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Mr Ian Blayney MLA
Chairman
Economics and Industry Standing Committee
Parliament House
Perth WA 6000

11 September 2015

Dear Mr Blayney

I refer to your letter requesting a submission from Shell Australia to the Standing Committee's Inquiry on technological and service innovation in Western Australia.

This response sets our Shell's approach to innovation on a worldwide basis and our approach to innovation in Australia. Australia remains a key location for development and deployment of Shell's innovation, with both the North West Shelf Venture and the Prelude FLNG venture examples of innovation in the LNG sector.

Shell and Innovation in Energy Markets

Shell's views innovation in the energy sector as fundamental in meeting rising energy demands from population growth and increasing prosperity in developing countries in the coming decades. To meet the rising energy demand, we will need more and cleaner energy from all sources – fossil fuels and renewables.

In 2014, Shell spent more than $1.2 billion on research and development. Since 2007, Shell has spent more on research and development than any other international oil and gas company. But no single company can realistically presume to develop all the energy innovations the world needs. Globally, Shell seeks to create the conditions in which innovation is supported within industry at large. By creating the right vehicles to carry ideas and concepts through to commercial deployment, Shell aims to provide the platform to support innovation across our industry and other industries around the globe.

Shell actively supports "open innovation" through collaborative partnerships because it helps speed up developments in areas such as natural gas, biofuels, water treatment, CO2 management and energy efficiency – subjects that are likely to feature prominently in tomorrow's energy system. The innovations the world requires need to be diverse and multifaceted, involving many different kinds of expertise. Shell works closely with partners and recognised experts both inside and outside our industry to share knowledge, spark new ideas and speed up their development and deployment. This cooperation extends into academia and the public sector. In Australia, Shell has established various research projects and multi-sectoral partnerships which are detailed further below.

Innovation and Prelude Floating LNG

Innovation is part of Shell's approach to doing business. In 1996 Shell founded the GameChanger programme which invites original thinkers to share their ideas for resolving energy challenges. The programme provides financial support to prove an idea's feasibility quickly and affordably. To date, GameChanger has worked with over 1,500 innovators and turned more than 100 ideas into reality. One of its first brainchildren was Floating LNG, with Prelude FLNG now helping to realise the potential of Australia's offshore natural gas fields.

Floating LNG is an example of the significant investment and time large scale research and development requires for innovation to come to fruition, as Shell has been working on FLNG technology since the mid 1990s, drawing on more than five decades of expertise in LNG technology, LNG shipping and operating offshore oil and gas facilities. Many of the technologies used on the FLNG facility have been used successfully onshore, but some have been adapted or modified in order for the processes, such as liquefaction and offloading, to run at sea. FLNG is the latest in a line of Shell achievements in developing new technologies for the oil and gas industry, reinforcing our leadership in technology and innovation that adds value.

Innovation and Partnerships in Western Australia

Shell in Western Australia funds a range of partnerships and projects which are aimed at fostering innovation and finding solutions to a raft of challenges faced by off-shore oil and gas operations. This excludes investments undertaken as part of Shell's Non-Operated Ventures (Gorgon, North West Shelf, and Browse). The principal Innovation/Technology/R&D investments made by Shell in Australia are broadly divided into the following categories:

1. (F)LNG Skills & Capability (Training);
2. Competitive Supply Chain and Local Content;
3. (F)LNG Operations focused Innovation (and R&D); and
4. Carbon Capture and Storage (CCS).

Through a multi-million dollar partnership with The University of WA and the Energy and Minerals Institute, Shell is funding geotechnical engineer Winthrop Professor David White, as the Shell EMI Professorial Chair in Offshore Engineering, to improve offshore capabilities in Western Australia. The Shell EMI team teach 100 undergraduates in offshore engineering and deliver courses to the industry in Perth and internationally. The EMI Chair is seen as a valuable industry resource for other oil and gas sector participants, who also work closely with the Chair on research.

Through the partnership with EMI, Shell partly funds former chief Shell engineer, Mike Efthymiou – who played a significant role in the development of Shell's FLNG design, and developed patented FLNG technology – in a part time professorial role. Through the partnership, UWA is able to access Mike's extensive industry experience and capability for offshore research projects, and in teaching undergraduates.

Shell is also a member of the Western Australian Energy Research Alliance (WA:ERA). The Western Australian Energy Research Alliance was established in 2003 and has supported the State and Federal Government goals of increasing the local benefits from the oil and gas industry through research. Shell became a partner in 2014 and our aim is to encourage research collaboration that leads to more holistic and better developed R&D outputs than would otherwise be possible. The main focus of our partnership is offshore gas technologies, facilities and subsurface technologies. In addition, Shell is a foundation member of the CO2CRC, collaborating with National Geosequestration Laboratory, CSIRO, Curtin and UWA on CO2 storage and monitoring technologies.

In addition to these research partnerships, Shell has worked to identify and partner with local companies who are developing innovative and novel technologies. Generally such involvement and support includes technical assistance and financial support, often working with companies at the early "proof of concept" stage. Further detail on Shell Australia's involvement in innovation and research and development in Western Australia is summarised below in Table 1. We would be happy to provide further information if the Committee is interested.

The Australian Innovation Challenge

For the last five years Shell has partnered with *The Australian* newspaper in sponsoring an annual Innovation Challenge, a national competition aimed at finding Australia's next big inventions in fields ranging from clean energy technology through agriculture to astronomy.

The awards are presented by *The Australian* and are supported by the Commonwealth Department of Industry and Science. Since establishment, the Challenge has uncovered and championed innovations created by Australians working in universities, laboratories, start-up companies, schools, communities and at home.

There are five professional categories this year aiming to attract entries from the academic community as well as a backyard and a young innovators category open to the wider community.

A panel of experts drawn from government, academia and industry judges the awards. Winners will be announced, and awarded their share, in this years $65,000 prize money at a ceremony on 25 November 2015. Shell Australia participates as a member of the judging Panel.

Shell in Australia

Shell has been in Australia since 1901. Since that time our company has changed to meet a changing Australian market. Today Shell Australia is focused largely in the Upstream sector, especially in the exploration, development and production of liquefied natural gas (LNG) and oil. Shell's headquarters is based in Perth, WA and today Shell Australia employs around 800 people.

In September 2014 Shell divested the large part of our downstream assets in Australia to Vitol (trading as Viva Energy) Shell retains some downstream assets, including aviation fuel supply and oil lubricants.

Shell is a major investor in key Australian LNG projects, including our operated Prelude FLNG project (67.5% equity), the Gorgon Joint Venture (25% equity), the North West Shelf Venture (16.6%equity), the Browse Joint Venture (c27%), the Sunrise Joint Venture (26%) and Arrow Energy (50%).

In addition Shell Australia maintains an active exploration portfolio, with operated and non-operated joint venture interests in the Browse, offshore Canning, Bonaparte and Carnarvon basins.

If you would like further information please contact John Dagostino, Government Relations Adviser, in the first instance.

Yours sincerely

James Pearson
General Manager External and Government Relations
Shell Australia Pty Ltd

Table 1

An overview of Shell's Innovation/Technology/R&D investments:

	(F)LNG skills and capability (training)	**Competitive supply chain & local content**	**(F)LNG operations focused innovation (R&D)**
Curtin University of Technology	• 3 Phd scholarships		• Microbial induced corrosion • Mercury speciation • Marine noise monitoring
The University of Western Australia (Centre of Offshore Foundation Systems)	• 3+ Phd scholarships • Funding Energy and Minerals Institute (EMI) Professorial Chair in Offshore Engineering. • Shell funded professor •		• Enhanced research and education program focussing on offshore engineering, building on UWA's capabilities and serving the needs of local and international industry. • Research includes flexible risers and mooring systems.
Challenger Institute of Technology Australian Centre for Energy and Process Training	• World first FLNG specific training program		
WA energy research alliance			• Collaboration that leads to more holistic and better developed R&D outputs than would otherwise be possible. • Focus areas: offshore gas technologies, facilities and subsurface technologies and CCS • Investigating hydrates (inhibitors in pipeline, subsea equipment)
CSIRO		• CO2CRC, National Geosequestration Labs, SW Hub	• Contaminated gas seperation technololgies
Commonwealth Bureau of Meteorology			• Partnership with Chevron, Inpex and Woodside – developing improvements to Tropical Cyclone Forecasting for North West WA
Commonwealth Industry Growth Centres			• Committed to support

The Australian Innovation Challenge	In association with The Australian newspaper, the awards are helping drive some of the nation's best ideas to commercialisation or adoption.		
Shell Australia Local Content Roundtable		• Collaboration with State, Commonwealth and NT Government to identify local content opportunities.	
Local supplier negotiations and activities – Novel and new technologies			
Contractor A – Novel pipeline and flow solution	• Manage the wear characteristics and effects on underwater pipelines.		
Contractor B – Downhole dual-purpose camera technology	• Novel "downhole" dual-purpose camera design used for inspecting the well and Blow Out Preventer. Current technology requires the well to be cleaned prior to a camera being deployed. The new dual purpose camera has built in capabilities to clean the well while being deployed. This essentially increases safety, efficiency and reduces costs.		
Contractor C – Advanced moor chain cleaning	• Advanced mooring chain cleaner. Designed to operate at great depths without damaging equipment and protective coatings.		
Contractor/University – 3D/4D/5D modelling	• 4D modelling allows stakeholders to visualize construction over the project duration to identify potential spatial/ temporal conflicts in schedule. Adding a cost component to the process creates a 5th dimension, making a 5D model. • 5D engineered models allow stakeholders to evaluate costs and model cash flows for each phase of construction.		
Contractor D – Novel flow splitting technology	• Subsea flow conditioning for multi-phase flow to allow even flow splitting immediately downstream		

For furhther information please contact John Dagostino at john.dagostino@shell.com