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The Chairman
Economics and Industry Standing Committee

Sent by email:

11 September 2015

INQUIRY INTO TECHNOLOGICAL AND SERVICE INNOVATION IN WESTERN AUSTRALIA

I refer to your letter of 26 June 2015 in relation to the inquiry into technology and service innovation in Western Australia inviting Woodside to make a submission.

Woodside welcomes the opportunity to make this submission as Australia's largest independent oil and gas company, with our headquarters and the majority of our production operations located in Western Australia. As Australia's most experienced liquefied natural gas operator, Woodside has a strong history of technological innovation in our operations.

Woodside's mission is to deliver superior shareholder returns through realising our vision of becoming a global leader in upstream oil and gas. For Woodside to remain competitive in an ever increasingly challenging environment, we need to adapt, innovate and work collaboratively not only with broader industry and government but also universities, researchers and other technical institutions.

1. Woodside's approach to science, innovation and technology

Woodside has a strong history of innovating, dating back to the world-record water depths we drilled off shore southern Australian in the 1950s. Ever since this time, our ongoing commitment to innovation and technology across the value chain has been a major contributor to our success.

Woodside's exploration success in Australia has been driven by our early adoption of leading-edge technology. We pioneered the use of 3D seismic data in Australia during 1980s, led the deepwater drilling initiatives in the 1990s and were at the forefront of amplitude-supported drilling in Australia in the 2000s. More recently, we have been the first users of 4D and multi-azimuth seismic data in Australia.

Our subsea technologies have allowed us to design, install and maintain pipelines and other subsea infrastructure to withstand the cyclonic waters in Australia and maintain subsea wells at the lower cost through light well intervention systems.

Well construction technologies including big bore gas wells and multilateral systems have enabled Woodside to boost production rates and reduce costs at out offshore oil and gas fields, while above the surface we have led the way in Australia on development of not normally-manned platforms.

Onshore, our development of six of Australia's LNG train, two using modular constructing, places us at the forefront of modular builds, which we now aim to take to a new level through patent pending Next Generation™ LNG technology.

Today, we are leading the application of data science in the oil and gas industry. This includes working closely with established technology providers on early adoption and practical application and also developing our own solutions that lower costs maximise the operation of our producing assets and deepwater exploration capabilities.

Woodside is committed to developing, improving and investing in technology. Our technology activities focus on four strategic areas: subsurface, upstream, downstream and disruptive technology and innovation. In 2015, Woodside established a dedicated Science function tasked with enhancing data science capability across the organisation.

Woodside supports the growth of science and technology not only within the oil and gas industry but also within the broader Western Australian community. An example of this support is Woodside's long term involvement as an industry alliance partner of the Western Australian Energy Research Alliance (WA: ERA). Including specific support for the continued development of innovative subsurface technologies to address the main engineering and geological barriers to the commercially viable exploitation of complex reservoirs and for facilities research expertise in the areas of offshore infrastructure on the seabed (subsea and pipelines), through the water column (risers) and on the surface (floaters).

Woodside also supports the Premier's Science Awards and sponsors the Early Career Scientist Award (ECSA). The ECSA is given to an outstanding scientist who is within the first five years of completing their highest degree and who has demonstrated excellence in a field of science, scientific research or technological advancement.

Woodside also proudly sponsors a joint initiative between Woodside and Scitech, the *Woodside Scitech Science Awards* which recognises and rewards graduating primary school students who demonstrate a passion for science and encourages greater interest in science in the wider community by fostering science students at an early age. [1]

2. Focus on Data Science

Woodside sees data science as a central element to success, enabling insights to be derived from data to expand our decision-making capabilities and enhance our ability to be predictive in our business.

Data science is the essential next step in Woodside's proud track record on innovation. Data science underpinned by an exponentially increasing volume and variety of data and the rapidly decreasing cost of computing, is likely to be a major disruptive technology to the oil and gas industry over the next decade.

Woodside is deploying cognitive computing, advanced analytics, machine learning and, in the future, real-time optimisation for improved decision-making supported by facts and data. We see data science as the essential next chapter in knowledge management, enabling us to unlock more than 30 years of collective intelligence.

Woodside is leveraging our existing knowledge and skills to progress major data analytics opportunities, including predictive analytics to improve maintenance and availability for our Pluto LNG operations and cognitive computing to support lessons learned 'Q&A' systems on major capital projects and shutdowns. Along with increased production efficiency, we believe there is potential for these developments to help us meet our safety and risk management goals.

3. Importance of collaboration and strategic relationships

Woodside recognises the power and strength of cross industry collaboration.

<u>Collaboration with universities and researchers</u>

Woodside has established collaborations with several Australian universities, which enable us to collectively share challenges and work together with academics and researchers to develop innovative solutions.

Woodside has invested A$10 million in the University of Western Australia's (UWA) *EZONE*, which is focused on revolutionising engineering education in Western Australia. *EZONE* will enable UWA to provide students with the best skills and knowledge and includes dynamic teaching and research spaces to encourage innovation and the development of engineering solutions.[2]

Also at UWA, Woodside supports three academic positions including the Woodside *Professorship in Computational Geoscience* (as part of a five-year program to establish Western Australia as a centre of

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[1] Scitech website: http://www.scitech.org.au/events/all/959-woodside-scitech-science-awards

[2] UWA website: http://www.ezone.uwa.edu.au/news/2014/9/woodside-donation

excellence in geoscience), the Woodside *Chair in Leadership and Management within the Business School* and the Woodside-Chevron *Chair in Geoscience and CO2 Sequestration.*[3]

In 2015, Woodside has also been involved in the Australian Research Council (ARC) *Linkage Projects* scheme, collaborating with UWA to support the work of Professor Liang Cheng to improve predictions of hydrodynamic forces on small submarine cables and pipelines through comprehensive experimental modelling. The ARC administers the National Competitive Grants Program, a significant component of Australia's investment in research and development.[4]

Woodside is also supporting Monash University to develop a materials science and engineering laboratory (e.g. 3D printing) which includes a collaborative space to encourage dialogue and the incubation of ideas.[5]

At Curtin University, Woodside supports a *Construction and Project Management Chair* to lead research initiatives and activities relating to oil, gas, LNG construction technology and project management as well as a *Chair of Corrosion Engineering.*[6]

Woodside's initiatives

Woodside's innovation program Futurelab aims to accelerate success through collaboration in data science as well as other technology and smart operations (see Case Study 1). FutureLab is focused on enabling people, both internally and externally, to develop disruptive solutions that will support future growth and commercial success.

Woodside is focused on forming strong links with the best researchers, small start-up companies and other like-minded large enterprises to deliver the next wave of innovation in our industry. Collaboration is viewed as an essential element in a fast-paced data science industry, as no single company can be across all of the cutting edge developments.

Strategic relationships

As an example, Woodside is a platinum sponsor of KPMG Australia's accelerator program *Energise*, which is a three-month intensive program for start-ups, designed to promote innovation and collaboration across the sector by taking the best start-ups/early-stage technology companies and connecting them with some of Australia's leading energy and natural resources companies [7]. Woodside is pleased to sponsor *Energise* and contribute Woodside personnel as mentors to start-up companies. Rapid innovation is crucial to our industry as we must be equipped to embrace disruptive change. Woodside recognises that start-up companies produce quick cycle time development of new techniques and we want to work with entrepreneurs in the West Australian community to create a legacy for the future.

Another example is Woodside's strategic relationship with IBM to use the IBM Watson cognitive computing system. Delivered via the cloud, the cognitive advisory service 'Lesson Learned' scales the knowledge of engineers making insights and information quickly accessible. Lesson Learned will enable Woodside personnel to ask complex questions in natural language. Watson has the potential to lead to faster resolutions, improved process flow and operational outcomes.

Woodside has also partnered with Accenture, a global leader in data science and predictive analytics, to develop a suite of predictive analytic models for application in our LNG plants. Accenture has assisted in developing a cutting edge data platform, with expandable analysis capability and has provided a global network of resources to support Woodside's data science development.

Woodside's ongoing priority is to continue to build capability in the area of data science including internal personnel and external partnerships. It is recognised that this form of collaboration needs to combine out-of-the-box thinking with opportunities to build capability in Western Australia, including initiatives such as the Woodside *DataHack* (see Case Study 2).

We recognise that the key to an effective data science program is to develop a culture of collaboration and sharing of data. Woodside acknowledges the value in establishing new partnerships with experts in the field of data science and sharing knowledge to build capability such as Cisco Internet of Everything Innovation Centre (see Case Study 3).

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[3] UWA Energy and Minerals Institute website: http://www.emi.uwa.edu.au/partners/woodside

[4] Australian Research Council website: http://www.arc.gov.au/2015-linkage-projects

[5] Woodside website: http://www.woodside.com.au/About-Us/trunkline/Pages/Story-3.aspx

[6] Curtin University website: http://news.curtin.edu.au/media-releases/woodside-supports-chair-for-lng-plant-construction-technology

[7] KPMG website: http://www.energise.kpmg.com.au/

The examples of collaboration and strategic relationships provided within this submission further demonstrate Woodside's holistic approach to the development and progression of science, innovation and technology in Australia.

4. State and Federal Government initiatives

Woodside appreciates the important roles of both the State and Federal governments in encouraging and incubating innovation and technology in Western Australia and across the nation.

The Australian Government's creation of the Industry Growth Centres (IGC) initiative, as part of the Industry Innovation and Competitiveness Agenda, is an important step forward in bringing together industry and science and research organisations to grow capability, grow productivity and create additional jobs and opportunities. [8] One of the IGC's relevant to Woodside is the Oil, Gas and Energy Resources Growth Centre (OGERGC) chaired by Mr Ken Fitzpatrick. It is understood that the OGERGC will promote greater collaboration across and sharing of infrastructure and logistics and the better integration across the whole value chain.

For Woodside, the OGERGC represents a key opportunity to centralise and distribute the information flow to industry, universities, researchers and business organisations. The OGERGC importantly has the potential to systematically link up existing initiatives and forums and minimise duplication of effort.

Woodside has been involved in discussions regarding the proposed strategic priorities of the OGERGC and has provided input with regards to the consideration of adopting trusted international standards. Woodside will continue to engage with Mr Fitzpatrick to support the progression of the OGERGC.

The West Australian State Government's *A Science Statement for Western Australia – Growing Western Australia (the 'WA Science Statement)* highlights five priority areas in which the advancement and application on science can contribute to the economy and create jobs.[9]

One of the priority areas directly related to Woodside is *mining and energy*. The WA Science Statement advises that the '*The minerals and energy industry in Western Australia is now a global centre for scientific and technological innovation, operating at the forefront of research and development and constituting about 75 percent of industry funded research in the State'.*[10] The WA Science Statement also highlights some important examples of resource science collaborations between industry, universities and technical organisations.

Woodside supports the State Government's vision and the premise that Western Australia has the potential to be a global centre for scientific and technological innovation. However, given the vast amount of innovation and technology initiatives currently underway in Western Australia, there remains an opportunity for increased communication on lessons learned from new technologies and collaboration to fully realise the State's potential to become a global centre for scientific and technological innovation.

The Australian Technology Network of Universities recent report *Innovate and Prosper – Ensuring Australia's Future Competitiveness through University-Industry Collaboration (the 'IP Report')* provides another perspective and encourages the '*triple–helix'* (namely Government, Universities and Industry) to recognise and embrace their respectively important roles in increasing Australia's competiveness. [11]

The IP Report's recommendations may be useful to the Committee in the context of the Inquiry, including:

- *Rebalancing the National Research Agenda to underpin Australia's economy and future prosperity;*
- *Creating incentives for university-industry collaboration;*
- *Training researchers for diverse careers;*
- *Enhancing career mobility between industry, academia and government; and*
- *Providing incentives for co-investment in research infrastructure between universities, industry and State and Federal Government.*

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[8] Australian Government's Industry Growth Centre website: http://www.business.gov.au/advice-and support/IndustryGrowthCentres/Pages/default.aspx

[9] Western Australian Government's Office of Science website: https://www.dpc.wa.gov.au/science/Pages/Default.aspx

[10] Ibid

[11] Australian Technology Network of Universities website: https://www.atn.edu.au/Publications/ https://www.atn.edu.au/Documents/Publications/Reports/2015/ATN%20Innovate%20and%20Prosper_web_version.pdf

Woodside sees value in the Committee's consideration of the matters raised within.

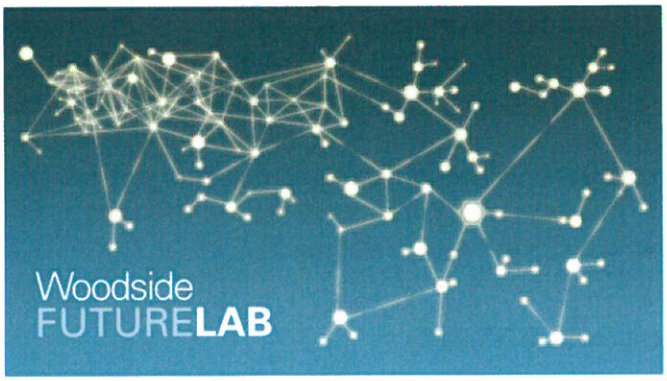
The Committee may also be interested in the European Innovation Partnership for Smart Cities and Communities concept[12] and Singapore's Smart Nation Vision[13]. The *smart city* concept sees traditional networks and services being made more efficient, with the use of digital and telecommunication technologies for the benefit of its citizens, industries and businesses.[14] The *smart city* concept allows for central coordination of information and has the potential to promote efficiencies and encourage investment.

I trust that this submission will be of assistance in the course of your Inquiry.

Yours Sincerely,

Shaun Gregory
Senior Vice President Strategy Science and Technology

[12] European Commission – Digital Agenda for Europe website: http://ec.europa.eu/digital-agenda/en/smart-cities
[13] iDA Singapore website: https://www.ida.gov.sg/Tech-Scene-News/Smart-Nation-Vision
[14] European Commission – Digital Agenda for Europe website: http://ec.europa.eu/digital-agenda/en/smart-cities



CASE STUDY 1 **Woodside FutureLab - Connected thinking. Accelerating innovation**

FutureLab, Woodside's innovation program, aims to accelerate success through collaboration in data science as well as other technology and smart operations. The program is about enabling people from inside and outside the company to focus on developing disruptive solutions that will lead to future growth and commercial success.

As the world becomes more interconnected, information, insights and ideas from disparate organisations can be quickly disseminated, shared and built on to deliver new solutions to old problems. We believe collaborative innovation is the key to future growth. And that's the premise of Woodside FutureLab.

By collaborating with researchers, entrepreneurs, subject matter experts and parallel leading industries, we aim to leverage our capabilities and maintain our leading position as a partner of choice. This dynamic network has the potential to create a world-class legacy of technological excellence in Western Australia.

FutureLab is an imperative that aims to nurture and grow our culture of diversity and innovation, harness new commercial opportunities and secure our long-term future as a global leader in upstream oil and gas. We intend to deliver our strategy of collaborative innovation by integrating both technical and non- technical work streams within the FutureLab program.

The program

	OCEAN ENGINEERING • Reliable production offloading • Safer riser and moorings • Anchoring and foundations • Loads – extreme waves, underwater waves • Lifecycle monitoring and decision support • Flow assurance	**PLANT OF THE FUTURE** • Process intensification • Adaptive controls • Non-intrusive inspection • Intelligent layout • Spares on demand	**ENTERPRISE ANALYTICS** • High performance computing for geoscience • Sensor fog and WiFi
Education & Events	Cooperative Education for Enterprise Development (CEED) student placement (University of Western Australia)	Corrosion Centre (Curtin University) Construction Technology & Augmented Reality (Curtin University)	Computational Geoscience (University of Western Australia)
Collaboration Spaces	Woodside Ocean Works (University of Western Australia)	Curtin University's Engineering Pavilion Woodside Proof of Concept Centre, Monash	Planning and development of Woodside Capital Square Cisco Internet of Everything Innovation Centre – Curtin University
Collaboration Partners	University of Western Australia CSIRO	Curtin University Monash University	WA Energy Research Alliance Massachusetts Institute of Technology – Industrial Liaison Program
Commercialisation & Deployment	KPMG Australia's Energise Accelerator Program WA Innovator of the Year Award through the Woodside Oil and Gas Encouragement Award		
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CASE STUDY 2

In collaboration with the Fiona Wood Foundation, Woodside will use its growing capabilities in data science to provide actionable insights to improve the lives of burns survivors.

Woodside will work with its data science partners Accenture, IBM and Optika to review 15 years of patient data (~2000 patients), allowing participants to contribute their knowledge, skills and capability in data science in-kind (corporate volunteering) to effect positive change.

The DataHack demonstrates Woodside commitment to working sustainably, making a positive contribution health research to the WA community.

The event will promote a culture of collaboration and sharing of data across a range of stakeholders and by doing so, encourage innovation and creativity.

Woodside DataHack

- 12-hour DataHack in collaboration with the Fiona Wood Foundation, supported by Woodside's data science partners, Accenture, IBM and Optika
- To be held in 2H 2015 for 12 hours, 7am – 7pm
- To be held at Woodside Auditorium at Woodside Plaza
- Participants:
  - Woodside, Accenture, IBM and Optika - Subject Matter Experts
  - Fiona Wood Researchers
  - Data Scientists
  - Developers & Visualisation Experts
- The DataHack will utilise data science to review 15 years of patient data (~2000 patients) and provide the Fiona Wood Foundation with actionable insights which they can use to improve the lives of burns victims.

Woodside and Fiona Woods Foundation

Woodside's relationship with Professor Wood spans two decades, dating back to the early 1990s when she worked with the oil and gas company on hypothetical emergency scenarios in the wake of the Piper Alpha disaster in 1988.

The Fiona Wood Foundation is a not-for-profit organisation that aims to improve the quality of outcome for burn survivors, in body and mind, both through acting as the primary support organisation for the world-renowned Burns Service of Western Australian (BSWA) and through strengthening its research nucleus the Centre of Excellence in Burns Research.

CASE STUDY 3

Cisco Internet of Everything (IoE) Innovation Centre

On 2 July 2015, Cisco officially launched the Cisco Internet of Everything (IoE) Innovation Centre, its eighth global IoE centre designed to serve as a hub for open innovation in Perth.

Together with its two foundation partners Woodside and Curtin University, the three have jointly committed to over A$30 million of investment.

IoE includes a state of the art laboratory as well as a technical collaboration area for companies, industry experts, developers, researchers and academics.

The idea being that IoE will create an environment of learning and sharing information with a view to accelerate innovation in resources, agriculture and astronomy sectors.

The IoE also has the support of the Government of Western Australia, with the Hon. Colin Barnett, describing the value of the initiative as '*...assisting Western Australia to become a global collaborator in research and innovation, offering a competitive advantage for investment, new business and creating new jobs'*[15].

For Woodside, the collaboration will create a globally significant centre for excellence that can be leveraged in our LNG operations, as we progress our remote operations capabilities.

It is an opportunity to accelerate our activities in the digital environment and build capability in predictive data science by attracting innovators and entrepreneurs in a fast track setting.

Initial IoE research projects will include the:

- *Square Kilometre Array* - the largest, most capable radio telescope ever constructed;
- *Plant of the Future* – an initiative to accelerate the flow of information between plant and people and help anticipate future events to optimise production and maintenance in facilities. Woodside's 30+ years operational and technical expertise will contribute towards this initiative; and
- *Smart Campus* – a new approach to address education challenges including remotely accessible labs and teaching platforms.

[15] Curtin University website: http://news.curtin.edu.au/media-releases/ciscos-internet-of-everything-innovation-centre-launches-in-western-australia/

References

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- iDA Singapore website: https://www.ida.gov.sg/Tech-Scene-News/Smart-Nation-Vision
- KPMG website: http://www.energise.kpmg.com.au/
- Scitech website: http://www.scitech.org.au/events/all/959-woodside-scitech-science-awards
- UWA Energy and Minerals Institute website: http://www.emi.uwa.edu.au/partners/woodside
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