

---

# **Opportunities and Challenges for the regulation of Health, Safety and Environment (HSE) in the Joint Petroleum Development Area.**

**Revision 3 19/2/2003**

A Paper by Jeremy Dunster Manager – HSE Timor Gap Joint Authority

As presented at the International Energy and Mineral Resources Conference  
5 – 7 March 2003, Dili Timor Leste.

The views expressed in this paper are those of the author and do not necessarily reflect the views and policies of the Timor Gap Joint Authority.

---

## Table of Contents

<b>INTRODUCTION .....</b>	<b>3</b>
<b>BACKGROUND.....</b>	<b>3</b>
OFFSHORE INDUSTRY HSE RISKS.....	3
REGULATORY CHANGES .....	3
<i>Australian Experience.....</i>	<i>4</i>
<i>JPDA Experience.....</i>	<i>4</i>
INDUSTRY HSE PERFORMANCE .....	5
<i>Global Industry Performance.....</i>	<i>5</i>
<i>Australian Industry Performance.....</i>	<i>9</i>
<i>JPDA Experience to-date.....</i>	<i>10</i>
<b>OPPORTUNITIES AND CHALLENGES FOR THE REGULATION OF HSE IN THE JPDA.....</b>	<b>11</b>
DEVELOPING THE LEGISLATION AND THE REGULATORY BODY .....	11
REGIONAL CONSISTENCY .....	11
<b>CONCLUSION .....</b>	<b>12</b>
<b>REFERENCES .....</b>	<b>13</b>

## Table of Figures

FIGURE 1 - FATAL ACCIDENT RATE.....	5
FIGURE 2 - LOST TIME INJURY FREQUENCY RATE.....	5
FIGURE 3 - TOTAL RECORDABLE INCIDENT FREQUENCY RATES .....	6
FIGURE 4 - REGIONAL LOST TIME INJURY FREQUENCY RATES .....	6
FIGURE 5 - REGIONAL TOTAL RECORDABLE INCIDENT FREQUENCY RATE.....	7
FIGURE 6 - OIL DISCHARGED PER UNIT OF PRODUCED WATER DISCHARGES - 2001 .....	7
FIGURE 7 - OIL SPILT PER UNIT OF HYDROCARBON PRODUCTION - 2001 .....	8
FIGURE 8 - TOTAL OIL DISCHARGED/SPILT PER UNIT OF HYDROCARBON PRODUCTION - 2001 .....	8
FIGURE 9 – AUSTRALIAN LOST TIME INCIDENT FREQUENCY RATES .....	9
FIGURE 10 - AUSTRALIAN TOTAL RECORDABLE, MEDICAL TREATMENT AND ALTERNATIVE DUTY INCIDENT FREQUENCY RATES .....	9
FIGURE 11 - AUSTRALIAN LOST TIME INCIDENT FREQUENCY RATES ACROSS SELECTED INDUSTRIES 2000 - 2001 .....	10

## **Introduction**

This paper seeks to provide a background of the performance of the offshore petroleum industry within a goal setting regulatory regime and in order to put into context what (in the authors opinion) are some of the key challenges and opportunities to the regulation of Health, Safety and Environment (HSE) within the Joint Petroleum Development Area (JPDA).

Wherever possible reference material is available via the internet to allow readers the opportunity to investigate further the topics covered herein and will also be made available to the conference organisers on CD ROM.

## **Background**

### **Offshore Industry HSE Risks**

History has shown that uncontrolled activities associated with the offshore petroleum industry can produce devastating effects on both the people it employs and the environment in which it operates. The combination of volatile products being extracted and processed at high pressures and temperatures in often remote and potentially environmentally sensitive areas means the industry presents significant risks to both the health and safety of people and the environment in which they work. Failure to adequately identify, assess and manage such risk can and has had catastrophic consequences.

The Piper Alpha disaster is probably the most infamous case of such a failure from a safety perspective. The incident started on the night of the 6<sup>th</sup> of July 1988<sup>1</sup> with an explosion in the gas compression module of the platform located 176km north east of Aberdeen in the North Sea. The fire and further explosion caused the failure of the emergency systems and ultimately the collapse of the entire platform with the loss of 135 lives. This disaster also had significant monetary costs including the loss of a billion dollar platform, insurance payout to survivors totalling nearly three billion dollars and the loss of ten percent of Britain's oil production at the time<sup>2</sup>.

From an environmental perspective the grounding of the Exxon Valdez on Blight Reef in King William Sound in Alaska shortly after midnight on March the 24th 1989 highlights a similar failure to manage risk. In this incident more than 11 million gallons of crude oil (the largest spill in US history) was spilt, presenting a significant challenge to both the company and the relevant government agencies involved. A lack of equipment, materials and logistics to ensure the resources could be mobilised to the site quickly combined to result in significant losses of birds and mammals either through direct contact with the oil or loss of food resources<sup>3</sup>. Ten years after the event neither all the natural resources nor human services that depend on them (tourism, commercial fishing etc) have fully recovered<sup>4</sup>. Exxon was fined \$150 million for this spill and agreed to pay \$100 million in criminal restitution and a further \$900 million as a civil settlement spread over the next ten years with provision for a further \$100 million as contingency for unforeseen damage to resources<sup>5</sup>.

These key incidents and a number of less well known ones highlighted to industry, government and society in general the need for changes in the way in which the industry managed risk and the way it was regulated.

### **Regulatory changes**

In the recent decade there has been a significant shift away from prescribed regulation and legislation in the form of codes that prescribe specific solutions towards goal setting regimes that

concentrate on specifying principles. Following the investigation into the Piper Alpha incident there was a significant change in the UK sector of the North Sea that saw the introduction of “Safety Cases” (a concept already in use in various other industries in the UK also driven by significant incidents over the preceding three decades across Europe). These changes effectively aimed to combine elements of prescription, goal setting, self regulation and regulatory intervention. This type of regime places the onus on the operator to put forward a case for the safety of their facility and the regulator to challenge this both prior to acceptance and then on an ongoing basis through the audit of the operators management practices against the case they present<sup>6</sup>. The early 1990’s also saw goal setting, risk based legislation introduced / improved in both the offshore Norwegian and United States sectors which, whilst similar, took a broader approach encompassing not only risks to personnel but also the environment and society in general<sup>7</sup>.

In response to loss of the “Herald of Free Enterprise” and other maritime disasters in the 1980’s the International Maritime Organisation in 1993 adopted the International Management Code for the Safe Operation of Ships and for Pollution Prevention (the ISM Code)<sup>8</sup>. This code provides a framework for a management system covering both vessels and their onshore support bases. This system became mandatory in 1998 with progressive implementation through to mid 2002 (beginning with passenger ships and oil/gas/chemical tankers and bulk carriers over 500 tonnes gross). As of December 2002 over 23,000 Safety Management Certificates had been issued to vessels and nearly 6,900 Documents of Compliance had been issued to onshore operators after successful audits by the various Flag state administrations and their delegates<sup>9</sup>.

### *Australian Experience*

Following the Piper Alpha disaster and subsequent inquiry by Lord Cullen, the Consultative Committee on Safety in the Offshore Petroleum Industry (COSOP) was established. After reviewing the findings of the Cullen enquiry the committee endorsed its’ recommendations and the introduction of the safety case concept into Australia<sup>1</sup>. In 1996 the Petroleum (Submerged Lands)(Management of Safety on Offshore Facilities) Regulations were enacted along with the repeal of a large number of prescriptive clauses from the regulations. In 1999 the Petroleum (Submerged Lands)(Management of Environment) Regulations were issued. These parallel the approach taken for safety in terms of requiring the preparation of Environment Plans that demonstrate environmental risks have been adequately identified and strategies are developed to ensure systems are put in place to manage them on an on-going basis. A key focus of both these new regulations is that of reducing risk to As Low As Reasonably Practicable (ALARP) with the implicit introduction of cost coupled with the need to demonstrate that to further reduce tolerable risk is not cost effective. This is achieved through a range of techniques including Cost Benefit Analysis (CBA) and concepts such as the Incremental Cost of Avoiding a Fatality (ICAF). In 1998 the Australian Maritime Safety Authority issued Marine Orders Part 58 – International Safety Management Code, bringing Australia into line with the IMO’s ISM Code.

### *JPDA Experience*

From a legislative perspective the Regulations and Directions issued under article 37 of the Petroleum Mining code, were closely modelled on the Regulations associated with the Australian Petroleum (Submerged Lands) Act (P(SL)A). Subtle additions take into account the unique nature of the Zone of Cooperation (as it was originally envisaged). In 1997 the Regulations and Directions were updated to incorporate the Safety Case concept although unlike the P(SL)A, the redundant prescriptive clauses were not removed resulting in a somewhat complicated set of regulations that incorporated both very prescriptive elements and a goal setting regime. Prior to the Timor-Leste popular consultative elections in 1999, a working group was setup and the process of regulatory reform commenced, however this process was subsequently put on hold pending the development of a treaty for the JPDA and formation of a Designated Authority.

**Industry HSE performance**

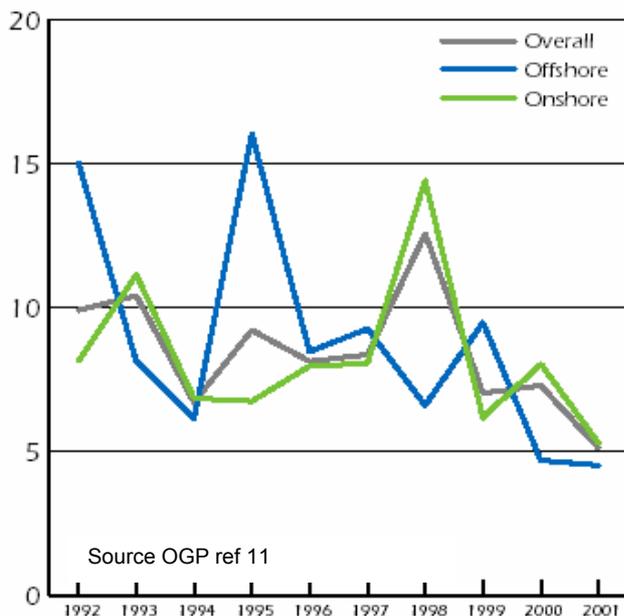
During this last decade of regulatory change the industry itself has not stood still. Possibly the most significant change is that of the growing realisation (at least within some large Oil Companies) that good HSE performance is fundamentally good business and from a societal perspective underwrites a company’s mandate to operate<sup>10</sup>.

**Global Industry Performance**

The safety performance of the global industry has shown steady improvement over the last decade (as shown in the following graphs<sup>11</sup>) with generally downward trends for Lost Time Injury Frequency Rates and Total Recordable Incident Rates. Fatality Incident rates are as yet too erratic to demonstrate a trend but have improved from 2000 to 2001.

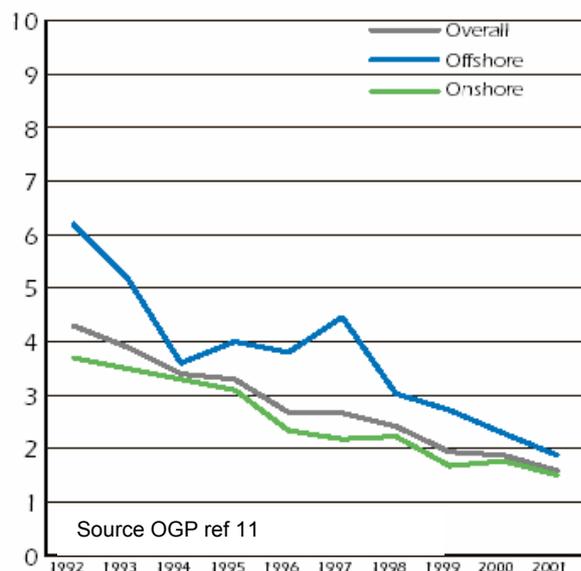
**Figure 1 - Fatal Accident Rate**

Fatal accident rate - onshore & offshore  
per 100 million hours worked



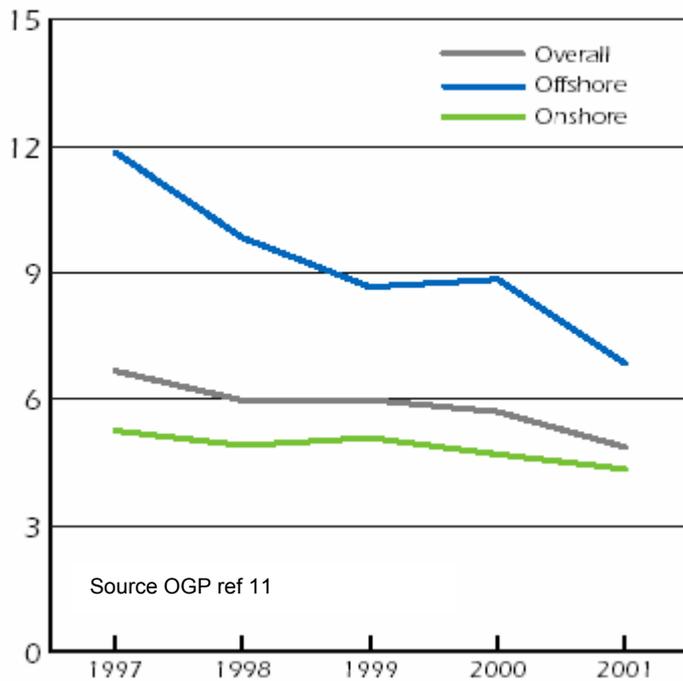
**Figure 2 - Lost Time Injury Frequency Rate**

Lost time injury frequency - onshore & offshore  
per million hours worked



**Figure 3 - Total Recordable Incident Frequency Rates**

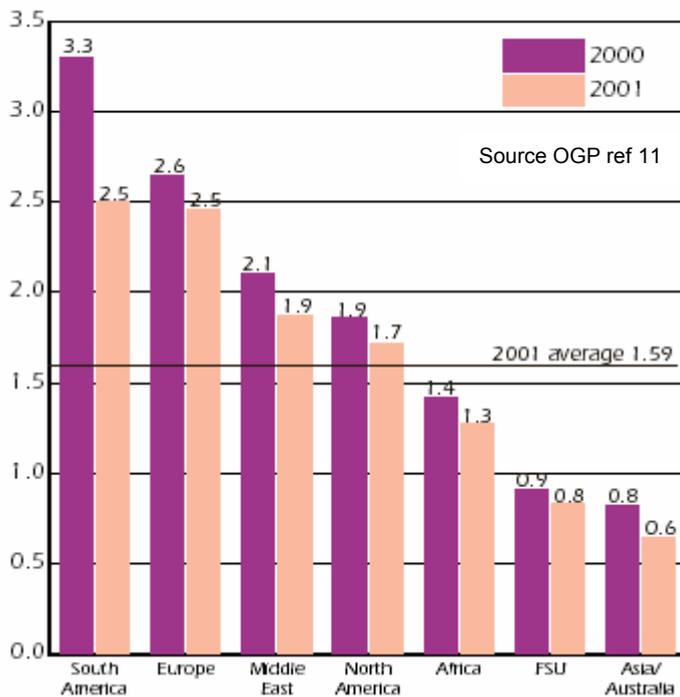
Total recordable incident rate - onshore & offshore  
per million hours worked



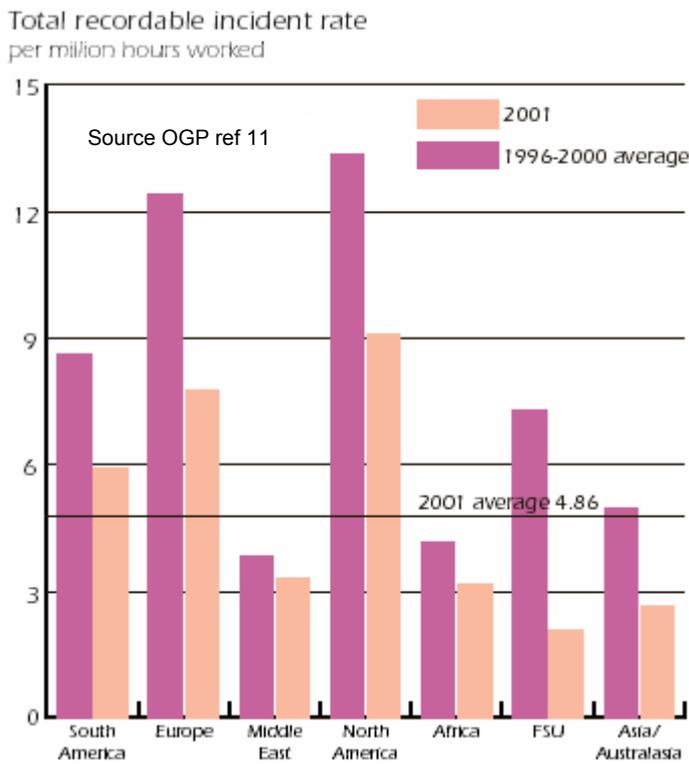
Of particular interest is the regional safety performance which as shown in the following graphs<sup>11</sup> highlights how well the Asia/Australia region's compares with the rest of the global industry.

**Figure 4 - Regional Lost Time Injury Frequency Rates**

Lost time injury frequency  
per million hours worked

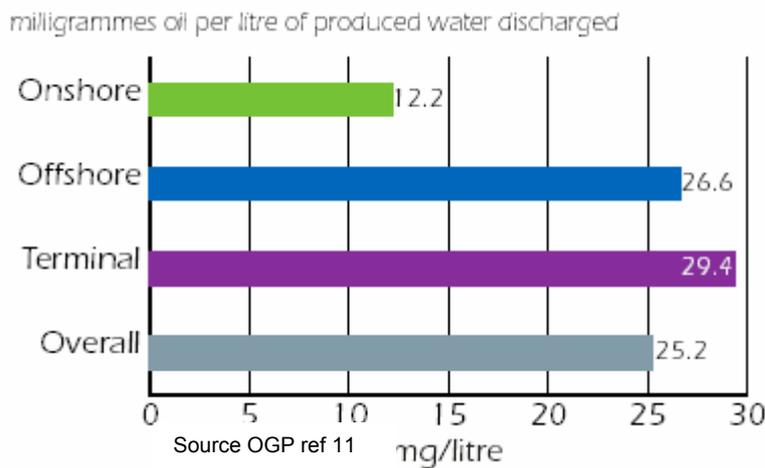


**Figure 5 - Regional Total Recordable Incident Frequency Rate**



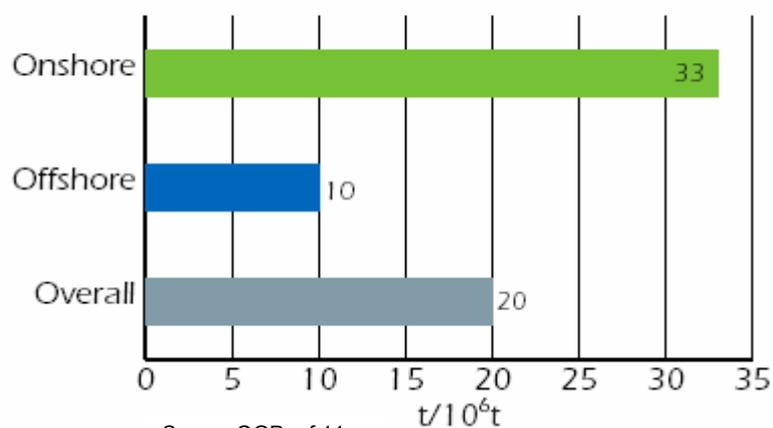
From an environmental perspective, development of performance indicators and the subsequent data collection is in the initial stages. The current data set only two thirds the size of that used for safety performance, has uneven regional coverage and acknowledged gaps in the data collected<sup>12</sup>. Below are the graphic results for three of the key performance indicator for 2001<sup>12</sup>.

**Figure 6 - Oil Discharged per unit of produced water discharges - 2001**



**Figure 7 - Oil spilt per unit of Hydrocarbon production - 2001**

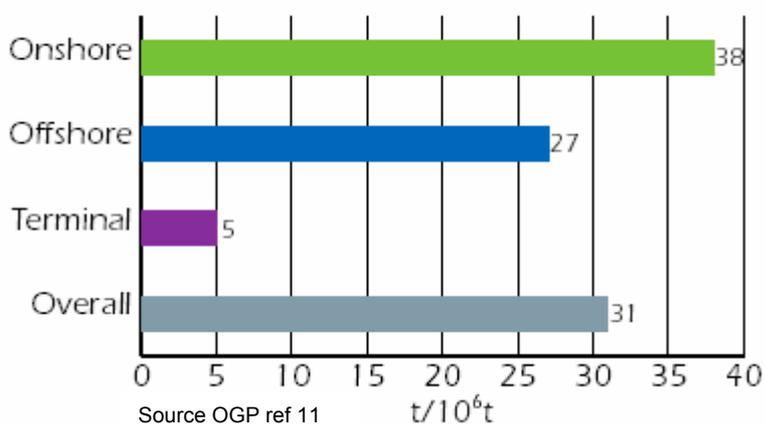
Tonnes per million tonnes



Source OGP ref 11

**Figure 8 - Total oil discharged/spilt per unit of hydrocarbon production - 2001**

Tonnes per million tonnes



Source OGP ref 11

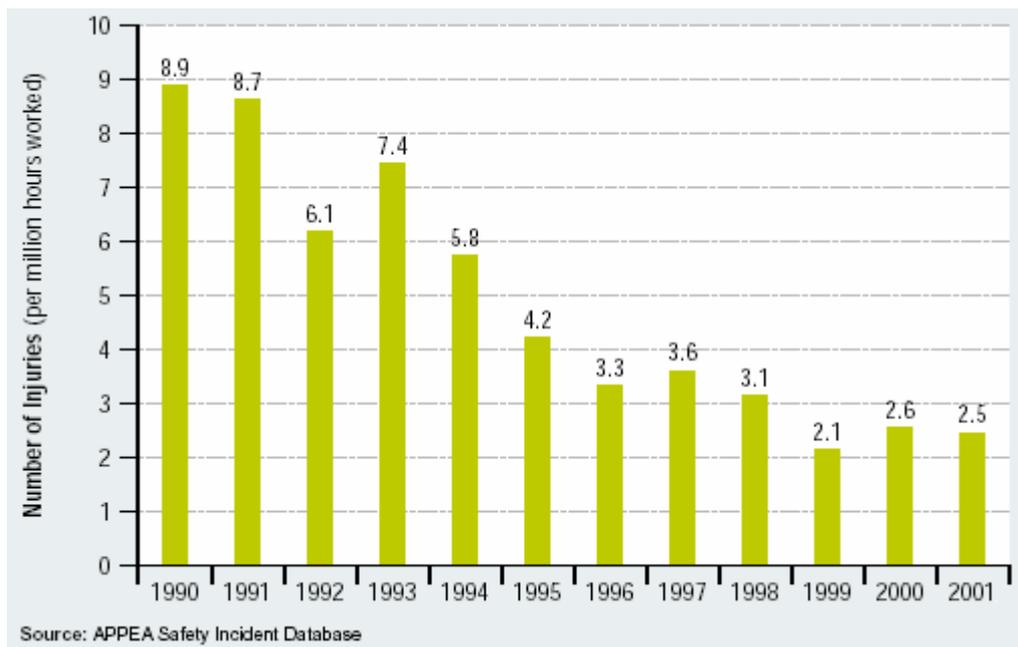
These figures are obviously in need of data from subsequent years. This would provide increased confidence as to the depth of the data set in order to provide meaningful indications of the industry's performance trends. For a broader view of how the industry is approaching environmental management the author suggests reviewing the following:

- a joint paper by the Oil Industry International Exploration and Production Forum (E&P Forum) and the United Nations Environment Programme Industry and Environment Centre (UNEP IE) covering Environmental management, which was published in 1997<sup>13</sup>, and:
- a joint International association of Oil and Gas Producers (OGP) and International Petroleum Industry Environment Conservation Association (IPECA) paper covering the industry and sustainable development, which was published in 2002<sup>14</sup>.

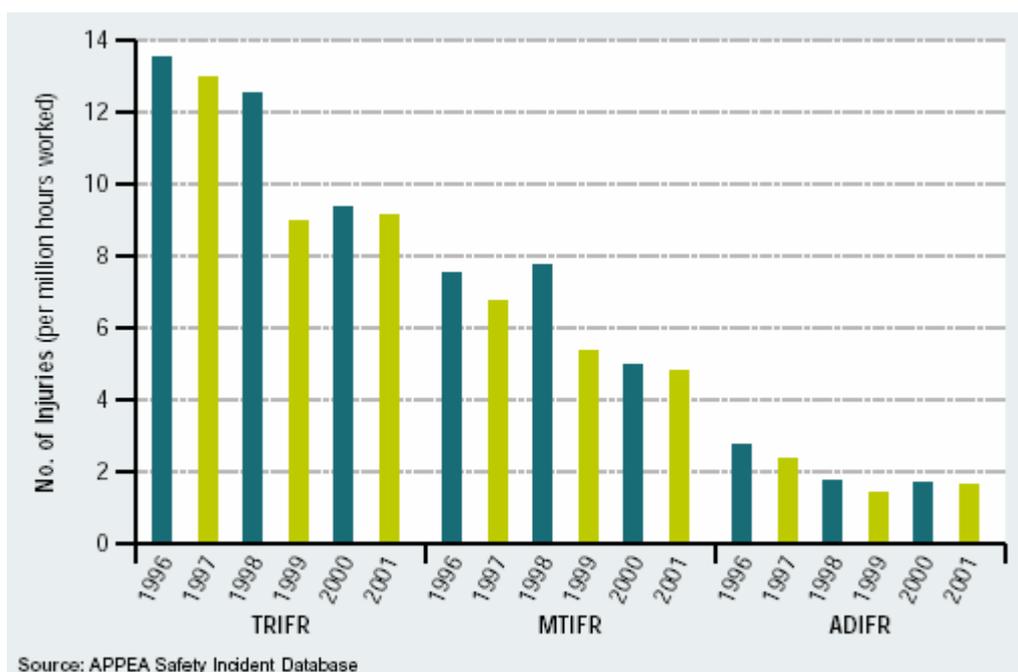
**Australian Industry Performance**

Given the JPDA is predominately surrounded by Australian waters, the performance of the industry in Australia is of some interest in terms of regional comparability. The Australian Petroleum Production and Exploration Association (APPEA) publish annual Safety statistics and like the global industry associations, is in the process of developing environmental indicators. Environmental performance is covered in their annual report for the first time in 2002. The following graphs show the general downward trend in the key safety performance indicators as reported in the latest APPEA Health, Safety, Environment and Social Responsibility Report<sup>15</sup>. A single fatality was recorded in 2001, which, whilst unacceptable, is significantly better than the 101 globally and 13 regionally.

**Figure 9 – Australian Lost Time Incident Frequency Rates**



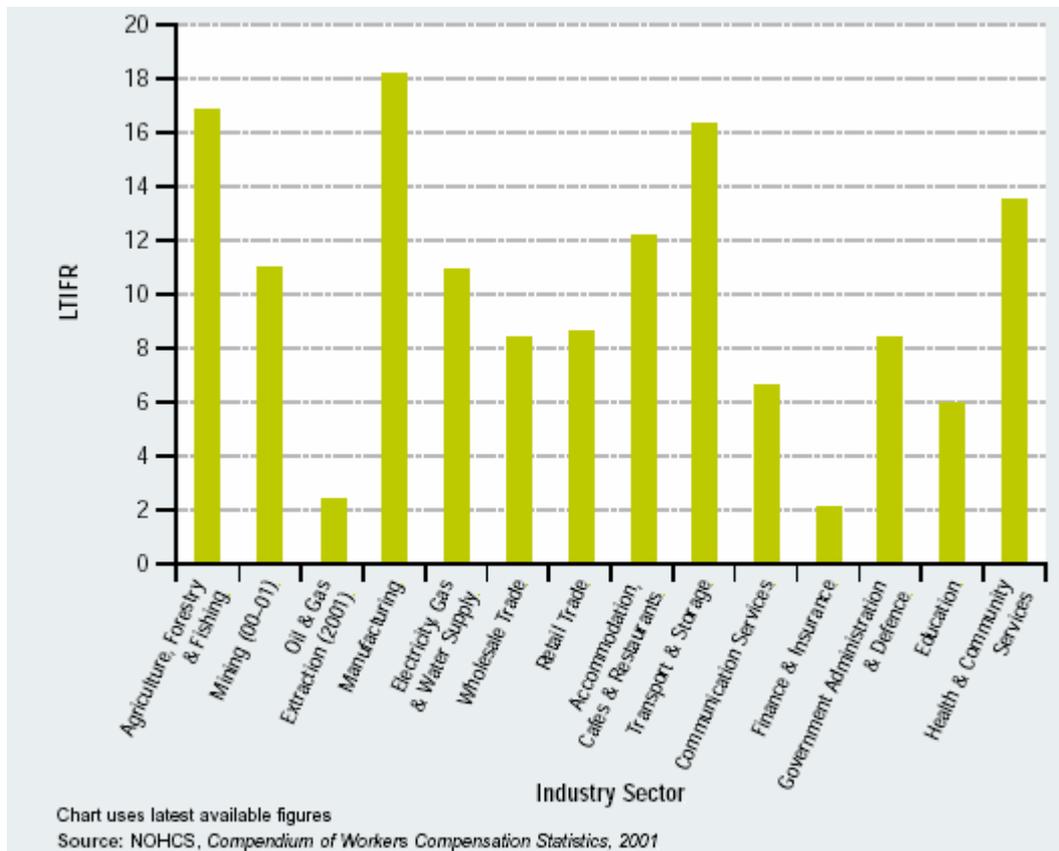
**Figure 10 - Australian Total Recordable, Medical Treatment and Alternative Duty Incident Frequency Rates**



Whilst the frequency rates are generally higher than the region's average this may be a function of the strong reporting culture that has been developed in Australia which arguably has led to a more complete data set compared to other countries in the region.

To provide some context to the Oil and Gas sector's performance in terms of lost time incidents Figure 11 highlights how well this sector performs in Australia.

**Figure 11 - Australian Lost Time Incident Frequency Rates across selected industries 2000 - 2001**



As mentioned previously, environmental performance indicators are only a recent addition and the 2002 APPEA report is the first to contain any environmental data which precludes any trend analysis at this stage. It is encouraging to note that in 2001 only 1 tonne of oil was spilt offshore for every 75 million tonnes produced<sup>15</sup> (or 0.0133 tonnes per million tonnes produced) which compares very well with the global figure of 27 tonnes per million tonnes produced (see Figure 8).

### ***JPDA Experience to-date***

With only one producing field (Elang Kakatua / Kakatua North (EKKN)) and the Bayu Undan field in the process of installation, there is limited data available. To-date there have been no fatalities for either project although there was a single fatality in 1994 on an exploration drilling rig in PSC area 91-01. The EKKN development has sustained a single Lost Time Incident (in December 2001) since start-up in 1998 and the Bayu Undan development has a Lost Time Injury Frequency Rate of 0.68 for the entire project (onshore and offshore) to-date. Environmentally, there has been only one significant spill (approximately 1 tonne of oil-based drilling mud from the MODU drilling at the Bayu Undan Well Head Platform) although an immediate search of the adjacent sea was unable to detect any traces of the spill and the report was based on a mass balance basis, ie fluid unaccounted for.

## **Opportunities and Challenges for the Regulation of HSE in the JPDA**

The opportunities and challenges for regulating HSE in the JPDA are, in the authors view, twofold and inseparably intertwined: to continue to develop a regulatory regime and organisation to ensure world class HSE performance; whilst maintaining the attractiveness of the area to future explorers and current producers in terms of a regionally consistent HSE regulatory framework.

### **Developing the Legislation and the Regulatory body**

As mentioned previously, there have already been opportunities for improvement identified in the existing legislation for HSE in the JPDA and efforts to make the changes needed, have started. The opportunity exists to make use of recent advances in Australia legislation (such as the Management of Environment regulations and Diving regulations) to strengthen and simplify the existing regulations and directions and further progress the goal setting regime. Such an approach would also dovetail with (as discussed later) the challenge to ensure a regime that is consistent with adjacent areas.

Similarly, the need to develop an HSE department, staffed with appropriately trained and experienced Timor-Leste nationals is acknowledged as a significant challenge and plans are already in place to achieve such an aim. This is a particularly important challenge given the widely acknowledged agreement that a suitably competent regulator is key to the success of a Safety Case regime<sup>6 & 16</sup>. In light of the availability of people with appropriate experience and skill-base on which to build, this presents an opportunity for the development of Timor-Leste HSE regulatory expertise in the long term.

### **Regional Consistency**

Irrespective of maritime boundary issues which must remain unrelated to the regulation of the HSE aspects of the petroleum industry in the JPDA, the ability of regulators and oil companies to effectively interact across jurisdictional boundaries in order to optimise both HSE performance and costs, presents a challenging opportunity for the JPDA. This is not a new issue, both in terms of past and current interaction by companies with interests inside and outside of the JPDA and in the wider global context. Even within Australia, this is an issue to a certain extent with each state and territory having its' own Designated Authority and associated regulations all with subtle variations and interpretations. This issue comes to the forefront when considering how Mobile Offshore Drilling Units (MODUs) move between jurisdictions and in situations where pipelines or flowlines cross jurisdictional boundaries.

In Australia this issue has been acknowledged and through an independent review<sup>17</sup> and subsequent report to the Commonwealth<sup>16</sup>, a process of rationalising the legislation and nationalising the regulation of offshore safety is now underway. This issue has also been recognised in the North Sea where MODUs regularly work in both the UK and Norwegian sectors and need to comply with two different sets of legislation, potentially adding significant cost and duplication of effort to both the companies and regulatory authorities. In 2002 the UK Health and Safety Executive and the Norwegian Petroleum Directorate jointly commissioned Smedvig Offshore AS to undertake a study of the regulatory requirements in the two sectors to identify the differences and make recommendations on a way forward<sup>18</sup>.

As it stands today, there are already opportunities for small discoveries to be commercialised through tie-backs to existing infrastructure outside of the JPDA. Such proposals could involve up to three regulatory jurisdictions (Northern Territory of Australia, Western Australia and the future Designated Authority) all with their own regulations and interpretations thereof. Fortunately there is a significant degree of commonality between the regulations in use to the extent that the operator need only make a single round of submissions to address the requirements of all three regulators. Whilst it would be speculation to suggest that if this commonality did not exist, it could impact on

the economic viability of such a development, tripling the effort required to ensure regulatory compliance. This would undoubtedly have some impact on costs both in the initial development phase and in terms of ongoing compliance.

For existing developments regional commonality is a potential issue more from a personnel portability perspective. Developing and implementing an effective HSE management system inescapably incorporates legislative compliance and therefore a clear understanding by workers of the regulations and expectations of regulators. The ability of companies to move personnel between jurisdictions would undoubtedly be impacted by significantly different regulatory regimes. Additional training (obviously dependent on the role of the personnel) may be required to ensure their understanding of the differing requirements. Arguably, for activities across multiple jurisdictions this, and the ability to maintain a single HSE management system (and in fact Safety Case and potentially significant portions of Environment Plans), would be attractive to both existing producers, and potential explorers and developers in the JPDA who may have existing interests in adjacent waters.

From a regulatory perspective regional consistency provides the opportunity to build on the successes, learn from the failures and share ideas and experiences in the knowledge that they can be applied across jurisdictions with relative ease. For the JPDA, this presents a significant opportunity in terms of having access to a large pool of regulators with extensive experience and skills working within a comparable regulatory framework. To date this has already proven useful in terms of the assistance provided by the Western Australian regulator for both a specific risk assessment study and the provision of the basis for the development of the HSE management system currently under development within the Joint Authority as well as regular consultation, communication and assistance from other Australian regulators.

## **Conclusion**

In conclusion, the offshore petroleum industry does present a number of risks to the health and safety of its workers and the environment in which they are located. An appropriate HSE regulatory regime can be effectively managed as the last decade's performance improvements have shown. For the JPDA, there is a challenging opportunity to ensure world class HSE performance and, through sound and well considered governance, attract new players by providing a regionally consistent regime that can optimise the efforts of the regulators and the companies in this shared goal.

## References

- 1 Western Australian Department of Minerals and Energy (2001) *Piper Alpha* [Online] Available at <http://www.dme.wa.gov.au/minpetrol/safety/piperalpha.htm> accessed 18/12/2001.
- 2 Conway. D., Salazar, V and Byrd. S. (1999) *Piper Alpha: The Disaster and Beyond* [Online] Available at <http://www.owl.net.rice.edu/~univ113/disasterweb.html> accessed 2/1/2002
- 3 United States Environmental Protection Agency (1999) *Exxon Valdez* [Online] Available at <http://www.epa.gov/oilspill/exxon.htm> accessed 17/12/2001
- 4 Exxon Valdez Oil Spill Trustee Council (1999) *Exxon Valdez Oil Spill Restoration Plan – Update on injured resources and services March 1999*. Alaska, Anchorage: Exxon Valdez Oil Spill Trustee Council
- 5 Exxon Valdez Oil Spill Trustee Council (2001) *2001 Status Report*. Alaska, Anchorage: Exxon Valdez Oil Spill Trustee Council
- 6 Wilkinson, P (2002) *Safety Cases: Success or Failure?* [Online] Available at [www.ohs.anu.edu.au/publications/pdf/seminar\\_paper\\_2.pdf](http://www.ohs.anu.edu.au/publications/pdf/seminar_paper_2.pdf) accessed 14/2/03
- 7 Carpignano. A, Romagnoli. R., and Vivalda. C. (1999) *Moving towards an international approach to safety case development* Proceedings Off-shore Mediterranean Conference OMC '99 Ravenna 24-26 March 1999, editor OMC srl, 1999, pp. 879-885.
- 8 International Maritime Organisation (c1999) *Safety Management* [Online] Available at [http://www.imo.org/HumanElement/mainframe.asp?topic\\_id=182](http://www.imo.org/HumanElement/mainframe.asp?topic_id=182) accessed 15/2/03
- 9 International Association of Classification Societies (2003) *International Safety Management (ISM) Code list 31/12/02* [Online] Available at <http://www.iascs.org.uk/whitelist/wlindex.htm#DOWNLOAD> accessed 12/2/03
- 10 McHolick, B. (1999) *Safety in a Low Cost Environment - Problem or Opportunity?* As presented at the National Oil and Gas Offshore Safety Conference, 26 - 27 May 1999. Advanced Manufacturing Technology Centre, Perth W.A.
- 11 International Association of Oil and Gas Producers (2002) *Safety Performance of the Global E&P industry - 2001* [Online] Available at <http://www.ogp.org.uk/publications/index.html> accessed 2/2/03
- 12 International Association of Oil and Gas Producers (2002) *Summary of Environmental Performance Indicators – paper – 2001 data* [Online] Available at <http://www.ogp.org.uk/publications/index.html> accessed 2/2/03
- 13 E&P Forum, and UNEP IE (1997) *Environmental Management in oil and gas extraction and production – An overview of issues and management approaches*. [Online] Available at <http://www.ogp.org.uk/publications/index.html> accessed 2/2/03

- 14 OGP & IPECA (2002) *The oil and Gas Industry from Rio to Johannesburg and beyond – Contributing to sustainable development*. [Online] Available at <http://www.ipeca.org/intro/publications.html> accessed 2/2/03
- 15 Australian Petroleum Production and Exploration Association (2002) *Health, Safety, Environment and Social Responsibility Report – 2001* [Online] Available at [http://www.appea.com.au/whats\\_happening/index.html](http://www.appea.com.au/whats_happening/index.html) accessed 25/1/02
- 16 Australian Commonwealth Department Of Industry, Science And Resources - Offshore Safety and Security, Petroleum and Electricity Division (2001) *Australian Offshore Petroleum Safety Case Review - Future Arrangements For The Regulation Of Offshore Petroleum Safety* [Online] Available at [http://www.industry.gov.au/content/controlfiles/display\\_details.cfm?ObjectID=3203C03E-CD21-4829-A6CA882FA73F4CD0](http://www.industry.gov.au/content/controlfiles/display_details.cfm?ObjectID=3203C03E-CD21-4829-A6CA882FA73F4CD0) Accessed 17/1/03
- 17 Australian Commonwealth Department Of Industry, Science And Resources - Offshore Safety and Security, Petroleum and Electricity Division (2000) *Stakeholder Survey - Report of the Independent Review Team* [Online] Available at [http://www.industry.gov.au/content/controlfiles/display\\_details.cfm?ObjectID=3203C03E-CD21-4829-A6CA882FA73F4CD0](http://www.industry.gov.au/content/controlfiles/display_details.cfm?ObjectID=3203C03E-CD21-4829-A6CA882FA73F4CD0) Accessed 17/1/03
- 18 Smedvig Offshore AS (2002) *Regulatory Requirements project 2001-2002 (NPD vs HSE)* [Online] Available at <http://www.npd.no/NR/rdonlyres/exwsyaioiktipvafqvm2nykjy45tvkvx2eh73rx4avcqy4fx3tpj4n5kqg6munapsuswn6k6y7b3dgn74kgqj6vx2mc/Totalreport.pdf> accessed 10/2/03.