ECONOMICS AND INDUSTRY STANDING COMMITTEE

THE POTENTIAL FOR THE DEVELOPMENT OF A CENTRE OF EXCELLENCE IN LNG INDUSTRY DESIGN IN WESTERN AUSTRALIA

A DISCUSSION PAPER

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The Potential for the Development of a Centre of Excellence in LNG Industry Design in Western Australia
A Discussion Paper

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A DISCUSSION PAPER

Report No. 3

Presented by:
Dr M.D. Nahan, MLA
Laid on the Table of the Legislative Assembly
on 11 March 2010

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COMMITTEE'S FUNCTIONS AND POWERS

The functions of the Committee are to review and report to the Assembly on:

(a) the outcomes and administration of the departments within the Committee's portfolio responsibilities;

(b) annual reports of government departments laid on the Table of the House;

(c) the adequacy of legislation and regulations within its jurisdiction; and

(d) any matters referred to it by the Assembly including a bill, motion, petition, vote or expenditure, other financial matter, report or paper.

At the commencement of each Parliament and as often thereafter as the Speaker considers necessary, the Speaker will determine and table a schedule showing the portfolio responsibilities for each committee. Annual reports of government departments and authorities tabled in the Assembly will stand referred to the relevant committee for any inquiry the committee may make.

Whenever a committee receives or determines for itself fresh or amended terms of reference, the committee will forward them to each standing and select committee of the Assembly and Joint Committee of the Assembly and Council. The Speaker will announce them to the Assembly at the next opportunity and arrange for them to be placed on the notice boards of the Assembly.

SCOPE AND AIM

Given the enormous potential for LNG developments in and around Western Australia, the Committee became interested in the idea of establishing Perth as a centre of excellence in LNG industry design.

To gain a better understanding of the issues involved the Committee determined to conduct a series of briefings in April and May 2009 with representatives of a number of major participants in the LNG industry as well as government agencies and other organisations. As these were not formal hearings the Committee has decided not to disclose the identity of these participants and has de-identified them by allocating a code name to each, for example, LNG (A), LNG (B) etc. The Committee would like to thank those who provided this information.

This paper is a summary of the Committee's understanding and interpretation of the evidence provided in these briefings.

The aim here is to raise with government and others the idea of developing an LNG centre of excellence in LNG industry design in Perth and, in doing so, stimulate discussion of the potential for such a development in Western Australia.

CHAIR'S FOREWORD

Further processing of natural resources has been a major focus of successive Western Australian Governments since at least the 1960s and remains so today.

The aim has been to promote further processing of the state's vast mineral and energy resources in order to:

- create new industry;
- diversify the state's economic base;
- attract investment;
- create jobs;
- reduce the state's exposure to the boom-and-bust commodity cycle; and
- promote regional development and exports.

The state's gas resource has been seen as playing a pivotal role in the further processing of natural resources not only in providing feedstock for chemical, petrochemical and fertilizer facilities, but also as the fuel source for processing minerals.

While there have been some successes, particularly in low mineralised ore types such as bauxite, nickel and gold, and in the liquidification of natural gas, outcomes have generally fallen short of expectations.

Over the years there have been great expectations of, and a great deal of effort put into, attracting an array of processing facilities including pellet plants, steel mills, aluminium refineries, petrochemical plants and advanced material plants. Few such plants have been realised and investments have often been short lived.

The reasons for the lack of success in downstream processing are many and varied, and include:

- high construction and labour costs particularly in the North West;
- high energy costs relative to countries with hydro electricity and non-exportable supplies of natural gas;
- highly competitive conditions in the mineral and energy processing sector;
- lack of domestic manufacturing facilities and investors; and
- technological risks.

In response, in part to the lack of success of traditional down stream processing, successive Western Australian governments have expanded the focus of policy to encompass the development of upstream service industries; that is, the attraction and development of businesses, skilled personnel, research facilities, business networks and technology involved in understanding, exploring, designing, planning and project oversight of mineral and energy developments.

Western Australia appears, at least on paper, to have a strong comparative advantage in upstream services and the scope to become a major regional, if not global, hub in mining, and oil and gas services.

Unlike its position in manufacturing and metal fabrication, Australia is cost competitive in upstream services. Most upstream services firms and facilities are based in high cost, developed countries such as the United Kingdom, the United States and Japan which have at least as high, if not higher, costs and wages than Australia. The key resource for these businesses is highly skilled people in technical areas including engineering, engineering design, geology and geophysics, and remote sensing. Western Australia is very good at attracting and producing these skilled personnel and has them in relative numbers.

Western Australia is one of the most dynamic mineral and gas regions in the world with $139 billion worth of projects either committed or under consideration in the state during the next few years. Most of the major mining, and oil and gas firms have operations or offices in Western Australia. Furthermore, many of the world's major mining, and oil and gas services firms either have operations here or can easily establish them. The mining, and oil and gas service sector appears to face economies of aggregation, that is, significant benefits from locating in places where there is a concentration of similar or allied operations. Success in this sector appears to breed further success. They are also wont to locate where the largest players are and where there is new, large scale development and potential. These three factors work in Western Australia's favour.

Again, the natural gas sector has been seen as playing a major role in the development of upstream services. The upstream gas sector in Western Australia is large in size and value. There is around $90 billion of liquefied natural gas (LNG) projects either committed or under consideration over the next few years in the state, with potential for more. Indeed, Australia accounts for over half the LNG projects under consideration around the world. This represents a scale of work both in range of projects and time to develop a strong local services sector. Aside from the Middle East and west Africa, which are not competitive home bases for upstream services, Australia is the dominant LNG centre in the world.

Western Australian firms have a long track record in developing LNG facilities – around 30 years. Most importantly, Woodside has successfully managed the North West Shelf (NWS) project, and is in the process of developing the Pluto project and planning the Kimberley Hub development. Australian-based engineering firms, Clough Engineering and WorsleyParsons, have extensive experience in many aspects of LNG development.

Importantly, in 2001 Clough, in joint venture with Kellogg, JGC and Hatch, undertook in Perth the engineering and procurement and construction (EPC) phase of the fourth Train of the NWS projects. While not large in terms of the overall expenditure of an LNG project, the EPC phase is

the crucial phase in terms of developing local upstream activity. It includes the majority of the high skills engineering design work – work that is transportable to other projects and locations. It has planning, oversight and management responsibility for the procurement and construction sector in which most of the services are employed.

The fourth Train of the NWS was successfully designed and built in Australia. It was the first LNG facility designed outside the three main LNG design centres, namely in Houston, Texas, Reading, UK, and Yokohama, Japan.

This Train represented a major milestone in upstream development in Western Australia and appeared to pave the way for further expansion. However, it did not do so. The fourth Train team was disbanded after completion. The EPC for the fifth Train of the NWS, as well as the two Trains of the Pluto project, have been awarded to overseas joint ventures.

The question is why? Why have the EPC of the fifth train of the NWS project and all subsequent LNG trains been awarded to offshore based joint ventures? Does a Western Australian based joint venture have the potential to win an EPC contract for one of the yet to be announced local LNG projects?

The aim of this discussion paper is to raise awareness of the issue with government and to allow further consideration of the potential for the establishment of an LNG Centre of Excellence in LNG industry design in Western Australia.

DR M.D. NAHAN, MLA
CHAIR

ABBREVIATIONS AND ACRONYMS

EPC	Engineering Procurement and Construction
EPCM	Engineering, Procurement, Construction Management
FEED	Front End Engineering Design
GRI	Geopolitical Risk Index
LNG	Liquified Natural Gas
NWS	North West Shelf

CHAPTER 1 SUMMARY OF ISSUES RAISED IN EVIDENCE

1.1 Context

(a) LNG Resources

There is general agreement that Australia represents one of the fastest growing liquefied natural gas (LNG) producers in the world.[1] Western Australia has huge reserves of offshore gas resources, with LNG offering the best way to generate a return on this resource.[2] As at April 2009 there were some 26 LNG targets in the region including those associated with Gorgon, Chevron Wheatstone, the Browse Basin and the Kimberley Hub. Of the 50 to 60 prospective projects world-wide, 20 to 30 of these are in Australia and New Guinea.[3] Upstream LNG developments recently commissioned or under construction include the North West Shelf LNG Venture Phase 5 expansion ($2.6 billion) and the Pluto LNG Project ($12 billion).[4] There is the potential for a further $80 billion to be 'invested in new domestic gas, condensate and LNG production capacity in the Pilbara or the Kimberley'.[5] While oil and gas production might be a challenging industry, long-term demand for LNG is expected to increase strongly, with the gap between demand and supply widening.[6] Given the resources and developments already in Western Australia, growth in LNG production in this state is real,[7] and is likely to continue.

(b) LNG Market

LNG production operates in a global market and, therefore, is subject to fluctuations in global markets as well as local events that have a flow-on effect around the world.[8] For example, events in Nigeria, Qatar and Saudi Arabia greatly impact upon investment decisions in relation to field development and, thus, design, manufacture and construction. Furthermore, it appears that LNG production is also subject to other forces that impact upon the market and on production. For example, the power of the few multinationals and their preferences in relation to project design

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1 LNG (D), *Committee Briefing*, April 2009; LNG (A), *Committee Briefing*, April 2009; Department of Resources, Energy and Tourism, *Realising Australia's Energy Resource Potential. Discussion Paper*. Energy White Paper, April 2009, p30.

2 LNG (A), *Committee Briefing*, April 2009.

3 LNG (D), *Committee Briefing*, April 2009; LNG (A), *Committee Briefing*, April 2009; LNG (C), *Committee Briefing*, April 2009.

4 Department of Resources, Energy and Tourism, *Realising Australia's Energy Resource Potential. Discussion Paper*. Energy White Paper, April 2009, p30.

5 ibid.

6 LNG (E), *Committee Briefing*, April 2009; LNG (A), *Committee Briefing*, April 2009; Department of Resources, Energy and Tourism, *Realising Australia's Energy Resource Potential. Discussion Paper*. Energy White Paper, April 2009, p30.

7 LNG (A), *Committee Briefing*, April 2009.

8 LNG (F), *Committee Briefing*, April 2009.

and construction have an enormous impact, as does the influence of a small number of sovereign governments. It has been suggested that the industry's multinationals do not favour the development of another LNG design hub and have the ability to block a new entrant.[9] These issues are also raised in the discussion of risk factors below.

(c) LNG Technology

Technologies for LNG processing are generally owned by specific specialist technology providers which are the licensed technology owners for LNG design. There are only two companies world-wide that are licence holders for the technology that is the essence of LNG design, namely Shell and Conoco Phillips Cascade. Plant owners and operators must purchase a licence to design and operate the facility, and project engineers then incorporate this technology into the broader processes.[10] Shell technology has been employed by MW Kellogg, Foster Wheeler, Technip and Snamprogetti, with various combinations of joint ventures established by these companies for each particular project. Conoco Phillips Cascade technology has been used by Bechtel Oil and Gas.[11]

Once a technology has been selected for a particular facility the owner/operator's design process goes through a number of phases.[12] This paper is concerned with high level design which is generally, though not always, associated with design up to and including the front end engineering design (FEED) and EPC (Engineering Procurement and Construction).

(d) LNG Design - Global Hubs

Once the basis of design has been determined, operators proceed to the FEED phase, with contractors (or contractor consortia) bidding for the FEED and EPC phases. It is generally acknowledged that there are three global hubs for LNG design, namely Reading, Yokohama and Houston.[13] Operating out of these hubs, there is a small number of widely recognised international companies considered to be either major or medium LNG contractors.[14] A 2007 Market Survey System report acknowledges the following significant LNG design companies:

'Major' LNG Contractors:

- Bechtel (Houston)
- Chiyoda (Yokohama)

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9 LNG (A), *Committee Briefing*, April 2009.

10 LNG (C), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009; LNG (A), *Committee Briefing*, April 2009.

11 LNG (A), *Committee Briefing*, April 2009.

12 LNG (G), *Committee Briefing*, May 2009.

13 LNG (A), *Committee Briefing*, April 2009.

14 LNG (C), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009; LNG (A), *Committee Briefing*, April 2009.

- KBR (London)
- JGC (Yokohama)
- Saipem/Snamprogetti (Italy/London)
- Technic (Paris)

'Medium' LNG Contractors:

- Foster Wheeler (London)
- CBI (London/Houston)
- Linde (Germany)[15]

The rise of specialised engineering, procurement, construction management (EPCM) companies such as Foster Wheeler is discussed further below.

(e) Australian LNG Design History

Australian engineering expertise has long been used in LNG plant design. However, this design occurred outside of Australia. For example, Australian engineering capability was utilised in Yokohama in the design of Woodside's LNG Trains 1 and 2.[16] While engineering for Train 3 was limited in scope (mainly because Train 3 replicated Trains 1 and 2), this engineering was carried out in Perth.[17] Australia's capacity to engineer such projects continued to develop throughout Train 3. This represents the strong push in the 1980s for Perth-based companies to pre-qualify for engineering and to show that LNG plant design could be undertaken in Perth.[18] Subsequently, Woodside and the Kellogg Joint Venture decided to engineer Train 4 in Perth; this 4.2 million tonne per annum LNG project was a noted shift away from the three globally recognised engineering design hubs. The Train 4 design project employed 350 people in Perth, including approximately 16 expatriates from London and Houston, during 2002-2003.[19]

While Train 4 was over-budget, it was considered to be a good project with a fast start-up time. The issue of budget will be returned to below.

The following history of engineering in Perth was provided by LNG (D):

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15 LNG (G), *Committee Briefing*, May 2009.

16 LNG (A), Committee Briefing, April 2009.

17 LNG (G), *Committee Briefing*, May 2009.

18 LNG (D), *Committee Briefing*, April 2009.

19 LNG (A), *Committee Briefing*, April 2009; LNG (D), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009.

	5% of a Domgas Plant was engineered in Perth	*1982*
	10% of 2 Trains were engineered in Perth	*1984*
	100% of a Train was engineered in Perth	*1991*
	100% of an LPG plant was engineered in Perth	*1995*
	100% of a Train was engineered in Perth	*2003*
Versus	*10% of two Trains were engineered in Perth*	*2006 and 2008*[20]

Nevertheless, FEED engineering for Woodside's Train 5 went offshore and will be carried out by Foster Wheeler.[21] It is also likely that engineering work for the forthcoming Gorgon Project will be performed outside Australia.[22] The design head office for the Pluto Project will also be located offshore.[23] As at April 2009, approximately 90% to 95% of engineering and design for Western Australian LNG plants has been or will be performed offshore from an overseas home office.[24]

LNG (E) advised that there has been a decline in local industry participation in projects, including design.[25] As noted, Train 4 design was done in Perth, making local content for this Train 72% of the project value. For Woodside's Pluto Project, 50% of the project value is expected to be local content; for the Gorgon Project, local content was initially forecast to be 66%, but this has been reduced to 50%.[26]

1.2 Western Australia's Capacity to Compete

The engineering of Train 4 in Western Australia was expected to be the beginning of the realisation of Perth's LNG design engineering potential. However, with the shift of Train 5 and other projects offshore, this potential has not been realised. A number of reasons for this have been put forward, and these form the basis of the following discussion. While many of these reasons are interconnected, for ease of discussion they are presented here as discrete issues.

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20 LNG (D), *Committee Briefing*, April 2009. The 1984 figure is for a number of off-site facilities and process utilities.

21 LNG (D), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009; LNG (A), *Committee Briefing*, April 2009.

22 LNG (A), *Committee Briefing*, April 2009.

23 LNG (G), *Committee Briefing*, May 2009.

24 LNG (D), *Committee Briefing*, April 2009.

25 LNG (E), *Committee Briefing*, April 2009.

26 LNG (E), *Committee Briefing*, April 2009.

(a) Capability and Competency

LNG (C) advised that more than 1,600 design engineers are required on a typical LNG project, with 500 of these involved in the upstream design.[27] LNG (G) stated that for the FEED phase of a typical LNG development, peak staffing would be between 100 and 200 over 9 to 15 months. During the EPC phase peak staffing would be between 400 and 800 over 3 to 5 years. The major contractors may have approximately 2,000 staff at their head office working on more than one project at the one time.[28]

Many of those who briefed the Committee held that Western Australia has the capability and competency to undertake high-level design work on LNG projects. Indeed, Train 4 demonstrated that such work could be done in Western Australia.[29] Furthermore, LNG (B) suggested that there was no reason from a competency perspective why LNG project design work could not be re-established in Western Australia.[30]

According to LNG (A), a lack of engineers is not an argument against Australian design as engineers are world nomads. In fact, Australian engineers follow projects around the world.[31] While a scarcity of down-stream engineering resources is acknowledged for 2001-2002, Australian engineers have relocated to Reading to participate in Train 5 design.[32] Similarly, LNG (D) suggested that Perth does not have a problem attracting staff for exciting projects, and that the resources and capability can be found in this state, particularly as engineering is a transferable skill and local engineers may possibly run out of work.[33] LNG (A) argued that while Perth may not have access to the extensive resource pools available to existing hub members, it certainly has sufficient resources to support current LNG projects.[34] As at April 2009, Perth was believed to have over 4,000 engineers and designers and, with a softening market, this capacity was expected to increase as more people became available. Expatriates returning to Perth were also bringing back international skills and expertise.[35] LNG (C) accepted that Australia is not necessarily cost competitive downstream, but argued that upstream Australia is very cost competitive and competent. In fact, LNG (C) believed that for upstream engineering design, Perth is already recognised as a centre of excellence in the world.[36] LNG (D) argued that Perth should not be seen as a low cost engineering centre and given only low technical level design work as is given to

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27 LNG (C), *Committee Briefing*, April 2009.

28 LNG (G), *Committee Briefing*, May 2009.

29 LNG (D), *Committee Briefing*, April 2009.

30 LNG (B), *Committee Briefing*, April 2009.

31 LNG (A), *Committee Briefing*, April 2009; LNG (C), *Committee Briefing*, April 2009.

32 LNG (A), *Committee Briefing*, April 2009.

33 LNG (D), *Committee Briefing*, April 2009.

34 LNG (A), *Committee Briefing*, April 2009.

35 LNG (D), *Committee Briefing*, April 2009.

36 LNG (C), *Committee Briefing*, April 2009.

centres in India, the Philippines, Jakarta, Singapore and Mexico. Rather, Perth is capable of full high technical engineering design and should be given the opportunity to undertake such work.[37]

Developments in information communication technology also positively impact upon Western Australia's capability in that it allows for effective and relatively easy sharing of information around the globe.[38] While some suggest that distance remains a factor for Perth, others believe that Perth can no longer be considered to be too far away.[39]

In contrast to the view that Western Australia has the capacity for high level LNG design, LNG (G) suggested that Perth's capacity is limited, in part, by its resource pool and concurrent developments. Therefore, rather than being in a position to undertake the entire design project, Perth-based companies form partnerships with the consortia undertaking the FEED and detailed design. LNG (G) also acknowledged the capacity of local companies to develop specialist roles in the early phases of development, in process control and safeguard system hardware and software, field erection, and brownfield support such as rectification and remedial works, de-bottlenecking and minor projects.[40]

(b) Continuity of Work

Lack of continuity of work is one of the key hurdles to establishing a centre of design excellence.[41] The loss of Train 5 to the Reading hub was a significant blow to companies established in Perth and to the possibility of sustaining Perth's developing status as a major LNG design centre. To regain design work that has gone offshore since Train 4, companies would need to establish themselves in Western Australia. This, in turn, would require continuity of work.[42] Clearly there is a circularity to this situation.

As noted, most design is undertaken in one of the three global hubs, and Train 4 placed Perth on the global map.[43] Perth was then ideally placed to develop as a major contender in LNG design excellence and capability. However, there was no sustainability of staff and facilities by the consortia at the end of that project.[44] As LNG (C) put it, Perth's LNG design potential withered on the vine.[45] Woodside's recent decisions in relation to LNG design will weaken Australia's ability to compete with other major players in the industry. It is suggested that it will weaken Australia's recognition and credibility as an emerging centre of excellence. If Australia and/or Western

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37 LNG (D), *Committee Briefing*, April 2009.

38 LNG (B), *Committee Briefing*, April 2009; LNG (A), *Committee Briefing*, April 2009.

39 LNG (F), *Committee Briefing*, April 2009; LNG (D), *Committee Briefing*, April 2009.

40 LNG (G), *Committee Briefing*, May 2009.

41 ibid.

42 LNG (B), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009.

43 LNG (A), *Committee Briefing*, April 2009.

44 LNG (C), *Committee Briefing*, April 2009.

45 ibid.

Australia have lost significant capability, the opportunity to compete for the billions of dollars expected to be spent on design has also been lost.[46]

Understandably, project specific LNG engineering offices are inefficient, with considerable establishment costs, staffing difficulties and the need to retrench staff at project completion.[47] As LNG (G) noted, this lack of continuity is an issue between project phases as well as between individual projects.[48] LNG (G) further suggested that any single engineering office would not be sustained by LNG engineering alone. Major contractors ensure continuity of work by providing services to other sectors of the oil and gas industry.[49]

(c) Cost Consideration and Competitiveness

According to LNG (G) capital expenditure costs for Australian projects are very high relative to its Asia Pacific basin competitors such as Qatar, Oman, Yemen and Indonesia. Citing FACTS Global Energy unpublished data, LNG (G) advised that the cost of Pluto LNG is US$1,291/tonne capacity, and that future Australian projects could cost over US$1,300/tonne.[50]

There is considerable difference of opinion as to whether or not cost is a deciding factor in design decisions and, if so, whether Perth offers a cost effective option for LNG design. Some argued that along with capability, cost is a major factor for LNG design.[51] Others, however, argued that because centres such as Reading do not provide a low-cost alternative, cost cannot be the overriding factor.[52] Added to this is the fact that as a proportion of a project's total cost, high level design is not particularly high.[53] It must also be acknowledged that the relative strength of the Australian dollar would impact on the total overall cost of any project.

Regardless of whether or not cost is the deciding factor, there is further difference of opinion as to Western Australia's ability to provide a cost effective alternative to existing design centres. For some, the state is a high cost jurisdiction.[54] With LNG design now a 24 hour process across the world, countries such as Thailand, India and China are offering more cost-effective alternatives.[55] LNG (G) reported that Train 4, for which the detailed design phase was undertaken in Perth, had resulted in significant negative cost and schedule outcomes.[56] On the other hand, others such as

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46 LNG (A), *Committee Briefing*, April 2009.

47 LNG (G), *Committee Briefing*, May 2009.

48 ibid.

49 ibid.

50 ibid.

51 LNG (G), *Committee Briefing*, May 2009; LNG (F), *Committee Briefing*, April 2009.

52 LNG (A), *Committee Briefing*, April 2009.

53 LNG (D), *Committee Briefing*, April 2009.

54 LNG (G), *Committee Briefing*, May 2009; LNG (F), *Committee Briefing*, April 2009.

55 LNG (F), *Committee Briefing*, April 2009.

56 LNG (G), *Committee Briefing*, May 2009.

LNG (C) suggested that for upstream engineering Australia is very cost competitive. Similarly, an Industry Capability Network review of the NWS project is reported to have argued that Australia 'provides a competitive option to engineering LNG projects'.[57] An experienced senior engineer is reported to have said that there was no cost penalty for Train 4. Rather, 'there were quite significant cost savings because design done overseas was not appropriate for contractors working in the north-west of the state'.[58]

According to LNG (A), Perth is generally competitive in oil and gas engineering services with a number of Australian engineering groups exporting their services worldwide.[59] Nevertheless, LNG (A) confirmed that for Train 5 the engineering cost difference between Perth and the UK was substantial. This is in contrast to the view held by engineering groups who advised LNG (A) that engineering salaries, productivity and office space costs for Perth should have been comparable with, and possibly even lower than, the UK in a normal tendering environment.[60]

1.3 Other Factors to Consider

(a) The Engineering Design-Procurement Relationship

Many of those who briefed the Committee maintained that there is a strong link between the project design base and the project's local content. For these stakeholders, procurement goes hand in hand with engineering.[61] According to LNG (C), it is difficult to get local content with overseas design, and to get Australian content the engineering needs to be done locally.[62] LNG (D) also considered engineering to be important for procurement, particularly as designers design for what they know, that is, for local suppliers.[63] LNG (G) advised that for all the projects it manages, global procurement was undertaken by the LNG contractor from their main engineering centre.[64] LNG (A) acknowledged that even though developments in information technology facilitates easier access to technological information off-site, there is still a definite link between procurement and the project base. LNG (A) cited Train 5 as an example, with Foster Wheeler, an EPCM, awarding contracts to European tenders.[65]

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57 Roberts, Peter, 'Gas Boom Spoils go Offshore', *The Australian Financial Review*, 18 January 2010, p12.

58 ibid.

59 LNG (A), *Committee Briefing*, April 2009.

60 ibid.

61 LNG (A), *Committee Briefing*, April 2009; LNG (G), *Committee Briefing*, May 2009; LNG (C), *Committee Briefing*, April 2009; LNG (D), *Committee Briefing*, April 2009.

62 LNG (C), *Committee Briefing*, April 2009.

63 LNG (D), *Committee Briefing*, April 2009.

64 LNG (G), *Committee Briefing*, May 2009.

65 LNG (A), *Committee Briefing*, April 2009.

LNG (E), however, suggested that the traditional assumption that there is a synergy between local project and supply is no longer valid.[66] According to LNG (E), the rise of specialised EPCMs is part of the reason behind the decline in local industry participation in Australian projects. EPCMs such as Foster Wheeler bring their global supply chain with them in that they outsource the decision-making and project management to others.[67] EPCMs use accredited supplies and, according to LNG (E), there are few Australian companies with the requisite LNG accreditation. Once a project goes to an EPCM, Australia's opportunity for a full, fair and reasonable quantity of local content is diminished.[68] Foster Wheeler's services as an EPCM allowed it to offer Woodside a complete package, which is necessarily easier and more effective.[69]

Given the relationship between EPCMs and design and procurement, if Western Australia wants to attract high level engineering design projects to Perth, it is reasonable to suggest that it needs to be the home for at least one EPCM.

(b) A Challenge to the Status Quo

It was suggested that rather than cost being the main decision-making factor, project control was the primary issue.[70] While, as noted above, Australia is held to be cost competitive for LNG engineering projects, project owners have not supported this.[71] It is possible that while tendering consortia believe that Western Australia can provide a competitive option, and that it would be possible to develop Perth into a recognised centre of excellence, project owners do not. Project owners appear not to have supported the concept of Perth as a centre of LNG design excellence and seem to support the maintenance of the status quo of the three established design hubs at present.[72] According to LNG (A), the result of this is Australia's elimination as a player.[73]

An alternative view is proposed by LNG (C) who rejects the notion that project owners such as Shell and Woodside want to keep the design club small. LNG (C) suggested, in fact, that such project owners wanted to encourage growth in the number of key design centres. For LNG (C), the mystique has been internally generated by the 'design club' members, particularly as the smallness of the club membership keeps the costs high.[74]

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66 LNG (E), *Committee Briefing*, April 2009.

67 ibid.

68 ibid.

69 ibid.

70 LNG (A), *Committee Briefing*, April 2009.

71 Roberts, Peter, 'Gas Boom Spoils go Offshore', *The Australian Financial Review*, 18 January 2010, p12.

72 LNG (A), *Committee Briefing*, April 2009.

73 ibid.

74 LNG (C), *Committee Briefing*, April 2009.

(c) Regulatory Environment

LNG (G) pointed to the federal government's 2009 *Energy White Paper Discussion Paper*, stating that this paper demonstrates first, that in comparison with other jurisdictions, investment barriers in Australia are not onerous and, second, that taxes are relatively high and investment returns relatively low.[75] The *Energy White Paper* reveals that there is 'a complex array of legislation and administrative frameworks affect[ing] Commonwealth offshore and state and territory offshore and onshore exploration and development of energy resources'.[76] This is further complicated by the different jurisdictions that have responsibility for resource projects, depending upon their location. The federal government has acknowledged the need for improvements to 'both the efficiency and the effectiveness of regulation', particularly in the area of consistency across jurisdictions and between sectors.[77]

The *Energy White Paper* notes that a number of studies have reached differing assessments of Australia's suitability as an investment option. The *Australian Upstream Oil and Gas industry Strategy* noted that Australia offers 'a reasonably attractive investment environment' and has 'transparent legal and regulatory processes'.[78] It also notes the lower risk, lower return characteristic of investment in Australia. According to a Wood Mackenzie study, Australia ranks moderately for return on exploration spending (38th out of 60 countries). A PricewaterhouseCoopers study placed Australia at 127 out of 181 countries assessed for total tax as a percentage of commercial profits.[79] In contrast, in 2008 the Fraser Institute's investigation of the countries with the worst barriers to investment ranked Australia as 7th lowest out of 81 jurisdictions.[80] The *Energy White Paper* concludes that while there are differing results obtained in these studies, 'taken together they indicate opportunities for the Australian gas sector to improve its international competitiveness'.[81]

In 2009, the Fraser Institute released results of its third survey of petroleum industry executives and managers in relation to investment barriers such as high tax rates, costly regulatory schemes, security threats and other factors affecting investment decisions.[82] Table 1 above provides information on the attractiveness or otherwise of Western Australia as an investment destination

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75 LNG (G), *Committee Briefing*, May 2009. See: Department of Energy, Resources and Tourism, *Energy White paper. Discussion Paper. Realising Australia's Energy Resource Potential*, Australian Government, Canberra, April 2009, pp21-30.

76 Department of Energy, Resources and Tourism, *Energy White Paper. Discussion Paper. Realising Australia's Energy Resource Potential*, Australian Government, Canberra, April 2009, p21.

77 ibid., p22.

78 ibid., p30.

79 ibid., pp30-31. Note: The higher the number, the higher the tax percentage of commercial profits.

80 Department of Energy, Resources and Tourism, *Energy White Paper. Discussion Paper. Realising Australia's Energy Resource Potential*, Australian Government, Canberra, April 2009, p31.

81 ibid., p31.

82 Fraser Institute, *Global Petroleum Survey 2009*, June 2009, p6. There were 577 respondents, allowing conclusions to be drawn for 143 jurisdictions.

for this industry. According to this data, neither Western Australia's taxation regime nor its regulatory requirements constitute a significant deterrent to investment.

Table 1: Criteria that Encourage or Deter Investment in Western Australian Oil and Gas Exploration and Production[83]

Criteria	Encourages or Is not a Deterrent to Investment (%)	Is a Mild Deterrent to Investment (%)	Is a Strong Deterrent or Would not Invest Due to this Criterion (%)
Fiscal Terms	82	16	2
Taxation Regime	78	20	2
Local Natural Gas Price	75	18	7
Cost of Regulatory Compliance	48	41	9
Regulatory Uncertainty	74	22	4
Environmental Regulations	35	44	21
Local Processing Requirements	75	17	8

1.4 Western Australian Advantages

A number of factors were raised as providing Western Australia with an advantage over its LNG design hub competitors. As well as the relatively friendly regulatory environment and the capacity to be cost competitive, as mentioned above, Western Australia is proximate to LNG project sites where the engineering has to be implemented.[84] As noted previously, there are a number of proposed projects in the Australian and New Guinea regions. There is also an increasing list of upstream companies coming to Western Australia as most upstream design work has to be done close to the source. This allows engineers to gain a better understanding of what is in the reservoir and, therefore, what needs to be incorporated into the design. Western Australia's proximity to

83 Fraser Institute, *Global Petroleum Survey 2009*, June 2009, pp72-102. The survey also provides this data for all Australian states and the Northern Territory. Note that not all percentages will add to 100%, presumably due to rounding adjustments.

84 LNG (A), *Committee Briefing*, April 2009; LNG (C), *Committee Briefing*, April 2009.

reserves in the region is seen as a distinct competitive advantage over the other hub countries that are clearly distant from these reserves.[85]

A further advantage raised is that of low sovereign risk. In relation to other jurisdictions, Australia has a very strong record of political stability. The Fraser Institute's 2009 survey also provides a Geopolitical Risk Index (GRI) that scores jurisdictions' political stability and security. According to the Institute, these two factors 'are considered to be more difficult to overcome than either regulatory or commercial barriers because political change typically is necessary before significant progress can be made'.[86] A high score represents political instability and/or security problems, which makes investment in that jurisdiction relatively unattractive. Jurisdictions with a very high GRI (between 80 and 100), and therefore significant investment risk, include Paraguay, Niger, Myanmar, Bolivia, Sudan, Democratic Republic of Congo (Kinshasa), Chad, Pakistan, Nigeria, Venezuela, Iraq, and Algeria. Western Australia, along with the Northern Territory, Queensland, South Australia and Tasmania, are among the 18 jurisdictions with the least geopolitical risk. All of these 18 jurisdictions scored a zero on the GRI, 'which means that no one gave them a negative grade on political stability and security'.[87] While cost is certainly a major factor in investment decision making, it has been suggested that low sovereign risk plus reliability of supply outweigh higher costs.[88]

Western Australia's experience, particularly with Train 4, is also considered to be a distinct advantage. According to LNG (C), Australia has an enormous endowment of knowledge, capability and expertise.[89] Similarly, LNG (D) advised that Perth has competent resources, historical experience, and experience in global work interfaces and major joint venture arrangements.[90]

1.5 Challenges

(a) Government Focus on Design Engineering

While Western Australia offers a number of advantages in relation to high level LNG engineering design, there are also a number of challenges to be faced. It is clear from briefings that there was general disappointment that, following Train 4, Train 5 design was not awarded to Australia. A number of reasons for this decision have been noted above. However, the LNG (A) suggested that despite relatively little being needed to be done to keep Train 5 in Australia, the focus of government was not on engineering.[91] At this time the government was interested in saving the

85 LNG (A), *Committee Briefing*, April 2009.

86 Fraser Institute, *Global Petroleum Survey 2009*, June 2009, p9. Security problems include 'crime, confiscation and use of company equipment and vehicles, and the threat of expropriation'.

87 Fraser Institute, *Global Petroleum Survey 2009*, June 2009, p23.

88 LNG (F), *Committee Briefing*, April 2009.

89 LNG (C), *Committee Briefing*, April 2009.

90 LNG (D), *Committee Briefing*, April 2009.

91 LNG (A), *Committee Briefing*, April 2009.

steel industry and, therefore, the production of module materials was the priority.[92] This sentiment was also expressed by LNG (B) which argued that the Northern Territory and Queensland are much more welcoming and enthusiastic than Western Australia in relation to encouraging and supporting LNG design.[93] Similarly, LNG (E) suggested that the economic climate was less important than political will, and that it was important for the government to determine its attitude to the LNG design industry.[94]

The reported focus on blue collar module production was also cited in *The Australian Financial Review* article in January 2010. This article draws attention to the 'focus on blue collar job creation' and notes the role of trade unions in 'maximising local content in areas such as steel fabrication'.[95] According to this article, 'there is no lobby group campaigning for the [engineering] profession' and Engineers Australia, the engineering professional body, 'has no policy on the issue'.[96]

(b) Contract Conditions

It has been suggested that one way for the government to support local LNG design is to insist on local design content as part of the local procurement requirements in State Agreements. With the system of State Agreements with local content provisions already in place, it would be possible to utilise such agreements to ensure the local content focus is on all aspects of the project, not just the steel fabrication.[97] LNG (D) suggested that there needs to be a clear definition of local content, with stipulations made as to engineering, procurement and construction, rather than one local content percentage for the entire project.[98] There needs to be clarification in the definition of local content so that it includes high level engineering rather than early works infrastructure, for example.

It has been reported that other countries such as Britain, Norway and Holland, when in a situation similar to that now facing Australia, 'made a strategic decision to keep all design in their home ports and the international engineering companies accepted those government conditions under competitive tender'.[99] It has been argued that Norway, for example, provides an excellent example of what government policy direction can achieve in that it helped Norway gain leverage in the engineering market.[100] It is LNG (C)'s view that Western Australia's current position is more advanced than was Norway's when its government took policy action in support of its design

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92 LNG (A), *Committee Briefing*, April 2009.

93 LNG (B), *Committee Briefing*, April 2009.

94 LNG (E), *Committee Briefing*, April 2009.

95 Roberts, Peter, 'Gas Boom Spoils go Offshore', *The Australian Financial Review*, 18 January 2010, p12.

96 ibid.

97 LNG (A), *Committee Briefing*, April 2009.

98 LNG (D), *Committee Briefing*, April 2009.

99 Roberts, Peter, 'Gas Boom Spoils go Offshore', *The Australian Financial Review*, 18 January 2010, p12.

100 LNG (C), *Committee Briefing*, April 2009; LNG (F), *Committee Briefing*, April 2009.

industry. That is, Western Australia has a head start in relation to cost and capability.[101] Given the relatively small proportion of total project cost represented by engineering, LNG (C) suggested that government could be more direct and encouraging. While demanding X% of fabrication or material purchases to be made in Australia would certainly harm a project, to demand X% of design, while not popular with project owners and/or EPCMs, would be accepted.[102] LNG (F), however, suggests that rather than follow the Norwegian model of having a nationally owned company, Australia's approach is a more open and transparent one; namely regulation and policy to achieve objectives.[103]

(c) Risks and Related Opportunities

With current LNG technology, harvesting and processing LNG requires offshore platforms, and Western Australia has significant industry involvement in the construction of these platforms. There is concern that LNG technology developments will bring increased modularisation and offshore floating platforms which, in turn, will bring about significant losses to Western Australia's construction industry.[104]

In this event, one opportunity for the state to obtain benefits from its oil and gas reserves, and its location, is to develop its capabilities and reputation as a centre of LNG engineering design excellence.

Given the risks associated with floating platforms, LNG (E) suggested that it would be beneficial for Western Australia to focus on developing niche markets such as project maintenance. This would mean a reorientation from the construction phase to the operation phase of a project. LNG (E) sees great potential for the service maintenance industry. In the LNG sub-sea future, the state's competitive edge would be in the offer of specialised support and service post-design.[105]

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101 LNG (C), *Committee Briefing*, April 2009.

102 ibid.

103 LNG (F), *Committee Briefing*, April 2009.

104 LNG (A), *Committee Briefing*, April 2009; LNG (D), *Committee Briefing*, April 2009; LNG (E), *Committee Briefing*, April 2009.

105 LNG (E), *Committee Briefing*, April 2009.

(d) LNG Design Centre of Excellence

Consideration must be given to what is meant by an LNG design centre of excellence. For example, is centre of excellence status to be gained by developing a reputation for excellence and attracting EPCMs to establish in Perth? Or is there a need for a particular entity and/or place to be designated as 'the' centre of excellence?

It seems that there are a number of centres in the state that may form part of a network that may undertake centre of excellence work. There is also considerable research being undertaken in Western Australia's universities, particularly in the engineering and energy fields. It has been suggested that what is lacking in this state is a structured mechanism to draw these separate threads together.[106]

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106 LNG (B), *Committee Briefing*, April 2009.