

**ECONOMICS AND INDUSTRY
STANDING COMMITTEE**

**INQUIRY INTO TECHNOLOGICAL AND SERVICE INNOVATION
IN WESTERN AUSTRALIA**

**TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
WEDNESDAY, 6 APRIL 2016**

SESSION ONE

Members

**Mr I.C. Blayney (Chair)
Mr F.M. Logan (Deputy Chair)
Mr P.C. Tinley
Mr J. Norberger
Mr T.K. Waldron**

Hearing commenced at 9.24 am**Mr PETER FAIRCLOUGH****General Manager, Policy, Government and Public Affairs, Chevron Australia, examined:****Mr MARK (ANDREW) TITLEY****Global Technology Centre Manager, Chevron Australia, examined:**

The CHAIR: On behalf of the Economics and Industry Standing Committee, I would like to thank you for your appearance before us here today. The purpose of this hearing is to assist the committee in gathering evidence for its inquiry into technological and service innovation in Western Australia. You have been provided with a copy of the committee's terms of reference. At this stage, I would like to introduce myself and the other member of the committee here today. I am the chair, Ian Blayney, and with me is the deputy chair, Hon Fran Logan. The Economics and Industry Standing Committee is a committee of the Legislative Assembly of the Parliament of Western Australia. This hearing is formal procedure of the Parliament and therefore commands the same respect as given to proceedings in the house itself. Even though the committee is not asking witnesses to provide evidence on oath or affirmation, it is important that you understand that any deliberate misleading of the committee may be regarded as a contempt of the Parliament. This is a public hearing and Hansard is making a transcript of the proceedings for the public record. If you refer to any documents during your evidence, it would assist Hansard if you would provide the full title for the record.

Before we proceed to the inquiry-specific questions that we have for you today, I need to ask you the following: have you completed the "Details of Witness" form?

The Witnesses: Yes.

The CHAIR: Do you understand the notes at the bottom of the form about giving evidence to a parliamentary committee?

The Witnesses: Yes.

The CHAIR: Did you receive and read the information for witnesses briefing sheet provided with the "Details of Witness" form?

The Witnesses: Yes.

The CHAIR: Do you have any questions in relation to being a witness at today's hearing?

The Witnesses: No.

The CHAIR: Before we ask you any questions, do you have an opening statement?

Mr Titley: We do.

The CHAIR: Thank you.

Mr Titley: Thank you for the opportunity to appear before the committee today. Chevron has been present in Australia for more than 60 years as a pioneer of the Australian oil industry on 24 March 1952. Chevron's downstream legacy goes back even further when Texaco began marketing petroleum products in Australia after World War I. In 1964 Chevron Australia was a foundation partner in what has become the North West Shelf venture, which has led to the development of the Gorgon and Wheatstone natural gas projects, which represent over \$80 billion in investment, jobs and economic benefits to Australia for many years to come. In terms of research and development,

as outlined in our written submission to the committee, Chevron Australia has invested \$1 billion in research and developments in Australia. This covers R&D across the LNG value chain and new technological development employment for Chevron's Australia operations.

Chevron's Gorgon carbon dioxide injection project is the single largest greenhouse gas reduction project undertaken by the private sector. It is estimated that \$2 billion will be invested in the design and construction of the Gorgon carbon dioxide project. The Gorgon project positions Australia as a world leader in the application of this technology, with injection rates between three and four times greater than applied by the existing commercial scale projects. In terms of the global technology centre, in 2007 Chevron opened a global technology centre in Perth. It is one of two such facilities in the Chevron group of companies, the other being located in Aberdeen, Scotland. As outlined in the written submission, Perth was selected as a location due to its source of talented technological experts proximity to our interests in the region and growth opportunities to pursue research and development alliances with universities and partners. The GTC in Perth partners with universities, industry bodies and research institutions to grow research capabilities to deliver technological advancements needed to secure Australia's energy future.

Research projects are undertaken through the Western Australian Energy Research Alliance, WA:ERA, which includes CSIRO, Curtin University and the University of Western Australia. Since Chevron Australia began investing in the alliance, it has already invested nearly \$50 million across 140 projects, including academic chairs and professorships. In terms of universities, WA universities represent a significant market share of new graduates hired by Chevron Australia. These individuals not only contribute directly to our WA projects, they also have the opportunity to work around the globe on our diverse assets and projects. We signed an initial UPP agreement with UWA in 2008, which included \$2.3 million over three years to fund a new chair, two postdoctoral appointments and two doctors of philosophy scholarships in gas processing engineering at UWA. In 2011 we elevated the existing chair in gas process engineering at UWA from a fixed-term agreement to endow chair in perpetuity at a cost of \$5.75 million. This enabled UWA to establish a new teaching laboratory for chemical engineering and a laboratory for natural gas research at the Australian research centre in Perth.

[9.30 am]

Since 2007 we have co-funded the Woodside Chevron share of petroleum geophysics at UWA along with Woodside. This was recently renamed the Winthrop professor in geophysics. Initially the funding included a five-year investment of \$65 000 for the chair to provide world-class petroleum geoscience research in the areas of 4D time lapse imaging, environmental and global climate processes, especially groundwater contaminant flow, and CO₂ injection and storage. In addition, Chevron funds the chair of petroleum geology at Curtin University, contributing over \$1 million since 2013. We also fund the Woodside–Chevron chair of corrosion engineering at Curtin University, along with Woodside, as well as conferences, student awards and bursaries. Chevron Australia values its partnerships in the education and innovation sector and the importance of bodies such as WA:ERA. Chevron recognises world-class researchers and academics are sought by world-class institutions in our globally competitive education sector. Government policies and support in attracting and retaining world-class capability in our universities and research institutions is essential to create opportunities for partnerships with industry, who will, in turn, support world-leading research.

Thank you for the opportunity to make this short statement. I am happy to answer any questions you may have.

The CHAIR: Thank you very much.

Mr F.M. LOGAN: Thank you very much for the introduction and the overview to the submission. Aside from the CO₂ injection program, which is part of the overall agreement for the project to go ahead in the first place, and the fact that, you know, CO₂ reinjection has been around for the last

60 years in terms of pumping up reservoir, whereas this is a deposit, but it has also been trialled elsewhere, what other things has the GTC been looking at and has possibly achieved in the period of time?

Mr Titley: I think two recent ones—it is always easier to talk recently—we have spent about \$2 million at Curtin University on our monoethylene glycol—it is called bench scale, but it is really a very large bench scale; it is about three or four metres tall. That is handled through the corrosion centre. We are looking at MEG used for gas production. It prevents hydrate formation, which are kind of ice-like crystals that can block production. We have done that at Curtin University. That is run by Professor Rolf Gubner. He may be familiar to you; he was one of our chairs previously. Also we have put a lot of work in with UWA and Professor Eric May there, and part of the contributions that we have provided—in particular, three projects—has led to Australian Research Council funding as well. So, those are two very recent examples. Over the years we have done a lot of work in exploration. That goes to the point of how successful we have been in terms of exploration, with just over 25 discoveries since 2009, which has added, I think, from recollection, about 10 TCF of gas, which I think, when you make that an equivalent in terms of oil, that is around 1.5 billion barrels of oil equivalent, so that is very successful.

Mr F.M. LOGAN: But in the areas of innovation, I mean, that is business as usual. That is what oil companies do, look for oil and gas.

Mr Titley: It is.

Mr F.M. LOGAN: But in terms of innovative breakthroughs, that might assist the industry or it might assist the company.

Mr Titley: But it is innovation for us because getting more successful at finding things in more remote and deeper waters is a challenge, and clearly it is very expensive, so if we can do it more accurately and more reliably, it certainly is innovation. Some of this is worked through with the David Lumley, the Winthrop chair at UWA, and the Chris Elders, who is the Geology chair at Curtin University, so this is innovation; this is cutting-edge exploration, which is why we have done so well. Although some of it is our own knowledge, there is that spin-off benefit to these professors, their postgraduates, and their PhD students that will help with the industry more widely. In terms of Eric May, as in the briefing, a lot of PhD students and a lot of developments in LNG technology again will have spin-offs not only for us, but for Woodside, Inpex, and Shell as well. Part of it is building organisational capability and part of it is funding research.

The CHAIR: Your Global Technology Centre in Perth is the second one in the world. Our understanding is that in the Global Technology Centre you seek to combine your in-house expertise with strategic partnerships. What does the Global Technology Centre look like? Is it a laboratory or is it a particular building?

Mr Titley: In Perth, it is not a laboratory. Ourselves and the other one is a UK global technology centre. They are predominantly based in Aberdeen. I think they have a small contingent in London. It is, essentially, office-based and computer-type activities. We do have a number of microscopes but it is not a lab in the truest sense. There is another centre in the US—but it is not called a global technology centre—where it is a much more laboratory-based activity. Here, microscopes are used for reservoir analysis—looking at samples of cuttings and core samples. The rest of us are dealing mainly with the universities who provide laboratory research. That includes UWA and Curtin, and CSIRO, obviously.

Mr F.M. LOGAN: What does the Aberdeen GTC look at? What do they study?

Mr Titley: We all provide multidisciplinary support across the whole development. Their speciality is subsea processing. It is a mature industry in the UK. They currently number around about 60 engineers and scientists; I think 25 are subsea experts, from recollection. They work collaboratively with the UK industry in labs.

The CHAIR: Did you say subsea processing?

Mr Titley: Subsea processing and production, yes.

The CHAIR: So they actually process underwater?

Mr Titley: Yes, you can do. You can separate underwater; you can compress and you can pump. It is very expensive, so it is sort of the basic functions rather than a full equivalent of a plant or a platform. But it is coming.

The CHAIR: Those big Brazilian oilfields well off the coast, they have to pump everything in —

Mr Titley: Brazil and Norway in particular—Statoil kind of leads this. If you are looking for innovation, and, obviously, it is used as a measure in terms of government–industry collaborations, Statoil tends to lead the way in terms of subsea processing. They have been trialling subsea compressors and separations, since, I think, the last two or three years.

Mr F.M. LOGAN: Are we looking at any engineering or subsea processing in the GTC here?

Mr Titley: We have a small team but, yes, we do look at that. Gorgon itself is one of the largest worldwide subsea developments. I think we have all been focused on the Barrow Island development, which is obviously very large indeed, but to support that, it is subsea production and that is a lot of infrastructure in terms of data transfer through what we would call an umbilical, which has electrical supply as well as communications, and also the piping and the valves.

Mr F.M. LOGAN: What is our GTC looking at?

Mr Titley: For the future, we have a little bit of involvement in subsea compression, which is done through an alliance we have with Statoil. We have recently had someone return from Norway. We are monitoring their development and their work, and it is a potential option if we look ahead to the 10 to 15-year time frame. We also look at long-distance transfer of power to run some of these capabilities as well. Some of these things are 200 kilometres offshore and are very comparable to some of the transmission that we do onshore, but there will be a lot more challenges because it is in 1 000 metres of water.

The CHAIR: So you actually run power out to the pump 200 kilometres offshore?

Mr Titley: Yes. The future aim is to run power on a large scale. At the moment it is power for communications, so it is kind of equivalent to a telephone cable, really. We are looking at fibre optics as well, but the challenge, I think, is long-distance transmission of power without voltage loss to run some of these compressors. We are then talking about megawatts of power rather than watts of power.

The CHAIR: We have just been joined by Peter Tinley, who is another member of our committee.

[9.40 am]

Mr F.M. LOGAN: In the GTC in Perth, how many engineers and people are looking at those types of technology?

Mr Titley: The predominant focus is on the Gorgon start-up at the moment and we provide technical expertise into that. We have a contingent of 60 engineers and scientists at the moment. It depends on the skill set; we would probably spend somewhere around 10 per cent to 20 per cent of our time looking at research and development. Research is more blue-sky and development is more, sort of, the next one to five years of activity. That would be around about 10 per cent to 20 per cent. It is spread across electrical specialists looking at that and compression specialists.

The CHAIR: To what degree could you say that our conditions are unique and, therefore, we deserve, if you like, novel research that might then become Australian technology that could be used somewhere else, or is what is developed in Norway for their oilfields pretty much directly

applicable to—our oilfields and gas fields are not necessarily that unique—what works in Norway is going to work here?

Mr Titley: Those are very good questions. There are two parts to answer. I will answer the second part first. Norway has deep water and cold temperatures. Here, we have warmer temperatures, so when we look at—we will take the compressor because we have just discussed it previously. The cooling requirements in Norway are different than in Western Australia. We are looking to leverage their technology so it would be a development of that technology. It is not directly applicable, but it is not far off. We would have to take it and develop it and make it unique to our conditions. In terms of the other question, I think if you look at WA in particular, some of the challenges that we have—the distances, the harsh environment—are actually potentially opportunities to export that sort of capability elsewhere. I know that a lot of work is being done, even in agriculture on drones. We look at drones for remote monitoring. We have used it as a test for turtle tracking. There is also the work that the Rios and the BHPs do on unmanned trains and things. These are all cutting-edge technologies that have developed because of the challenges of the Western Australian kind of environment—the distance, the harsh environment and the remoteness. I think if we were looking to identify opportunities worldwide in some of the other areas, that would be an opportunity. Clearly, there are many opportunities, but if you are looking at international—we do work internationally—you have to be able to compete more. What causes you to strive to greater things is that challenge. So I think there is great work done in drones, unmanned operations and long-distance transmission of power—all that sort of stuff. I am aware that WA can offer a lot of benefits.

Mr F.M. LOGAN: What projects are you working on in the GTC that you think might be able to be spun out of the GTC, or does Chevron have a view about releasing any of the information out of the GTC or spinning anything out to be developed here in WA?

Mr Titley: I think a lot of the operators patent or protect their knowledge mainly to protect their freedom to operate. Commercially, it does not make an awful lot of sense for us to be making tens of thousands on a piece of technology. So we always look to spin off the technology and collaborate. We are currently going through two combined patent applications with UWA. We would have to work the commercial aspects of that if they are successful but we would take a very small percentage and they would be free to market it. I think they have some interest in China for one of those applications, and that is great.

In terms of spin-offs, we do have Chevron Technology Ventures based in Houston. It comprises a team I think of about eight—just under 10. They are currently involved in about 35 companies. If we use one of those examples, which I think is called Halfwave, it has been successfully used by Woodside, just locally, for inspection of one of their pipelines. So, again, we are not looking to prevent people from using it; we are really looking to protect our freedom to operate. We would not necessarily want a small company patenting something that we have been investigating and saying, “Now you owe us a licence fee.” If we go back to the MEG plant at Curtin University, we have had discussions—although we provided the start-up funding—with Woodside, Shell and Inpex about using that collaboratively for their own purposes, and that would be Shell on Prelude, Woodside on Pluto and Inpex on Ichthys. We are open to either letting them use the facility, which will then again build Curtin’s capability, or going in and looking at some research collaboratively, which is a bit harder but we are very happy to look at it.

The CHAIR: Chances are that with the value of IP and the work done to protect it and preserve it, it is almost not worth the trouble of doing it in most cases.

Mr Titley: The main focus is that it would have to be commercially very beneficial. Obviously, ConocoPhillips patents their own LNG technology. If we came up with something like that, that is a possibility. However, for the other stuff, where we are looking at start-up companies and where we are looking at tens of thousands, hundreds of thousands, millions of dollars, that is

not where we are interested. We are looking to stop people from patenting stuff that we have done and then inhibiting our freedom to be able to use it. In discussions with Woodside—it is mainly been Woodside that we have had discussions with—that is a very similar approach that they are taking, and I am sure it is the same for the other operators.

The CHAIR: One of the major themes that we have discovered while we are doing this is the relative lack of risk capital for early stage commercial projects in Australia. Do you have a corporate venturing arm and would you consider getting into this space as part of a future growth strategy?

Mr Tittley: Yes; as I have said, we have Chevron Tech Ventures that are sponsoring those 35 companies or taking out a percentage ownership. We have had discussions. Time moves very quickly—I believe it was 2014 when they came over to Australia to look at things. We have quite stringent requirements and obviously managing it from the US makes it a little bit harder geographically. We are in that space. We are sponsoring companies. Pathway is a Norwegian-based company. So we are at that. Although it is not our business, there probably is a lack of tech venture funding in Australia for these sorts of things. We do look on a regular basis and have been successful, but I am not aware of anything in Australia at the moment.

Mr F.M. LOGAN: I have asked this of many of the other multinationals that have come before the committee. One of the biggest hurdles for small companies that are out there innovating with technology, either in the resources sector—that is, the mining sector—or in the oil and gas sector, but particularly in the oil and gas sector, is the conservative nature of oil and gas companies to be the first movers in any technologies. They might well be interested in that technology but say to those innovative companies, “Come back when somebody else has picked up your idea and tested it.” What is Chevron doing about that, because you are well aware of it, and all oil and gas companies are aware of that problem and are moving to look at a different approach?

Mr Tittley: I read Shaun Gregory’s transcript. Obviously one of his recommendations was test small. I think from his comments it was a very eloquently put and obviously well thought through strategy. Chevron is quite conservative, and it is not a Chevron phrase—it is an industry phrase—the best achievement is the race to second place. Being the first mover has challenges and risks. Being the second mover and learning from the others can be an advantage, but clearly we cannot all be racing to second place; some people have to step out. I think there are examples, whether it is Shell, Woodside or ourselves, of where we do that. Our success has really been in exploration here in Perth, and that has been the focus of growing our reserves. Obviously, Shell with Prelude has taken a kind of first-mover approach on something slightly different, and Woodside with their I think it is the FutureLab arrangement is looking to collaborate and build partly around data analytics. So we are all doing something slightly differently at the moment.

[9.50 am]

I think Shaun Gregory’s advice about moving quickly and testing to prototype is very good. One of the things that we are watching with interest is these kinds of hackathons. I think it was Unearthed that has been run in Perth—I might be a year out of date; has it just been run or is just about to be run?—had some very successful spin-offs in the mining industry. I think that demonstrates the benefit of testing prototyping quickly over a weekend. Pressure technologies or rock technology was one of the prize winners. We were very impressed by that. That sort of example is what is great about moving quickly. We are quite a large organisation—quite conservative—but we are well aware of the issue.

The CHAIR: So what is your view of the commonwealth government’s industry growth centres initiative? Obviously, the oil and gas and energy growth centre would be the one that you would be most likely to be involved in. How would you like to see that operate when it opens, and what sort of role would you envisage Chevron having?

Mr Titley: We had a discussion with Ken Fitzpatrick, which is probably six or nine months ago or so. We are very interested to see how it develops. I think it is a very big positive that they have co-located, I think it is at the ARRC centre, with WA:ERA; we are mainly involved in WA:ERA. I apologise about quoting a business book, but there is a business book I read which is *Future Engage Deliver*. I think what we would like to see from that is setting a framework for the future. In terms of that, for me, it is roles and responsibilities and what they are doing and who is doing the other stuff. Clearly, with the centre, clearly with WA:ERA, APPEA, the Institute of Engineers, there is a lot of overlap, and potentially a good, clear framework of who has got what responsibility and who is not in some case doing things, because I think the terms of reference for all of them are quite broad and there is a lot of overlap. So there are all sorts of opportunities if they focus on cross-learning with other industries, because clearly they are in mining, and we have talked about driverless trains, and maybe it is driverless forklift trucks for us, or whatever. That could be a possibility. Most of our focus is on WA:ERA, where we are looking at the universities and research. There is clearly a bit of an overlap there, and UWA is just about to launch their LNG Futures, which includes an aspect of training as well, which again is a bit of an overlap. So I think for us—Peter can chip in—a clear definition of roles and responsibilities and a framework of who has got what, because that can be a bit confusing for us.

Mr Fairclough: That is correct. We gave qualified support to the centre on the basis that there are organisations out there like WA:ERA and APPEA that are currently doing good work, where you do not need any duplication or overlap. So if it is about collaboration and driving value for the industry, we are very supportive of it.

Mr F.M. LOGAN: How did Chevron's relationship with Icon Engineering go with their drilling technology that Chevron was looking at?

Mr Titley: I do not know.

Mr Fairclough: We can take that on notice; that is fine.

The CHAIR: There are gaps between industry and academia. How do you think this energy resources growth centre could address that?

Mr Titley: We have got some very good relationships between ourselves and academia. There are some very, very good people, Eric May in particular, who is one of our star performers. We have had him on sabbatical at our Richmond laboratory, the one that is actually set up as a laboratory. He did that as part of a one-year sabbatical, I think, with Imperial College in London and then he came to us for six months. So we have got some very good engagement, and obviously going with shared patents with UWA as well. So there are some very bright sparks of achievement and collaboration. I think, as any industry person would state, it is about deployment and getting the technology, or the research into technology, and deploying that technology. Clearly, academia is set up or is measured mainly around papers published, and I believe there is some discussion about moving that sort of dial to sort of deployment. I think that would be great, and that would help with the collaboration because we would both be focused on a final game that would match. I think Professor Klinken quoted it as the valley of death between research and deployment, and I think we see that. It is where a great idea then requires a lot more funding, which again is why Shaun Gregory is saying start small and over achieve and it gets you there quicker. Yes, that sort of incentivisation to deployment rather than publication would be great. Have I answered your question?

The CHAIR: Yes. I thought it was quite well put, actually, especially that last bit about the valley of death and this obsession that universities have to have with publications over working with industry productively.

Mr Titley: It is almost like they are finishing when we are just getting started or interested, really. That is a bit harsh, but, yes, we get involved in the start, and they think, “Great research; we’ll publish that”, and we have done something else, and it has just got our interest.

The CHAIR: And when they say they are doing such and such a research because it will lead to a lovely paper, you sort of go, “Um; okay.”

Mr Fairclough: I think certainly that a shift in emphasis that the commonwealth government has had with universities and university funding is to move it from the traditional research and publication to things that can be applied commercially.

Mr Titley: I think CSIRO are having a bit more of a look at that. I think from some of the newspaper articles and some of the interviews I have seen that the new guy has come in and he is focused on deployment and —

The CHAIR: And application.

Mr Fairclough: Yes; a definite policy shift from the commonwealth government.

The CHAIR: The problem is, though, for academics, that is how their promotions come about and that is how their pay comes about, or even just their security of the job comes about, so they are going to be very reluctant to change it, because you are almost saying to them, “Yes, you have got this thing that is commercial, and that is great, but you are out of a job.” So it is maybe a bigger change, because almost the entire structure of academia has been built that way.

Mr Titley: It is, yes. I have mentioned Eric, my colleague, too often, but David White, who we have less involvement with, at the Centre for Offshore Foundation Systems at UWA, is another great bright spark in the industry, looking at application, looking at industry involvement. So these people are around and it is by nurturing them that they will then filter to others, I think.

The CHAIR: Peter, you must have a question. You have not asked a single question. That is unusual.

Mr P.C. TINLEY: I have a more general one. Chevron has been around for a long time, and globally, of course, innovation takes on many forms. Most of the time it is not a widget; it is a new way of doing things, better business practices, those sorts of things. In the industry generally, and maybe more specifically at Chevron, which you are probably more competent to talk about, where do you see that the big trends are in innovation? Have we peaked, or is there more to do?

Mr Titley: I do not think you can say we have peaked. People have said we have peaked in the past. It is very difficult to predict the future beyond five to ten years. I know there is a lot of work in data analytics at the moment, and Woodside has been operating for a while and has just had some success with uploading their data to the cloud and doing data analytics at Curtin with Cisco. I think that is definitely a trend for the future, that sort of data management, and clearly in how we manage that there are all sorts of opportunities for innovation there. But to say that is going to require a lot of work in the future, I do not know. It depends how artificial intelligence works and whether it will all be done by computer rather than by individuals and they will self-innovate. So, yes, the data has taken off astronomically, and it is managing that data.

The CHAIR: Would that be processing new data that is coming from new wells, or could you go back and reanalyse old data that is left over from other wells?

Mr Titley: It is how the data is stored. If we go back a while, it was all paper-type storage. So, it is conversion. But, yes, certainly with effort, you can convert the old data, and there is some software around that will take it, whether it is Excel or another Microsoft product, and combine it into a dataset.

[10.00 am]

Mr P.C. TINLEY: Disruptive technologies in the industry, you see it every industry, particularly automations. For example, you see in the traditional mining sector, the mineral sector, driverless trucks, drillers, all those sorts of things, robotics. Is that an area that you see as being a big shift or has it been something that has slowly been moving that way anyway or not at all?

Mr Titley: I think it goes in fits and spurts. I have been in Australia for 20 years. The Angel platform, the Woodside platform, is unmanned entirely. You thought that was a big move in the right direction. I have been involved in an unmanned gas plant in New Zealand, around the same sort of—2002–2004. Fits and spurts—I am sure there will be a lot more unmanned operations coming through. We have our own integrated operation centre that takes some of the load from our remote facilities here in Perth. Certainly that sort of remote operation—unmanned trains, unmanned UAVs, robotics, that sort of thing—data analysis here, rather than on site, that is all certainly the next one to five years, possibly one to 10 years.

Mr P.C. TINLEY: The reason that drives that question is the old—well, it is now almost a cliché in the innovation world, as Alan Finkel, Chief Scientist, keeps talking about the 40 per cent of current jobs that will not exist by a point in the future, in 2030, and it is not suggesting that it is going to be 40 per cent unemployment, it just means we are going to be moving up the technical spectrum. The question here is: How fit do you think the workforce here is in Western Australia to provide the flow of skills that you will need into the future? What innovation do you see coming? A workforce planning question about: where is it going to come from?

Mr Titley: I think grounding in the STEM—science, technology, engineering and mathematics—is essential. Easier for me as a chemical engineer; I graduated in 1985 and it has done me well for 30 years. I am not sure that is necessarily going to be the case for the future, so it is getting the grounding, I think, on a broader base rather than specialists, and being nimble and ongoing education.

Mr P.C. TINLEY: To put the more serious question, or the more pointed question: has Chevron done any investigation into the available workforce for the future and put any quantitative or qualitative assessments around what is going to be the need, and is it going to be able to be met by the Indigenous population of Western Australia—Western Australians—or is it going to be a global buy?

Mr Titley: I think with the cost pressure at the moment we will be looking local wherever possible. You are asking a GTC person an ABU question. I am aware we have done it globally, we would call them job families, and whether that is data analytics and virtual reality, they have certainly been identified. Cybersecurity is a big one at the moment, because of protection and hacking. We have looked at it globally—I cannot comment locally—but I assume it is similar.

Mr Fairclough: Locally there has been a shift. We are moving from a project builder—where you need a set of skills around construction and major capital project management—to becoming a long-term operator of two significant LNG plants, so the skill mix is quite different and the employment needs are quite different. I think one of the challenges for us is to think about: do we have the capability and the capacity to service complex LNG facilities over the next 30, 40, or 50 years? Yes, we do work with universities and others to say we have got this realignment taking place and these are the skill sets we are going to need in the future.

Mr P.C. TINLEY: Culture is a fundamental part of innovation. Clearly, going from project to an ABU-based arrangement is what is happening; the culture is going to be fundamentally important. I understand within Chevron there are a lot of expats being redeployed both ways. What is the assessment, or is anybody looking at culture in Chevron in relation to innovation as it goes through this transition?

Mr Fairclough: I think there are a couple of things. One is that I think innovation is just a normal part of business for companies like Chevron; if you do not, you do not succeed. Innovation and the

deployment of technology is fundamental. In terms of redeployment and repatriation of skill set, Chevron has been really, really effective at deploying Australians across the globe to develop their skills and we are in the process of bringing these people back—highly skilled project people, plant operators, technical people—who will enrich what we do here. They have been very, very good at that.

The CHAIR: I will have to close it. It is good that we have got plenty of questions for you.

Thank you for your evidence before the committee today. A transcript of this hearing will be forwarded to you for correction of minor errors. Any such correction must be made and the transcript returned within 10 days from the date of the letter attached to the transcript. If the transcript is not returned within this period, it will be deemed to be correct. New material cannot be added via these corrections and the sense of your evidence cannot be altered. Should you wish to provide additional information or elaborate on particular points, please include a supplementary submission for the committee's consideration when you return your corrected transcript of evidence.

If it is okay, we might have some follow-up questions which we will just write to you. Are you okay with that?

The Witnesses: Yes.

The CHAIR: With that, thank you very much for your time today.

Hearing concluded at 10.05 am
