbon emissions are involved, governments and clear policy goals play a critical role. This is the case for example, for CCUS demonstration projects, and to build new supply chains for an Australian hydrogen industry or for automation and robotics.

The Industry Growth Centres are collectively playing a key role in accelerating the commercialisation of advanced technologies through support for emerging supply chains and assisting them access local and global supply chains and achieve scale through multiple industry sector penetration. NERA, as the Industry Growth Centre for energy resources, is increasingly playing a role in supporting the acceleration of low emissions technologies through

<sup>13</sup> For more information: <https://www.nera.org.au/NERA-projects/jundah-project>.

the deployment of our project funds and through technology clusters. Hydrogen, CCUS, the blue economy and ocean energy are covered in further detail in this submission.<sup>14</sup>

### **Case Study: Australian Technology Catalogue portal powered by NERA<sup>15</sup>**

NERA has implemented an Australian Technology Catalogue — an online platform that connects technology suppliers and end-users to solve oil and gas challenges and rapidly deploy technologies.

Recognising the challenges many Australian operators and technology end-users have when searching for and comparing available solutions, and the challenges many Australian technology suppliers have deploying their technology, this platform is all about connecting operators and technology end-users with the solutions they need.

Accelerating international pathways for Australian innovators: End-users can quickly explore, review and compare multiple options to find the right solutions to their specific challenges.

Feature technology solutions: The Technology Catalogue allows suppliers to showcase and prove their technology solutions, helping them to connect with end-users and bring their technology to market

## **7. Significant Trends and Priorities**

As an Industry Growth Centre, NERA has a mandate to foster collaboration and innovation and help the energy resources sector respond to emerging trends and priorities. Through this work, NERA helps facilitate movement towards developing a common expectation about the skills, regulatory frameworks and industry responses needed to prepare for an uncertain future. The key trends and priorities affecting Australia's energy resources sector are addressed below:

### **A. Remote Operations, Robotics, Automation and AI**

Australia's energy resources and the broader resources sector are leading the world in remote management of their operations, including through the deployment of robotics, automation and artificial intelligence. These technologies and applications are critical requirements in any future near space and other space exploration initiatives. Australia is seeking to advance on existing capabilities and strengths through partnering space technology and services with other industries, for example the Federal Government is supporting investment in space data analysis facilities that can support analysis of satellite data for areas such as mining, agriculture, emergency services and maritime surveillance, and will build capability in data analysis for space missions.

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<sup>14</sup> For more information on NERA's range of projects and their impact and value back to the sector, visit: [www.nera.org.au/NERA-projects](http://www.nera.org.au/NERA-projects).

<sup>15</sup> For more information: <https://nera.technologycatalogue.com/>.

The Industry Growth Centres are all supporting advanced technologies in robotics, automation and AI. For more information on NERA's range of projects and their impact and value back to the sector, visit: [www.nera.org.au/NERA-projects](http://www.nera.org.au/NERA-projects).

#### B. Hydrogen Supply Chain and Australian SMEs

There has been a considerable amount of work undertaken (both globally and domestically) that seeks to quantify the economic opportunities associated with hydrogen. Australian governments agree that clean hydrogen presents an opportunity for Australia to take the lead in the emerging global market for low and zero emissions energy.

In December 2019, the COAG Energy Council launched a National Hydrogen Strategy to:

- build a clean, innovative and competitive hydrogen industry;
- position Australia's hydrogen industry as a major global player by 2030; and
- coordinate the approach to projects that support hydrogen industry development.

The National Hydrogen Strategy forecasts a cautiously optimistic scenario that could see an Australian hydrogen industry generate about 7,600 jobs and add about \$11 billion a year in additional GDP by 2050.

Whilst the global hydrogen economy is still embryonic and will develop and mature over the next two decades, action is required now to ensure Australia captures the significant opportunity to help shape the production and use of hydrogen and becomes a leading source of hydrogen knowledge and solutions. It addresses the whole hydrogen value chain from production, storage, transport to the applications/utilisation.

To overcome barriers to market activation, action is needed to build the scale and capabilities of Australia's hydrogen industry start-ups, scale-ups and SMEs and help them commercialise their intellectual property (IP) here in Australia.

The four overarching 'Actions' identified by the National Hydrogen Strategy<sup>16</sup> include tasking NERA to support Australian SMEs to take advantage of opportunities in the hydrogen industry by forming an industry-led hydrogen cluster. The cluster will build capabilities and drive industry collaboration across the value chain. This will help maximise the economic benefits by ensuring Australian companies are well placed to supply new technology, products and services. The cluster proposal and objectives support the portfolio of the Hon Minister Karen Andrews MP.<sup>17</sup>

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<sup>16</sup> See xvii of the Executive Summary of COAG Energy Council's National Hydrogen Strategy, <https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy>.

<sup>17</sup> For more information on NERA's Hydrogen Cluster: <https://www.nera.org.au/News/Hydrogen-cluster>.

A cluster is a concentration of enterprises (including technology SMEs) and related knowledge communities linked by similar interests and needs. An industry led cluster opportunity emerges based on such factors as geographic, resources, infrastructure, R&D, knowledge advantages, and market opportunities and challenges. Clusters each have different preconditions and potential. They can be small or large and the participants can be in a regional, national or international position. Clusters help SMEs, researchers and governments collaborate and innovate to tackle common challenges that they could not achieve on their own. The members of a cluster need to have a level of interdependence, whilst still having the ability to own their own IP and compete. For SMEs, clusters provide a 'central' connection point for customers to find and access their capabilities. Clusters support the development and scaling of industry supply chains.

The NERA Hydrogen Technology Cluster will build capabilities and drive industry collaboration across the value chain to help maximise the economic benefits by ensuring Australian companies are well placed to supply new technology, products and services. The Hydrogen Technology Cluster will create a technical forum for high value technology development in city and regional hubs. Founding cluster partners will come from leading energy resource organisations, including from the LNG industry, research institutions, innovators and importantly would provide vital support for start-ups, scale-ups and SMEs drawn from across Australia and connected to the local and world hydrogen opportunities.

The priorities and timeframes are:

- **Short-term** – establishment; local, national and international partners; identification of first work programs.
- **Medium-term** – work skills committee; technology and suppliers forum.
- **Long-term** – self-sustaining growth model focussed on technology and market development aligned with state, national and international opportunities.

#### ***Immature Clusters Need Government Support***

International experience is that the early phase of identifying and bringing together an emerging industry-focused community and fostering early collaboration and innovation requires significant government and other support. Norway provides the best example of government policy underpinning strong industry led and high value creating clusters and Norway is taking this approach for hydrogen.

**A total of \$2,000,000 of additional funding** over a four year period will be sought from the Australian Government to support NERA's \$200,000 already committed and being deployed for the short to medium term timeframes and priorities, with additional matched funding to be sought from the states/territories and other early foundation members.

#### C. Carbon Capture, Utilisation and Storage

Currently the annual world production of hydrogen is about 70Mt. The majority (98%+) is produced from the steam reforming of methane or gasification of coal.<sup>18</sup> In the short term hydrogen can immediately be made from these steam reformers of methane, in well-established industrial processes, and this can also act as an early entry point for low-cost CO<sub>2</sub> transport and storage. However, this would require the separation of the CO<sub>2</sub> emissions if Australia is to meet its emissions targets.

Carbon Capture and Storage (CCS) and its supporting technologies will therefore need to be an integral component of Australia's approach to its hydrogen economy and activating the technology market. While CCS is available internationally at commercial scale (1mtpa), this is not the case in Australia. However, there are some world leading pilot projects:

- The Hydrogen Energy Supply Chain (HESC) is a world-first pilot project to safely and efficiently produce and transport clean hydrogen from Victoria's Latrobe Valley to Japan. This project provides a good opportunity for the proposed NERA Hydrogen Technology Cluster to learn from access to Japanese expertise and engagement. The project could potentially bring billions of dollars of international investment to Victoria and Australia, create a significant number of jobs across pilot and commercial phase construction and operations and position Australia as a global leader in the supply of clean hydrogen energy. The HESC project will create a sustainable solution for the use of Australian coal deposits that does not contribute to carbon emissions, by coupling the project with CCS and considering carbon offsets to mitigate the CO<sub>2</sub> produced by gasification and gas refining process.
- The CarbonNet Project (CarbonNet) is another initiative that the cluster would benefit from partnering with. CarbonNET is investigating the potential for establishing a commercial-scale CCS network. The network is seeking to bring together multiple CO<sub>2</sub> capture projects in Victoria's Latrobe Valley, transporting CO<sub>2</sub> via a shared pipeline and injecting it into deep underground, offshore storage sites in Bass Strait. The Gippsland region is widely recognised as a world class location offering significant potential for CCS. The offshore Gippsland Basin has been found to have the highest technical ranking of 25 major basins across Australia and the largest storage potential of any east coast basin.<sup>19</sup>

Historically, developed industrial economies have over-focused on the application of CCS to electricity generation from coal with some attention to gas. This has pitched the final product of decarbonised electricity (from coal) into a market where subsidised renewable generation can produce electricity at prices comparable to or cheaper than conventional high carbon

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<sup>18</sup> See the International Energy Agency (IEA) 2019 report:

[https://webstore.iea.org/download/direct/2803?fileName=The\\_Future\\_of\\_Hydrogen.pdf](https://webstore.iea.org/download/direct/2803?fileName=The_Future_of_Hydrogen.pdf).

<sup>19</sup> Carbon Storage Taskforce 2009, National Carbon Mapping and Infrastructure Plan – Australia: Full Report, Department of Resources, Energy and Tourism,

[https://www.parliament.wa.gov.au/parliament/commit.nsf/\(\\$lookupRelatedDocsByID\)/518FAC2BBA6C246648257C29002DB8E6/\\$file/NCM\\_Full\\_Report.pdf](https://www.parliament.wa.gov.au/parliament/commit.nsf/($lookupRelatedDocsByID)/518FAC2BBA6C246648257C29002DB8E6/$file/NCM_Full_Report.pdf).



power. CCS then fails commercially. **The true value of CCS is its ability to be applied across the entire economy.**

NERA has good linkages to Australia's research organisations and industrial companies currently working on the application of carbon capture, utilisation and storage (CCUS). Organisations such as CO2CRC, CSIRO, ANLEC and Coal21 who are currently working on CCUS (using both industry and government funding) would be encouraged to become key contributors into the NERA Hydrogen Cluster.

As noted by CO2CRC Ltd:

*“Global energy demand will rapidly grow into the foreseeable future. Even with significant reductions in fossil fuel reliance, commitments to a two-degree emissions limit cannot be met unless the fossil fuels we continue to use are properly abated. Emissions reduction will require a full suite of responses: increased use of renewable energy, greater energy efficiency, fuel switching, and the use of carbon capture and storage as the major technology to curb industrial emissions.”<sup>20</sup>*

The International Energy Agency expects that CCUS will account for seven per cent of the cumulative emissions reductions needed globally by 2040.<sup>21</sup>

NERA support the \$51 million funding proposal submitted in December 2019 by CO2CRC Ltd to the Minister for Energy and Emissions Reduction, Hon Angus Taylor MP and the Minister for Resources and Northern Australia, Senator the Hon Matthew Canavan. The proposal is for \$51 million over the period July 2020 to June 2025 (to be matched) to drive a viable ongoing future for carbon capture, utilisation and storage (CCUS) research, demonstration and innovation.

#### *CCS and Enhanced Oil Recovery (EOR)*

Resource companies such as Santos and Bridgeport are exploring the use of CO2 into EOR in the Cooper and Surat Basins. In December 2019, the NERA Board approved funding for a strategic carbon CCUS project in partnership with CO2CRC Ltd and oil and gas companies. The project, which will likely commence in April 2020, will examine the economic and technical feasibility of CCUS and the potential of using CO2 in enhanced oil recovery for all prospective onshore and offshore basins in Australia. The study has the potential to bring to the Australian energy market what are currently marginally economic resources, and will comprise of two main tasks:

- Task 1: screening all prospective onshore and offshore basins in Australia for their potential for CO2-EOR and associated CO2 storage.

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<sup>20</sup> For more information see: See CO2CRC, 'What is CCS', <http://www.co2crc.com.au/whats-ccs-2/>).

<sup>21</sup> International Energy Agency (IEA), 'Carbon Capture and Storage', <https://www.iea.org/topics/carbon-capture-and-storage/>).

- Task 2: a detailed field-level study to assess the technical feasibility of applying CO<sub>2</sub>-EOR and CO<sub>2</sub> storage in Australia's onshore oilfields (priority will be given to the Cooper and Surat basins). This includes estimating oil recovery and CO<sub>2</sub> requirements, identifying viable CO<sub>2</sub> sources, performing screening-level economic analysis and exploring supportive policies, incentives and regulations.

#### D. Harness Australia's Ocean Energy

The International Renewable Energy Agency (IRENA) has noted: *"The potential of oceans as an energy source is staggering – more than sufficient to meet global electricity demand well into the future. Yet the contribution of ocean energy to the world's energy mix remains very small, with key technologies still in development and demonstration phases."*<sup>22</sup>

Fulfilling the potential of ocean energy requires continued investment into technology development, national test sites, supportive industry policies and continued engagement across related industry supply chains such as for example: offshore wind, oil and gas, aquaculture and advanced manufacturing.

Around the world, increasing commercial maturity is expected to be achieved in competitive nations such as the UK, Portugal, Ireland, France, USA, Canada, Japan, the Republic of Korea and many others. The governments in these countries have realised the potential for ocean energy to contribute to energy independence, decarbonisation and job creation, with ocean energy being recognised as far more predictable than solar and wind. Tides are predictable over all time frames and waves have a forecast horizon up to three times more than wind.<sup>23</sup>

Australia, the world's largest island continent, has enviable access to ocean energy, with over 25,000 kms of coastal area and the third largest Exclusive Economic Zone, with over 80 percent of that being classified as offshore, beyond two nautical miles from the coast and subject to oceanic waves, tidal currents and wind. With the world's most powerful wave and tidal resources available, ocean energy development in Australia means our surrounding seas and oceans offer enormous potential to deliver power (energy and hydrogen), heating and cooling, drinking water and other products (for example oxygen). This potential is multiplied when partnered with:

- other major infrastructure projects such as offshore wind farms or deep-sea oil and gas platforms.
- other renewable energy sources (solar/wind) to deliver improved predictability, decreased variability, spatial concentration, and greater socio-economic benefits in the localised area.

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<sup>22</sup> International Renewable Energy Agency, Ocean Energy Report 2014, [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/IRENA\\_Ocean\\_Energy\\_report\\_2014.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/IRENA_Ocean_Energy_report_2014.pdf).

<sup>23</sup> CSIRO, Ocean Renewable Energy, 2012.

## 8. Australian Ocean Energy Group and Integrated Micro Grids

NERA is supporting the Australian Ocean Energy Group (AOEG) - an industry-led cluster formed to facilitate industry collaboration across the ocean energy industry to create significant value for Australia. The founding partners include leading energy organisations, Australian research institutions, plus innovators and SMEs drawn from across Australia and the world.<sup>24</sup>

NERA's project funding and industry support to AOEG is providing the important catalyst to attract engagement and collaboration with Australia's energy sector and adding ocean energy to Australia's future energy mix. The following are some of the key ocean energy projects that will be implemented for Australia in 2020:

- Development of a 10-year Ocean Energy Roadmap: This strategic industry document will outline opportunities to accelerate ocean energy technology development in Australia as a commercial, stable and viable low carbon energy source, suitable for multiple industrial and community applications. In developing solutions to meet Australia's unique set of circumstances, the Ocean Energy Roadmap also recognises the opportunity for the Australian ocean energy sector to serve global markets, and deliver new technologies, approaches and/or supply chain capabilities.
- Aquaculture/Ocean Energy Market Assessment AOEG, in collaboration with CSIRO and Avil Allen Consulting, are submitting a project proposal to the Blue Economy-CRC to undertake a market analysis of the commercial potential for ocean energy as part of the decarbonisation of the offshore aquaculture and fishery industries.
- Analysis of ocean renewable energy uptake for the energy-intensive industrial sectors of Australia's Blue Economy (study). This is a graduate research project conducted under the direction of AOEG. The graduate intern is co-funded by CSIRO and Climate-KIC Australia.

**However, there is a significant additional opportunity** to support coastal, offshore and island communities, including tourism operations, to build greater self-sufficiency, resilience and disaster recovery capabilities across energy, fresh water, small scale hydrogen and other additional externalities, such as oxygen for improved waste water treatment. The opportunity is from integrated micro-grid systems.

By creating not just a micro-grid but also an integrated micro-grid (e.g. a grid which supports multiple sources of renewable energy and which can meet the load demand of various modular technologies e.g. hydrolyzers, desalination units, waste water treatment units) communities can enjoy numerous complementary and ancillary benefits from harnessing the water and energy from Australia's oceans.

Australia has numerous potential competitive advantages (ocean resource, research, technology, manufacturing), as well as geographical proximity to key end-user markets, which

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<sup>24</sup> For more information see: <https://oceanenergygroup.org.au/>.

could see Australia secure a global market leadership position in this niche, but significant sector.

Ocean energy can play a significant role in supporting coastal and island communities, including tourism resorts who are unable to connect to a large-scale grid and/or would seek to:

- reduce their reliance on a large-scale grid.
- stabilise /integrate the use of solar/wind.
- decarbonise both their energy and their fuel sources (diesel replacement).
- utilise other potential by-products of ocean resources (hydrogen & oxygen).
- void over-head electricity transmission systems.
- ensure disaster recovery capabilities (extreme weather/ fire/drought/flooding).

The global micro-grid market is estimated to reach \$US18 billion in 2022, with the demand in the Asia-Pacific to grow the quickest (cumulative annual growth rate of 18 percent from 2017 – 2022) due to the strong interest in micro-grids in Japan, Indonesia and other island-nations in the region.<sup>25</sup>

### ***Funding Proposal***

To catalyse the development of internationally competitive technologies and capabilities in **integrated micro-grid systems**, NERA will support AOEG to develop a full proposal to the Australian Government for operational and project funding of **\$5 million over three years**.

1. **Operational** - 3 x FT Staff - Project Managers & Stakeholder Engagement
2. **Feasibility study** - into a wave energy technology and end user micro-grid development site on Garden Island, WA and a tidal range facility in Tasmania. These sites would enable end users, government agencies, utilities, councils and others to plug and play their desalination units, hydrolyzers, batteries, etc to test their efficacy with different wave energy technologies. Data from pilot projects would be made available bilaterally to those involved and non-commercially sensitive data would be shared across the industry.
3. **Establish Test Site 1 – Garden Island, WA – wave technology**
4. **Establish Test Site 2 – Tasmania – tidal range technology**

<sup>25</sup> GlobalData, November 2018, Microgrids, Update 2018 – Global Market Size, Competitive Landscape, and Key Country Analysis to 2022, <https://store.globaldata.com/report/gdpe1057emr--microgrids-update-2018-global-market-size-competitive-landscape-and-key-country-analysis-to-2022/>.

5. **Regulatory Project** to participate in international standards work to ensure Australia is not shut-out of international market opportunities for integrated micro-grid solutions
- NOTE: Infrastructure costs for a Tasmanian site may be the subject of a separate funding proposal if the feasibility study is positive. This is because, unlike in Garden Island, WA, no suitable micro-grid infrastructure already exists which can be re-purposed.

Open access or “Plug and Play” development centres are key to Australia being able to test both wave and tidal range devices, while simultaneously advancing capabilities in integrating with local grids, batteries, desalination modules, small scale hydrolysers and/or waste treatment units, as well as houses or other equipment. By specialising in micro-grids, Australia can potentially carve out a global niche in the provision of integrated systems which permit coastal and island communities, including tourism resorts, to be totally or partially self-sufficient in terms of energy, fresh water, transport fuels (diesel replacement) and other by-products (oxygen for waste treatment). In 2019, Australia outlined a \$500 million foreign aid program to help Pacific nations to invest in renewable energy and disaster resilience. Micro-grid systems which utilise ocean energy could support Australian foreign aid objectives of this kind.

To pursue this niche, yet globally significant sector, requires a level of funding beyond NERA’s current funding scope, and therefore NERA is supporting AOEG in seeking additional funding from the Australian Government to advance capabilities in integrated micro-grids utilising ocean energy.

#### Repurposing Offshore Infrastructure and Decommissioning Supply Chains

Decommissioning refers to the legal obligation for companies to remove or dispose of oil and gas assets at the end of their productive life, in a way that meets the health and safety requirements of NOPSEMA, the offshore regulator.

Australia has an estimated \$30 billion in potential liability associated with decommissioning of oil and gas infrastructure, including more than 3,500 kilometres of pipeline and 35 platforms in Commonwealth waters. These assets, if encouraged, can potentially play a significant role in Australia’s energy transition, through supporting carbon capture and storage, hydrogen and renewable energy production. This opportunity was recently explored in a report from the UK Oil and Gas Authority investigating energy integration.<sup>26</sup> If these assets are removed, maximising recycling of steels, plastics and other materials will play an important role in supporting Australia’s circular economy, reducing the need for the production of new materials and supporting emissions reductions.

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<sup>26</sup> UK Oil and Gas Authority, ‘UKCS Energy Integration: Interim Findings’,  
<https://www.ogauthority.co.uk/media/6257/ukcs-energy-integration-interim-findings.pdf>.

If closing down/decommissioning expenditure exceeds assessable royalty receipts, the excess gives rise to a refundable credit at 40 cents in the dollar of the excess. Similar refunds exist for the oil and gas industry in the United Kingdom and this has catalysed substantial government efforts to drive efficiency and reduce taxpayer liabilities for decommissioning. The current target is cost reductions of 35 per cent, with 17 per cent reductions achieved over the past two years. NERA is pursuing a program of work to reduce decommissioning costs, including through operator collaboration, efficiency and technology improvement. Technology is estimated to account for 50 per cent of potential cost reductions that can be achieved for decommissioning.

Driven by Australia's leadership in oil and gas production for more than 40 years, the Australian service sector has developed world class expertise capabilities which directly translate to decommissioning activities. Many of these companies are already globally connected and have a presence in international markets. The Asia Pacific region is expected to require \$100 billion of decommissioning work, including 55,000 kilometres of pipeline, 35,000 wells and 2,600 platforms. NERA is working with Austrade and the service sector to understand and facilitate further opportunities for growth of Australian SMEs, including particularly in South East Asia. For example, in 2019, NERA facilitated two roundtables to connect Australian suppliers with opportunities in Malaysia.

Specific actions underway include:

- Seeking support to progress a scope of work to quantify Australia's decommissioning liability including potential cost savings for operators and the Australian Government.
- Exploring the concept of collaborative approvals for decommissioning, to streamline approval timeframes, promote consistent operator practice and encourage cost sharing measures such as vessels of opportunity or multi-asset decommissioning campaigns.
- Charting decommissioning challenges for industry and the potential opportunities for technology and innovation solutions to support improved efficiency in Australia.
- Development and delivery of the National Decommissioning Research Initiative to improve understanding of the impact of oil and gas infrastructure in the marine environment over time through independent science.<sup>27</sup>

## 9. Conclusion

As Australia's Industry Growth Centre for the energy resources sector, NERA is uniquely positioned to support sector-wide transformation towards a smart, high-value and low carbon energy future. Our role continues to deliver value back to the national economy through our industry brokering role and the source of insight into challenges, solutions, skills and regulation

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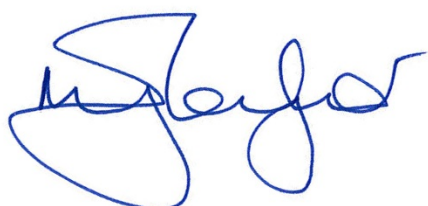
<sup>27</sup> For more information on the National Decommissioning Research Initiative, see: <https://www.nera.org.au/NDR/>.

that will ensure Australia maximises its huge energy resources advantage and becomes a global energy powerhouse.

Through continued Australian Government support for NERA and our identified pipeline of projects and initiatives, we can continue to maximise the value to the Australian economy by developing an energy resources sector that is globally competitive, sustainable, innovative and diverse and unlock **+\$10 billion of new value for the Australian economy**.

NERA looks forward to discussing this submission in more detail and to working throughout 2020 with the Australian Government, the Industry Growth Centres and all our stakeholders to support advanced and low emissions technologies, grow businesses and jobs and transform the economy for the benefit of all Australians.

Yours sincerely



**Miranda Taylor**  
CEO

## Appendix 1: Letter of support from METS Ignited

METS Ignited Australia Ltd  
Institute for Future Environments  
Queensland Institute of Technology  
Level 8, P Block, Gardens Point Campus  
2 George Street Brisbane QLD 4000



30 January 2020

Miranda Taylor  
Chief Executive Officer  
National Energy Resources Australia  
Australian Resources Research Centre  
Level 3, 26 Dick Perry Avenue  
KENSINGTON, WA, 6151

Dear Miranda

### **Letter of Support: NERA Priorities for Funding—2020–21 Pre-Budget submission**

The future of Australia's energy sector faces a unique set of challenges. We at METS Ignited believe that technology will play a critical role in meeting those challenges and unlocking the future of our energy needs. At our Industry Growth Centre, we are focussed on the role that equipment, technology and services providers can play in addressing those future needs of industry, and as we look at the growth in Australia's energy and resources sector, it is clear that ongoing investment in new technology will be critical to this and maintaining our global leadership position in these sectors.

In NERA and METS Ignited's combined research with AlphaBeta, the \$74B of economic growth and over 80,000 potential additional new jobs highlight the magnitude of the growth opportunity for the national economy. We support your request for ongoing funding of the Growth Centre Initiative, as it is key to maintaining the momentum we have built and embracing this growth opportunity across our priority sectors.

I note your submission identifies the key challenges and opportunities to address climate change. We see sustainability as one of the most exciting challenges of this decade, which must attract the best and brightest of our next generation from all over the country to participate in our technology sector.

Finally, we also recognise the local challenges facing our energy systems here in Australia. Many of the network challenges faced locally could be addressed through alternative fuel sources, energy storage technologies, critical energy minerals and off-grid energy management systems. The complexity of the issues extends well beyond technology and span a range of stakeholders. Whilst the topic of energy can be polarising for many different groups, I firmly believe that the work we have been doing with NERA is key for our energy future, and I offer my full support for the NERA priorities in your 2020–21 pre-budget submission.

Yours truly,



Adrian Beer  
**CHIEF EXECUTIVE OFFICER**



Australian Government  
Department of Industry,  
Innovation and Science

**Industry  
Growth  
Centres**



## Appendix 2: Case Study – NERA Collaborative Seismic EP Project (CSEP)

Seismic surveys are an integral part of identifying potential oil and gas resources and, with Australia's ongoing significant reliance on oil and gas, will continue to be used for the foreseeable future. However, exploration has been on a long-term decline in Australia. There are a number of uncertainties influencing the exploration outlook:

- The average time for environmental approvals for seismic Environment Plans is between 76 days and 103 days. The aggregate time and variability in approvals timeframes can make it difficult for operators to schedule vessels or access vessels of opportunity;
- Stakeholder consultation is complex, particularly the long-term tension between commercial fishing and petroleum businesses over access rights and environmental risks; and
- Uncertainty relating to future regulation that might result from the current Senate Inquiry Impact of seismic testing on fisheries and the marine environment.

NERA has commenced a project, in collaboration with 11 oil and gas and geophysical companies, to streamline future environmental approvals for seismic activities in Commonwealth waters, demonstrate a best practice stakeholder consultation process and strengthen the relationship between the oil and gas and fishing industries and local communities. Specific project objectives include:

- Streamline and strengthen the consultation processes between the oil and gas and fishing industries and with local communities.
- Reprofile marine environmental impacts and risks to enable a more strategic consideration of what may or may not be acceptable levels.
- Restructure the business environment for seismic activities to assist Australia become a globally competitive place to invest seismic activities.

### **Appendix 3: Case Study – Robotics for Confined Spaces Inspections and Developing Robotic Operational and Maintenance Skills.**

Working in confined spaces is estimated to be 100 to 150 times more hazardous than operating on an open site. By their nature, confined spaces are not designed for people to work in. They often have poor ventilation, which allows hazardous atmospheres to quickly develop, especially if the space is small.

With NERA's support, Perth-based company Nexxis and CSIRO's Data 61 are developing a robot that can perform confined-space and hazardous inspections so that humans don't have to, bridging together the science and commercial worlds and supporting the growth of Australia's robotics industry. This Australian product will be designed, developed, tested and ready for export in 2020. The robotic solution will not only decrease the need for humans to enter hazardous confined spaces but will also significantly reduce the downtime associated with such exercises.

This technology will be available for use across all facets of the energy resources sector (and other industries), both nationally and internationally, with the potential to position Australia as a world-leader in automated robotic inspection research and manufacturing and establish an export market for EX-rated technology.

Established in 2014 with a workforce of three, Nexxis has now grown to 40 full-time staff doubling its workforce in the last year alone. Nexxis continues to position itself to assist in commercialising Australian research and development, by developing strong links with the research community including CSIRO's Data61, Edith Cowen University, UWA and University of Technology Sydney.

Nexxis is also applying to be a registered training organisation (RTO) to support the increasing demand for robotic inspections. RTOs are an important aspect to the skills ecosystem as they offer flexibility while providing relevant, transferable and innovative training. This type of RTO facility provides upskilling and retraining opportunities for the current workforce to meet the transition to more robotic operations. Nexxis is an example of industry and research organisations working together to provide the following impacts:

- Develop Australia's capabilities in automated robotic inspection technology research and manufacturing, positioning Australia as a world leader.
- Enhance the efficiency of operations and maintenance and reducing downtime by using the latest technologies, including robotic sensors and innovations in the control of heat and spark output.
- Develop the vocational and engineering skills required to design, manufacture, operate and maintain robotics technologies.

- Work with research, education and training and industry to develop new curriculum, competencies and qualifications.
- Work with research sector and industry to improve and enhance EX-rated inspection and testing technologies, and to develop applications for such technology across other industry sectors.
- The opportunity for Australia to establish an export market for robotic and EX-rated technology products and services.