Managing Technical Advice for Regulation:

The Case of Petroleum Exploration and Production

by

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This thesis is submitted to fulfil the requirements of the unit of Masters Thesis in Administration, and complete the requirements for the degree of Master of Arts in Administration

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Foreword

This thesis is submitted to complete the requirements for the degree of Master of Arts in Administration through research. This is a higher degree requiring an approved preliminary program and a research study, within the field of management and administration.

The University requires the research to include completion under supervision of a substantial thesis that is based on investigation into an approved administration topic.

The thesis arrives at conclusions on management of technical advice for regulation of industry. The conclusions contribute to the public management body of knowledge for resource industries in particular.

Paul Edwin Williamson
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ABSTRACT

Governments, the community and industry expect public policy to be implemented effectively and efficiently, particularly when that policy and regulation affects the economic well being and environmental values of the nation. The offshore petroleum exploration and production industry is a case where public policy and regulation are attracting national focus through discussions on the timing of world peak oil production and the future of national and global oil and gas production. An overseas history of famous environmental disasters associated with petroleum exploration and production and transportation also ensures a specific focus on the environmental regulation of the industry.

This study elaborates the history and characteristics of the offshore petroleum E&P industries in Australia and the US, and the systems and processes used to provide technical advice that informs and advises the regulation of those industries. The study then analyses the management of technical advice for government regulation of the offshore petroleum exploration and production (E&P) industry in Australia using the US equivalent as benchmark. Further, the analysis develops a model that incorporates strategic and operational elements of such advice. Strategic elements include openness, transparency and accountability, and operational elements include use of expertise, timeliness and peer communication.

The study illustrates the relative challenges to providing technical advice under Australia's Westminister form of government which can be less open, transparent and accountable when compared to the US Congressional form of government. The study also shows the greater use of expertise and peer communication associated with the more extensive petroleum research effort in the US, reflecting the greater age and size of its petroleum industry.

Acknowledgements

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I gratefully acknowledge those in Australia and the United States that I interviewed for this study, and the Heads of their Organisations for supporting those interviews.

I am grateful to the Australian Public Service for awarding me a Senior Executive Service (SES) Fellowship in June and July 1997 (Williamson, 1997), which ultimately lead to this study. Interviews for the SES Fellowship were held in United States, Japan, United Kingdom, Australia, Chile and with Greenpeace. I am indebted to Bruce Smith of the US Brookings Institute for discussion during the Fellowship on scientific advice to government. The Fellowship brought to the surface issues of whether and how it was possible to apply in Australia processes successfully applied overseas. This study was undertaken to address some of those issues by comparing systems and practices for technical advice for regulation of the offshore petroleum exploration and production in Australia with the US as benchmark. A review of the relevant literature also indicated that this study could be a useful addition to literature on the subject of management of technical advice for regulation.

I appreciate the support of the Secretary of the Department of Primary Industry and Energy and the Executive Director of the Bureau of Resource Sciences in the granting of the Senior Executive Fellowship.

I have inevitably benefited from discussions with my colleagues in the technical advice, regulatory and scientific research areas of the Department of Industry, Tourism and Resources and the Department of Primary Industry and Energy. In particular, I benefited from discussions with colleagues in the Petroleum and Greenhouse Gas Advice Group of

Geoscience Australia, the Resources Development Branch of DITR and colleagues in Geoscience Australia and the Bureau of Resource Sciences. Notably interactions with Denis Wright, David Truman, Alan Williams, Steve Payne, John Griffiths, Ilkka Aaltonen and my father William Williamson were beneficial in developing this thesis. Christine Purtell helped with typing for an early draft of the thesis. During some of the study I was recipient of Study Bank support from the Australian Commonwealth Public Service. I also benefited from discussions with staff and lecturers at the Brookings Institution in Washington, where I undertook the 'Inside Washington' course as part of the Fellowship.

I am grateful to my wife Janet and my children Luke, Anna and Lara for their support.

The views expressed in this thesis are those of the author and can not be considered to represent those of Geoscience Australia or of the Australian Government.

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PART I: QUALITY IN TECHNICAL ADVICE FOR SCIENCE-BASED REGULATION

CHAPTER 1: INTRODUCTION

The Research Topic

This study examines managing of technical advice that informs and advises the development of public policy and regulation of science-based industries and the impact of this knowledge management on quality in the technical advising. A key role for such technical advice exists for example in developing and implementing resource regulation. There is also a broader emerging interest in the use of science for determining policy, which leads to the need to protect the integrity of science-intensive regulatory activities that manage growing levels of risk (Doern and Reed, 2001). Thus science is no longer viewed as an adjunct to government – a 'fifth estate' (Price, 1965). Indeed, recent studies of government have emphasised governance (Aucoin, 1997; Grabosky, 1995) whereby science is assuming greater importance in the study of policy and regulation (Papon, 1996; Wilson and Anderson, 1997; Levidow et al., 2005) and as a basis for managerial (Rousseau, 2006) and regulatory decision making (Clarence, 2002).

For some time there have been relatively narrow technical areas of interest in the use of science for policy for environment, safety, consumer and product safety laws and occupational health. In the 1970s to today this interest has related to the potentially deleterious effects of particular chemicals and pharmaceuticals and the frequent call to apply the so-called 'precautionary principle'. The birth defects caused by thalidomide , concerns over the use of vinyl chloride (Badaracco, 1985) and the negative environmental and health effects of pesticides such as DDT (Bosso, 1987 and 1988) have produced a new, higher level of attention to science and its use for advice in government

(Nemetz et al., 1986; Doern, 1981; Brickman et at., 1985). With regard to oil and gas exploration and production there was a need to manage crises such as the Piper Alpha petroleum platform disaster in the UK North Sea (The Honorable Lord Cullen, 1990), plus others such as the Santa Barbara oil spill (Nation, 2003). Scientific advice has been required for government management of the United Kingdom's BSE (bovine spongiform encephalopathy or mad cow disease) and foot and mouth disease outbreaks, Canada's blood safety regulation failures, and for policy innovation (Drabek et al., 1981; Rosenthal, 't Hart and Kouzman, 1991; and Korac-Kakabhase and Kouzman, 1996). There followed global concerns on the lack of governance of biotechnology (Doern and Reed, 2001; Inside Business, 2000) and these are all cases in point. In discussing regulation of genetically modified products Levidow et al. (2005) speak of the great burden placed on science as a basis for societal choice. The issue of corporate social responsibility has become one of intense study (Kakabashe and Kakabashe, 2006).

Few, if any researchers however have mapped science in policy and decision-making in a way that takes into account the critical middle management features of science-based regulatory regimes (Anderson, 2000; Williams, 2000; Doern and Reed, 2001). This study seeks to help fill that gap by mapping and analysing the relevant practices of both technical advisers and regulators that aim to provide quality public policy for regulating offshore petroleum resource industries in Australia and the United States. Various historic starting points can be identified but in the US the offshore disaster at Santa Barbara ranks high on the list (Nation, 2003).

Governments regulating resource and other industries depend on technical advice because they seek to maintain science-based industrial activities at acceptable professional standards while allowing for benefits to accrue to industry and indirectly to the community. Those regulations cover areas of activity at international, national and local levels. Because they fall within the general scope of public policy, they need to reflect the interests of the business community, institutions, the bureaucracy, the states and the public as 'stakeholders' (Howlett and Ramesh, 1995; Ch 2). Issues surrounding the management of technical advice in public policy are diverse and complex, ranging from

the need for appropriate expertise, to cultural difficulties associated with interaction between advisers and regulators. All of these factors affect the potential use of any given advice for legislators and regulators.

It is important to understand that the role of technical advice in regulation, while it is often critical to regulatory decisions, is only one contributor to the regulatory process. For over 40 years, most policy analysts have recognised that there can never be a purely scientific justification for any policy, and that assertions to the contrary seriously misrepresent real decision-making processes (Gilpin, 1962; Weinberg, 1972). Economic and political factors, for example, also impact on regulatory decisions. In the final analysis all three components of democracy are involved: The Executive, legislators and the Judiciary. The US and Westminister models differ significantly in this regard (Rose, 1981).

The Need for Research on this Topic

There has been little research to date on management for effective use by government of quality technical advice in formalising government regulation. The role of the expert technical adviser as described by Doern and Reed (2001) is made up of a middle stratum of issues, practices and relationships in the domain of science-based regulation. While 'Big' and 'Little Science' differences (de Solla and Price, 1963) are acknowledged (being major scientific initiatives and the work of individual researchers respectively), middle-level or 'meso science' (the domain of technical and scientific advisers in policy and regulation) has received little academic attention (Doern and Reed, 2001). A more generalist 'meso' management advisory model must therefore be developed in this more scientific, boundary-spanning technical role.

Ravetz (2001) goes so far as to say that: *'in 'science advice' a new function is being required of the scientific community. This is qualitatively different from research in important ways. On its present scale scientific advice is a new function, for which the scientific community is unprepared'*. Few, if any, researchers have mapped science in the critical middle level features of science-based regulatory regimes. There is thus an

analytical gap that needs to be eventually filled (Doern and Reed, 2001). This study seeks to map and analyse such 'meso-level' technical advice for offshore petroleum E&P regulation in Australia and the US, to address the emerging public policy issues concerning that gap.

Jasanoff (1990) maintains that the ideal scientific (technical) adviser to public policy needs to be more than a scientific expert. The ideal adviser needs to be capable of 'boundary work' (Smith, 1992). This implies sufficient knowledge of the policy and/or regulatory process to provide knowledge-based inputs that are relevant and intelligible to more generalist regulatory staff. Thus, the skilled technical adviser to regulators needs the expertise to provide technical advice of a nature and in a form that is suited to the regulatory process. The technical adviser operates '*at the interface between science and policy and has a role in analysing, assessing and packaging science*' for regulation (Bureau of Resource Sciences, 1997). Technical advisers to policy makers and regulators either provide inputs using their expertise in their own scientific speciality, or draw together other expert scientific inputs to formulate advice. The use of technical advice is likely to be critical to the regulatory process when the particular regulation embodies an essentially scientific rationale. However, in 'whole-of-government' systems such as Australia it is necessary to define and refine the decision criteria relevant to this important task as is stated in Chapter 2.

This Comparative Study: Oil and Gas Exploration and Production

This study seeks to analyse and critique practices in Australia compared to the US as an international benchmark and seeks to answer how they manage respectively technical advice for one area of resource regulation. A number of conclusions are stated below as proscriptions and revisited in Chapter 7: Conclusion. The comparative study focuses on the systems and processes for regulating offshore petroleum (defined as oil and gas) exploration and production in the two countries. The study seeks to address fundamental elements for quality in the management of such technical advice. A model is developed using often accepted criteria and is applied to the US experience and then related to

emerging regulation in Australia. US experience will inform this modelling both as developmental advice (exploration and production) and control ('public interest' regulation). Later, such lessons will be compared with Australian systems and practices and proclaimed interest in developing a more discretionary and consciously 'self regulatory' (objectives-based) framework concerning corporate offshore activities (Daintith, 2005).

The choice of the US as the benchmark is because the US petroleum exploration and production industry is more developed historically than the Australian industry. It began in the mid-nineteenth century, a century before the Australian industry. It is also orders of magnitude larger than the Australian industry on the basis of activity levels as will be described further in Chapter 4. Both countries have well developed offshore petroleum E&P industries regulated by the respective national governments. In this respect this allows a comparison of like with like.

Regulation of the offshore petroleum E&P industry in both the US and Australia is evidence based and utilises technical advice. As such it corresponds to 'guardianship' as described by Kouzman and Jarman (2004) following Brewer and de Leon (1983) and Quade (1985), and 'crisis reduction' as described by Dror (1983), Wheatley (1991) and Bradley (1999).

Interviews in the US, United Kingdom and Chile, which are within the general scope of this study have provided additional insights into the broader traditions of managing and providing technical advice for regulation in those countries. Australia has drawn some of its offshore petroleum regulatory approaches from the UK. Chile is used at times for comparison in this study because it has a much less developed petroleum industry and provides a contrast through how that county addresses different issues in seeking to ensure quality in technical advice. The US study will help determine the criteria and lessons learned from their protracted experience.

In the study, the generic term 'technical advice' will be used to mean expert advice which is in part based on new science including knowledge management (Feldman, 2000). It overlaps in meaning with scientific advice and includes engineering advice for example. Australian resource regulators use the generic term 'technical advice'. Roget's Thesaurus presents the words 'scientific' and 'technical' as synonyms, although its definitions of 'scientific' emphasise research and data whereas definitions of 'technical' emphasise applied expertise. 'Technical adviser' thus implies someone who can answer 'how to' questions and in the context of this study necessarily includes 'expert' as adviser for public interest regulation.

The offshore petroleum E&P industry is one in which the author has been employed as an explorationist and as a planning analyst employment with Mobil Oil International. Further recent work includes being Group Leader of the Petroleum and Greenhouse Gas Advice Group and the Innovation and Specialist Services Group in Geoscience Australia, in the Commonwealth Department of Industry, Tourism and Resources and in the former Departments of Industry, Science and Resources, and Primary Industry and Energy.

Science for Policy and Policy for Science: Some Definitions

This study of technical advice for regulation is in the context of formal regulation law as a central component of contemporary public policy. Dye (1972, p.2) provides a brief definition of public policy as:

'Anything a government chooses to do or not to do';

Later public policy making was defined more specifically by Jenkins (1978) as:

'A set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where those decisions should, in principle, be within the powers of those actors to achieve'.

A generic definition was later given by Anderson (1984, p.3) as:

'A positive course of action followed by an actor or set of actors in dealing with a problem or matter of concern'.

The contributors to public policy are largely the 'actors' and institutions including the Executive, and the bureaucracy, business, academia, experts and the public generally referred to as 'stakeholders' (Howlett and Ramesh, 1995). Policy development by government has a historical context (Walton, 1972; Polsby, 1984; and Chrystal, 2002) but also needs to deal with current facts (Brewer and de Leon, 1983) including new facts (Dror, 1983; Bradley, 1999; Kouzman and Jarman, 2004; Table A.1, p. 206). Policy development for oil and gas exploration and production often builds on previous policy decisions and is achieved through networks of agency officials, interest groups and experts (Carlson, 2000). It also reflects broader historical effects on the society including urbanisation, division of labour and capitalism, and globalisation (Giddens, 1986; Kakabashe, Kakabashe and Jarman, 2006). More recently, newly emerging issues relating to 'climate change' are further complicating the policy situation (Campbell, 2006; Australian Financial Review, 2006a and b; Stern, 2006).

Important in the development of policy are issues of content, carriage, cost, benefits, policy tools and outcomes (Howlett and Ramesh, 1995). Incorporating appropriate scientific data and technical advice into this complex policy can impact on those issues in many areas; an obvious example is in public policy for health where medical science underpins much of the policy. It also applies to regulation of resource industries, the subject of this study.

Science for Policy: The International Scope of the Study

Science for policy includes advice and research that in part variously affect policy development for science- based industries as well as for fast-breaking issues including those that 'become the subject of serious government attention' and form the 'agenda'

like greenhouse effects. Government agendas require technical advice in diverse areas such as environment, primary industry and resource industries and health. At the same time there is recognition in some of these areas that technical advice has been underused in developing and implementing policy, such that calls have been made for more professional involvement to introduce more data and scientific analysis into the policy process (Brown, 1999).

This concern has been reinforced recently by the increasing prominence of expert scientific advice in health, safety and environment fields of public policy (Jasanoff, 1997; Powell and Leuss, 1997; Public Policy Forum, 1998). Environmental issues are commonly linked to resource development. The prominence of environmental issues has led to calls from the scientific community for greater involvement in policy (Stewart, 1998). Thus in an editorial in Science, Bruntland (1997 states that science must underpin our policies and that if we compromise on scientific facts and evidence, repairing nature will be enormously costly if possible at all.

There is thus an incentive to achieve an effective contribution from scientific studies into environmental policy and regulation. However, effective management of science for policy and regulation more broadly is likely to be also pivotal in achieving a nationally beneficial contribution by science to the community. Therefore policy for science often relates to funding for research and development and serves to influence what research is undertaken by government. These political decisions relate to the long-standing debate on whether the research should favour 'pure science' and the search for new concepts and insights as advocated by Vannevar Bush (Nelson and Romers, 1996) or 'applied science' as advocated by Donald Price (Price, 1965). An alternative and less adversarial approach is to fund scientific research projects on the basis of comparing the expected values of their outcomes (Fischhoff, 2000). Scientific research however contributes to both science for 'knowledge' and policy. The research often aims at reducing uncertainties in the understanding of physical processes, and can become an input to technical advice to policy development and regulation. However in this regard, debates still occur

concerning the linear 'science' to 'technology' as development (Rosenberg, 1991). In this thesis no such linearity is assumed.

The Propositions

The following propositions constitute the main underlying assumptions in this study. The benchmark US study in Chapter 3 will relate the propositions to the regulation of the offshore petroleum exploration and production industry. The propositions relate to the elements of the model for quality advice both the strategic and operational for public policy making in the two countries. The propositions are:

1. ***Technical advice constitutes a critical component for the effectiveness and efficiency of regulation of an essentially science-based industry such as petroleum exploration and production.***
2. ***Technical advice provides a knowledge and evidence base that can enhance the scientific credibility and public acceptance of regulation of science-based industry.***
3. ***Technical advice supports regulation that seeks to protect both the public interest and balance environmental cost-benefit with commercial risk and reward.***
4. ***Technical advice supports a risk versus reward approach in regulation rather than exclusive use of the precautionary principle.***
5. ***Technical advice is a coordination activity between the meso-level technical adviser and the regulator as policy maker.***
6. ***Technical advice occurs at the meso level of day-to-day use of science for regulation rather than as a linear approach to policy advice.***
7. ***Technical advice is only one of the expert inputs to regulation of science-based industry and is necessarily subject to political decision making***
8. ***International promotion of environmental issues is forming an international benchmark for environmental management and progressively impacting on setting domestic environmental standards for regulation of industry.***

Methodology for Evaluating Technical Advice

The methodology used in this study seeks to provide a relevant base for the comparison between Australian and US systems and practices in the context of the model for quality in both the strategic and operational aspects of technical advice for regulation that is shown in Chapter 2. The different aspects of knowledge management quality in the model allow for the comparison and evaluation of practices and structures in the two regimes, leading to a view as to which approaches might be able to provide better quality policy and regulatory advice. There is a diversity of practices between the two regulatory regimes which allows for comparative evaluation.

Data for each of the country-based cases were collected from a variety of sources. Although interviews were carried out relating to regulation of offshore petroleum E&P in the two regimes (Appendix 1, p.210), the interviews were limited in number and consisted of two in Australia and six in the US (one specifically related to petroleum). The study relies mostly on public information about the two regulatory regimes and underpinning technical advice. For Australia it also relies substantially on the experience of the author who for over 15 years was being responsible for technical advice for offshore petroleum E&P regulation in the Commonwealth Government. In this respect the author is inevitably a participant commentator and must guard against organisational 'group think' ('t Hart, 1994) and advocacy in the analysis. This caveat is always important where participant observation data are used extensively by the author.

Thesis Structure

Part I of this dissertation comprises Chapters 1 and 2 and addresses the research topic:

Quality in technical advice for science-based regulation.

Chapter 1 defines the research topic, justifies the research, and provides the underlying propositions, the thesis structure and the mode of analysis. It also differentiates science for policy including regulation (the subject of this study) from policy for science, a long-standing issue in the literature. Chapter 2 gives the model used for analysis, background information and literature relating to the research topic. It provides background information relating to the elements of putative advisory quality in the model. It also addresses the aims of the regulation that the technical advice supports. The model will be used in the following analysis whereby systems and practices relating to technical advice for regulation of oil and gas (petroleum) exploration and production in the offshore of the US and Australia are compared and contrasted.

Part II comprises Chapters 3, 4 and 5 and addresses:

Institutional arrangements of regulation of offshore petroleum exploration and production.

Chapter 3 considers the relevant institutional arrangements in the US and analyses their systems and practices using the model for quality in technical advice (Table 2.1) as a benchmark for the subsequent Australian analysis. The US represents an appropriate conceptual and analytic benchmark because its petroleum industry is more developed being a century older and orders of magnitude larger in terms of activity than the Australian industry. Chapter 4 describes Australian institutions for the regulation of offshore petroleum exploration and production. In particular the topic of self regulation (objectives-based regulation) will be considered as both the US and Australia governments are committed to such a less formalistic 'self-regulatory' approach. Chapter 5 analyses the Australian systems and practices using the model for quality in technical advice.

Part III comprises Chapters 6 and 7 and addresses:

Comparative analysis of quality in Australian regulation of offshore petroleum exploration and production

Chapter 6 compares US and Australian systems and processes for quality in technical advice for regulation, using the model developed in Chapter 2 and the data from Part II as a benchmark. Although the US system is used as a benchmark because of the greater age and size of the industry compared to that in Australia, the US system is not considered the exemplar which is one possible interpretation of "benchmark". The conclusions of the study and suggestions for further research are given in Chapter 7.

The Model for Analysis: A Brief Overview

In this study, a strategic and operational model for quality in technical advice (Chapter 2) for regulation is used to analyse practices in Australia compared to those in the US. It is derived from a broader model of policy analysis and implementation that reflects criteria that are often applied in relation to regulatory processes and advice for regulation that draws on specific technical expertise, and are reflected in quality knowledge management concepts. Similar criteria for example appear in the Auditor General's Performance Audit of the Australian Taxation Offices Administration of Taxation Rulings (The Auditor General, 2002). In that instance technical correctness, fairness, consultation, timeliness and cost issues were addressed. Some of the same criteria are mentioned by the United Kingdom Office of Science and Technology (1997 and 2005) in their publications on the use of scientific advice in policy making. In those instances expertise, balance, communication and transparency are seen as mandatory. Considerations about quality for technical advice, however, also fall within the broader criteria for decision-making quality applied to government activities. Those criteria suggested for the Australian Government for example include appropriateness, effectiveness and efficiency (Department of Industry, Tourism and Resources, 2005; ITR Corporate Communications, 2003). Attributes listed as required for public service policy

and administration including technical advice in the US have emphasised use of expertise and effective strategic and peer communication (Rosenthal, 1973).

In constructing and using the model, the author recognises that it concentrates on provision of publicly funded technical advice for petroleum E&P policy and regulation. Political, economic and other factors also on impact these regulatory and policy processes and the technical advice may or may not ultimately prevail in any particular strategic and regulatory decision. Irrespective, without sound technical advice, the regulatory and policy process for resource industries can be flawed because of the reduced quality of the scientific basis of the relevant Act, Regulations and guidelines. The author thus considers the model of quality elements in Chapter 2, including the strategic and operational components relates to an important component of the policy process.

Data Sources: The Case Studies

Objectives of the Case Studies

A major objective of the study is, through critical analysis, to provide conclusions that could lead to enhanced technological advisory systems and practice for managing policy advice for offshore petroleum E&P in Australia. The studies thus aim to be an informal evaluation of the common use of science in that regulation and as such may foster learning and innovation as described by Cohen and Levinthal (1990) and Roberts and King (2000). While scientific advice for offshore petroleum E&P regulation is specifically studied, this learning process may have broader implications for providing technical advice for regulation in diverse circumstances in government and in particular in the Australian Public Service, and such learning may help foster future innovation. Conclusions for management and technical advice in policy are thus intended to be 'largely generic and broadly applicable' in the manner described by Rose (1993).

The analyses of the studies aim more broadly to shed light on the basic elements for managing technical advice for regulation (Rose, 1993, p.29). This approach recognises

that the emphases that particular areas of government regulation wish to apply to these concepts would vary to reflect their particular circumstances. With diminishing resources in many areas of government activity, concepts for management of technical advice may for example need to achieve performance within reduced costs. Therefore a risk-reward analysis is included in the study in addition to the more conventional cost-benefit analysis approach often used in the US.

Countries Chosen

The US is considered an appropriate analytical benchmark for the Australian analysis in Chapters 4 and 5 because its petroleum industry is a century older than the Australian industry and has orders of magnitude more activity than Australia's (as indicated earlier). The most thorough case study is of scientific advice for regulation of the Australian offshore petroleum E&P industry (the upstream petroleum industry). This is an area in which the author has had long involvement. International interviews contributed to the study of technical advice for regulation of the petroleum industry especially in the US.

Together, the two regulatory regimes reflect a range of issues and problems in the level of national and international public scrutiny of technical advice and the associated policy and regulation. Environmental issues relating to the petroleum industry have in more recent times made a particular impact in the US and more generally receive increasingly high levels of local, national and international public attention. This is part of a general trend that sees resource industries increasingly affected by international and national environmental legislation (Pring, Otto and Naito, 1999a&b; Stern, 2006). Environmental policy and perceptions can even have a significant influence at parliamentary elections as demonstrated in the European Community where 'Green' parties are strongly represented. Other facets of regulation of the petroleum E&P industry normally receive less public scrutiny. Industry scrutiny of regulators is, however, substantial. The schema developed in Chapter 2 will provide more detail in this regard.

The Interviews

Interviews of regulatory staff overseas support the studies. Additional insights into regulatory practices in the US came from interviews in other organisations and on topics other than the key example in this study. These interviews were part of a much briefer Senior Executive Fellowship study (Williamson, 1997) that provided a broader overview of the manner in which science is used for policy in a number of countries and in Greenpeace, a prominent environmental Non Government Organisation (NGO). The interviewees in government came from groups dealing with areas as diverse as petroleum and mineral resources, environment, agriculture, fisheries, food and drugs, quarantine, public health, and fine ceramics. In the case of Greenpeace, the interviewees were their scientific staff.

The Australian case study is prominent in part because the initial Senior Executive Fellowship work that led to this thesis study, aimed to provide insights for managing technical advice for regulation in Australia. Regulation of the Australian offshore petroleum E&P industry is the main Australian case study because of the long-term interest and involvement of the author who was responsible for providing technical advice within the Australian Government for regulation of this important national industry over a period of fifteen years to 2005 (as discussed earlier). It nonetheless appears to be a useful study for providing insights into management of other areas of science for regulation in Australia of industries with high scientific and technical content in their operations. The US case material is not used as an exemplar but does provide a basis for comparative analysis in benchmarking Australian practices using a global datum.

Methodology of Interviews

The author interviewed senior regulatory staff in government organisations that regulate petroleum E&P industries in Australian and the US, using the same set of questions (Appendix 2, p. 212). The interviews were carried out using an earlier more extensive putative schema for elements of quality (Williamson, 1997). That was refined into the derived schema used in this study (Table 2.1).

The responses to the questions provided the author with information on the cases in this study, and addressed elements of quality in technical advice for regulation, that are described in the schema used in this study. The interview process allowed the author to explain questions so they were understood. There remain, however, recognised inherent problems in obtaining knowledge by questioning individuals. These include possible personal and historical bias and individual interpretation. Long ago Popper (1962) observed that knowledge is mixed with errors, prejudices, hopes and dreams.

A standard set of questions was used to avoid interviewer bias, as described by Oppenheim (1966) and Kerlinger (1973). To avoid bias, the respondents own words were also used where possible in recording the interview. Open questions were used to allow for unexpected responses not anticipated by the research design (Kerlinger, 1973). The questions were useful in that they gave the respondents a frame of reference within which to react without placing any constraints on the reaction (*ibid*). The author agreed with interviewees that information obtained would not be attributed to the particular individuals interviewed.

The results from the interviews that contribute to this study also inevitably reflect in part both the particular interviews undertaken and the author's own background. Nonetheless,

a concerted attempt has been made to use the interviews to produce a broad-ranging study, the results of which may be widely applicable within government.

The specific questions include the following topics:

- uses for science in policy
- providers of scientific advice
- access to expertise
- objectivity (including balance and avoidance of capture)
- communication
- utility
- timeliness
- acceptability and
- cost

In summary, there is now a demonstrated need for governments to seek technical advice where both cost-benefit and risk reward considerations are needed. The destabilised global energy environment compels such novel decision-making a fact increasingly recognised in both countries.

CHAPTER 2: A MODEL FOR THE ANALYSIS OF TECHNICAL ADVICE FOR REGULATION OF OFFSHORE PETROLEUM EXPLORATION AND PRODUCTION

This chapter describes ends to be achieved by the regulation. The chapter also addresses the model used for analysis of structures and practice for technical advice for regulation of offshore petroleum exploration and production in Australia against the US as benchmark, along with issues relating to elements of the model.

Avoidance of Bureaucratic Capture and Conflict of Interest

Appropriate management of relationships with industry is critical. Where industry dominates the advisory process ('capture'), the broader public interest is not well served. Capture of the regulator can be by the regulated industry (Wilson, 1980) or by groups with particular values (Healy, 2001). Devices to avoid capture include the US Advisory Committee process (Cardoza, 1981 and Smith, 1992). On the other hand when policy makers are too remote from industrial realities and community concerns, regulation may be counter-productive or difficult to enforce. Real or perceived conflict of interest makes it difficult or impossible to use some providers of technical advice for regulation. These include consultants, a significant part or most of whose livelihood is derived from an industry or a non-government organisation to which the regulation relates. Research areas, a significant part of whose research funding is derived from the regulated industry or non-government organisation, can also be unusable through consideration of conflict of interest in effectively the same way as some consultants. Whether or not the advice from these areas would be affected by the desire for future funding from those industries or organisations is difficult to ascertain. The credibility of the regulation using scientific inputs from areas with real or perceived conflict of interest can however be threatened. Thus even apparent bias in scientific advice to regulation may present problems in choosing individuals or organisations to provide technical advice.

In this respect, the United Kingdom Government has been engaged in a concerted move to put scientists increasingly into policy development and implementation in the UK. This arguably was initially in seeking to ensure the appropriate technical content in policy deliberations going forward to the European Union (EU) where technocrats can be the norm in some regulatory areas. Governmental notes on scientific advice for policy certainly focus on the EU (e.g. United Kingdom Office of Science and Technology, 1997).

The normal ethical considerations, requiring freedom from inappropriate influence in decision making, also apply to both regulators and technical advisers for regulation. Interests of government technical advisers that may lead to perceived conflict must also be avoided. Such interests include ownership of stock, alignment with industry 'peak groups', political organisations or community interest groups, relatedness and family associations. The United Kingdom Government for example in its seven principles of public life set out by the Committee of Standards in Public Life include the obligation to declare any private interest relating to public duties so the departments can judge whether the interests could undermine the credibility of independence of advice (Committee of Standards in Public Life, 2004).

Regulators and technical advisers may employ international scientific expertise if using local providers from outside government for technical advice to regulation presents difficulties because of real or perceived conflicts of interest. In these instances, overseas expertise can offer an option for accessing balanced technical advice. Structural separation of technical advisers from policy advisers is a way of avoiding capture by requiring the more difficult capture of two groups rather than one.

Lobbying can extend to technical advisers and Millstone and Zwenenbing (2001) argue that the first scientific committee to advise on the disastrous mad cow disease outbreak (bovines spongiform encephalopathy) in the UK was both deliberately and inadvertently used to provide spurious scientific legitimation for policy decisions which government

officials believed Ministers, other government departments, the meat industry and the general public might not otherwise accept.

Therefore, in summary, for policy advice to be regarded as being proffered in the public interest, a degree of balance is needed between technical quality and political will.

Technical advice for Regulation of Offshore Petroleum Exploration and Production: Some Comparative History

This next section addresses some historical intra governmental requirements required for technical advice for regulation of the offshore petroleum exploration and production (E&P) industry especially in the US and Australia. It also considers some societal and industrial ends being served. This history will form the basis of the analytical modelling that follows.

Regulation of Industry: Some International Benchmarks

The public regulation of industry seeks to ensure health and safety outcomes for the employees of the industry and the community and contributes to a legal framework in which commercial activities can be undertaken by the industry. These commercial activities require large capital investment in long term projects that need to be underpinned by industry confidence in the regulator from a perception of ongoing competence (Lewis and Weigert, 1985) that is demonstrated by regulators and technical advisers. This component of government policy involves setting policy and legislative frameworks to maintain physically measurable standards acceptable to the national and often international communities. This occurs for example in policy relating to industry, health or environmental conservation. Technical advice is often critical in setting and monitoring these standards for both prescriptive and objectives based policy. Such advice and research are required for setting standards and monitoring in the case of prescriptive based regulation of the US petroleum E&P industry for example, and agreeing plans and monitoring performance in the case of objectives-based regulation for

the petroleum exploration and production industry in the US and Australia and elsewhere especially in the UK. The use of objectives-based or prescriptive policy has advantages for differing elements of the industry that government is regulating.

Prescriptive-based policy has mandated requirements legalised by government either with or without major industry impact. Prescriptive policy defines in detail the standards of the process being regulated, and governments monitor industry through mandated feed back systems to ensure that these standards are met. This allows for minimum standards that are defined for activities by small businesses, to ensure these activities are legally acceptable. An example is in the US petroleum exploration and production industry where thousands of small companies are active. The public can also expect these standards to be met. The main feature of the process is that these standards tend to require detailed definition sometimes as guidelines and/or law. Defined standards can take time to put in place and the standard applying at any particular time can lag current best practice. In addition, when those who are engaged in particular regulated activities encounter a situation not covered by a standard, they may not look past the standards to their intent. They may thus consider no action is needed when the spirit of the regulation indicates that it is.

The prescriptive-base approach is advocated by environmental activists citing the 'precautionary principle' (Johnson et al., 1996 and 1997; Barrett and Abergel, 2002). The move to objectives-based regulation shifts the onus to industry to meet the spirit of the policy rather than creating a climate which encourages carrying out prescribed regulations as required by stringent public regulation based on a perceived balance of stakeholder interest. In his comparative review of petroleum regulation in Australia, UK Canada and the US however, Daintith (2005) concludes that comparative levels of regulatory discretion are variable in different aspects of their petroleum regulation.

A notable example of a disaster associated with prescriptive regulation is the Piper Alpha disaster in the offshore petroleum industry of the UK North Sea. The subsequent inquiry in the UK by Lord Cullen recommended objectives-based regulation for safety for the

petroleum industry in the North Sea (The Honorable Lord Cullen, 1990). This concept has subsequently been adopted in the safety case regime of the Australian petroleum exploration and production industry (NOPSA, 2006).

Objective-based policy is progressively replacing prescriptive policy in many areas (Cobby, 2000; Department of Consumer and Employment Protection, 2006). This is the case for example for safety and environment for the petroleum exploration and production industries in Australia and offshore safety in the UK petroleum industry. The aim of objectives-based policy is to achieve more effective and flexible performance by industries in pursuing their interests while maintaining the interests of the community. Objectives-based regulation tends to allow industries to pursue their activities in ways dictated by their corporate best judgment. Under objectives-based regulation, a plan for the industry activity is agreed with government. Technical scrutiny of the plan by government prior to acceptance helps ensure that the plan meets the policy objectives.

Large companies as opposed to small companies are often well placed to comply with objectives-based regulation because of their larger scientific and technical workforce and broader experience. Large companies, including service companies, commonly develop initiatives to maintain standards that are publicly acceptable. In the petroleum exploration and production industry, the service companies are responsible for collecting exploration data worldwide and define and update their own standards. In that instance the International Association of Geophysical Contractors through their Health, Safety and Environment Committee define these standards. They require that data acquisition teams have an environmental plan for any given project. This is particularly critical in environmentally sensitive areas. The environmental guidelines were first put in place in 1993 and are updated to keep pace with new exploration technology (Shirley, 1999).

Small companies and private individuals may not have the scientific and technical knowledge, research-base or financial resources to each develop the objectives based management plans dictated in policy. Smaller companies may then need to band together to establish a joint plan for a particular class of activities that is acceptable to government

or draw heavily on publicly available plans for similar activities developed by other companies. The experience of objectives-based regulation in the petroleum industry is that the associated requirement for technical advice for regulation is different and often greater when compared to prescriptive policy. As objectives-based guidelines are encouraged by governments (eg Australia and the UK) so self-regulation will tend to dominate planning considerations especially by large companies. The 'public interest' test now needs to be considered.

Technical Advice: Meeting Community and Industry Expectations

Technical advice is related to the regulation of industries such as the Australian offshore petroleum exploration and production industry that contributes significantly to the Australian economy. The Australian petroleum E&P industry is discussed in Chapter 4 of this study and its regulation and associated technical advice are analysed in Chapter 5. In implementing that regulation the technical experts advise governments on compliance concerning industry. This advice requires a depth of understanding in the particular scientific area of expertise, such that the intelligent layman would be unable to perform the function. Technical advice and underpinning research for regulation seek to provide an evidence base that can enhance the scientific credibility and the public acceptance of the regulation. Public acceptance of regulation can be reduced however by perceived capture of the regulatory process by industry and other stakeholders. This can occur particularly through the greater leverage of the larger companies that are often involved in offshore petroleum E&P. Technical advice and contributing research also aim to have a positive value by contributing to the effectiveness and efficiency of development (Jarman, 2001), and framing and carriage of policy, including reducing short and long-term costs. This thesis however does not imply the scientist as gate-keeper who protects the public interest. Completely objective advice is considered impossible to achieve in practice, in part because of the background and affiliations of the advisers (discussed in Chapter 3).

Public policy often involves regulation that seeks to ensure that physical outcomes of a process or processes undertaken by industry are in a range acceptable to the community. In the area of environmental issues relating to resource industries, these outcomes can impact *inter alia* on air and water quality and contamination of land. Such processes can involve chemical substances and require waste management. Science usually contributes to regulation relating to these industries, to improve quality of life of the community and to protect the environment (Department of Environment, 1996). Technical advice for regulation may also serve to promote best practice in industries or activities.

When regulation describes or implies a range of physically measurable outcomes, scientific elements are often imbedded in the regulation and the quality of the technical advice impacts on the quality of the regulatory process. An example is the technical advice on the scientific and technological concept of 'good oil field practice' in the Petroleum (Submerged Lands) Act (1967) relating to the petroleum E&P industry. In this respect good quality technical advice would imply an ethical oversight role (Laswell, 1971; Brewer and de Leon, 1983) in that the resulting activities should be appropriate in relation to resource management, health and safety.

Legislation and other policy documents often contain scientific and engineering terms that reflect the underpinnings of the industries activities. Specific meanings of scientific or engineering terms are often different to popular meanings for the same words. In such cases, strong scientifically-based advocacy by industry to government may be impossible for non-scientific regulatory staff to understand and technical advice may be critical in making informed regulatory decisions. Thus, components of regulation that are poorly framed in scientific terms can produce outcomes that are unclear or ambiguous. Scientifically poorly framed regulation can lead to confusion, waste of time in continually clarifying or revising written regulation, unnecessary and expensive litigation particularly in the case of prescriptive regulation, and considerable doubt as to whether the community interest is being served efficiently. For industry, it may inject uncertainty into commercial decisions. This has resulted in a technical advice role in framing regulatory Acts.

Many jurisdictions develop prescriptive resource regulations to protect community interests. In these instances, specific technical definition is needed. Detailed scientific wording is less used in defining objectives-based policies, for example in environmental management and safety policies for the petroleum industry, but technical advice is required for assessment of company management plans and monitoring their implementation. Technical advice is used to identify errors in scientific meaning in draft regulation and associated guidelines. In this instance, technical advice is likely to be brief and to involve scientific checking of the wording in documents. For reasons that relate to specific meaning, the policy makers or legislative draftsman can inadvertently introduce wording that misinforms or invites legal challenge for example on the level of taxation of revenue from a regulated activity.

Responses to stakeholder concerns and submissions on regulatory processes also often deal with technical topics. Such responses can relate to drafts of regulations for industry for example. Technical advice can also fulfil a role in addressing these stakeholder concerns by looking for scientific common ground between interest groups and the public interest.

Technical advice contributes to government's estimates of risks and rewards from the regulated activities. In formulating policy and in regulation, technical advice is combined with other inputs including economic, sociological and political considerations. The range of physical, economic, sociological and political outcomes acceptable to the community necessarily imply at least their tacit acceptance of the risks associated with those ranges and a generally accepted balance of the risks with the rewards of the associated activities. An example of this policy process is in balancing the reward from access to energy, associated employment and protection of balance of payments through reduced imports, with the potential risk of pollution from a national petroleum industry. To be most useful in this process, scientific inputs need to be of high quality. A discussion of elements comprising a model for quality is given later in this Chapter.

Responding to Community Environmental Issues: Interest Groups' Activities

Environmental issues are subject of strong social criticism and measures for community involvement particularly relating to the precautionary principle (Barrett and Abergel, 2002; European Environmental Agency, 2002). Not developing mineral and energy resources, however, is currently an unacceptable option for the community because such development can be a key component of a nation's economic development (Australian Government, 2004). Government resource regulation attempts to manage environmental and commercial risk by balancing it against the expected reward. In industries such as the petroleum exploration and development, technical advice supports regulation that seeks to protect the public interest in the petroleum resource and balance risk with reward as the benefit to the community from use of oil and gas for cost effective energy for transportation, heating and electricity and as raw materials for various industries such as the petrochemical industries.

Environmental aspects of petroleum E&P evoke a particular community focus and usually are substantially addressed if regulators require good oil field practice from operators. Governments also use technical information to respond to concerns of community groups and to environmental non-government organisations (NGOs) such as Greenpeace, about possible environmental damage from resource development. The claims of environmental NGOs often obtain significant media coverage and significantly impact public perception. Although regulators may claim that existing processes for assessing environmental hazards are science based and sufficiently precautionary, they must respond to the advocacy for a stronger role for the precautionary principle (e.g. Barrett and Abergel, 2002). The scientific underpinnings and contribution to scientific literature by Greenpeace (for example, Stairs and Johnson, 1991; Johnson et al., 1996b) use the precautionary principle such that no risk is acceptable, rather than the risk-versus-rewards approach espoused by governments. This is, however, a matter for public policy determination. In this process governmental technical advice in relation to regulation may increase community acceptance of the environmental implications of that regulation.

However, government policy can be inconsistent in this regard, eg climate change modelling approaches between the Australian States and the Australian Government.

Environmental issues are increasingly the subject of national and international public scrutiny and public policy. Thus both national and international environmental policies are relevant to examples of resource regulation in this study. For environmental issues non-government organisations in particular are promoting international awareness. Their international scrutiny relates to the environment and *inter alia* to trade and transportation of substances including mineral and petroleum resources and particularly radioactive compounds and waste, and some pesticides that are potentially hazardous to the environment through abuse or accident (Johnston and others, 1977). In addition, environmental pollution in one nation is increasingly seen as a global problem. Continued manufacture in India of organochlorine pesticides and their contamination of the environment thus received worldwide attention (Santillo et al., 1997). The ultimate result is that international promotion of environmental issues is increasingly impacting on domestic environmental policy in many nations.

Environmental policy-making on environmental issues is increasingly being undertaken at both international and domestic levels (Kellow, 1997). This includes development of international principles and laws. The petroleum and minerals exploration and production industries are affected by international agreements impacting for example on the removal of production platforms and pipelines at the end of field life. '*Multi national approaches to environmental issues are on the rise and nations are increasingly surrendering portions of their sovereignty over natural resources by joining in international treaties and other agreements*' (Pring, Otto and Naito, 1999a, p. 4; and 1999b). This trend is producing a body of international 'soft law' that can be moved to 'hard law' through the actions of national courts and international financial institutions (Pring, Otto and Naito, 1999a and 1999b).

The biggest new trend faced by economic development efforts is the reorientation of international and national law and regulatory frameworks to comply with the new

paradigm of sustainable development (Pring, 1998). The United Nations World Commission on Environment and Development (1987, p. 43) defined 'sustainable development' as

'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

The concept of sustainability underpinning international and increasingly national environmental policy thus also embodies the notion of 'inter-generational equity'. The emergence of that concept was evident at the UN Conference on Human Environment at Stockholm, Sweden in 1972. From that Conference emerged the 26 Stockholm Principles (United Nations, 1972b), intended to be a charter for the global environment in the future. At that Conference developing nations questioned application of the same environmental standards to themselves as applied to developed nations. The question was then ultimately addressed via the United Nations World Commission on Environment and Development (Bruntland Commission) formed in 1982, and in their report called *Our Common Future* in 1987. This report outlined global expectations for states in relation to 'sustainable development' (eg Gore, 1992) and how to meet them (Herriman, Tsamenyi, Ramli and Bateman, 1997, p. xiii). The world acceptance of the concept of 'sustainability' was achieved at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992 (Pring, Otto and Naito, 1999a, b). The Rio Declaration (United Nations, 1992), updating the Stockholm Principles, was a result of the latter Conference.

The broad acceptance of the concept of sustainability also marked a move from the doctrine of 'freedom of the seas' and the associated rights of universal exploitation (including by petroleum development) (Van Dyke, Zaelke and Hewison, 1993, pp. 3-5) to recognition that the seas and oceans were sensitive environments that needed management. The Interventional Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969 (United Nations, 1969), had addressed this for oil pollution. That convention had been in response to the oil pollution damage that

resulted from the grounding of the 118,000 ton Liberian registered oil tanker Torrey Canyon in international waters near England on 18 March 1967 (White, 1994). Other examples have been the Santa Barbra oil spill offshore California in 1969 (Nation, 2003) and the Kirke oil spill offshore Western Australia (ABC Radio National, 1996). The International Convention was followed in 1973 by the Protocol Relating to Marine Pollution other than Oil (Herriman, Tsamenyi, Ramli and Bateman, 1997, p. 69).

The Basel Convention in 1989 addressed pollution from the dumping of hazardous waste at sea (Pring, 1999). The disposal of the Brent Spar petroleum platform in the North Sea by sinking it was viewed in this light by Greenpeace. The Basel Convention resulted from a number of notorious incidents. One of the most notorious was the Khian Sea incident (1986-88) in which the ship, loaded with 15,000 tons of US incinerator ash, dumped part of its load in Haiti before being stopped and then sailed the seas for two years pursued by Greenpeace ships, before presumably dumping its cargo in the Indian Ocean (Pring, 1999). The Basel Convention sought the 'environmentally sound management' of hazardous waste and restriction on its movement.

Makers of soft international laws including United Nations Agencies and other International shareholders thus play a part in establishing international practice relating *inter alia* to resource regulation. In addition, governmental organisations, international industry codes, ISO Standards, financial institutions and environmental and other non-government organisations also seek to establish standards. At the national level, indigenous peoples and local communities also play a part. Table A.2 (pp. 207) shows key international environmental laws and principles (after Pring, Otto and Naito, 1999a and 1999b; and Herriman, Tsamenyi, Ramli and Bateman, 1997). The vast majority of the laws and principles in the table apply to the offshore petroleum E&P industry in many different ways.

The number of regulatory bodies involved domestically can affect the degree of implementation of international soft law. Japan for example ratified the Law of the Sea Convention on 20 June 1996. However, in Japan there are four government bodies

responsible for coastal matters. Different national laws apply to different areas of the coast depending on which government authority is designated as the responsible authority for any particular area. In addition, involvement of prefectural law, city law and laws for special areas complicates the environmental management of coastal areas (Nakahara, 1997). The occurrence of a number of regulatory bodies relating to the same issue is also common in other nations.

Addressing Global Environmental Issues Relating to the Petroleum E&P Industry: Some Tentative Conclusions

Examples in this study address in part how regulators seek to ensure that environmental requirements for the petroleum E&P industry are met. The industry is subject to specific environmental components of petroleum legislation and also to the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982. That Agreement requires that all applications for approval of plans of work shall be accompanied by an assessment of the potential environmental impact of the proposed activities and a program for oceanographic and baseline environmental studies (section 1(7) of the Annex to the Agreement).

The petroleum E&P industry also addresses the guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the Exclusive Economic Zone. Coastal States have the responsibility to ensure removal of unused facilities (Herriman, Tsamenyi, Ramli and Bateman, 1997). International law in the petroleum industry also includes standards such as the American Petroleum Institute environmental standards that are used as guidelines for E&P activities, including drilling.

A significant component of public scrutiny of the overall petroleum industry relates to the potential for pollution from oil spills as stated above. Serious oil spills have dominantly been the result of shipping accidents such as the highly publicised Exxon Valdez case, and Gulf wars. The public is very anxious to avoid oil spills in areas of worldwide environmental significance like the Great Barrier Reef of Australia. The latter area is

administered by the Great Barrier Reef Marine Park Authority (GBRMPA). Petroleum exploration and production does not occur in the region and any spills have again been associated with shipping (Craik, 1991; Raaymaker, 1994). The major danger to the environment from spills is thus not directly associated with petroleum E&P and it is more a matter of responding to spills associated with shipping than application of the precautionary principle as stated above.

However, the occurrence of spills associated with shipping appears to have heightened public sensitivity to the environmental performance of oil exploration and production. Apart from oil spills, other sources of potential pollution from petroleum E&P include rock detritus from drilling (Flood, 1992; Hinwood and others, 1994), non water-based drilling fluids (Oliver and Fisher, 1999) and oil in produced waters from geological formations (Holdway and Heggie, 1998). In Australia this has prompted an industry-sponsored review that highlighted the historically good environmental performance in the national petroleum exploration and production industry (Swan, Neff and Young, 1994; Black et al., 1994). The industry claims that potentially positive effects of the upstream petroleum industry on environment include offshore production platforms that play a role in protecting marine ecology (Galloway and Lewbel, 1982; US Department of the Interior, 2006).

Industry groups have also reacted to public environmental concerns (Washburn et al, 2001) by setting up industry environmental codes to encourage best practice. The petroleum industry in Australia established a code of environmental practice beginning in 1977 (Cochrane, 1999). The Australian minerals industry also has a code for environmental management beginning in 1995 (Wells, 1999). The response from the environmental NGOs to the Australian minerals industry code of environmental management was that it was a step in the right direction but that the self-assessment involved gave the code a problem with credibility. They conclude that serious thought should be given to independent monitoring, and possibly a mining ombudsman (Atkinson, 1999) such as was used in investigating environmental pollution in the Fly

River of Papua New Guinea resulting from acid drainage from the Ok Tedi mine (Ok Tedi Mining, 2006).

Risk Assessment and Management: Regulation of Petroleum E and P Reviewed

Seminal contributions were made between the often difficult nexus of science and politics by Wildavsky (1988 and 1995) and in particular between the political and cultural aspects of the scientific treatment of uncertainty, probability, risks and cost benefits in high technology regulatory settings. Wildavsky (1988) demonstrates that adjustments and transitions towards economically optimal policy can be slow and costly due in part to psychological and socioeconomic factors such as value judgements, perceptions of citizens' rights and mistrust of governments. Reducing vulnerability has subsequently been discussed by Berkes (2007) and Pidgeon (2007). Wildavsky (2005) further shows that in environmental and health issues both sides of a policy argument can claim to have science on their side, and an informed understanding by a citizen can be difficult.

Regulators can assess and manage risk associated with petroleum E&P by jointly using scientific and economic inputs (Coleman, 1997). Risks relating to resource regulation may be of adverse environmental repercussions of exploration or development or of economic consequences of a regulatory decision. Risk associated with petroleum E&P however could also be social or political. Risk assessment using scientific inputs is commonly a part of the resource regulation process. It is important to keep in mind, however, the possibility of bias in these assessments from the interests of those doing them (Douglas and Wildavsky (1982 and 1988).

It is often impossible to completely avoid environmental risk through regulation. For example, the use of the environment for normal living, recreation and industry always carries with it some risk of inverse impacts on the survival and health of flora and fauna and on land, air and water quality. In such cases, technical advice may contribute to policies to limit environmental risk to a level considered acceptable. In public policy, this may be a level acceptable to the community.

US scientific advisory committees are drawn into determining acceptable risk, particularly when making threshold decisions about the adequacy of evidence (Jasanoff, 1990, p. 232). Thus, risks and consequences are often explicit in technical advice for high profile regulation in areas such as food safety (Council of Agricultural Science and Technology, 1994). Risk assessment however remains inherently an estimate on the basis of available evidence and community environmental groups such as Greenpeace are quick to point out its inherent limitations from the lack of knowledge (Johnson and others, 1996b). This limitation has resulted in the application of the precautionary principle with its emphasis on the limits of scientific knowledge. The precautionary principle has been applied for example to European regulation of the use of genetically modified products (Levidow et al., 2005; Toft, 2005).

Risk management in government regulation also applies to the level of acquisition of scientific inputs. Through scrutiny of funding for government agencies, governments take a risk management approach even to their level of funding for technical advice for regulation and development of policy. This emerges in part because the cost of completely researching and developing policy on every risk would be considered unacceptably high. That cost can be reduced by accepting a level of risk perceived to be appropriate, on the viability of the resulting policy or regulation.

The often unavoidable use of limited scientific data for technical advice also requires risk management. Particularly for fast breaking issues and recently emerging issues such as the greenhouse effect on global warming from emissions into the atmosphere of carbon dioxide and other 'greenhouse agents', relevant data and information are likely to be incomplete (Stanley, 2004). The time for the level of research and data collection that could provide greater certainty is often considerable. Consequently, in this and other cases it is often necessary to provide technical advice on incomplete data and manage inherent risk, through dealing with the resulting levels of uncertainty. In other instances extensive scientific data may be available but the implications of the data while strongly consistent with one interpretation may not be considered sufficient to prove it. For a long

time this was considered true of the connection between smoking and lung cancer (Talley, 2004).

To complicate the matter further, a fundamental property of the scientific method is that data can be consistent with an interpretation but cannot conclusively prove the interpretation (i.e. the cause and effect relationship). Thus management of risk is inherent in using technical advice for policy, as a result of the scientific method itself; and this quite apart from risks associated with how effective the interactions between the scientific and policy cultures (Kuhn, 1970) are in the process. Consequently, risk management is a constant element that is needed in providing and using technical advice and scientific data for policy and regulation.

The presence of scientific assessment of risk and associated technical advice also does not mean that scientific risk assessment rather than political will necessarily determines the regulatory response. An example is given by Marris et al. (2005) in relation to the role of the precautionary principle in regulation of genetically modified organisms used in food in France. She concludes that public debate focussing on the precautionary principle can serve to separate public decision and scientific risk assessment leading to politically based regulation. This approach reflects the wider adoption by the European Commission of the precautionary principle and the Commission's precautionary principle plan (European Environmental Agency, 2002). That is, regulation in Europe may ultimately not relate to scientific risk assessment and this has resulted in debate between US and European regulators (Chemical and Engineering News, 2002).

Summary

Technical advice is provided to assist in providing an evidence base for regulation to address the community, governmental and industry issues of national and industry benefit, environmental values and management of risk that are summarised above. The input-process-output schema and related model and criteria for quality in technical advice

that are presented below represent a framework for analysis of the quality of that technical advice and the systems and processes that affect it.

The Input-Process-Output Schema and Model for Quality

The following schema and model with its associated criteria for quality in technical advice, have been used for analysis. The criteria for quality are similar to those criteria described in Chapter 1. They cover for example criteria set out in The Auditor General (2002), United Kingdom Office of Science and Technology (1997 & 2005), ITR Corporate Communications, Canberra (2003), and Department of Industry, Tourism and Resources, (2005). The schema and model consist of the following:

Inputs

- ***The resource-related inputs for government and industry.***

Strategy

- ***Transparency including to industry, the public and the scientific community;***
- ***Openness including to industry, the public and the scientific community;***
- ***Accountability to stakeholders including investors and parliamentary institutions.***

Operation

- ***Use of expertise (scientific, scientific adviser, research);***
- ***Timeliness in provision of scientific advice to government.***
- ***Peer communication including with regulatory and Ministerial areas;***

Outputs

- ***Balance of advice to government including objective advisory inputs and avoidance of conflict of interest by advisers, researchers or consultants; and avoidance of agency capture;***

The strategic criteria of transparency, openness and accountability have been demonstrated globally as having strong systemic components which relate particularly to strategies and practices for communication within government, with industry and with the community. The operational components of peer communication, use of expertise and timeliness conform specifically to professional practice in the technical advice process. The input-process-output schema and model for quality in technical advice are summarised in Figure 2.1.

INPUTS > > ***OUTPUTS***

Cost efficient/economy technical advice

Balance of technical advice and political will

Strategic

Transparency	Openness	Accountability
Use of expertise	Timeliness	Communication

Operational

Figure 2.1: The input-process-output schema and model for quality in technical advice

This study therefore will concentrate on the inter-relationship of two sets of variables; the strategic (transparency, openness and accountability) and the operational (use of expertise, timeliness and peer communication) shown in Table 2.1. It should be noted that the US Congressional benchmark (Chapter 3) differs from the Australian –UK 'Westminister' system. The US Appropriations Committees for example do not exist in Westminister systems of government.

INPUTS > > ***OUTPUTS***

Criteria	
Strategic Transparency	
Openness	
Accountability	
Operational Use of Expertise	
Timeliness	
Peer Communication	

Table 2.1: Strategic (transparency, openness and accountability) and operational criteria applied in this study for quality in technical advice (use of expertise, timeliness and peer communication).

Issues relating to this model are discussed below. It is argued that the more completely an executive government jurisdiction addresses the issues inherent in each set of criteria, the more effective will be its system for generating high quality scientific and technical advice for supporting decision making and enhancing the public interest. Regulations therefore become a complex mixture of technical advice and political will. This comparative analysis of quality in technical advice in Australia with US as benchmark is summarised in Chapter 6 using one of the two possible qualitative measures commonly used in such studies, namely high-medium-low (H-M-L) and often-rarely–not applicable (O-R-NA). The H-M-L was used because it highlighted the intensity of stakeholder disagreement which in the US can become contentious because of the increased use of the precautionary principle, as indicated in Chapter 3.

Issues Relating to Elements of Quality in Technical Advice

The following discussion concerns the factors and trends impacting elements of quality that is provided by specialists in technical advice (Figure 2.1 and Table 2.1) for the development of public policy for science–based industries and activities. The regulations which follow are normally predicated on the formalised legislation.

Quality in Inputs: Cost Efficiency and Economy

The now protracted move towards greater cost reductions in government has coincided with a move since the 1980's to considerable growth in the reliance on external contracting. The New Zealand government has been in the forefront of this trend (Boston, 1996). In Australia the effort for reduction of cost in government is generally bipartisan. So far as the Australian public service is concerned, the difference between Labor and the Coalition's approach is mostly one of style and speed (Schroder, 1997). Thus, in Australia and in many other nations there have been and are strong pressures to reduce the costs within areas of government. This has included costs within regulatory and technical advice areas especially where government seeks to achieve greater levels of 'self-regulation'.

'The expectations of the community and of governments towards the public sector have changed in recent years…This has focussed the attention on improving the efficiency of the public sector and making most effective use of limited resources' (Public Service Act Review Group, 1994).

Cost considerations can lead to a strategy where an agency prioritises technical advice and other expertise and retains only the high priority expertise to serve core components of a particular regulatory or policy area. For day-to-day advising, the agency may then access lower priority expertise through other groups both internal to government and

external (e.g. consultants). The choice as to what constitutes high priority expertise versus medium or low priority expertise can, however, be problematical and may vary quickly depending on political imperatives. The following issues describe this situation.

Contestability

Contestability is required for provision of services to government in theory to promote efficiency and effectiveness, and particularly cost-effectiveness, but its applicability in technical advice areas for petroleum E&P regulation can be open to question because of limited access to suitable independent expertise. Contestability theoretically applies to all areas of government including policy, science and regulatory areas. Under contestability, if a balanced judgment indicates a group or individual outside conventional government channels is more suitable to deliver a particular service to government then the service would logically be outsourced or contracted to that group or individual (Scott, 1966; Department of Finance, 2004). In the Australian context there has been an increased move in some areas of government to purchase technical and advisory services rather providing them in house.

Outsourcing

The growing trend to outsourcing reflects a policy direction towards movement of services for government to the private sector but again its use in technical advice for regulatory areas has some problems. Outsourcing can promote efficiency if government need only pay for the level of service it needs. For much of the last century, the state has been characterised by its self-sufficiency and institutions with a defined 'sphere of obligations' separating government or the official concerned from other governments or from private individuals or agencies. Under present outsourcing arrangements this model is breaking down and a 'non-state public sector' has also developed (Sturgess, 1996). However, there is a concern that in some instances contracting out by government may reduce wage and other costs but reflect reduced service quality or abandonment of community service obligations (Quiggin, 1996).

Privatisation

Prioritising the needed technical advice and research functions has been a tool for privatising to reduce the cost of scientific inputs for regulation. In the UK this process has lead to scientific advice for regulation sometimes coming from corporatised or privatised previously governmental research agencies. To obtain contract science and particularly research for policy and regulation, the UK Department of Environment (1996a) market-tested their own research establishment where appropriate before awarding research, and published Research Management Process Notes for buyers of contract research (Department of Environment 1996b).

Multi-departmental scrutiny of public sector research agencies in the UK has sought *to identify those public sector research establishments where early privatisation is feasible and desirable* (Efficiency Unit, Cabinet Office, 1994). This scrutiny reflected government's wish not only to reduce expenditure but also to make science more politically relevant. This process has changed science in the UK and more funding for former and current government scientific research agencies is coming from the private sector. It has also introduced the issue of sustaining technical quality as government funding is reduced in the research areas (Cook, 1996).

In Australia, partial privatisation of government scientific groups began in the late 1980s and mainly took the form of external earning targets. They were applied to research establishments like CSIRO, Geoscience Australia and the Bureau of Resource Sciences (now the Bureau of Rural Sciences). Cooperative Research Centres including the Australian Petroleum Cooperative Research Centre were and are government funded but industry also supplies much of their funding as on-going partnerships.

In 1999 the external earnings target of Geoscience Australia was considered by Government to be a 'dead letter' although external earnings were still expected. In that case, the lapsing of the formal target was allowed because aiming at the 30 percent

external earnings target was considered to reduce the focus on the core functions for which the agency was primarily funded. Geoscience Australia provides data support for industry and government and technical advice for science-based regulation including of the offshore petroleum and minerals exploration and production industries. Prior to 1999, the latter areas also had an external earnings target of 30 percent to reduce the cost of providing technical advice. Geoscience Australia carries out technical advising for resource regulation but also research to provide data and information that supports and promotes investment in petroleum and minerals exploration and development in Australia. Geoscience Australia also provides data and information for programs to manage geohazards such as tsunami, earthquake, and the marine environment.

Strategic Issues for Quality in Technical Advice (see Table 2.1)

Transparency

Transparency helps to provide more certainty to companies operating in competitive industries, as to how they are being treated in comparison to their competitors. This certainty can reduce impediments to investment by industry. Technically, transparency often requires the development of scenarios for both demand and supply factors in exploration and production (Pritchard and Hogan, 2005).

The often laboured performance of major companies is noted, in addressing regulation and guidelines for production licence applications in the Australia petroleum exploration and production industry. Such experience suggests the objectives-based requirements may become somewhat opaque. Legislation, regulation and guidelines for prescriptive regulations in the US do on the other hand retain the requirements a company has to meet.

Openness

Openness in technical advice and regulation is important because it helps allay public suspicion about the appropriateness and possible adverse consequences of governmental

and industry policy and activities. Thus, public confidence depends on these values which can include public participation.

The absence of openness can provoke very strong reactions from the public. An example was the decision of the United Kingdom government to allow industry to dispose of the Brent Spar floating petroleum storage facility by sinking it in the sea (Pearce, 1996). This was arguably an example of the characteristic relative secretiveness of Westminister systems and resulted in scrutiny of both transparency and openness in that governmental process (Side, 1997).

Levidow and Marris (2001) relate a need for openness to the value judgements that are likely to be implied in technical advice. They explain that expert advice is implicitly equated with science *in turn evoked as if scientific knowledge were a value neutral basis for regulatory decisions.* Willinsky (2005), however, considers that greater public access to scientific results has contributed to the democratic quality of peoples lives.

In Australia the public normally have access to copies of legislation and through Freedom of Information, to records of regulatory considerations. Material available through FOI does not include information to Ministers, and especially material involving commercial value to companies (commercial-in-confidence). Public consultation may be no more than that formally available for all regulation such as the opportunity to comment on Regulatory Impact Statements when regulations are being developed.

Accountability

Accountability in regulation of science-based industry is required in part because it underpins public confidence in science and technology based processes (Feldman, 2000). Accountability can suffer if the inputs to technical advice and regulation are themselves biased. It may be sometimes difficult to achieve objective inputs concerning technical advice. ASTEC (1990) for example stated that in Australia there is no recognised mechanism for obtaining independent scientific input to environmental decision-making.

This is because technical advice or research is often sourced from providers that have particular organisational, financial or philosophical interests and may be biased towards those interests. This may result in the technical advice to regulators lacking scientific objectivity or being aligned with industry or other interests to an extent that they are not objective inputs to the regulatory process. This potential conflict of interest is a general problem and may present a particular challenge in areas such as the environment where diverse and polarised views exist.

Governments need ways of balancing these conflicting assessments. The traditional approach has been to set up Advisory committees (Smith, 1992) , and public advisory bodies, staffed by independent experts, to give the necessary objectivity, either directly or by assessing scientific inputs from different perspectives such as industry, government and research, all of which inputs may be biased towards their constituency. Many of these contentious issues emerge as part of national auditing processes which can then provide (ex post facto) leverage for regulatory reform.

Nonetheless accountability regimes in government remain controversial. Critics argue that current regimes can be subverted by bureaucrats and become 'sheer window-dressing'. Some public office holders however argue that the accumulation of accountability arrangements is so onerous that they defeat any useful purpose. This has highlighted the need for a comprehensive model to quantitatively assess public accountability regimes in a more systematic fashion ('t Hart, 2006).

Operational Aspects of Technical Advice

Use of Expertise

The specific scientific expertise of the technical adviser can be critical for technical advice for offshore petroleum E&P policy and regulation. That is because the first most obvious ground for arguing quality is congruence with the task (Ball, 1995). Thus, it may not be possible for a single group of experts to provide all the scientific input for advice that is needed for a particular area of policy development. Consequently, a number of

individual scientists or groups may contribute the scientific expertise for any technically related area. These scientists may reside domestically and even internationally. The expertise to provide technical advice for a particular area of policy can change with time as new areas of technology and science develop and old areas are superseded. This implies a migration in the range of scientific and technical expertise needed to support the policy process and that in-house experts are likely to need to analyse and synthesise expert inputs from various sources (both public and private).

If appropriate scientific expertise is unavailable the performance of the associated regulatory function may be progressively eroded. In the extreme case, the critical scientific expertise may not be available and may need to be developed to support a particular regulatory process. The issue of linearity will be discussed below. An organisation may consider the level of access to expertise an element of risk management. The cost savings associated with a conscious reduction in the quality of technical expertise could be weighed for example against the risk to the community, political risk or cost to the public, from the non-optimum development of some resource base. In practice, the number and level of staff positions dedicated to in-house technical expertise does imply at least a tacit decision on risk versus reward in the regulatory process, due to its implications for the ability to provide appropriate expertise for policy.

Potential providers of scientific expertise for advice may come from within government agencies, from industry (with some constraints due to potential conflict of interest), from academia, commercial research agencies or consultancies. Expertise may also come from the scientific research arm of the regulatory department.

Additional scientific expertise can be accessed from working groups or committees that draw together the inputs of various stakeholders with scientific expertise. Advisory committees help fulfil this role in the United States (Smith, 1992) as is discussed in Chapter 3 of this study. Scientific interpretation of the same or related data by community interest groups and industry groups can vary. In these instances, committees

can help provide input to the technical advice and draw together the range and common ground of interpretations.

Specialised scientific expertise to support new developments in regulation may not be available locally for fast-breaking issues and technical advice in these areas which may require international scientific expertise. International sharing of scientific expertise and technical advice is common for regulatory advice in areas such as petroleum E&P, and environment and safety that are part of international as well as national agendas.

A key component of the expertise of the technical adviser is to provide the advice in a form useful for policy or regulation development. Smith (1992) considers the scientific (technical) adviser requires many of the qualities required by a lawyer. This comment is consistent with the quasi-legal environment within which regulatory staff and their technical advisers inherently operate. The reason for this is that the ultimate authority for their actions lies in legislation. The quasi-legal environment requires sensitivity to possible legal implications, an accurate use of words and an understanding of precedents, which can have implications for the particular scientific advice and of the ultimate regulatory decision.

Management of the Technical Workforce: Some Organisational Design Issues

Flattening of organisational structures including staff reductions for economy can lead to 'muddling through' (Lindblom, 1959; Simon, 1961 and Jarman, 2001) and increase the responsibility of sub-groups and individuals that provide technical advice. This makes the level of expertise and experience of the specialised areas or individual adviser even more critical to the quality of advice for regulation. Expert areas providing technical advice or research are likely to be composed of a collection of specialised sections or individuals. Within specialised sections, however, a particular element of technical advice or research is often the responsibility of one or a few experts.

Reliance on a small number of experts or on a single individual can bring into sharp focus the aging of the workforce. This aging is resulting in retirement of experienced experts that provide key technical advice. It makes vulnerable the provision of technical advice for offshore petroleum E&P regulation in both the Commonwealth and State/Northern Territory in Australia. Reliability is needed to enhance response (Sagan, 1993) and a level of redundancy in expertise can be seen as a safety factor for durability and reliability (Landau, 1969; la Porte, 1994 and Jarman, 2001) The challenge is being dealt with by retaining some retired staff on contract. An ameliorating factor is the tendency of industry to let go older professionals at a time when their experience is useful to government. This allows some hiring of older professionals.

In theory the leaders of areas providing technical advice are responsible for the quality of that advice, but 'flattening structures' can move accountability for technical advice for regulation to less senior staff. This change of responsibilities within organisations often reflects financial pressure on government departments leading to reduced staffing levels as a result of testing as to whether a greater level of management adds to the value of technical advice. The 'business-case' for enhanced 'value-adding' is a matter of contentious debate (Lindblom, 1959; and Jarman, 2001).

Incomplete Scientific Data

Technical advice is often provided from incomplete data. For new areas of policy this is more usual, so in both cases the provision and use of the advice is complex and problematic. Thus the use of technical advice for regulation does not guarantee that the advice will be conclusive. As discussed by Harrison (1994, p. 6):

"A common theme in the literature of regulatory science is that policy decisions based on uncertain advice inevitably contain political or value judgements either implicitly or explicitly."

Forester (1984) considers that the nature of decision making of workers in public policy

"depends on the situations in which they work. Pressed for quick recommendations they cannot begin long studies. Faced with organisational rivalries, competition and turf struggles, they may be justifiably less candid with their plans. What is reasonable to do depends on the context one is in, in ordinary life no less than in public administration".

There is thus a challenge of using incomplete scientific inputs for technical advice for regulation in a way that is broadly accepted as objective, free of conflict of interest and credible to the regulating and scientific communities, government, industries and the public interest. These organisational design issues remain largely unresolved and can change in nature with each new minister. Therefore Stone has provided a suitably broad definition of such expertise.

Stone (2002) defines research as a codified scholarly and professional mode of knowledge production that has its prime institutional loci in universities, departments or international institutes and is produced by academics, experts and development professionals.

A key element in research in many fields is catch-up (Forbes and Wield, 2004). This is also the case for offshore petroleum E&P as demonstrated by Williamson and Wright (2002) in the study of Australian petroleum research priorities. For offshore petroleum E&P catch-up involves applying technologies developed overseas to the local geological conditions that the industry has to deal with. Regulation of offshore petroleum E&P includes regulating the use of these technologies.

Scientific research is thus capable of providing a significant input to evidence based or evidence aware (Nutley, 2003) policy and regulation. There is a recognised divide, however, between researchers and policy and regulatory staff. That divide reflects the perspectives and traditions of the respective groups and results in difficulty in introducing the results of expert-based research into policy. This is discussed by van Buuren and Edelenbos (2004) for research relating to science and technology in general. Many of their comments are applicable to research for offshore petroleum E&P.

Although many policy and regulatory questions require results of research to contribute to their resolution, Edwards (2002) nonetheless describes an uneasy and unrealistic relationship between researchers and policy practitioners due to their different conceptual and practical perspectives. Difficulties identified by policy staff in relating to researchers include ignorance and naivety of researchers about policy issues, their advice being over-technical and their timescales being different to policy timescales. The UK Commission on Social Sciences (2003) indicates that, from a governmental perspective, results of research sometimes need drastic editing to make them readable to key players.

A role undertaken by technical advisers, located as they are at the interface between science and policy (Jasanoff, 1990; Jacob, 2005), is often to take the results of researchers and write them in a form that allows regulators and policy staff to use them more easily. Technical advisers for offshore petroleum E&P for example can also assist policy and regulatory staff in identifying what research is needed.

Timeliness

Timeliness of technical advice is a further element in the operational model for quality in providing technical advice for policy that was stated earlier in this chapter.

Unnecessary delays in regulatory responses may delay revenue and reduce return on investment for industry. Lack of timeliness in the regulatory process may also affect adversely its credibility both within government, within the regulated industry and with the public.

Technical advisers and research providers may help to enhance timeliness by applying project management principles to their work and reporting (Kerzner, 2003). Substantial time lags in technical advice may occur however when the necessary scientific research simply has not yet occurred and the information to provide technical advice for an area of regulation may need to come through establishing research programs. The time 'lag'

issue is well understood whereby politicians demand ‘more science’ so as to defer contentious decision making (Jasanoff, 1990).

Peer Communication

Communication with Regulatory Staff

For regulatory staff to be satisfied with technical advice, they must perceive that the advice has a value to them. When the necessary expertise, data and information are available for technical advice for regulation, this value then relies in part on adequate communication in formulating and providing the specific advice. Adequate communication between the regulatory area and the scientific advisers can help define the breadth and scope of the needed technical advice. If both the regulatory and technical advice areas have a clear understanding of the form in which the technical advice should be provided, acceptance of that advice is also more likely.

Words often have a specific, scientific meaning to the adviser and a different (everyday) meaning to the regulator. For these reasons, effectively conversing between scientific and regulatory areas is not necessarily straightforward. To manage science for regulation well, it is necessary that the regulatory group and their technical advisers understand what is needed and possible. When effective communications do not occur, the appropriate technical advice for regulation may not be requested or provided. In addition, the scientific inputs may not be those most suited to the purpose. Effective interaction normally involves both face to face and written communication.

Communication between regulators and technical advisers is challenging when insufficient scientific data and information are available to formulate definitive advice. The required information may even be beyond current scientific knowledge. In this circumstance, the technical adviser may be able to do little more than to provide interim conclusions along with a summary of the inadequacies of the data and information and the resultant uncertainties in the advice.

A significant challenge in managing technical advice is in communicating across the cultural interface between technical advisers and regulatory staff. Technical advisers and regulators typically have different educational backgrounds. Scientists and researchers have educational backgrounds in science and technology and as a group are considered to adhere to central principles of communalism, universalism, originality and organised scepticism (Menton, 1973; Grove, 1990). Regulators often have educational backgrounds in economics (as in Australia), arts (as in the UK) or law (parts of Europe) (Pusey, 1991; Edwards, 2004). Added to this, the subsequent differences in professional experience and roles can understandably result in regulators and technical advisers and researchers having significantly different philosophies, traditions and paradigms (Kuhn, 1970).

The differences in cultures between the technical advisers and regulators mean that a degree of tension is natural between the groups. The most famous example of this is given by Snow (1959) and his classic discussion of the 'two cultures', science versus arts and humanities, and of science advisers and politicians, the latter famously discussed through Snow's views of the flawed relations between Churchill and Lindermann, Churchill's chief wartime science adviser (Snow, 1964; Edgerton, 2005)). Achieving and maintaining satisfaction of regulators with the technical advice will be enhanced if the two cultures recognise their differences so that expectations can be realistic (Snow, 1959; Barash, 2005; Edwards, 2004). If no tension exists, it could mean that one culture has captured the other. If that is the case, it is likely that one or the other group is not contributing fully to optimising regulation. Thus arguably a degree of positive tension should be part of the technical adviser/ regulator interface.

Management of Bureaucratic Politics

Turf considerations can generate tensions between regulatory and technical advice areas if the responsibilities of the two areas are not clearly defined. Those tensions can impact on the effectiveness of communication of technical advice for regulation. Forester (1984) points out that the policy process can in practice reflect 'organisational rivalries, competition and turf struggles' and this can result in participants being 'justifiably less

candid with their plans'. Thus turf considerations may impact on both the requests for scientific inputs and their policy-related effectiveness. They may result in appropriate technical advice and research not being requested for the regulatory process. They can also mean that technical advisers do not provide inputs in the most efficient way. There may be a perception by the regulatory group within a department that technical advisers could be capable of dominating the regulatory process into which they advise. This may be particularly true where there has been a tradition of non-specialist policy advisers such as non-specialists in Australia. Where such perceptions exist they could impede the optimum uses of science for regulation.

Beale (1995) also observes that simple territoriality is often a problem. Organisational rivalries can occur both within and between government departments. Between departments rivalries can reflect differences in political constituency, for example, industry or environmental groups. Thus the degree of acceptance of technical inputs to policy can reflect departmental interests within government. Forester's observation may partly explain difficulties between departments in both providing and accessing technical advice and research for regulation (Forester, 1984). Turf struggles may also result from areas of government seeking to achieve control over aspects of policy or regulation. An example may have been Commonwealth environmental regulation of petroleum exploration and production in Australia. The resource and environmental departments both have an interest in controlling the process or aspects of it. This situation could have impeded the availability of needed advice between the departments. Environmental regulation for the offshore petroleum E&P industry in Australia is now controlled by the Department of the Environment and Heritage or the Department of Industry Tourism and Resources depending on the specific aspect of environmental regulation. The issue will be discussed in more detail in Chapter 4.

The Australian tradition of the mobile public servant may further exacerbate turf rivalries within departments if the tradition results in an emphasis by regulatory staff new to a particular area on the policy process at the expense of content, including scientific content.

PART II: US AND AUSTRALIAN INSTITUTIONS FOR REGULATION OF THE OFFSHORE PETROLEUM INDUSTRY

CHAPTER 3: MANAGEMENT OF TECHNICAL ADVICE FOR REGULATION OF THE UNITED STATES OFFSHORE PETROLEUM EXPLORATION AND PRODUCTION INDUSTRY

Introduction

This chapter analyses US systems and practices for technical advice for regulation of offshore petroleum exploration and production (E&P) against the previously established model for strategic and operational factors for quality in technical advice (Table 2.1). The US systems and practices reflect a very much older and larger industry than in Australia and one that is operating under the scrutiny of both a Congressional system of government and of environmental NGOs. Thus the US is used as a benchmark for the Australian analysis. The chapter addresses how the system of technical advice works for regulation of the US offshore petroleum E&P industry, and what it achieves. It looks at how expert technical advice and underpinning scientific research relate to regulation that seeks a balance with the political will of the United States Federal Government, and the advocacy of industry and the public. In particular the chapter addresses the regulation of the petroleum E&P industry on the Offshore Continental Shelf (OCS) by the Minerals Management Service (MMS), headquartered in Washington, D.C. Analysis for the Australian industry is described in Chapters 4 and 5, comparison with the US as benchmark is given in Chapter 6 and conclusions are given in Chapter 7.

Value of the Petroleum Exploration and Production Industry to the US Economy

The US in 2004 depended on imports for 53 percent of its oil needs, producing approximately 9.3 million barrels per day of the 19.8 million barrels used per day (EIA

AEO 2004 Reference Case (Courtesy John Winslow, DoE)). The value of oil production per day is almost half a billion dollars (at $50 per barrel).

Since 1953, OCS lease sales have generated about $150 billion in revenues from federal offshore collections along with 14 billion barrels of oil and 150 trillion cubic feet of gas. It has also provided oil as royalty-in-kind to help fill the US Strategic Petroleum Reserve (SPR). The SPR is considered to be a critical buffer against potential disruption in oil supply. In 2003, the OCS provided 60 million barrels of oil to the SPR as royalty-in-kind, approximately half of the 120 million barrels required per year for the SPR. When full in 2005, the SPR contained approximately 700 million barrels of oil (US Department of the Interior, 2004a).

The US consumption of natural gas in 2004 was between 22 and 23 trillion cubic feet. The OCS provided 23 percent of the natural gas produced in the US. Gas production in the Gulf of Mexico has remained flat with gains of some 229 percent in deep water production from 1997 to 2002 being offset by falling production in shallow water.

Revenues from OCS oil activities alone include from 1982 to 2004, $75.4 billion to the US Treasury; $27.9 billion to the Land and Water Conservation Fund, the National Historic Preservation Fund and the Reclamation Fund; $13.5 billion to 35 states; and $3.4 billion to 41 American Indian tribes and 20,000 individual American Indian allottees.

Structure of the US Petroleum Exploration and Production Industry

In the nineteenth century the United States was a cradle of the world petroleum E&P industry. The US thus has a long history of regulation of the petroleum industry. Currently the US petroleum exploration and production industry extends from the Gulf of Mexico to Alaska. Previously protected and unexplored offshore areas in the far north have been progressively opened up for exploration. This began with the first offshore test well in 1975 followed by the first Alaskan lease sale in 1976. That lease sale raised $572 million in revenue. Alaskan lease sales have followed regularly but the first

production from offshore Alaskan OCS was not until 2001 (US Department of the Interior, Minerals Management Service, 2003).

The US offshore petroleum E&P industry that operates on the OCS is very large with numerous companies involved. Those companies range from the super-major oil companies to multinationals and small local companies. In 2006 in the Gulf of Mexico alone there are around 4000 production platforms and hundreds of drilling rigs operating. Drilling occurs in shallow water and down to water depths deeper than 5000 feet (US Department of Interior, Minerals Management Service, 2006).

The US oil industry is a mature industry and oil production has been declining such that in 2004 the US produced nearly forty percent less than it did in 1970. Over the next 20 years, domestic oil production is expected to decline by 1.5 million barrels per day. Likewise, natural gas demand will increase 50 percent while domestic production is expected to increase by only 14 percent (Minerals Management Service, 2002).

The major exception to this decline is in the 1.76 billion acres of the Outer Continental Shelf. The area begins 3 to 10 miles off the coast. It is an area three quarters the size of the United States itself. The OCS oil and gas producing regions comprise the Gulf of Mexico Region, the Pacific Region and the Alaska Region. In 2004, the OCS provided 30 percent of US domestic oil production. By 2012, that amount could increase to 40 percent or more because of deep water operations which now account for 60 percent of overall Gulf of Mexico production.

Regulation of the US petroleum industry has had to accommodate the continual technological innovations in the industry including any related environmental concerns. These include innovations in seismic exploration and reconnaissance methods, drilling techniques and in the production methods including those for developing and producing oil and gas fields in progressively deeper water. Associated environmental issues included the possible affects of seismic data collection on whales, and the famous Santa Barbara oil spill (Nation, 2003). Although the oil spill at Santa Barbara resulted in

legislation that arguably applied the precautionary principle in stopping oil exploration and production in that area, regulation has normally applied a risk-versus-rewards approach.

US Government regulation has particular characteristics that reflect the US political system, US institutions, commerce and society. The Executive Branch of the US Federal Government is headed by the President and includes the Vice-President, Executive Office, Cabinet and Agencies. The President exerts power over the Executive Agencies (Moe, 1982; Moe and Wilson, 1994; Mier, 1993; Huber and Shipan, 2002). In 1995 the Executive Office comprised 17 groups including the Office on Science and Technology Policy and the Council on Environmental Quality (United States Government, 1995). In addition, the Judicial Branch of Government, consisting of the Supreme Courts and other lower courts, interpret the Constitution of the United States and adjudicate legal challenges to legislation and regulation. The Legislative Branch of Government consists of the Senate and the House of Representatives collectively known as the Congress. The Congress provides laws and major programs for the United States and also oversees the functions of the Executive Office. Both the Senate and House have Committees that review legislation. In the 105th Congress in 1997 there were 20 House Committees, 20 Senate Committees and 4 Joint Committees. These Committees had 154 Subcommittees comprising 86 House Subcommittees and 68 Senate Subcommittees (Watson, 1997). The Congressional Committees clearly influence the activities of Agencies (Moe, 1985; Sholz, 1991; Woodward and Anderson, 1993; and Shipan, 2004).

The US legislative process was successfully designed to make it easier to block legislation than to enact it: In a typical two-year Congress approximately 10,000 bills are introduced, but only 600 become law. Of the 600 only about 300 deal with substantive issues – the rest are so called commemoratives, for a designated national Day or Week such as National Ice Cream Week (The Brookings Institute, 1995). The US committee system has both appropriations and oversight functions unlike the Westminister system.

There is a tradition of entrepreneurial independence by Senators and State representatives. The US system thus allows a high level of independent influence on regulation from Members of Congressional Legislative Committees. Politicians in Committees also provide an additional avenue of input for technical and scientific advice and other advice to the committees for development of regulation. They also provide an avenue for representatives of industry and other interests to seek to influence decisions through submissions (e.g. Committee on Energy and Natural Resources, 2005). Submissions can in addition reflect the input of a range of Think Tanks and Public Interest Organisations (US Government, 2006).

Where policy development has an element of underlying technical advice such as for petroleum legislation, this requires that Agencies and Departments take responsibility for providing appropriate technical advice in the development of the draft legislation. The President proposes an overall budgetary program to Congress. Only Members of the Congress however, can introduce a piece of legislation but the idea can come from a variety of sources including 'the Administration'. Policy development however, occurs not only in the Congress but also in the Government Agencies and Departments. These groups draft some legislation for the Legislative Branch (The Brookings Institution, 1995).

Government Legislation for the Petroleum E&P Industry on the US Offshore Continental Shelf (OCS)

The first offshore oil production in the United States began in 1896 in Californian state waters but the first exploration well in offshore Federal waters was not drilled until 1946 in the Gulf of Mexico. This was followed in 1953 by the Submerged Lands Act that gave States jurisdiction to three nautical miles from their coastline, and the OCS Lands Act that provided Federal jurisdiction over the OCS. It also authorised the Secretary of the Interior to lease those lands for mineral development (including petroleum development). In 1954, the first OCS lease sale occurred in the Gulf of Mexico (US Department of Interior, Minerals Management Service, 2003).

The first Pacific OCS production began in 1968. Unfortunately for this new venture, in 1969, there was a platform blow out in Federal waters, resulting in the Santa Barbara oil spill (Nation, 2003). This resulted in 1969 in the National Environmental Policy Act that requires a detailed environmental review and statement before any major or controversial Federal action that has associated environmental issues. In 1970, the Clean Air Act was passed to regulate the emission of air pollutants from industrial activities. This was followed in 1972 by the Marine Mammal Protection Act that provides for protection and conservation of all marine mammals and their habitats. In 1973, the Endangered Species Act followed. That Act requires that all Federal agencies must ensure Federal actions will not significantly impair or jeopardise protected species or their habitats.

In 1977, there followed the Clean Water Act that regulates discharge of pollutants into the surface waters of the United States. Petroleum platforms discharge produced water and can discharge other pollutants. In 1981, there occurred the first OCS leasing moratorium enacted by Congress, for the central and northern Californian OCS. Leasing moratoria were later extended to six other OCS planning areas.

The Minerals Management Service (MMS) was not created until 1982. In that year, the Federal Oil and Gas Royalty Management Act also passed. It was designed to assure proper and timely revenue accountability from production and leasing of Federal Offshore Mineral (including petroleum) leases and onshore Federal Lands. Onshore Federal Lands include Indian Reservations of which mineral rights including coal exploration and development leases are let by the Government. The MMS determines the royalties owed to the Federal Government from these leases, and collects, disperses and audits revenues. It also undertakes inspection of leases and enforcement of lease conditions.

Further Acts affecting the OCS were later passed. These included the National Fishing Enhancement Act that encourages using offshore oil platforms as artificial reefs. The

Acts also included the Oil Pollution Act of 1990 that was enacted in response to a large number of oil spills.

A number of amendments ensued to the various Acts relevant to OCS petroleum E&P. The air quality regulatory authority for offshore California was also transferred from the Department of Industry to the Environmental Protection Agency.

In 1995, the Deepwater Royalty Act passed expanding MMS's discretional authority to grant royalty relief and mandating royalty relief for some Gulf of Mexico (GOM) leases in 200m or greater water depth (US Department of Interior, Minerals Management Service, 2003). This discretion of MMS to provide taxation incentives to encourage exploration is not present for Commonwealth Resources Division in the Department of Industry Tourism and Resources (DITR) that regulates offshore petroleum E&P for Australia.

Regulation under the Offshore Continental Shelf (OCS) Lands Act

There is a greater role at Federal level in US regulation of the OCS petroleum E&P industry than in Australia. This emerges because of the absence in the US of State Designated Authorities that undertake much of the day-to-day administration as in Australia. The MMS however has a direct role in collecting royalties from oil and gas production and the Resources Division in Australia does not.

The legislation for offshore US is nonetheless similar to that for Australia in that both Federal governments have sovereign rights over offshore minerals (including petroleum). The Federal Government consequently regulates the US offshore petroleum industry and develops the necessary legislation. The regulatory regime deals with taxation, title allocation and administration and has health and safety and environmental implications. Because the regulation of the offshore petroleum E&P industry is carried out by the Federal Government it comes under the responsibility of the Secretary for the Interior.

The Secretary for Interior

The Secretary for the Department of Interior has overall responsibility for regulation of the OCS petroleum industry under the Offshore Continental Shelf Lands Act. Responsibility extends to the Federal Oil and Gas Royalty Management Act and the Deepwater Royalty Management Act. Regulation under these three Acts is included in the MMS role.

Regulation of the US Offshore Petroleum Exploration and Production Industry by the Minerals Management Service

Regulations for the offshore petroleum E&P industry result from Congressional mandates that evolve with legislation that impacts on MMS's role. Regulations are added to or revised to implement new or amended laws. The MMS identifies programmatic activities and external influences that could require legislation or regulation (Mineral Management Service, Department of Interior, 2004). For example, MMS wrote to the Vice President of the United States and the Speakers of the House in 2003 with a new legislative proposal for energy related activities in the OCS such as LNG (liquified natural gas) facilities (www.mms.gov).

Regulation by MMS includes administering and monitoring compliance with rules that they have put in place. These include rules that regulate the OCS petroleum industry. Because the rules themselves often have technical and scientific underpinning, monitoring and administering the rules by MMS requires constant technical and scientific advice. Congress and Congressional Committees, agencies and departments formally propose these rules and the public reviews and critiques the rules before implementation. MMS like other independent regulatory agencies uses rule making authority and quasi legal action to mandate licensing and standards (Meier, 1993). In developing the rules agencies such as MMS assemble the underpinning technical advice. The formal rule-making process of Government involves peer review and input from industry and

community groups. The public has an opportunity to vet concluding documentation and published results. This comes formally from publication in the Federal Register of a Notice of Intent to Regulate, which spells out the government's position and reasoning. Any and all persons may submit comments and recommendations. MMS studies these comments on their proposed regulation and uses them where feasible in redrafts of the proposed rules.

The mission of the Minerals Management Service is: *To manage the mineral resources on the Outer Continental Shelf (OCS) in an environmentally sound and safe manner and to timely collect, verify, and distribute mineral revenues from Federal and Indian lands* (Department of Interior, 2000). As part of this mission, the MMS regulates the offshore US petroleum industry under one of their two primary operating programs, the Offshore Minerals Management program. The Directorate of Policy and Management Improvement, the Directorate of Administration and Budget and the Offices of Public and Congressional Affairs support this program. The role of MSS is direct regulatory jurisdiction and imposition of rules on release of new leases, drilling proposals, conservation, environmental leasing, inspections and environmental impact statements. The rules applied by the MMS are prescriptive and define what is legally required for a participant in the industry

The regulation of the US offshore petroleum industry allows for leasing of exploration and production acreage. Acreage is allocated to companies through lease sales on the basis of the highest cash bid. This is fundamentally different to onshore petroleum E&P in the US. Onshore the land-owner owns the mineral rights. Companies carry out exploration and production pursuant of negotiations with the land owner.

The MMS has three centres for the management of offshore regions. They are in New Orleans for the Gulf of Mexico Region, in Camarillo for Louisiana and the Pacific Region, California, and in Anchorage for the Alaska Region (US Department of Interior, Minerals Management Service, 2004). The MMS develops and implements regulation for the US offshore petroleum E&P industry in these three regions. The Gulf of Mexico

is, however, the pre-eminent source of oil and gas in the US. In this respect there is a continuing danger of capture of the US regulator due to industry pressure as well as the industry background of many of the technical advisers to regulation. This will be discussed further in this chapter. The regulatory role of the MMS is complex in part because of the large and diverse offshore petroleum industry as well as the need to deal with continual technical innovation.

The large amount of technical advice and underpinning scientific research for the regulatory processes of the MMS comes from the intense use of science and technology in the industry and because, as mentioned above, of the large size and diversity of the industry. The quality of inputs for regulation by MMS relate to the quality criteria used in this study. In particular lack of availability of appropriate advice or research expertise or not accessing them through poor communication within government, with industry and academia or with the community, could negatively impact the quality of regulation as output. In addition, any restriction in appropriate consultation including through membership of Advisory Committees could impact on openness, transparency and accountability and adversely impact the content and societal relevance of the regulatory output.

The practices for obtaining and using technical advice in the regulation of the US petroleum E&P industry and similarities and differences with practices in Australia can logically help provide some insights into optimising those practices in Australia, since the US petroleum E&P industry is one of the largest and most advanced in the world. To provide information on these practices an interview was carried out in the MMS. This analysis will be carried out in the next two chapters.

In addition, the MMS collects, disperses and accounts for $8 billion per year in revenues from offshore minerals (including petroleum) leases and from the onshore leases on Federal and Indian Lands. In total, since its inception in 1982, MMS has collected and distributed over $135 billion to Federal, State, and American Indian accounts, the

General Fund of the US Treasury, the Historic Preservation Fund and the Land and Water Commission Fund (US Department of the Interior, Minerals Management Service, 2004).

Evidence from inspection of exploration and production activities and locations often drives changes in rules. The agency reviews accidents, oil spills, and near accidents and oil spills. Field advisory groups advise on emerging issues. An example of an emerging issue was the discovery of gas hydrates (petroleum gas frozen in solid form) just below the water bottom.

Best international industry practice is a basis for developing rules and regulations. International incident data (such as data on near or actual oil spills or accidents) provide a basis for keeping up with best practice by highlighting emerging international issues. Access to such information is facilitated by the global IT networks. Information on emerging issues can also be shared through conferences, seminars and workshops. Interactions with the international regulatory forum also elicit new changes in rules. Joint work in relation to regulation is done with the Canadian Government for example, in areas of mutual concern such as investigation of sorbents to deal with oil spills (www.mms.gov). There are strict rules on the relationship with industry (see below).

The Need for Technical Advice for Prescriptive Regulation under the OCS Lands Act

The regulatory regime in the US for the MMS regulation of the OCS petroleum industry is dominantly prescriptive and requires constant technical advice to adjudicate on whether the prescriptions are being followed. (A list of elements of technical advice for regulation by MMS of the OCS is provided in Appendix 3, pp. 216). Prescriptive regulation appears to suit the highly entrepreneurial and diverse US business sector. Prescriptive regulation allows the small companies with limited resources to have more certainty in the standards needed to meet to satisfy the law. However, to some extent prescriptive regulation has been the result of several of the recent Presidents coming from a different party to the parties that held power in the Congress. Congress apparently

wanted to limit the ability of Presidents to change policies and therefore the Congress often enacted laws involving prescriptive regulation to give agencies little discretion.

This prescriptive and sometimes fragmented approach to regulation has however, caused problems in areas not specifically referred to in the prescriptive regulation. This can include aspects of complex operations or new processes or technologies, as well as new applications of existing processes. There is also a danger that passing a prescriptive regulatory inspection may engender a false sense of security in the staff operating a process and lead to accidents through lack of vigilance. Such an accident and resulting loss of life in the offshore Piper Alpha petroleum production platform disaster was the reason for moving away from prescriptive safety regulation in the UK North Sea (The Honorable Lord Cullen, 1990). However, major oil spills in the US are rare in open sea drilling so the prescriptive best practices approach would seem to need little reform.

The US Federal Advisory Committee Process

Societal criticism of particularly the controversial environmental record of the petroleum industry was discussed generally in Chapter 2. Such criticism is addressed for regulation of the US offshore petroleum E&P industry in part through use of Advisory Committees. The US Federal Advisory Committee process is a legislated process that was developed to harness external input into government policy and avoid anti-trust litigation that could be associated with industry involvement. The Advisory Committees of the Minerals Management Service (MMS) are the OCS Policy Committee, the Royalty Policy Committee and the OCS Scientific Committees. The MMS uses the Federal Advisory Committee process in developing acreage releases Offshore Alaska. Interviews by the author with the Environmental Protection Agency (EPA) also discussed their use for the Clean Air Act. The formal and legislated use of the Committees is a unique aspect of policy development and scientific and technical input to policy and regulation in the US.

The Federal Advisory Committee Act (FACA) is invoked in constituting the Advisory Committees. The Federal Advisory Committee Act was signed into law in the US in 1972 (Cardozo, 1981). The Act included rules for formation of the Committees. However, the Department of Justice in the early 1950s had proposed standards having ‘a remarkable similarity to the basic requirements of the FACA….20 years later' (Cardozo, 1981). The rationale for both measures was to allow consultation with industry in making regulation while at the same time averting antitrust violations (Smith, 1992).

Advisory Committees particularly deal with development of regulation for publicly sensitive issues such as environmental issues. The communication with stakeholders in the US through the Advisory Committee process includes advice for development of regulation. The process now also benefits from the free availability of government data and information through US law that provides data, or from Freedom of Information requests to government agencies. The intent of these measures is to make the governmental data and process as open as practicable.

The use of an Advisory Committee in development of legislation for the Clean Air Act by the EPA is a broad reaching example. It involved nation-wide hearings by a large and diverse panel. For such politically sensitive environmental regulation, EPA staff claimed at interview that they rushed nothing. They considered it most important for government to get the regulation correct, including carefully developing drafts. They circulated draft technical advice and other inputs and the draft regulations to the diverse participants before the public and national Advisory Committee meetings. The composition of the committee covered a broad range of the interest groups and stakeholders of the proposed legislation. For the Clean Air Act there would be 10 to 25 public meetings held throughout the US. The duration of each meeting would be up to three days. Agency staff reported that such meetings were often well attended.

The Advisory Committee process arguably has provided a pressure to incorporate formally technical advice into submissions to the committees in part because the absence of such technical advice would be more likely to be apparent and attacked as a flaw in the

process, by groups that disagreed with the outcome. In addition, interest groups participating in the process are likely to have an advantage if they can provide unanswered credible scientifically based arguments as well as arguments with economic, social and other bases.

A way of introducing technical advice into the Advisory Committee process is through submissions from government. This encourages agency staff to put in place appropriate facilitating processes to gather the technical advice, and to overcome any difficulties in coordinating input of such advice from government and the scientific community into deliberations to the Committee.

The MMS has and does use Advisory Committees in regulation particularly when it involves possibly contentious issues such as for planning the release of exploration acreage in the Beaufort Sea off Alaska. The Advisory Committee was used for Oil and Gas Sale 176, the 8th on the Beaufort Sea (US Department of the Interior, Minerals Management Service, 2004). In this instance, environmental considerations meant public interest was likely to be high. MMS established a committee to advise the Regional Director for design of the sale. Nominations for 10 positions on the Alaska Region Offshore Advisory Committee were sought from North Slope communities, the State of Alaska, the petroleum and support industries, and environmental organisations. Lease sale No. 186 occurred in 2003 so the MMS processes appear to be acceptable.

Relationship of MMS with the States

The MMS has responsibility for regulating the petroleum E&P industry in the OCS and does not have the State as a designated authority for day to day administration as in Australia. Some legislation however produces overlap in State responsibility. For example, The Coastal Zone Management Act was passed in 1972 and requires State review of Federal action that affects the land and water use of the coastal zone. The MMS has steadily increasing responsibility for regulation of petroleum production. It

currently regulates over 25 percent of US oil and gas production and by 2012 this could be over 40 precent (http://www.mms.gov).

Cost Efficiency and Economy

Cost efficiency and economy are overall considerations for the regulatory and technical advice processes.

The MMS assesses comparative value for money as a criterion in choosing external providers for research inputs and scientific advice for regulation and in this they approach the classic application of cost effectiveness. They compare the costs of external research to independent Government cost estimates and peer review includes evaluation of the cost of proposed research. They also carry out broad consultation on appropriate cost. If scientific research projects are not delivering value for money, the MMS terminates them and redirects funding to areas that could perform. Occasionally they can effectively waste funding through the cost of unsuccessful bid evaluations, and they consider these to be sunk cost. This occurs when no expert emerges to provide the required research after the process of seeking bids.

Agency budgets are the general constraint on cost of technical advice and research for regulation and this must inevitably present issues for the quality of some advice. Costs of technical and scientific advice can however be reduced by using the results of work that has previously been carried out somewhere in the world. The aim here is to avoid the cost of duplication.

Reviews of proposed regulation include reviews of costs of regulation including costs to the agency, industry and the community. Economic analysis for looking at the effects of proposed rules used input from the industry and contractors. MMS staff stated that most rules were either cost neutral or cost cutting. The information burden on industry is an issue and the agency seeks to ensure that burden is not unnecessarily increased.

Agency staff consider the commonly-used workshop process to be a cost-effective way to assemble expert technical and scientific inputs for development of regulation.

The normal agency budget pays for external review of some processes to ensure the regulatory process and particularly its technical advice are of an acceptable standard. The importance of the regulatory question tends to dictate if reviews are undertaken. Regulators acknowledge that if they needed external technical or peer scientific review they have to pay for it at market price.

The legislated Advisory Committee process has a cost to the MMS but to put this in context, the cost of litigation that could result from not following the process, including litigation from industry and consumer groups, could easily be much higher. The cost of the Advisory Committee process can also be high however. The estimated cost for the Advisory Committee process for the Clean Air Act was three quarters of a million dollars although the Environmental Protection Agency did attempt to make the process more economical.

Summary

To summarise the US institutional arrangements and following the model shown in Chapter 2, their relationships to the elements of quality (strategic elements as transparency, openness and accountability; meso-level operational elements as use of expertise, timeliness and peer communication) are described in Table 3.1.

US

Criteria	
Strategic Transparent	Advisory Committees Consultation with industry Congressional Appropriations Committees Congressional Oversight Committees US General Accountability Office Think Tanks
Open	Posting of draft rules Formal consultation with industry Informal consultation with interest groups Congressional Committees Advisory Committees
Accountable	Technical Congressional Oversight Committees General Accountability Office Congressional Budget Office Environmental interest groups Industry response
Operational Expert	Experts within MMS Contract research/ not-for-profit and academia, Research partnerships with industry Workshops Intergovernmental/ world best practice Advisory Committees Industry
Timely	Deadlines in research contracts Workshops to collect data Time needed to respond adequately for science –based inquiry
Peer Communication	Intergovernmental National and international scientific societies Publishing results Conference seminars and workshops Global IT networking

Table 3.1: US institutional arrangements and practices for technical advice and their relationships to the elements of quality.

Factors Impacting Quality of Technical Advice for Regulation: The OCS Lands Act and the MMS Experience

The criteria developed for the quality of technical advising by MMS are the strategic and operational criteria described in Chapter 2 and Table 2.1. They include strategic criteria of transparency, openness and accountability and operational criteria of use of expertise, timeliness and peer communication.

Strategic Issues for Quality in Technical Advice in the US

Transparency

Transparency in systems and practices relating to technical advice for regulation of the US offshore petroleum E&P industry include Congressional Appropriations Committees and Congressional Oversight Committees and US Government Think Tanks that affect the activities of agencies including the Minerals Management Service (MMS). At the MMS level transparency mechanisms include consultation with industry and use of the legislated Advisory Committee process.

Broader acceptance of technical rationales via the Advisory Committee process used by MMS could result from deliberations of the Committee. Advisory Committees allow for very diverse technical advice and research results coming from the very diverse stakeholders and this is likely to generate broader acceptance if there is an ability to influence decisions. Membership of the Committee to include key stakeholders and interest groups would also tend to contribute to broader ownership of scientific rationales by the Committee. Well-developed and well-balanced governmental advice, including scientific advice would doubtless also promote broader acceptance by the Committee. These decision inputs often require detailed analysis of future demand and supply conditions. Scenario writing constitutes a key aspect pf US policy making.

The Advisory Committee Process in Communication

The Advisory Committee process was generally regarded at interview as contributing to development of more publicly acceptable regulation in the US, particularly for politically sensitive areas like environment, such as release by the MMS of petroleum acreage offshore Alaska. Staff of the Environmental Protection Agency and the Food and Drug Administration and the Department of Agriculture described the Advisory Committee process in interviews as 'self-correcting'. This was taken to mean that the history of using the Committees was one of achieving broadly acceptable results and avoiding unacceptable regulation through wide and sufficient consultation with stakeholders, especially the public and incorporating their inputs where appropriate. Regulation by the agencies often had underpinning technical and scientific advice and acceptance of such advice through the committee process could be important. Arguably for government, agency submissions to the committees and other measures to engender acceptance by the public are part of the process of drawing together the technical advice for the draft submissions.

The benefits of the Advisory Committee process as an interface with the public and other stakeholders and in generating acceptable regulation have long been important in the US regulatory process. The Advisory Committee process evolved (as discussed earlier) from steps in the 1950s to harness the expertise of industry for the benefit of government while avoiding anti-trust difficulties (Smith, 1992). The legislation governing Advisory Committees was enacted in 1972 (Cardozo, 1981). It is probable that Advisory Committee processes in the US, with their enhanced communication with stakeholders, have also significantly reduced the amount of litigation relating to the resulting regulations. This was clearly part of the original intent of the initiatives that ultimately lead to the Advisory Committee legislation, and reduced litigation would be expected to result from producing regulation that recognised the breadth of interests of the community and other stakeholders and the need for broad ownership of resulting

regulation. Incorporating draft government submissions with public and stakeholder inputs has been politically effective in developing regulation, such as for release of petroleum acreage by MMS offshore Alaska. Doubtless, the process also tends to reduce public programs against the incumbent government(s) over the regulation.

Flaws in the usefulness of the Advisory Committee process can result from the lack of representation by key players. Pring (pers. comm., 2001) stated that not including key NGOs in environmentally oriented committees was one such instance. This has meant that the results from some Committees have been less widely accepted than if all key stakeholders had been included.

Openness

A recent trend has been for the user community to want to be heavily involved particularly in the environmental decision making process. Consequently, governmental task forces and committees in the US have included representatives of these interest groups. For example, the Advisory Committees used by the MMS in relation to Alaskan lease sales contain community representatives. Regulators are invariably aware of the need to keep their thinking open to external opinions, and particularly for politically sensitive areas to incorporate all points of view. This is not withstanding what is probably a natural bias in government to have some empathy with the petroleum industry in part because of its value to the US economy. Government holds workshops and meetings and publishes results of the meetings. Thus, openness in formulating governmental submissions also uses formal and institutionalised channels. At interview, a regulator from the US Department of Agriculture expressed this trend as: when in doubt, regulators and technical advisers should seek to err on the side of openness.

MMS staff aim to identify the range of public, industry and scientific perspectives and to seek representation of diverse but important interests. Staff carry out informal consultation with interested groups both within and external to agencies. Consultations employ all available channels including hotlines and email along with the World Wide

Web. There are also outreach groups of some agencies to collect input from the community. These contacts also help to define key speakers for workshops that can draw together relevant scientific and technical advice.

Openness is a likely benefit of the Advisory Committees used by the MMS. The MMS has three main Advisory Committees. They are the OCS (Offshore Continental Shelf) Policy Committee, the Royalty Policy Committee and the OCS Scientific Committee. The OCS Scientific Committee is chartered to advise the Director on the feasibility, appropriateness and scientific value of the OCS Environmental Program and the OCS Sand and Gravel Program. Members are appointed by the Secretary of the Interior. Members are appointed for their scientific competence, reputation within their field of expertise, and ability to represent important elements of MMS's research and science information efforts (http://www.mms.gov).

The legislated Advisory Committee process as discussed earlier was developed in the US post World War II to use industry expertise and provide balance in government policy, but avoid anti-trust litigation. Advisory Committees aim to produce balanced policy and regulation by incorporating inputs from all relevant groups. It is thus critical that there is an emphasis on appointing balanced Advisory Committees. In particular, environmental groups have felt that key NGOs have not always been present on the committees. Pring (pers. comm., 2001) maintained that not having key environmental groups represented on same Advisory Committees restricted the balance achieved in the advice from some advisory committees. This implied that there remained the need to ensure the Advisory Committees themselves were balanced. Acceptance from government, industry and the community of environmental regulations and their underpinning technical and scientific advice has been particularly critical in the US because of the very active and diverse stakeholders and the potential for litigation. This was doubtless a reason for MMS using the US Advisory Committee process for the Alaskan petroleum lease sales, because any move towards achieving a consensus at each step of regulatory development and implementation is likely to enhance the possibility of broad acceptance within the US of the ultimate policy.

Accountability

The US Congressional Committees and other committee processes provide strong mechanisms for accountability in the US. Congressional Technical Oversight Committees, the US General Accountability Office (GAO) and the Congressional Budget Office all provide mechanisms for accountability relating to the activities of agencies including MMS. Community interest groups and the industry can have a strong voice in Congressional Committees through political representatives, lobbyists and submissions, and can hold the MMS accountable for their regulation under the OCS Lands Act, and for the underpinning technical advice. In this respect the use of the precautionary principle in the US in restricting for example the offshore Californian petroleum E&P industry is much greater than in Australia where such a degree of restriction in the development of a petroleum province has not occurred.

Another critical area of concern for accountability for technical advice by MMS and in general is the acceptance of the advice by the regulators within government. This is because technical advice and research results are unlikely to be useful in the regulatory process if they are not acceptable to the regulators. The following results of interviews in MMS and other US agencies address measures to enhance acceptance of technical advice by regulators and doubtless reflect what they considered to be best practice.

To ensure acceptable technical advice for regulations, regulators considered it was important to clearly define and agree between the regulatory and advice areas the issues on which the regulators needed advice and the scope of that advice. In framing the advice, dialogue between the regulators and advice areas contributed to keeping that process on track. In some US governmental organisations such as the Food and Drug Administration and Department of Environment, where interviews were also carried out, the role of some regulatory staff advisers was specifically to facilitate communication between regulatory and technical advice areas. Interviewees acknowledged communication was a challenge in science-dominated agencies. One device for

communication between regulators and technical advisers however was through steering committees. Appropriate membership of scientific advisory boards promoted acceptance of technical advice to regulators within agencies. Such memberships tended to promote joint ownership of decisions on what technical advice and research was needed, and of the resulting advice and regulatory decisions.

The Federal Advisory Committees in the United States are a unique example of a legislated process that seeks to provide broadly acceptable policy and underpinning technical advice. The process was well regarded at interview as a provider of balance, by the regulators using it. The EPA for example expressed the view that the Advisory Committees process was an important part of a 'self-correcting' policy and regulatory process. That process included review of technical advice that was provided for the particular policy or regulation.

Wilson (1980) addresses conditions for capture of the regulatory process by industry where benefits and costs are concentrated as 'interest group politics' in which the capture of the regulator by the industry Weaver (2003) can occur. Thus in the US capture of the petroleum regulator by industry can be a possibility because of the perceived value of the industry and the high costs of the industry. Even if classic capture is avoided technical advice is provided in the context of the educational and professional backgrounds of the advisers and is likely to reflect to some degree the associations and professional affiliations of the advisers. Thus Healy (2001) points out that *'science and politics are generally construed to be fundamentally autonomous domains. Science, notwithstanding some acknowledgement of social influences, is conceived of as the domain of factual understanding of the natural world. Recent decades however have witnessed …interdependencies between fact and value that challenge these premises'*. Similarly environmental values can be in danger of capturing petroleum regulation in some instances. The relationship between fact and value is thus problematic. It embodies the Cartesian tradition and our flight to objectivity (Bordo, 1987). Experts are challenged to be objective and Tong (1986) considers that expert objectivity is a cognitive responsibility. However Hammond and Adelman (1986) see values as complimentary to

fact in the advice process. Others, however, also consider that maintaining the fact/value distinction in such a sophisticated form is impossible (Kuhn, 1970; Lakatos and Musgrave, 1970, Landau, 1984). Thus even in spite of best endeavours an industry department can favour that industry partly because the technical advisers often have backgrounds in the industry.

The US petroleum companies often claim a less close relationship with their Government than in Australia. Nonetheless a level of capture of both regulators by industry seems probable. The experience of the author in interviewing staff of government departments and environmental NGOs through the fellowship which preceded this study was that whereas technical advisers, regulators and scientists from the various areas appeared to be making every endeavour to do their job well, the advice different agencies would offer on the same subject was likely to be different and reflect some level of capture by their constituencies. This implies for example that there is likely to be some level of capture of technical advisers by the resource industry they help regulate and of advisers in environmental areas by their constituencies. The strong Congressional and Advisory Committee processes in the US can tend to mitigate these dangers (Smith, 1992; Shipan, 2004).

Operational Issues for Quality in Technical Advice

Use of Expertise

The normal mechanism used by MMS to seek to ensure appropriate quality technical advice for regulation is to use expert in-house staff with broad experience in providing such advice. In the MMS the technical advisers were in the same agency as the regulators. The benchmark for expertise for drawing together in-house technical advice, is now world best practice. There is also a growing trend towards 'harmonising' regulation with other countries. In the MMS, engineers, geologists and biologists provide the advice for regulation. This included reviewing accidents and near accidents, assessing new technologies and following the literature on a global scale.

Scientific inputs underpin technical advice to companies displaying poor performance so it is important that the science be well focused and of good quality. To seek to provide good quality technical advice from external providers, specific questions are set for scientific inputs. Universities have provided long term research for example on new technologies developments.

External scientific advisers and researchers have also provided expertise unavailable within agencies, including specialised scientific advice. The providers are either domestic or international. This advice is in addition to feedback and advice that agencies routinely have sought from industry and other interest groups. Technical advisers have used the external scientific and technical advice and other inputs in formulating their technical advice.

The MMS considered that the careful choice of external providers of technical advice and research data to be very important. External advisers have included academia, research organisations and the private sector including non-profit and labour groups. Worldwide organisations such as the World Health Organisation also provide technical advice. In choosing external technical advisers and researchers, agencies consider recommendations, published record, professional reputation and specific expertise. Formal peer reviews assess the standard of external technical advice and research. The scientific credibility of the individual external adviser is also assessed. Appropriate choice of providers constitutes a particularly serious issue where the depth of expertise in the particular speciality retained in MMS is not extensive enough because of budgetary considerations, and consequently reliance on the standard of the external advice is greatest.

The MMS contract external research much more than Geoscience Australia which rarely does it for technical advice for the offshore petroleum E&P industry. Steps used to streamline applications for external research projects include oral presentations judged by a panel. The applications are openly competitive and ultimately formal or informal peer review has decided the successful applicants. Planning sessions are one of the

mechanisms to refine the focus of research with yearly reviews of the relevance of the research.

Cooperative processes that contribute to the continued access to expertise for technical advice include international cooperation between government agencies, cooperation with universities and industry in research, use of public workshops, and the benchmarking against worldwide best practice. These processes all allow access to technical advice and scientific expertise outside the organisation. Sometimes, however, appropriate external expertise simply is not available, and then an agency may need to develop and retain that expertise, including in-house.

External expertise is also accessed through peer review of the rules and regulations. In particular the MMS discusses the rules with the 'top people in the service industries', the American Petroleum Institute Panel for Procedures, and through networking with the industry. There is also considerable informal dialogue, for example by email. In addition, the various MMS groups hold annual meetings. The MMS announces work on the Internet for comment and publishes it. There are outreach and coordination programs, and a scientific advisory board to facilitate dialogue. The industry, scientific and environmental communities are well organised and that makes dialogue with them easier. Workshops help to engender ownership of rules by facilitating broader input into their development. However, rules can, be commented on by anyone.

Discussions of the differing technical and scientific views of different stakeholders are necessarily part of the Advisory Committee processes used by MMS for Alaskan lease sales. Thus the advisory committee process also encourages balance in technical advice for developing regulation because part of the consultation in the Committees has inevitably concerned the differing perceptions of technically based activities that the legislation seeks to regulate. Thus ultimate technical advice is also likely to be impacted by input from the Committee.

The Committee process in this way puts pressure on government staff to provide balanced technical rationales for regulation. Policy staff (at interview) normally recognised the need for balanced and objective technical and scientific advice to the Committees. Superimposed on this, the Advisory Committee Process has the opportunity to scrutinise government submissions. This scrutiny doubtless encourages an effort in government to provide balanced technical advice in making their submissions.

The MMS relies mainly on their staff to respond to the constant requirement for balance in technical advice that supports their daily regulatory activities. Consequently balance in technical advice is reliant on the judgement of advisers who formulate the advice. To further help provide balanced advice, formal consultation with stakeholders in industry and the community used additional mechanisms includes outreach efforts, in-house and independent peer review and dialogue committees. The public also has an opportunity to comment on concluding documentation and published results. There is also comment by industry, scientific and environmental communities amongst others, but the latter community is particularly well organised in most of the US. There is a statutory requirement for notice of comment on regulation.

External scientific inputs are provided in a structured way and constitute a further device for obtaining balanced technical advice for regulation. These inputs come from partnerships with research in industry, from the Canadian Government, the National Energy Board and the State Energy Boards in Canada, the UK Health and Safety Authority and the Norwegian Petroleum Directorate. External input also comes from public workshops that address specific technical issues such as the abandonment of petroleum production facilities at the end of field life, use of composite materials in engineering and the effects of hurricanes on industry facilities such as production platforms. At these workshops a panel typically deals with each key issue.

The research done jointly with industry, universities and other agencies is another part of the externally focussed measures that were designed to help enhance the technical advice. Louisiana State University for example manages facilities for studying well control of the

pressures encountered while drilling. These pressures can cause blow-outs and operational problems and have safety and cost implications. The University of Houston and Texas A&M University also conduct research on deep water floating oil and gas production facilities including spars and tension leg platforms.

As normal practice, staff of the MMS attempt to choose external scientific advisers that possess industry credibility, and are not overtly promoting a hidden agenda. One way of achieving this is by using consultants suggested by large professional societies with strong scientific and academic bases and broad perspectives. These societies provide suggestions on who has the expertise to provide particular elements of advice or research.

There was an acknowledged sensitivity in the MMS to the potential for perceived conflict of interest for some potential external advisers and in particular for researchers who obtained most of their income from industry. MMS assess the suitability of external research providers quite specifically against this criterion as well as against scientific capability. This criterion specifically addresses conflicts of interest that might affect the real or perceived objectivity of the external advice. This sensitivity also occurs when research providers outside government are competing to provide technical and scientific advice for offshore petroleum E&P industry regulation. Procedures in place in MMS seek to minimise occurrence of real or perceived conflict of interest included peer review provided in such a way as to seek to ensure technical and scientific objectivity.

MMS also regard their in-house expertise as a way to maintain balance and objectivity in providing technical advice for petroleum E&P industry regulation. This result depends in part on an emphasis on the careful selection of their expert advisers which included consideration of their objectivity. It was often considered more important to get sufficient technical and scientific data in place than to be timely, and to assess this sufficiency they undertook extensive peer review. A summary of these providers of technical advice is given in Appendix 4, p. 215. All of the above measures if undertaken would tend to encourage balanced and objective technical advice.

MMS considered that technical advice obtained for regulation was most useful when it reduced uncertainty in regulation. To increase the usefulness for regulators and stakeholders of research reports, the researchers usually attach a summary to assist in understanding the sometimes complicated and specialised scientific argument and data. Therefore Executive Summaries constitute an important element of report writing in the US.

Timeliness

The MMS has an emphasis on deadlines, which are built into contracts for research. However, in regulation, definition of the problem can evolve and make quick decision-making difficult. Outside influences can also slow down the process for example in requiring redefinition of research parameters. Striking a balance between delay and delivery can be a difficult task.

At interview, the US Food and Drug Administration considered the biggest challenge for regulatory managers to be the timeliness of technical advice to the regulators. They acknowledge there could also be a trade-off between timeliness and quality because of the time needed to respond adequately when using science-based inquiry. Budget constraints also had implications for timeliness.

Some agencies including the US Environmental Protection Agency require assessments of technical and scientific advice and policy development based on a particular schedule. There is also a statutory requirement for timing in some legislation, including timelines set for recommendations, the development of regulation, the regulation process, and reporting on regulation. The timeframes for provision of technical advice and of regulation development varies from case to case.

Issues that could emerge and have slowed down the process of regulation include those related to communication and review. Legal review for example could slow down the process in the MMS. Progress could be slow for regulatory processes that require

extensive legal advice. Another example in Food and Drug Administration approvals and removal of approvals involves a legal mandated 'due process' procedure that is inherently slow. Phases of technical advice necessarily underpin these processes.

When using workshops as a device the organisers in government agencies claim to carefully manage the timing of the ultimate reports. Workshops were nonetheless a mechanism for increasing the speed of diverse technical and scientific advice for the development of regulation. Workshops include 'arms-length' workshops on specific topics under independent, usually academic, auspices.

Timeliness however is not always considered to be a serious issue for routine reactive regulatory work where regulators and advisers deal with questions as quickly and as efficiently as possible. At interview, Food and Drug Administration staff expressed this view (Food and Drug Administration, pers. comm., 1997).

Peer Communication

Effective communication of technical advice to peers is critical for credible regulation in a regulatory environment like the US where the industry is so large, strong and entrepreneurial. Communication of the technical advice and research for regulation are provided usually in the form of workshops, conferences, seminars, publishing results, use of global IT networks such as the worldwide web, and internal and external committees. A high level of informal dialogue with industry also promotes acceptance by communicating with peers in industry.

MMS have contracted and published diverse external as well as internal research and this breadth of scientific information is likely to enhance credibility with the scientific and industrial communities as well as the public. Research covers subjects as diverse as aerial surveys of endangered whales (Treacy, 2002); oil spill clean up and litigation (Russel et al, 2001); social and economic impact of petroleum E&P on communities (Wallace et al 2001) and petroleum blowouts and fires (Basey et al., 2001). Technology

overviews also include radar for physical oceanographic ecological studies (Washburn et al, 2001) and systems for air quality which relates to venting and flaring of gas from gas and oil production platforms (Coe et al., 2001).

These measures for broad consultation on technical and scientific inputs arguably generate broader public ownership of the resulting technical advice. To further enhance acceptance by scientific and other communities of the scientific inputs to regulation, consultation by agencies also includes bodies such as the National Academy of Science and international scientific agencies to ensure scientific objectivity and credibility. In addition, communication involving the press and media aim to enhance acceptance. The press, media and community groups are avenues for potential support for policy, regulation and technical advice. The use of the worldwide web is also advancing at exponential rates both in terms of traffic volume and line speed. The US also has a highly sophisticated super-computer program that in part supports the worldwide web (Museum of Science and Industry, 1997).

Conclusions: The US as Benchmark for Technical Advice for Petroleum Regulation in Australia

The Congressional Appropriations Committees and the Advisory Committee process can be beneficial systems in the US system for transparency, openness and accountability, and can assist in developing balanced regulation and underpinning technical advice as well as promoting their wide acceptance particularly for environmental issues. In addition the age and size of the petroleum industry in the US and the maturity of the systems supporting industry-related research can be strengths for access to expertise and peer review. Consequently the US is a useful benchmark for analysis of the Australian system for technical advice for offshore petroleum E&P regulation against the factors for quality given in Table 2.1.

The elements of quality for the US are assessed against their opposites from high-medium-low along the horizontal axis in Table 3.2. As discussed in Chapter 2, the H-M-

L qualitative measures are used rather than the other commonly used qualitative measure often-rarely-not applicable (O-R-NA). H-M-L highlights the intensity of stakeholder disagreement which in the US can become contentious because of the precautionary principle.

US

Criteria	High	Medium	Low
Strategic Transparent	X		
Open	X		
Accountable	X		
Operational Expert	X		
Timely		X	
Peer Communication	X		

Table 3.2: The elements of quality for technical advice in the US assessed as high-medium-low (H-M-L).

CHAPTER 4: THE REGULATION AND TECHNICAL ADVICE SYSTEM FOR THE AUSTRALIAN OFFSHORE PETROLEUM EXPLORATION AND PRODUCTION INDUSTRY

Introduction

This chapter maps the Australian system for regulation and technical advice for the offshore petroleum exploration and production (E&P) industry, and what it achieves. The mapping will form the basis for analysis of quality against the US system, using the criteria presented in Table 2.1. The chapter studies and analyses how technical advisers operate in relation to the organisations and structures that are involved in regulating the offshore petroleum E&P industry, particularly those in the Australian Commonwealth Government, but in a secondary way in the States/Northern Territory governments. It also considers technical advice in support of regulation under the Commonwealth Petroleum (Submerged Lands) Act, (1967) (P(SL)A) and in the future under the Offshore Petroleum Act (2006). Those Acts administer (will administer) the petroleum E&P industry for offshore Australia. Petroleum is defined as including oil and gas, so the E&P industry includes both oil and gas exploration and production.

The next Chapter analyses Australian processes for the technical advice, in relation to the strategic and operational elements of the model (Table 2.1) for quality in providing technical advice for regulation and policy development. Elements of the model include transparency openness, and accountability (strategic); and use of expertise, timeliness, and peer communication (operational). These criteria were related to the earlier study of the more established US system of petroleum E&P.

Value of the Petroleum Exploration and Production Industry to the Australian Economy

The Australian petroleum (E&P) industry is important to Australia because of its positive contributions to balance of payments, security of oil and gas supply and provision of energy for industry and domestic use. The presence of the domestic industry removes from the national balance of payments a negative amount of approximately $10.0 billion that would have been associated annually with importing the petroleum that Australia uses. The petroleum (E&P) industry provides energy for transport, heating and electricity generation. The electricity in turn is used for domestic purposes, manufacturing and other industries. The Australian petroleum E&P industry is small by worldwide standards and contained in its oil fields only 0.3 percent of the worldwide oil reserves at the beginning of 2002. This compared with the US holding 2.9 percent, Saudi Arabia holding 24.9 percent and Russia holding 4.6 percent. Australia held in its gas fields 1.6 percent of the world's gas reserves at the beginning of 2002. The US held 3.2 percent, Saudi Arabia held 4.0 percent and Russia held 30.7 percent (Bank of Scotland, 2003).

An additional national contribution from the petroleum industry is the value of taxes from the industry to government. In 1999, these taxes were $3.27 billion, and constituted a direct return to government accounts as consolidated revenue. There is also a positive flow-on effect from the petroleum industry into the wider commercial sector through employment and construction. The development of the liquified natural gas (LNG) facility on the Burrup Peninsula in Western Australia for example was modelled to have a more than significant. affect (greater than 5 percent increase) on the economy of Western Australia and the nation (Greig, 1994) through multimillion dollar projects and spin-offs for industry and employment (Gallop, 2005).

Gas pipelines that transport the produced gas have allowed development of new industries around Australia that can capitalise on the ready access to energy that gas supplies. The gas pipeline from the Burrup Peninsula to Perth has provided energy to support new industries and domestic use in Western Australia. The gas pipeline from the

Cooper/Eromanga Basin in onshore South Australia supports industry and domestic use in Adelaide, Sydney, Brisbane and adjacent regions. The gas pipeline from the offshore Gippsland Basin into Victoria supports industry and domestic use there, and has subsequently been extended into New South Wales and to Sydney.

Australia has effective self sufficiency in oil and gas because imports of the heavier grade oils that are not produced in Australia are compensated for by exports of LNG. Production of oil and gas is predominantly from offshore Western Australia, Victoria and the Northern Territory. These regions provide approximately 95 percent of oil production and 80 percent of gas production (Geoscience Australia, 2005). The remaining production comes from other offshore and onshore areas.

The major policy issue for the Australian petroleum (E&P) industry at the beginning of the twenty-first century is the projected decline of national crude oil production by 50 percent to 2010 (Powell, 2001). The reason is that the very large oil fields of the Gippsland basin are being depleted and production is exceeding reserves in the newly discovered fields (Powell, 2001). However, Australia does have large reserves of gas that are mainly located on the North West Shelf and this can support the LNG industry, domestic gas usage and the planned gas-to-liquids projects well into the future. Estimated supply from currently identified gas resources is forecast over approximately 35 years at projected use (Williamson and le Poidevin, 2005; Williamson and Bradshaw, 2006).

The petroleum exploration and production (E&P) industry is a worldwide industry, thus the pressures on the Australian industry are in part generated from company head offices overseas and through competition with other nations for petroleum investment. The Australian offshore industry is composed of companies many of which operate worldwide. These range in size from majors such as ExxonMobil, ChevronTexaco and Shell (through Woodside Petroleum) down to significantly sized independents like Apache and Kerr McGee and to smaller independents including burgeoning Australian companies. The larger companies operating offshore Australia are capable of exerting

significant pressure on petroleum regulators particularly the Designated Authorities in the States/ Northern Territory industry centres. This and the industry background of many technical advisors to regulation make capture of the regulator by industry a particular danger. This will be discussed further in Chapter 5.

The number of exploration wells in Australia is small compared with other countries where petroleum exploration occurs. Consequently, Australia is considered to be under-explored. Less than 9000 petroleum exploration wells had been drilled onshore and offshore Australia up to the end of 2005 compared to over a million in the US. In 2002, there were 120 international and national companies that held interests in exploration and/or production titles that were located offshore Australia. Exploration and/or production is normally carried out by a consortium of companies. An exploration permit or production licence will commonly consist of up to six partners. Essentially the same consortium of companies that explores for and discovers an oil or gas field will normally take part in its development. Changes in partnerships occur as companies seek to maintain balance in their investment portfolios or reduce financial commitments in one title to allow investment in other E&P ventures. In Australia, the E&P companies, particularly the larger ones, are often members of the Australian Petroleum Production and Exploration Association that lobbies government on behalf of the industry. Companies, including members of APPEA, also lobby government separately.

Government Regulation for the Australian Offshore Petroleum E&P Industry

Commonwealth petroleum legislation and regulation are important to the offshore petroleum industry because together they provide a relatively stable framework for commercial decision-making. This is necessary because production from oil and gas fields commonly occurs over more than a decade and often for several decades. Regulation of the Australian offshore petroleum E&P industry occurs in the context of the Australian Westminister type system of government. The parliamentary committee structure in Australia is less comprehensive than that of the US Congress. Australian parliamentary committees however include Senate Standing Committees that can conduct

public hearings, call for evidence and produce reports on the Annual Reports of Departments (e.g. Senate Standing Committee in Science and Environment, 1982). Other non-parliamentary committees range through whole-of-government Ministerial Committees to departmental committees.

Development offshore Victoria of the Gippsland Basin oil and gas fields began in the 1960s and 1970s and none of the major fields there had been abandoned by 2006. A stable policy basis for such development arguably includes consistency and fairness in governmental decisions. These decisions dictate if a company is granted licences to explore for oil and gas and how a company may develop a field after a discovery is made. Government decisions include exemptions from paying excise for the first 30 million barrels of oil produced from an oil pool. These decisions could be worth in the order of $100 million to the producing companies. The excise regime and excise exception provisions were put in place under the early petroleum legislation at a time when infant industry approaches including using taxation provisions (Harvey, 2004) were being applied to protect the fledgling Australian petroleum production industry (Ian Lavering, pers. comm., 2006). The excise provisions are now only applied for the Woodside North West Shelf Venture petroleum titles. The petroleum taxation regime for the remainder of offshore Australia now involves the Petroleum Resources Rent Tax which is profits-based, and Corporate Tax.

Government regulates the offshore upstream petroleum industry through the Resources Division of the Commonwealth Department of Industry, Tourism and Resources (DITR), answering to the Minister for Industry and Resources. Regulation under the relevant Act(s) decides on approvals relating to petroleum titles, with the aim of ensuring exploration of petroleum resources is managed in accord with good oil field practice. The Act(s) contains provisions relating to exploration, development and operation of production facilities including pipelines.

The Petroleum Search Subsidy Act (PSSA) 1957

Because of the late start of the Australian petroleum industry in the 1950s and 1960s, initial legislation aimed to bring the industry into being and to nurture it. This tone has persisted in Australian petroleum legislation. Initial exploration had achieved little success and this led to the early perception that Australia was not prospective for oil or gas. This perception was the reason for subsidies for exploration, under the Petroleum Search Subsidy Act. The Act also sought to counteract the negatives of lack of pipeline and other infrastructure and the distance from the major overseas markets. These factors made petroleum exploration more expensive and difficult to develop and market in Australia.

The PSSA 1957 was the precursor to the Petroleum (Submerged Lands) Act (P(SL)A). The Commonwealth Government enacted the PSSA and through it subsidised petroleum exploration wells in new areas. There was a positive response from industry to the Act and positive results from the exploration it stimulated. The discovery of virtually all of the main currently known petroleum provinces in Australia occurred over the seventeen years the PSSA was in force. Discoveries of oil and gas were made offshore Victoria and offshore Western Australia. The regions of those discoveries have been Australia's main petroleum-producing sedimentary basins from that time. Onshore discoveries of oil and gas were made in of South Australia, Queensland and the Northern Territory. Those discoveries heralded important petroleum production from the regions of the discoveries. The producing sedimentary basins discovered under the PSSA still supply virtually all gas used in Australia.

The PSSA governed aspects of the petroleum E&P industry, including allocation of acreage, for E&P and conditions for subsidy. The Act also required that petroleum exploration data and information be lodged with government to be made publicly available after specified time periods, the length of time depending on the classification of the data. This availability of data facilitated exploration by subsequent explorers

because it helped the assessing of investment opportunities. Because different companies applied different exploration concepts (reflecting their prior experiences in national or international exploration), companies commonly explore acreage relinquished by a prior explorer.

The Petroleum (Submerged Lands) Act (P(SL)A) 1967: Policy and Recent Regulation

The emergence of the Australian petroleum industry under the PSSA resulted in 1967 in the enactment of the P(SL)A, the Act that removed subsidy but retained measures to stimulate exploration such as the superior ease of access to high quality exploration data. In its amended form this Act still regulates petroleum exploration and development offshore Australia today. An underlying principle of the P(SL)A, like the PSSA, is that the oil and gas that is discovered is subject to sovereign rights by the Australian Government until produced. As a result of this, the legislation aims to manage the public petroleum resource and regulate its access for the benefit of the public. After production, the oil or gas becomes the property of the producing company.

The policy position of the Australian government to stimulate and sustain the industry is in contrast with the public-benefit-oriented policy stance of a country like Norway that enjoyed early exploration success and an early perception of high petroleum prospectivity. Norway is also close to a major centre of petroleum exploration and production in the UK North Sea, and close to major markets in Europe. In Norway the policy stance concentrated most strongly on producing benefits from the industry and less on encouraging exploration and production.

The P(SL)A deals with the same activities and approvals for petroleum exploration and production as dealt with by the PSSA, but only for offshore Australia, not for all of Australia as was the case for the PSSA. The Commonwealth Government under the P(SL)A regulates petroleum exploration and production outside three nautical miles from the coastline (called the territorial sea baseline). Inside the three nautical miles the States/Northern Territory regulate the industry using their own Acts that often mirror the

P(SL)A. The Australian petroleum industry continued to grow under the P(SL)A and in the 1990s Australia became self sufficient overall in petroleum.

A fundamental change in legislative philosophy in the 1990s and into this century has occurred in the approach of the Commonwealth Government to the P(SL)A. It has been the move towards objectives based regulation. The requirement for a company under this type of legislation is to provide the government with a plan for a proposed activity, such as production of oil or gas, or management and lodgement of petroleum data. The performance of the company is then assessed against that plan. The intent of objectives based regulation is to allow companies to effectively and efficiently carry out the intent of the legislation using appropriate expertise without being constrained by possibly limited and technologically-superseded prescriptions. The Offshore Petroleum Act 2006 seeks to further develop processes under the P(SL)A including objectives based management by industry of their regulatory requirements.

Objectives based regulation of the offshore petroleum E&P industry is being progressively introduced into Australia. It resulted largely from the Piper Alpha production platform disaster in the United Kingdom North Sea (BBCNEWS, 1988) and the subsequent inquiry headed by Lord Cullen to look into the reasons and possible solutions for the underlying causes (The Honorable Lord Cullen, 1990). The enquiry concluded that rigorous adherence to prescriptive regulations had not succeeded in maintaining safety for the giant offshore Piper Alpha production platform. The result was the loss of many lives from fires and explosions caused by leaking gas being ignited. The Cullen Inquiry espoused objectives based safety plans (cases) for UK production facilities. Objectives based policy for safety in the UK petroleum industry passed the onus substantially back to the company to devise and follow a plan that they had agreed with government. The Australian Government later largely followed this procedure. The approach started with safety plans but is progressively being applied in other areas of regulation of offshore petroleum E&P. The States or Northern Territory Designated Authority normally vets objectives based management plans to ensure consistency with the Act and Regulations, prior to approving the plan for implementation. The DA then

monitors implementation. This monitoring requires technical advice because the industry activities described in the plans (for example data management) are often technical in nature. The Petroleum (Submerged Lands) Act will be superseded by the recently legislated Offshore Petroleum Act (2006) which aims to clarify the law, both statutory and regulatory.

Regulation under the Petroleum (Submerged Lands) Act (P(SL)A): 2006

Regulation by the Commonwealth under the P(SL)A is organised such that the regulatory role is situated in the Resources Division of the Department of Industry Tourism and Resources (DITR). Those regulators are provided by Geoscience Australia with expert technical advice which constitutes technical evidence to support the regulatory decisions under the P(SL)A. Joint decisions for the more pivotal approvals are one feature of the P(SL)A and involve the Commonwealth Resources Division of DITR (under delegation from the Minister) and the State or Northern Territory Designated Authority (DA) that is situated in its relevant industry department. In the case of the DAs the technical advice is provided from within the regulatory group. The DAs also carry out some day to day regulation on behalf of the Commonwealth, under the P(SL)A.

In carrying out this regulatory role on a day to day basis, the Resources Division is provided with technical advice by Geoscience Australia mainly from the Petroleum and Greenhouse Gas Advice Group (PGGAG) but also in part by the Innovation and Specialist Services Group (ISSG) since 2005. Geoscience Australia is a Prescribed Agency of DITR. The technical advice relates to the technical activities by industry that are covered by the Act and associated Regulations and Guidelines. Technical advice is requested by the Resources Division and taken into account in making regulatory decisions.

Day-to-day regulation under the P(SL)A aims to put into effect Commonwealth government policy relating to the offshore petroleum exploration and production (E&P)

industry. In broad terms industry policy under successive governments has been based on three major policy platforms; microeconomic stability – getting the industry fundamentals right; microeconomic reform – creating a conducive framework for competition in international markets; and specific interventions – to bolster international competitiveness, investment and innovation and to facilitate adjustments (Department of Industry Tourism and Resources, 2005). Day-to-day regulation under the P(SL)A addresses these three major policy platforms as applied to the offshore petroleum E&P industry.

Commonwealth Minister for Industry and Resources

The Commonwealth Minister for Industry and Resources has overall responsibility for regulation of the offshore petroleum exploration and production industry. The legislation that the Minister administers consists of the Petroleum (Submerged Lands) Act 1967 (as amended) that has previously been described and is to be superseded by the Offshore Petroleum Act 2006. In carrying out responsibilities associated with the P(SL)A the Minister is assisted by a Parliamentary Secretary. Up to July 2000, the Minister for Resources was also primarily responsible under the P(SL)A for ensuring environmental standards in carrying out petroleum E&P. From July 2000 some of that responsibility has passed to the Minister for the Environment and Heritage under the Environmental Protection and Biodiversity Conservation (EPBC) Act.

Industry interacts with Ministers and their Parliamentary Secretaries including on ministerial decisions that can have significant financial implications for companies, from tens to up to hundreds of millions of dollars in excise payable, for example. The company will thus commonly argue their position strongly at State and Commonwealth levels up to ministerial levels. In these advocacy situations, technical advice which is consistent with how the regulatory and technical interpretation has been applied in the past is likely to be credible and contribute to a considered response to industry.

The Minister or Parliamentary Secretary responds to letters expressing concerns from members of parliament, industry or groups in the community. When the issue of falling groundwater levels in the Gippsland basin was publicly aired in 2000 the response used considerable technical advice provided by Geoscience Australia. Reviewing current scientific and technical knowledge and planning studies to assess better the situation assisted the Minister in providing a suitable response to letters from State politicians and irrigators.

The Minister's office also provides press releases reporting on the performance of the petroleum E&P industry, particularly recounting the successes of exploration offshore through oil and gas discoveries, high annual numbers of wells or levels of seismic surveying. Depending on how prominent other concurrent news issues are, these results are taken up by the media.

Technical advice developed through consultation with industry allows industry views to be represented in Ministerial statements and is likely to reduce any pressures from industry on the Minister. This consultation arguably enhances the public currency of the advice because the Australian industry is often at the forefront of developments in petroleum technology.

Department of Industry, Tourism and Resources

The Department of Industry, Tourism and Resources (DITR), through its Resources Division, provides policy advice to the Minister for Industry and Resources on petroleum E&P and regulates aspects of the industry under the P(SL)A through authority delegated by the Minister. Geoscience Australia, through the Petroleum and Greenhouse Gas Advice Group, provides technical advice to the Resources Division to support that regulatory role. The Resources Division of DITR also provides policy advice for downstream aspects of the petroleum industry such as oil refining and gas pipelines. In the Resources Division various aspects of advice for offshore petroleum E&P are provided by the Offshore Resources Branch, the Resources Development Branch and the

Safety, Taxation and Projects Branch. Policy advice for the P(SL)A uses inputs from technical advisers, but also academics, economists, legal advisers, political advisers in the Minister's office, industry, and national and international consultants. Thus whereas there is a strong technical underpinning to the P(SL)A because it regulates a science and technology based industry, technical advice is amongst a number of inputs that are used in the policy process. Regulation by DITR of offshore petroleum E&P under the P(SL)A and the OPA applies a risk-versus-reward approach through generic regulations, rather than exclusive use of the precautionary principle that some environmental NGOs would favour. Regulation is also moving towards self regulation by industry and management-by-objectives and is moving away from prescriptive regulation.

In the Resources Division, the Offshore Resources Branch (and its predecessors) regulates and develops policy for petroleum exploration and production under the P(SL)A. The Offshore Resources Branch is composed of policy specialists normally with non-scientific backgrounds. In the case of the Commonwealth, policy staff are expert in the policy process. Staff, especially senior policy managers, are moved between policy areas to develop experience or as need dictates. Corporate knowledge however, can at times become thin, but has usually been maintained by retaining senior staff in the same or related policy roles over several years.

The Branch regularly develops and coordinates development of amendments that are needed for the P(SL)A (and soon the Offshore Petroleum Act 2006) to maintain currency of the legislation with changing technology and industry practice. These are passed to the Parliamentary Draftsman. After drafting and consultation with Resources Division and industry**,** the final drafts or amendments of legislation are lodged in Parliament for agreement prior to acceptance. Regulations relating to the Act have lower formal parliamentary requirements. They need to be tabled and to be open for comment or objection for specified periods but are not the subject of debate before ratification. Guidelines relating to the Act have even lower formal parliamentary requirements. Consequently, there has been a trend by the Commonwealth to define only basic

regulatory requirements of a particular area of petroleum E&P activity in the Act or Regulations. More rapidly changing requirements are given in the associated guidelines.

Staff at the Safety, Taxation and Projects Branch of the Resources Division, develop advice for the Ministers responsible for resources and revenue on taxation and excise matters that relate respectively to the billions of dollars of tax and royalty revenue from petroleum E&P.

Interdepartmental Committees are involved in advising DITR on legislation, amendments and regulation relating to petroleum E&P particularly on topics where there is cross departmental interest and the possibility of controversy. The Department of the Environment and Heritage (DEH), The Department of Prime Minister and Cabinet (PM&C), Attorney Generals (AG) and Agriculture, Fisheries and Forestry Australia (AFFA) are commonly also involved in these committees.

Technical Advice for Regulation under the Petroleum (Submerged Lands) Act

Technical advice for petroleum regulation is provided by the Petroleum and Greenhouse Gas Advice Group (PGGAG) of the Petroleum and Marine Division (PMD) of Geoscience Australia as stated previously. From 2005 advice on petroleum survey and data was provided by the Innovation and Specialist Services Group (ISSG) of PMD. However, the outputs of groups in PMD other than PGGAG and ISSG also contribute elements of technical advice relating to promoting released petroleum exploration acreage and providing advice to the Department of the Environment and Heritage, and the National Oceans Office on marine environmental issues such as regional marine plans.

Geoscience Australia is a Prescribed Agency of DITR and provides the majority of the technical advice to Resources Division for regulation under the P(SL)A. This level of advisory separation is greater than that for provision of advice under the US Continental Shelf Act where the technical advice is provided from within the Minerals Management

Service, the regulatory agency. As a Prescribed Agency Geoscience, Australia has more policy advisory and financial independence than a Division of DITR but less than a Statutory Authority like CSIRO. Geoscience Australia contains the Petroleum and Marine Division that as well as providing technical advice carries out petroleum research to promote take up of exploration acreage by industry. A list of elements of technical advice for regulation of the offshore petroleum E&P industry under the P(SL)A is provided in Appendix 5 (pp. 216). The current petroleum technical advice role in various forms has been continuous since 1957 when the Bureau of Mineral Resources (the precursor to Geoscience Australia) became regulator for the Petroleum Search Subsidy Act. Geoscience Australia also has an equivalent minerals responsibility under the Minerals (Submerged Lands) Act but the minerals industry is almost totally onshore and under State/ Territory jurisdiction, so that technical advice role is small for Geoscience Australia. GA in addition provides technical information to government, industry and the public, all with the aim of adding to national wealth and welfare.

Technical advice is critical in supporting regulation under the P(SL)A because the Act often deals with the scientific and technical activities that constitute offshore petroleum E&P. Consequently scientific and technical terms and criteria are contained in the legislation, Regulations and Guidelines associated with the P(SL)A. Companies are obliged under legislation to lodge technical data from their activities and government uses these data in formulating technical advice to aid regulation of the petroleum E&P companies.

Amendments to the P(SL)A and associated Regulations and Guidelines also need technical advice. The amendments aim in part to keep up with evolving practices within the industry. An example of such an evolution is the changes in the P(SL)A, Regulations and Guidelines to accommodate the new three dimensional seismic method to map petroleum fields and prospects in more detail. That technology evolved from the two dimensional seismic method which produced a course grid of survey lines. The 3D method produces a data volume and was not in existence when the P(SL)A was first put in place in 1967. Since its inception, the 3D method has progressively become a

mainstay of petroleum E&P. Its arrival however required changes to legislation, Regulations and Guidelines.

Technical advice for amendments to legislation can be critical in avoiding introduction of inaccuracies in legislation that have expensive tax revenue or legal implications. When such unintended inaccuracies occur, costly legal appeals can take place, particularly if the new wording allows for an interpretation by which a company can reduce its tax liability. An example was in the description of requirements for a combination certificate. A combination certificate allows a group of related projects to be considered one project. The wording of the legislation referred to petroleum reservoirs of the same age as a criterion for development of petroleum in those reservoirs being considered part of the same project. This was a very broad criterion since reservoirs of the same age occur commonly on vast areas of the Australian Northwest Shelf for example. It does not appear that technical advice areas of government had any input into that wording in legislation. Appeals to the Administrative Appeals Tribunal (AAT) were made and upheld in relation to a number of oil fields offshore Darwin. Fortunately, the ultimate decision did not relate specifically to the unfortunate wording (D. Wright, pers.com., 2002).

After the regulatory areas of government pass on proposed amendments or additions to petroleum legislation for parliamentary drafting, unintended changes of wording and on scientific and technical meaning can still however, be introduced by the parliamentary draftsman. Industry can seize on any ambiguity thus introduced to test legally if it implies possible financial advantage. There may be little opportunity however, for regulatory or technical advice areas to affect the final wording of the legislation. It can thus be of significant benefit for technical advisers to review the various drafts of legislation as the above case of the combination certificate suggests. In summary therefore, Geoscience Australia's technical advisory role is only part of a complex policy making and regulatory process. New modelling systems have been implemented but problems do remain in making regulatory changes.

Geoscience's Australia: Petroleum and Greenhouse Gas Advice Group

The Petroleum and Greenhouse Gas Advice Group (PGGAG) of Geoscience Australia provides technical advice on an almost daily basis to Resources Division of DITR but this is mainly done on request from the regulator, not through legislated requirement. Greenhouse issues have recently become a component in development of gas fields with high carbon dioxide content such as the super-giant Gorgon gas field, offshore Western Australia. Consequently, PGGAG has recently added a carbon sequestration research project under the Cooperative Research Centre for Greenhouse Gas Technologies, and a Greenhouse Gas Advice project to advise on storage of carbon dioxide underground. The Group also liaises with industry and the Department of the Environment and Heritage (DEH), and advises on environmental matters regulated by DEH under the Environmental Protection and Biodiversity Conservation Act (EPBC), and some environmental matters that are still regulated under the P(SL)A. The Group formerly dealt with safety aspects of the petroleum E&P industry, but interaction on safety matters will now be through the recently formed national authority. The advisory staff of the Group is composed of explorationists, engineers and environmental scientists. PGGAG also has expertise in industry statistics and database. This expertise is sometimes augmented through specialist input from petroleum explorationists within the other Groups of PMD.

Precursors of PGGAG have provided technical advice for petroleum E&P regulation from within the Bureau of Mineral Resources and subsequently the Bureau of Resource Sciences (BRS) and the Australian Geological Survey Organisation, since the enactment of the Petroleum Search Subsidy Act (PSSA) in 1957. The precursor of the Petroleum and Greenhouse Gas Advice Group was located in the BRS from 1992 to 1998 (under the name of the Petroleum Resources Branch).

Policy Making and Regulation since the 1990s: Some Background

In the early 1990's the relationship between the precursors of the Petroleum and Greenhouse Gas Advice Group and Resources Division was probably poorest. The two

were then separately located in the Bureau of Mineral Resources and the Department of Primary Industry and Energy. The relationship was strained over technical advice relating to a number of development decisions. Arguably, the causes for tension between the then Petroleum Resource Assessment Branch (PRAB) of BMR and the petroleum regulatory area, were in part a lack of understanding by PGGAG of the role of technical advice as one of a number of inputs to the policy function, as well as a lack of understanding of the reasons for the technical advice by the regulatory area. Wilkinson (1996) describes

'A heated and very public debate in the first months of 1992 that became known as the 'floating platform affair'. The issue revolved around the relative merits and demerits of floating production facilities and subsea wells, as a method of developing small to medium offshore oil fields'.

'Minister Simon Crean asked for a specific briefing on the subject … Department Secretary, Geoff Miller, thought the issue was too sensitive because market forces would be challenged. Bureau engineer, Denis Wright, was given permission to present the idea as a paper at the Australian Institute of Energy National Conference in Canberra early in 1992. Falvey (Associate Director of BMR) went further and authorised an accompanying media release pointing out that an estimated $15 million worth of oil could be left in the ground if proposals then being contemplated by industry to install floating production facilities on the Northwest Shelf went ahead'.

'BMR strayed off the straight and narrow when it went public on the issue on the floating platform debate in the media release authorised by Falvey … Technical arguments ... should have been reserved for technical advice. Ministers were understandably upset by this breach of policy'.

This strained relationship between the technical advice area, the regulatory area and the Minister immediately preceded relocation of PRAB and the Minerals Resource Assessment Branch of BMR to the newly forming Bureau of Resource Sciences (BRS)

also in the Department of Primary Industry and Energy (DPIE). The Government renamed the remaining parts of BMR as the Australian Geological Survey Organisation (AGSO).

BRS represented a second model for the deployment of technical advising areas to achieve effective communication. BRS was then a collection of technical advice groups that provided advice to various divisions in DPIE, including divisions dealing with fisheries, forestry and agriculture. Thus, in BRS the petroleum technical advice group worked within a purely technical advising agency. This structure was maintained for six years and clearly coincided with a greater development of acceptance of technical advising for regulation of the petroleum industry. PGGAG and the petroleum regulatory area were initially located in separate buildings but then collocated in the Edmund Barton building. The greater proximity between the technical advice area and the petroleum regulatory area within the Edmund Barton Building doubtless helped to establish more positive professional interactions between the two areas. This was in part the result of the staff of the two areas being able to easily visit their opposite number and discuss what advice was required and in what time frame. It also allowed for convenient discussion of drafts of advice when the regulatory issues and/or the technical advice were potentially contentious or complex. Examples of such advice were in recommending against Designated Authority (DA) recommendations that were inconsistent with previous practice or that would establish precedents with a potentially negative impact in the future. This could be the case for example if a DA recommended allocation of exploration acreage to a bidder with a work program that would previously be considered insufficient. The ultimate result of initial recommendation in such cases could be a trend towards little-explored acreage and the exclusion of competitors' policy outcomes, to be avoided if possible.

The DA model operates as a third model which can potentially present the greatest challenges to quality in technical advice into the regulatory process. In the DAs the same staff carry out the technical advice function and the regulatory function. In particular, since the same staff provides both the regulatory and technical inputs to decisions,

retaining technical capability and appropriate technical inputs may, under the pressure of delivering regulatory outcomes, not receive a high priority. Thus ultimately this could result in poor regulatory decisions due to pressures from industry on the regulatory process, resulting in the absence of necessary technical content in advice leading to regulatory decisions, and subsequent dissatisfaction of the Ministers, industry and the Commonwealth as clients of the decisions.

Geoscience Australia: A Review of Institutional Development

The BRS arrangement under the ALP Government, made access to the geoscientific expertise in Geoscience Australia on petroleum and mineral matters more difficult because of the separation and the systemic effect of being in different agencies with different roles. However, an important benefit for PGGAG of working within BRS as a technical advising bureau was that different advising was undertaken in the different branches and lessons learnt by one branch could be absorbed by others.

When PGGAG returned to AGSO from BRS, and after AGSO's loss of the major Rig Seismic data collection program, the petroleum promotion of exploration opportunities mainly undertaken until then by PGGAG passed to other areas of PMD to carry out.

Advisers in PGGAG and ISSG usually have considerable prior experience in the petroleum E&P industry, both nationally and internationally, and this is beneficial in promoting high quality advice. In recruiting advisory staff, such industry experience is considered desirable. Without advisers with considerable industry experience it is difficult to provide technical advice that has consistent industry credibility for regulation. The senior advisory staff of PGGAG and ISSG have an average of over ten years in the technical advice role. This contrasts with the average experience in the corresponding regulatory branch, which was over two years in 2002 (D.Wright, pers.com., 2002). The Group provides advice, concentrating on scientific and technical expertise, consistency with previous advice and on what precedents are being established. Thus, PGGAG's and

ISSG's advice reflects their national technical overview of current, past and potential activities and approvals under the P(SL)A.

Co-regulation with States/Territory Designated Authorities

For key decisions under the P(SL)A, Commonwealth and States co-regulate petroleum E&P through a Joint Authority comprising Resources Division staff and petroleum regulatory staff of the relevant State or Territory Designated Authority. This is in contrast with US regulation under the OCS Act which is done without such a relationship with the States. Decisions by the Joint Authority include granting of petroleum exploration licences that the Commonwealth Minister releases for bidding in the first half of each year at the Australian Petroleum Exploration and Production Association Conference. PGGAG provides technical advice to the Joint Authority (and ultimately the Ministers) that then decides what is the work program that will best advance exploration in each title. Successful bids are awarded on the basis of these best work programs. Joint Authority decisions also include granting of production licences to develop oil and gas fields. The Joint Authority also reviews and approves, if appropriate, major changes to production licence applications for development plans for oil and gas fields.

In contributing to these decisions the Designated Authorities and their staff have an overview of what is happening in their marine and onshore jurisdiction while in contrast, the Commonwealth staff has a national overview. The States and Northern Territory Designated Authorities undertake the day to day regulation on behalf of the Commonwealth of aspects of the P(SL)A under the Constitutional Settlement. Day to day administration includes for example granting of production rate approvals for petroleum fields and minor changes to approved development plans.

Because the States/Northern Territory carry out not only the Designated Authority role under the P(SL)A but also regulate the upstream petroleum industry in their area of jurisdiction, their breadth of scientific support for P(SL)A activities does not necessarily directly relate to the number of staff required for offshore regulation under P(SL)A. It is

not surprising then that South Australia with the strongest onshore industry also has probably maintained the strongest scientific and technical support available for P(SL)A regulation although their requirement in that area is less than for some other States. The onshore South Australian industry is centred on the Santos gas production in the Cooper Eromanga basin in the north of the State.

Requests for technical advice from the Commonwealth by the Designated Authority also occur outside the Joint Authority process. Requests from the DA will normally be made to the regulatory area in the Commonwealth Government. The technical advice from PGGAG can then be an input to the regulatory response. Exceptions occur when the issue is purely technical and in that case, the Commonwealth regulator often requests direct technical interaction between the PGGAG staff and those of the relevant DA. An unsuitable regulatory response by a Designated Authority could potentially make an element of legislation unworkable in the future by accepting argument that could be broadly applied in avoiding fundamental responsibilities, for example an exploration program that was a condition for obtaining the exploration acreage.

A key difference between the Commonwealth and the Designated Authorities in technical advising for petroleum E&P regulation is that the DAs in the States/ Northern Territory do not maintain separate technical and policy advice roles as are maintained in the Commonwealth Department of Industry Science and Resources. The DA arrangement is similar to that in the US Minerals Management Service. Thus the emphasis on breadth and depth of technical advice of the States/Northern Territory is likely to be less than that maintained by the Commonwealth. This is because the States/Northern Territory Designated Authorities have Mines Department or Mines and Energy Department structures in which the policy and technical advice staff can be one and the same. This is achieved by appointing policy staff mostly with scientific backgrounds and in many instances, petroleum industry experience. The lesser depth in the technical advice function for regulation is compounded by their lesser range of responsibility. It is not unusual for a Designated Authority not to have a reservoir engineer for example to provide advice in relation to field developments while PGGAG by comparison has three.

Absence of particular expertise is also common in Designated Authorities through loss of staff or inability to fill positions. That understandably can also result in lack of depth in petroleum exploration expertise for regulation. The range of technical advice available in the Designated Authorities is thus variable over time depending on the ability to fill positions. PGGAG often provides informal technical advice to the Designated Authorities which in part compensates for periods of lack of staff in the DAs. One DA routinely seeks formal technical support from another DA that has greater technical capability.

The Commonwealth's national overview of the offshore petroleum industry E&P facilitates national consistency in Commonwealth decisions and in Joint Authority or DA decisions in which the Commonwealth is formally or informally involved. As indicated previously, these decisions include major decisions under the P(SL)A like granting of production licences for oil and gas fields. The Commonwealth overview helps to mitigate against potential inconsistency in technical advice that may result from reflecting mainly one State's experience and knowledge. The Commonwealth can provide technical advice to advise Designated Authorities on factors external to the DA experience and knowledge, and thus help facilitate consistency of regulatory decisions from different jurisdictions. This balance in regulation under the P(SL)A and in technical advice is also assisted more broadly by informal advice that reflects the national overview, from Resources Division and PGGAG to DAs. When a DA seeks informal advice on such matters the resulting advice can also contribute to balance and consistency among DAs' decisions. In practice there is considerable formal and informal consultation between Designed Authorities and PGGAG on technical advice for regulation. As a result, the incidence of inconsistent decisions by individual Designated Authorities is undoubtedly reduced.

Regulatory Interactions with other Commonwealth Departments: The Whole of Government Approach

The Department of Industry, Tourism and Resources (DITR) interacts with other Commonwealth departments that have responsibilities in regulating petroleum E&P. These include the Department of the Environment and Heritage (DEH), Australian Tax Office (ATO) and Attorney Generals (DAG). PGGAG provides technical advice supporting these interactions and regularly provides formal or informal technical advice to those Departments.

As indicated earlier, with the enactment of the Environment Protection and Biodiversity Conservation (EPBC) Act in July 2000, overriding responsibility for some environmental aspects of activities undertaken under the P(SL)A fell to the Minister for the Department of the Environment and Heritage assisted by the Minister's Department. The powers of the EPBC Act are broad and potentially encompass environmental implications of any activities for both onshore and offshore Australia. DEH commonly consults with DITR in decisions relating to the petroleum industry activity that may affect whales for example. PGGAG often provides technical advice in this process at the request of DITR and DEH.

Understandably, taxes are a major focus of the petroleum industry since taxes impact on their profits. The Australian Tax Office (ATO) has a responsibility for taxing revenues from petroleum production. In 2001, the ATO also took over from the Department of Customs and Excise the role of administering excise, effectively another form of taxation. The Petroleum Resource Rent tax applies in areas offshore Australia except for the two areas where the prior excise regime is still in force. PRRT is a profit-based tax. Company tax also applies to the offshore petroleum E&P industry. Industry has sought special tax relief, for example for deep-water exploration and production. The Resources Minister assessed this with advice from policy staff of the Resources Division of DITR.

Staff of PGGAG advised DITR on technical aspects of the arguments mounted by industry on that taxation. The industry has argued that deepwater exploration deserves special tax concessions because it is more risky than shallow water exploration both economically and in terms of petroleum prospectivity, and because deepwater exploration, development and production are more expensive than their equivalents in shallow water.

Regulatory decisions and technical advice that underpin decisions under the P(SL)A are potentially subject to legal appeal. Companies reviewing their legal options for appealing a decision by government under the P(SL)A may request, under the Administrative Decisions (Judicial Review) Act 1977, a formal 'statement of reasons' for the regulatory decision made by the Resources Division. Consequently, it is important that the Resources Division and PGGAG retain appropriate rigour and due process in their decisions and in providing and recording technical advice. The advice should thus be reasonable and consistent with previous advice provided in similar circumstances and with requirements of the Act or regulations.

When companies mount legal challenges against government decisions in the Administrative Appeals Tribunal or the High Court, Resources Division coordinates the response to the challenges, and staff of PGGAG supply or organise expert witnesses for that part of the challenge that is substantially based on scientific argument. The Attorney General's Department on behalf of DITR defends these challenges. Cases have involved for example appealing the denial of a combination certificate (and associated tax advantages) for developing a group of petroleum fields. In this case, the company's argument on the basis of the criterion of geological similarity of the reservoirs of the fields required a scientific response in technical advice and PGGAG coordinated this.

The Upstream Petroleum Subcommittee (UPS) consists of the heads of regulatory branches dealing with petroleum exploration and production in the Commonwealth, States and Northern Territory governments. It recommends changes in regulation under the P(SL)A and consequent amendments to the P(SL)A. The Resources Division of

DITR holds the Chair of that Subcommittee. The Subcommittee meets twice yearly and follows a work plan endorsed by the Senior Committee of Officials for the Ministerial Council on Mineral and Petroleum Resources. The Subcommittee reaches decisions by assessing in session the content and recommendations of regulatory papers generated by DITR, Designated Authorities and PGGAG and circulated prior to the meeting. The author, as Group Leader of the Petroleum and Greenhouse Advice Group of GA, was for many years technical adviser to the Commonwealth in the Subcommittee.

The UPS commonly refers for advice complex issues such as changes in legislation, regulations or guidelines, to working groups drawn from the organisations represented on the Subcommittee, and from industry. These working groups provide papers to the Subcommittee for discussion, amendment, refinement and adoption or otherwise.

The Petroleum Data Consultative Group (PDCG) is a working group of the Subcommittee, advising on changes to legislation, regulation and guidelines on lodgement, access and management for petroleum E&P data. The Group was constituted as an on-going working group to the UPS after some years of providing internal advice to the Subcommittee. Access to good quality petroleum exploration data in Australia is better than almost anywhere else in the world and is a critical competitive advantage for Australia in attracting exploration (Williamson and Foster, 2003 and 2004). The Group is a working group of both the offshore (Commonwealth and States/NT) and onshore (States/NT) components of the UPS and has used this to move towards nationally consistent regulation for petroleum data in spite of differing interests and practice in the different States/Northern Territory and industry. Industry has strongly supported this move. The Group contains technical and policy representatives of Commonwealth and State governments and representatives of industry and of the Australian Petroleum Production and Exploration Association (APPEA), the industry peak group discussed in the next section. It also contains representatives of the International Association of Geophysical Contractors. The author has been chairman of the Group since its inception.

The Role of Industry Peak Groups in Regulation: Onshore and Offshore Issues

The Resources Division seeks and receives frequent feedback from industry on any proposed changes in regulation, and from individual companies on regulation relating to approvals for petroleum E&P activities. This is done both informally and formally through reviews like the review of the Commonwealth role in Administration of the P(SL)A in the late 1990s. For that review, the Australian Petroleum Production and Exploration Association (APPEA), individual companies and the States/Northern Territory, provided input.

The main industry peak group for upstream petroleum policy is APPEA and that group advocates the interests of its members on government regulatory issues. The members of APPEA include many of the companies involved in petroleum E&P in Australia. APPEA is centred in Canberra, the location of the Commonwealth regulators, with an office in Perth in Western Australia, currently the main centre for the Australian offshore petroleum E&P industry. The Association has frequent interactions with the petroleum regulatory areas of Australian governments. APPEA is also often represented on working groups of the Upstream Petroleum Subcommittee and thus contributes to changes to petroleum guidelines, regulations and legislation.

The Australian branch of the International Association of Geophysical Contractors (IAGC) makes representation to regulators to support the commercial interests of its members and is consulted about petroleum regulation in their areas of interest. IAGC is dominantly made up of representatives of companies that collect and process seismic reflection surveys, the main exploration tool of the petroleum E&P industry for assessment of acreage and siting exploration wells. Unlike APPEA it has not had full time office staff in Australia. IAGC members are represented on working groups of the Upstream Petroleum Subcommittee when those working groups deal with regulation associated with collection or submission of seismic reflection data. In general, IAGC have favoured long term or total confidentiality of data whereas Government and industry support access to data after a relatively short confidentiality period. Interaction with

IAGC is thus an exercise in managing their conflict with the interests of industry and government. The IAGC is represented on the Consultative Petroleum Data Group that advises the Upstream Petroleum Subcommittee on guidelines and regulations for petroleum data submission.

Other peak groups such as the Petroleum Consultants Association that represent the interests of independent consultants that carry out studies on behalf of petroleum E&P companies, rarely involve themselves in discussions of petroleum regulation. The Australian Gas Association (AGA), the Australian Pipeline Industry Association (APIA) and the Australian Institute of Petroleum (AIP) are mainly concerned with the downstream petroleum industry including pipelines, refining and sales and are less involved in issues relating to petroleum E&P regulation. In particular, these peak groups normally input much less to consultation on regulation of the offshore petroleum E&P industry compared to APPEA or IAGC.

Input to Petroleum E&P Regulation from Research Groups

Petroleum research groups in Universities provide a low level of expert input to technical advice for regulation, mainly on the prospectivity of acreage released for exploration. This has been done through sub-contracting studies for Geoscience Australia and through results from the Australian Petroleum Cooperative Research Centre (APCRC). Government initiatives have sought to increase efficiency in their scientific research relating to petroleum E&P through the APCRC. Cooperative Research Centres (CRCs) were designed 'to promote cooperation in research and through it a more efficient use of resources in the national research effort' (Australian Government, 1993). CRCs were also developed such that they cooperate with and obtain a significant component of their funding from industry. The APCRC, which operated to 2003, had participants drawn from academia, government and industry. Geoscience Australia was part of the APCRC. The University of New South Wales Petroleum Engineering School, a member of the APCRC, at times provided engineering advice to PGGAG for regulatory advice under the P(SL)A.

CSIRO has involvement in some CRCs. Its research is dominantly aimed at meeting industry needs and is little used in technical advice associated with regulation of offshore petroleum E&P. An exception was their review of ground water pressure history in onshore Gippsland during the time of offshore oil and gas production. That study followed on from technical advice from Geoscience Australia on the subject, including input by the author, to Minister McGauran during a meeting with Gippsland irrigators in Sale Victoria in 2003.

Conclusion

This chapter has been largely descriptive and institutional. However, a short summary of issues will lead into the next analytical chapter. The key conclusions are as follows:

1. Since the 1990s the interdepartmental structures have been consolidated.
2. The more recent 'whole of Government approach' has been applied to offshore petroleum E&P involving States/ Territories, industry, contractors, data management, technical R&D and interdepartmental policy arrangements.
3. The policy (DITR) and advisory (GA) arrangements are now less problematic regarding the relationship between technical advice and legislation/ regulation.
4. New policy issues are emerging very fast in relation to energy sourcing.

CHAPTER 5: QUALITY OF TECHNICAL ADVICE FOR REGULATION OF AUSTRALIAN OFFSHORE PETROLEUM EXPLORATION AND PRODUCTION

This chapter analyses practices for the provision of technical advice for regulation of the Australian offshore petroleum exploration and production (E&P) industry against the strategic elements of quality of technical advice given in Table 2.1. These elements are strategic (transparency, openness and accountability) and operational (use of expertise, peer communication and timeliness). The analysis in this chapter is then compared to the US analysis in Chapter 3 as a putative benchmark.

Strategic Elements for Quality in Technical Advice

Transparency

Transparency in regulation of the offshore petroleum E&P industry and associated technical advice is provided at the Parliamentary level by Parliamentary Estimates Committees that allow for questioning of Australian Government officials. Royal Commissions have broad powers of investigation and can be used if required.

The level of transparency in Australia has tended to result in companies regarding sovereign risk as not constituting a significant problem. A component of this transparency is that regulatory decisions and underpinning technical advice have been consistent with precedents set in similar interactions between government and industry under the P(SL)A, assuming no new factors are involved.

In Australia the regulatory system for offshore petroleum E&P can be quite transparent, open and rigorous. However, the Australian approach to the petroleum E&P industry regulation can be at variance with traditions of petroleum industry regulation in some

other regimes around the world. Such regimes include the UK where allocation of exploration acreage has been the result of negotiations on work program between government and industry with government choosing the successful company on the basis of achieving strategic objectives through the allocation of acreage. In contrast, in the case of the offshore Australian petroleum E&P industry, allocation of acreage occurs through the application of a work-program bidding system. Technical advisers in the Commonwealth Petroleum and Greenhouse Gas Advice Group (PGGAG) and the States advise in relation to publicly available criteria stated in the P(SL)A, or associated Regulation and Guidelines for all E&P applications. The Joint Authority interviews bidding companies in the case of close bids for exploration areas or to clarify bids as necessary. Successful bidders are publicly announced along with the work program for which they bid. In this and other processes relating to regulation of offshore petroleum E&P there is considerable consultation between the Commonwealth regulators and advisers and the States/ Northern Territory Designated Authorities, including through their involvement in departmental working groups that address technical and other aspects of regulation.

Transparency with industry can also be facilitated by consultation with companies so that they can understand decisions and the reasons for them. Consultation will often involve industry presentations to Commonwealth and State/ Northern Territory regulatory and technical advice staff, and responses can involve requests for industry documentation that demonstrates that any ultimate approval can be consistent with the P(SL)A. Such regulatory approvals are ultimately applied for formally in writing. Decisions are conveyed in writing to the company and normally incorporate the technical rationale that underpins the decision. The company can also request any supporting documents through Freedom of Information or a Statement of Reasons relating to a decision.

Openness

At the intergovernmental level open consultation occurs with States/ Northern Territory through the Ministerial Council on Minerals and Petroleum Resources and associated

committees. These include departmental working groups that often include industry representatives but rarely representatives of other interest groups.

Although open consultation with groups that have their own strong agendas may be difficult, an effort can often be made to undertake such consultation. This can occur with environmental NGOs that philosophically oppose the activities of the petroleum E&P industry. Some NGO groups routinely and as a matter of policy oppose especially minerals exploration and production, but also petroleum exploration and production. Consultation can also be difficult because government tends to pursue a risk versus reward approach and to use for example, acceptable levels of risk as a guide whereas environmental NGOs apply the precautionary principle so that any risk may cause opposition to a proposal. Industry groups can also have strong agendas, typically the reduction of taxation on their industry. The regulatory system allows companies making strong representation to Commonwealth and Designated Authorities to advocate their position including through public comment that is invited on Regulatory Impact Statements provided by government in the development of regulation.

The free access to offshore petroleum E&P data in Australia is another important aspect of openness and contrasts with systems for data access and pricing elsewhere in the world. In Australia petroleum data collected by companies in the course of E&P are lodged and made available to other explorers free, or for the cost of transfer, after a relatively short confidentiality period. Such access has been the case since the inception of the Petroleum Search Subsidy Act in 1957 and was originally a condition of the subsidy. Free access was retained under the P(SL)A and extended under the Commonwealth Spatial Data Act in 2001 to all Commonwealth spatial data including studies relating to petroleum E&P and databases (Williamson and Foster, 2003). The free access to petroleum data in Australia has been further augmented by specific programs provided by the Australian government to collect petroleum exploration survey data for free distribution to industry to further stimulate exploration (Williamson and Foster, 2004). PGGAG also provides information to the public in the form of quarterly and annual summaries of survey and drilling activities, discoveries and production by the

oil and gas industry. That information becomes incorporated in media investment information.

Accountability

Regulation and technical advice can have considerable financial impacts on industry so regulators need to be able to respond credibly to industry concerns. Consequently, consistency in regulatory decisions contributes to a competitive environment where no company can be seen to have an unreasonable advantage over their competitors through perceived favouritism in government decision making or in the underpinning technical advice. Thus maintaining credibility in such regulation and advice can be components in keeping sovereign risk at a low level.

Companies may test regulatory decisions through legal channels if they are not satisfied by the normal consultation with government. In these instances industry is often looking for a decision that will result in less taxation or less expenditure. This ability for legal redress can further encourage openness in the regulatory system. In these instances, if a government decision is appealable, technical advice requires a strongly legalistic approach particularly for a Statement of Reasons which a company can request from government. The Statement of Reasons provides formally the reason for a specific regulatory decision. Thus, the technical advice invariably has an appropriate semi-legalistic form. Companies request a Statement of Reason as part of the appeals framework for the Administrative Appeals Tribunal Act. Companies may see an advantage in taking this route of appeal when available because the AAT can change a government decision whereas the High Courts or Federal Courts adjudicate on process and may require a decision to be remade by government to ensure all due process has been followed, but will not change substantively a decision. Accountability can also be addressed more generally by Royal Commissions for serious matters of public interest.

The interaction with the States/ Northern Territory in the regulatory process also means that the ability of States/ NT to respond in favour or otherwise to Commonwealth proposals provides in effect another avenue of accountability.

Regulation and technical advice must also necessarily account for public interest in an environmentally sustainable industry including at international level as expressed through soft environmental laws promulgated by the United Nations (see section Chapter 2). This public interest is reflected in the Commonwealth government's emphasis on ecologically sustainable development (e.g. Productivity Commission, 2000). Thus, technical advice involves not only advice relating to petroleum exploration and production techniques and practices but also advice relating to their potential environmental affects.

Arguably the direct contact between Ministers' offices and policy areas has tended to reinforce the primacy of policy processes over technical content in Australian resource regulation. This emphasis could mitigate against balance in technical advice through reducing the formal need for external consultation and through an under-use of technical advice. The Westminister system in Australia was inherited from the UK. In the UK it can be argued that the primacy of process over content was also strongly evident until Michael Hesseltine, (when Deputy Prime Minister to Prime Minister Margaret Thatcher), made a strong push to put science at the highest levels of policy development. As discussed earlier, this push coincided with interaction of the UK government within the European Community and with nations such as Germany. Such nations had a tradition of appointing scientists with high relevant qualifications to high levels within the policy portfolios. In the UK, departments in response instituted the Chief Scientist role. Australia has chosen not to commit to a peer review as the UK did through participation in the European Community government and has not developed the departmental Chief Scientist role as in the UK. That role is in effect the chief technical adviser to policy and regulation in that department, as in the UK Department of Environment for example. Australia does, however, have a Chief Scientist for the whole of the Australian Government.

Capture by Industry

In Australia the relatively large size of companies operation in offshore petroleum E&P and the perceived economic importance of that industry mean that considerable political pressure can be applied by those companies on the regulators and particularly on State/ Northern Territory Designated Authorities in industry centres. The role of Geoscience Australia in the regulatory process is important in helping the petroleum regulator in the Department of Industry and Tourism (DITR) limit capture by the industry. In this respect, it is difficult to argue that an industry oriented group in government may not tend to favour the industry it regulates. The technical advice role provides, however, a focus on compliance by industry with regulation, independent of policy issues and pressures. Thus regulatory decisions usually have independent technical advice as one of their pillars. That advice is acknowledged by Resources Division as adding credibility to their regulatory advice. Having the two independent pillars of input for a regulatory decision doubtless also helps the policy process absorb the industry pressure the industry can apply through Ministers' offices and State Governments. A danger however exists for capture of technical advisers by industry because of the industry background of many advisors. When policy areas are combined with technical advice areas as in the Designated Authorities of the Australian States and the Northern Territory, the pressure exerted on the policy area by industry is not in any way separated from the pressure on those providing technical advice. Advocacy by industry may include direct or indirect suggestions that major projects will be jeopardised or that industry activity would move outside Australia if a favourable judgement is not granted. The pressure on government to leap to a regulatory response with little expert consideration can be great. Transparency and openness as discussed above can both be jeopardized in this regard.

The more direct pressure on DAs by the local industry can partly explain the use by the DAs of the Commonwealth as a source of separate advice. The approach that if the Commonwealth agrees we will also accept the application has been commonly used by some DAs. This approach both provides external expert advice to the DA as well as

being a mechanism for diverting the pressures that may be applied by companies on the technical advisers/ regulators in the DAs.

There is also the possibility that a company's technical presentation directly to technically inexpert ministerial and policy staff may be the sole source of technical input to a policy decision. In this instance, a skilled advocate of an industry position would be expected to provide only the information that supports their case. This was described as the role of good industry advocacy by an Amoco lobbyist (Slaughter, 1997) and is reflected in industry approaches to government such as recently in Cyber Industry (2006). This could result in the advocacy being accepted as technical advice in the absence of external expert critical review. Such instances could result in poorly balanced regulatory decisions. Therefore access to government at the highest level by self-interested parties remains on an issue-by-issue basis problematic as 'in-confidence' considerations obtain.

Public Consultation on Environmental Matters

When formal or informal regulatory consultation between departments or between Commonwealth and State/ Northern Territory governments occur, this may not necessarily include consultation with environmental NGOs in addressing environmental regulation. Such consultation is more likely to occur in working groups or as a response to formal governmental processes such as Regulatory Impact Statements. Nonetheless the relatively limited legislative basis for broad consultation means that consultation in Australia may not be as broad as it could usefully be to promote balanced regulation.

Although the petroleum regulator has responsibilities for environmental elements under the P(SL)A, consultation on environmental matters is now dominantly a matter between companies wishing to undertake petroleum exploration and production activities and the Department of Environment and Heritage (DEH) for clearance or conditions under the Environmental Protection and Biodiversity Conservation Act (EPBC). Consequently, the Resources Division of the Department of Industry Tourism and Resources and DEH consult on environmental evaluation of acreage for release for petroleum exploration.

Consultation with the public in areas of public scrutiny can enhance general public acceptance of regulatory decisions and associated technical advice, although the more polarised views rarely appear to be affected. For example, in the case of public concern on possible affects of seismic surveying on calving of the Southern Right Whale, in 1991 the Minister for Resources attended a public meeting in Warnambool. The public meeting in Warnambool was also attended by representatives of the local council, Project Jonah (the local whale watch group), Deakin University, BHP Billiton and Greenpeace. In that case, a compromise decision was reached and the public consultation arguably enhanced broad public acceptance of that regulatory response. There was no available technical evidence to indicate potentially significant adverse affects on whales from seismic data collection and the final compromise was mainly political.

There is also sensitivity to development of petroleum fields in scenic areas where visual pollution is an issue. Thus in looking to develop the Minerva gas field off the Victorian coastline in an area famous for the scenic views incorporating the 'twelve apostles' offshore rock structures, BHP Billiton the operating company, consulted through meetings with the local community and interest groups. The public is also sensitised by oil pollution associated with shipping accidents and effects on beaches of illegal discharge of bunker oil by ships and write letters expressing environmental concerns to the Minister. Providing draft ministerial responses to these often requires technical and scientific advice.

An implication of the study by Pring et al. (1999a, b) is that lack of public acceptance of governments' rationale for regulation of resource industries can have disastrous results for the industry. Another implication of the study is that government and industry need to be diligent to answer each concern expressed by environmental NGOs and the public. A robust technical base for policy will obviously assist this process. Where diligent answering of concerns is not present, there is a demonstrated progressive history of the concerns being tacitly accepted as fact and of restriction on mining and production of mineral commodities and ultimately on end use of some commodities, through use of the

precautionary principle. This approach to policy analysis has been the case with potential lead poising for example. The recent history of the demise of the European minerals industry can be seen as a precautionary tale for the offshore petroleum E&P industry.

The petroleum exploration and production industry does not normally attract much public notice because it is offshore or in remote areas and is not close to where large numbers of voters live. Thus the amount of consultation with the public that is needed to maintain public acceptance (passive or active) in administration of the P(SL)A is not usually large. A lack of public consultation, however, can result in technically incorrect actions being undertaken by governments to satisfy political pressure. Such a result followed public pressure involving environmental NGOs in the case of the Brent Spar incident in the North Sea where the final politically agreed solution for the disposal of the petroleum storage facility was generally agreed to be less appropriate for environmental and safety reasons (Lotstedt and Renn, 1997).

Appropriate Skills for Consultation

It is probable that neither the skills of a careful and thorough drafter of policy nor those of a technical adviser are the same skills required to carry out the effective consultation that may be needed to engage in consultation to achieve balanced technical advice. Thus there may be a desirable style that suits key policy or regulatory functions such as clear and concise writing, and concentrating on maintaining staff with those skills could have a secondary affect of tending to minimise consultation. Skilled scientists or technical experts may also benefit in their area of expertise by being somewhat introverted and /or too technically narrow in relation to their area of interest. In summary, there exist many cross pressures in providing and having accepted technical advice by government. The elements of this issue concerning strategy making using various forms of policy advice have been discussed above. But pressures also exist at the operational level which will now be considered.

Operational Elements for Quality in Technical Advice

Use of Expertise

Providing high quality technical advice for operational regulation requires access to both expertise in the relevant science and technology, and expertise in technical advising. Pressure on availability of expertise comes in part from the trend to smaller government and the pressure to reduce funding for staff in government including scientific and technical advisers for regulation. Areas of government associated with petroleum E&P have tended to experience pressure on their funding base over the years. For example there has been progressive erosion in the number of staff in PGGAG that provide technical advice for regulation under the P(SL)A.

A standard of technical advice that is sufficient to reduce unnecessary litigation can, however, result in overall cost efficiency. If the available budget leads to inadequate technical advice for regulation of petroleum E&P industries, then reduced cost can represent a false economy if reduced investment or reduced benefit accruing to the nation is a result of poor and inconsistent decisions by regulators. Thus there is at some level of funding, an implied trade-off between the budget for technical advice for petroleum E&P regulation and the threat to the national interest from any perceived deficiency in the technical advice.

Industry applications to the regulator from industry represent only a partial input of expert content for technical advice and will contain that component which supports the industry application. Thus input provided at the time of the application will often not cover all the aspects needed as a basis for advice by PGGAG for regulation. Discussion with industry on scientific and technical aspects of their applications can, however, provide important information for PGGAG better to understand those applications.

PGGAG staff need to be expert in their scientific fields to be able to assess critically for technical advice for regulation, the industry data and the interpretations. In advising for

policy and regulation PGGAG also critically assess and use other scientific expertise through written and verbal representations from peak groups including the Australian Petroleum Production and Exploration Association (APPEA) and the International Association of Geophysical Contractors (IAGC). The major international contractors that provide services to the petroleum industry also retain dominant technical expertise in their areas of speciality, in effect defining de facto technical standards, and as such are also sources of expert input to technical advice for regulation.

For technical advice to be acceptable to the Minister's office the advice is normally not presented in a form that exposes the Minister to political attack. The process in PGGAG requires that such advice be approved by the top expert in any particular field and the Group Leader to ensure that the material is factual and appropriately expressed.

Partnerships with multiple government and industry organisations provide access to additional expertise. Such consultation is a long-established convention. An example is fisheries information from the Bureau of Rural Sciences to assess any past or potential impacts on fisheries from seismic data collection. Analysis suggests that Australia produces scientific and technical research at about the expected rate (Barlow, 2006). Scientific expertise of academia for petroleum regulation at times augments that provided by PGGAG technical advisers or industry.

Expertise for technical advice for regulation also comes from international governmental organisations. This access to expertise is important because the perceived quality in technical advice is often seen as synonymous with consistency with worldwide best practice. Overseas government agencies including the UK Department of Energy, the Norwegian Petroleum Directorate and the US Minerals Management Service (MMS) have provided expert technical input to PGGAG. The US MMS has a memorandum of understanding with PGGAG to share information. MMS has provided opinions via email on what constitutes worldwide best practice in relation to aspects of petroleum field development for example. Advice from the MMS can constitute a valuable source of expertise and experience because of the thousands of offshore petroleum platforms and

other development facilities in the Gulf of Mexico compared to less than one hundred in offshore Australia.

Norwegian Petroleum Directorate staff have also provided expert advice to Australian technical advisers on their world-leading national petroleum data storage facility. In Norway the data storage was arguably facilitated by the greater power of governmental suggestion in a petroleum province of perceived high prospectivity, when the need for high petroleum revenues for Norway was as not critical as for many nations.

Those dealing with objectives based regulatory initiatives for the UK petroleum industry have been similarly helpful in providing expert advice for regulation in Australia. The UK Department of Industry has also provided expert input to PGGAG on technical aspects of applications for production licences. In addition, Australia has drawn substantially on UK guidelines in developing the Australian guidelines for production licence applications for offshore petroleum production facilities.

International industry associations and groups like the American Petroleum Institute and the Society of Exploration Geophysicists set the standards that are used worldwide. Further technical information for advice come from organisations such as the Petrotechnical Open Standards Consortium (POSC) and the Petroleum Public Data Model (PPDM) Association which seek to set worldwide standards for information and data structures for petroleum E&P.

Another, but more problematic avenue to access expert technical advice for regulation is use of external consultants. The difficulty with this widely-practised approach is in finding consultants free from the perception of a possible conflict of interest. This concern is because consultants in petroleum E&P who could consult for regulation in Australia are likely to obtain most of their employment from the petroleum E&P industry. Fro example, retired government scientific advisers have been employed to provide for example technical advice in legal cases between the Commonwealth and industry.

Expertise in technical advising is also provided through audits of technical advice from various government departments by the Australian National Audit Office (The Auditor General, 2002).

Maintaining Expertise

If final technical advice could not be signed off by someone who has the qualifications in the technical area of the advice then the quality of the advice must be in doubt, since it could be unsuitable for accreditation under a quality management scheme, such as an ISO scheme. Thus quality of technical advice provided by PGGAG relies on the experience and expertise of the staff. That expertise is commonly derived from working in and with industry and subsequently on industry applications and data. Nevertheless, expertise in technical advising on regulation is developed mainly in government. Consequently, the project leaders in PGGAG are normally senior experts in their particular field. Expertise is also needed to identify areas of input that cannot be sourced from PGGAG and hence must be accessed externally to maintain the quality of advice. An inexpert adviser may not necessarily recognise that a particular area of expert input is absent and needed. Quality of technical advice can also require expertise to meet the challenges involved in formulating the advice so that is most useful to the regulators. Experience has been considerable in PGGAG and key experts have had experience of over ten years in the role by 2005.

The technical advisers in the Designated Authorities (DAs) for regulation of onshore petroleum E&P also undertake the role for offshore petroleum E&P under the P(SL)A. Consequently, although the DAs have day to day roles under the P(SL)A, the expertise that is available and consequently the quality of their technical advice under the P(SL)A are partly a reflection of the expertise needed for their total regulatory responsibility including regulation of their onshore petroleum E&P industries. There has also been at times particular difficulty in recruiting and maintaining appropriate advisers for petroleum E&P regulation by DAs in industry centres such as Perth in Western Australia.. An option to maintain access to technical expertise for advice is to seek

through outsourcing the use of the expertise available within another DA. Tasmania in this way has arranged for advice for petroleum E&P regulation from the Victorian DA. A further and common option to access expertise for a DA is to temporarily or semi-permanently avail themselves of expertise available within the Commonwealth.

DA staff have a technical overview of what is happening or has happened in their jurisdictions onshore and in relation to the P(SL)A. Understandably, they may respond in that more localised context rather than in a national context and regulatory responses may not be nationally consistent between DAs. Such a lack of consistency can cause confusion in the industry.

The Mines Department model that is used by the DAs in the States/Northern Territory, has the technical advice role vested in essentially the same staff that carry out the policy role. This contrasts with the case within the Commonwealth Government, where policy expertise and technical advice roles for the petroleum E&P area are in separate organisations of the same Department. This arguably increases the emphasis on maintaining expertise in both functions. As stated earlier, the Petroleum and Greenhouse Gas Advice Group is located in Geoscience Australia and the policy function resides in the Resources Division of the same Department of Industry Tourism and Resources. Therefore the strategy-to-operations interest of the 'policy' department may mean that broader political considerations can affect ultimate decisions.

Combination of technical advice areas with regulatory areas in the Commonwealth has in the past resulted in the loss of some of those required technical and scientific capabilities. The resulting diversion of technological staff of the unit to carry out regulatory functions probably reflected the dominant culture in the group, in channelling resources to carry out the dominant operations-to-policy role.

Timeliness

Timeliness can be critical when regulatory responses have to meet very short time frames, for example, within timeframes that allow a company's unexpected or poorly planned commercial activity to proceed most cost effectively for the company. This can be exacerbated in the offshore petroleum E&P industry by high daily costs of drilling rigs or of seismic surveying vessels. In such cases the Australian Government makes every effort to carry out regulatory processes in a time frame that avoids unnecessary cost to industry.

Timeliness of technical advice and regulation under the P(SL)A is in part addressed through time lines agreed between Resources Division the DAs and industry for some government responses, once the relevant data have been received from applicants. The difficulty in this process is that obtaining the relevant information to provide adequate advice can involve a number of phases due to the different perspectives of technical advisers, industry and government on what data are required.

Public consultation in relation to possible environmental effects of offshore petroleum E&P may extend the time to arrive at the regulatory decision as in the case of consultation with the community and environmental NGOs. This was the case for development of the offshore Minerva gas field in the offshore Otway Basin in the region of scenic 'Twelve Apostles'. In this instance the consultation with government and the community was undertaken by BHP Billiton that intended to operate the field. It arguably both lead to a better-accepted result and allayed fears that the community could end up seeing 'thirteen apostles' (one further offshore).

Peer Communication

Communication relating to the technical advice process can enhance technical quality by assuring appropriate input is sought from relevant diverse areas of expertise including within the department, from other departments, from consultants or from the public. In the Westminister system of government such as in Australia, however, a threat to quality in regulation and associated technical advice is arguably systemic. This is because an effect of this system can be that policy work associated with legislation under the responsibility of a Minister can normally be dealt with by that Minister and his or her department without formal need for broader consultation. Consultation usually occurs on the basis of perceived need to draw together the technical and other advice and information to support the policy content. Even informal consultation may be less likely for immediate, routine or non-contentious issues that have little public profile.

Communication between technical advice and regulatory roles can be facilitated by physical proximity of technical advisers with the regulatory areas, for example during PGGAG's time spent in BRS. Subsequent physical separation of the PGGAG technical advice group from their main regulatory clients has needed a concerted effort from both groups to interact constructively. This has been done through monthly liaison meetings and visits on a more than weekly basis between staff of the two groups for regulatory meetings or discussions of issues. Constructive relationship has been emphasised as a result of tensions between the two groups in 1991 and 1992. That tension undoubtedly contributed significantly to the break up of BMR and the formation of BRS referred to in Chapter 4. Subsequent sustained efforts for constructive interaction resulted in 2003 in PGGAG and the Offshore Resources Branch being presented at the ITR Senior Executive Workshop as a model for constructive interaction between regulatory staff and technical advisers (CEO Geoscience Australia, pers. comm., 2003).

Normally, a petroleum company would be expected to seek to maximise its profits as the prime objective in their applications under the P(SL)A. Communication on advice can

therefore require obtaining information a company does not initially provide. This can result from the company's aims being at variance with resource regulation in the national interest. The community's interest can generally be equated with maximising economic production while maintaining acceptable or mandated oil field practice ('good oil field practice') and environmental values.

Contractor companies, particularly those involved in seismic surveying for exploration, will also understandably provide information to elicit government support for regulatory arrangements that benefit them commercially. In this respect, exploration companies that use the contractors can communicate in their presentations to government valuable insights on the benefits and deficiencies of particular technologies and the completeness of information provided by the contractor companies.

Consultation includes meetings and working groups that are drawn together on a less formal basis as well as more formal processes such as Inter Departmental and Ministerial Committees and Subcommittees. Offshore petroleum E&P regulators and technical advisers consult the Department of Defence and Department of Transport when there are issues relating to defence (such as firing ranges) or transport (shipping lanes) in the region of proposed petroleum exploration licences. Other consultation includes that with the Australian Taxation Office, Attorney Generals, Department of Foreign Affairs, Agriculture Forestry and Fisheries Australia.

Additional peer communication on issues that relate to technical advice can come through academic publication. This includes communication of results from studies by external researchers on environmental, geological, engineering or other topics that provide information (e.g. Swan et al., 1994; Basey et al., 2001) that forms part of the content of technical advice. Scientific publication by Geoscience Australia's technical advisers communicates technical information to researchers and industry (e.g. Williamson and Wright, 2002; Williamson and le Poidevin, 2005).

The tradition in Australian government of a more 'generalised' public service can negatively impact peer communication for technical advice in formulating regulation as new staff inexperienced in regulation of offshore petroleum E&P are likely to be less aware of what advice could be needed. In the Commonwealth Government policy staff are commonly moved between different departments (Australian Public Commission, 2005) and between different areas of responsibility and apply policy and regulatory processes in those areas.

Technical advice is most effectively communicated to regulators if it is in a form that regulators consider adds value to their regulatory process. Well tailored advice thus can result from appropriate communication between technical advice and regulatory areas. This in turn can result in clear definition and mutual understanding of the nature and extent of the needed advice.

Communication with Designated Authorities on Commonwealth technical advice for regulation

Acceptance of Commonwealth technical advice for regulation by the Designated Authority can be promoted by communication with the Commonwealth in helping the DA to formulate regulatory decisions. It is common for the DAs to seek advice from Commonwealth technical advisers even for matters that are the responsibility of the DA. Acceptance of Commonwealth technical advice can be strengthened within the DAs because of the additional authority it can give in withstanding industry pressure on their regulatory decisions. Thus if a DA can tell a company that they have consulted with the Commonwealth and a particular decision has been agreed, it can provide the Designated Authority with additional support, possibly in the face of strong company lobbying for a different decision.

The Australian process however allows the DA to promote independently what they see is their interests. A cooperative role for Joint Authority decisions, however, has the Commonwealth and DA both contributing to the technical advice. This is the case for

plans for development of oil and gas fields. Contribution to such reports ideally does not involve duplication in the technical inputs. Participation of Designated Authorities in technical working groups can reduce any tensions over PGGAG technical advice and promote broader acceptance. DAs contribute to formulating recommendations from such groups to the Upstream Petroleum Subcommittee (UPS). Commonwealth, industry and DAs' representatives are part of the Petroleum Data Consultative Group (PDCG), that advises the UPS for example.

Communication by PGGAG with industry on technical advice to regulation

Technical advice is commonly communicated to industry as part of the regulatory process. Technical advice that has a view to precedent and future implications may cause short-term frustration to a company unsuccessful with an application. The ability of industry to hold credible technical discussions and debate at a senior technical level with PGGAG and ISSG in the Commonwealth, can also improve industry satisfaction with regulatory decisions based on Geoscience Australia's advice. Technical advisers for government petroleum E&P regulation may thus enhance industry satisfaction through having the industry and advisory experience that allows for such discussions. Thus, in Australia, the 'benchmarks' of regulation constitute a mixture of local experience and international 'best practice'. These factors of interaction will be analysed in the next chapter.

Conclusions

The systems and practices impacting the elements of quality defined for this study in the model of technical advice in Table 2.1 (strategic elements as transparency, openness and accountability and meso-level operational elements as use of expertise, timeliness and peer communication) are summarised for the Australian petroleum E&P regulation in Table 5.1. The quality of inputs to technical advice in Australia relate particularly to availability of the required expertise and the extent of access to expertise through peer communication. Therefore, an implicit *quid pro quo* can relate to data gathering and

availability between government and industry. The quality of outputs under the Australian Westminister system is impacted by communication processes for transparency, openness and accountability that serve to define the range and focus of the advice.

Criteria	
Strategic Transparent	Consultation with industry Consultation with States Departmental working groups Parliamentary Estimates Committees
Open	Consultation with industry Ministerial committees/ working groups Regulatory Impact Statements
Accountable	Environmental interest groups Industry response States' response Administrative Appeals Tribunal Royal Commissions Independent agencies eg UN
Operational Use of Expertise	Experts within Geoscience Australia Industry expertise Intergovernmental/ world best practice Australian National Audit Office
Timeliness	Industry negotiated timelines for some advice Time needed to respond adequately not always available
Peer Communication	With Department of Industry Tourism and Resources With industry Intergovernmental

Table 5.1: The systems and practices impacting the elements of quality of technical advice for Australia

These elements all combine to contribute to the systems and practices for technical advice for regulation and have implications for the quality of that advice. The strategic and operational elements of quality for Australia are assessed for later comparison with

the US analysis. The levels of elements of quality are expressed from high to low along the horizontal axis in Table 5.2.

Australia

Criteria	High	Medium	Low	Criteria
Strategic Transparent		X		Opaque
Open		X		Closed
Accountable		X		Obfuscating
Operational Expert		X		Generalist
Timely		X		Untimely
Peer Communication		X		Legitimizer

Table 5.2: Assessment of Australian elements of quality for technical advice expressed as high-medium-low (H-M-L)

The Westminister System of government as in Australia can present challenges for transparency, openness and accountability, and can militate against developing balanced regulation and underpinning technical advice. This can be ameliorated for environmental issues for offshore petroleum exploration and production by the independent responsibilities of both the industry and environmental departments. Because of the relatively young age and small size of the petroleum industry in Australia, the small extent of industry-related research can present challenges for access to expertise and peer review.

Chapter 6 provides a detailed comparison against the elements of quality given in Table 2.1, of technical advice for regulation of offshore petroleum E&P by Australia and the by the US.

PART III: COMPARATIVE ANALYSIS OF QUALITY OF TECHNICAL ADVICE IN GOVERNMENT

CHAPTER 6: COMPARISON OF US AND AUSTRALIAN SYSTEMS AND PRACTICES FOR QUALITY

This section compares the management of technical advice for regulation of offshore petroleum exploration and production (E&P) industries in Australia with the United States. The US is regarded as being an established benchmark which allows for the commonalities and the differences to be compared in relation to elements for quality in technical advice that were given in Table 2.2. This comparative approach is designed to help in critiquing the respective structures and practices as they relate to better quality in the provision of technical advice for the regulation.

Relationships of Elements of Quality

The interrelationships between the strategic elements of quality (transparency, openness and accountability) and the operational elements of quality (use of expertise, peer communication and timeliness) (Table 2.1) as addressed in this analysis are indicated in Figure 6.1.

At the strategic level transparency relates to openness through boundary spanning activities involving public participation. These activities can be local, national or international and reflect the globalisation of issues such as environmental activities relating to offshore petroleum E&P. The latter include issues of oil spillage, detritus, noise and disposal. Transparency relates to accountability through networking with stakeholders and benchmarking of systems, practices and regulatory decisions against what is considered ‘good’ practice.

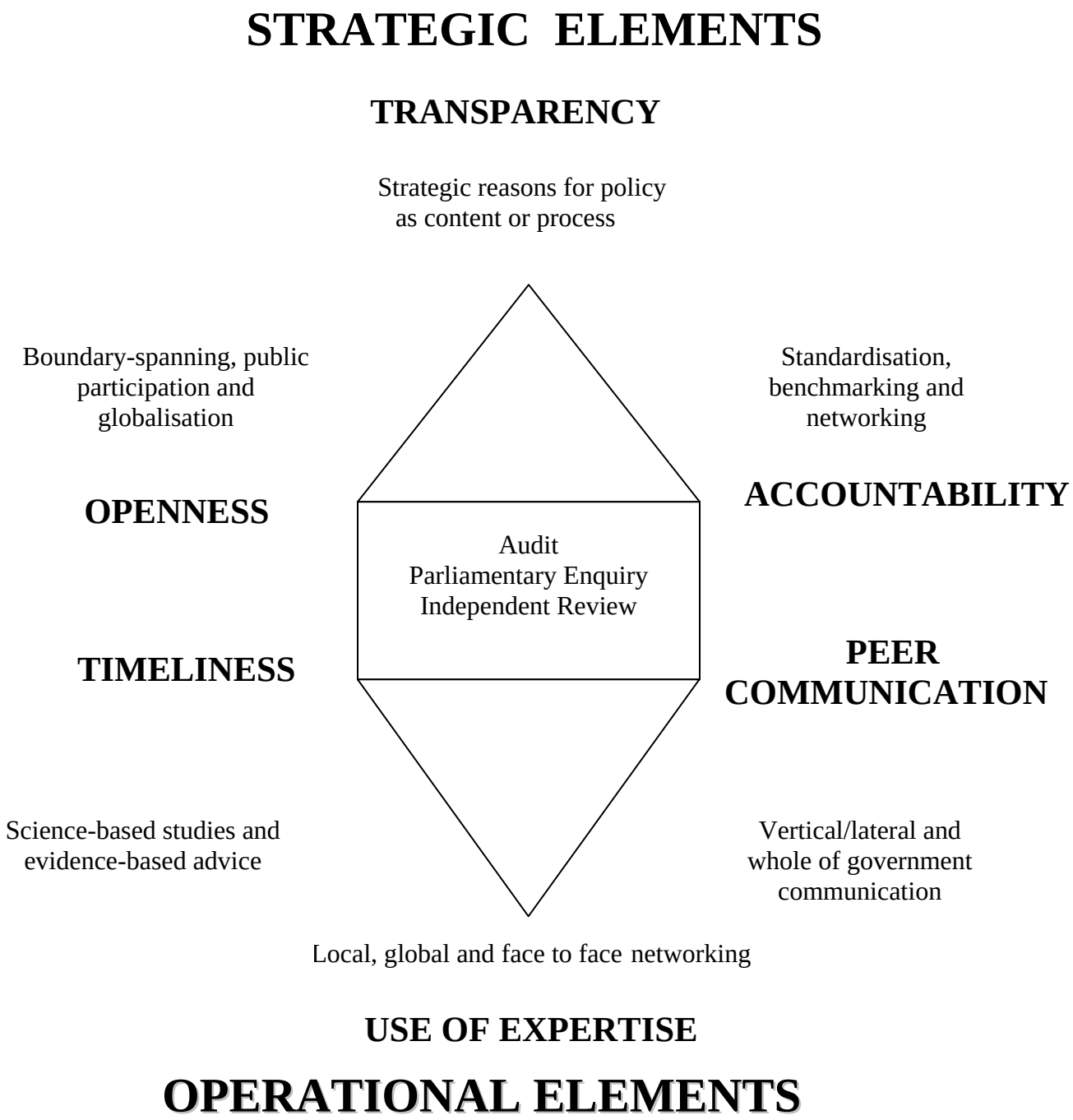

Figure 6.1: Interrelationships between the strategic and operational elements of quality in technical advice

Openness links to accountability through parliamentary enquiries of various types which address regulatory standards. Audits within government can also address aspects of regulatory process. As indicated in Figure 6.1 transparency, openness and accountability are interrelated and also relate to peer communication, use of expertise and timeliness which are practiced at the operational level.

At the level of day-to-day operations to provide technical advice for regulation of the offshore petroleum E&P industry, access to expertise involves peer communication and measures for timeliness as shown in Figure 6.1. Through these processes technical advice provides input to evidence based regulation along with political and economic advice. Thus the technical advice is usually 'on tap, not on top'.

Use of expertise for technical advice involves lateral communication with scientific, industry and regulatory peers. It also involves vertical communication with higher governmental levels through parliamentary and whole-of-government processes. Use of expertise also relates to timeliness in providing technical advice through the time taken to obtain and analyse scientific information for the advice. The time required to engage in peer communication during this process and in the processes involved in providing the technical advice also link timeliness with peer communication.

Peer communication, timeliness and use of expertise are required in providing technical advice that forms part of the content in strategic processes for transparency, openness and accountability. Thus although the comparative analysis in this study of systems and practices for providing technical advice for regulation of offshore petroleum E&P is applied separately to the strategic and operational elements of quality given in Table 2.1, it should be noted that these elements are interrelated as reflected in Figure 6.1. This approach is consistent with the expected norms of rationality which scientists and technologists generally espouse. However, numerous case studies show that other factors may modify or disregard such 'rational' advice as it progresses into the political arena (Marris et al., 2005; Levidow et al., 2005; Toft, 2005).

Comparison of Elements of Quality

Strategic Factors

Transparency

There is a danger of lack of transparency in regulating in a Westminister system like Australia's where agencies advise departments and Ministers without any formal requirement for external consultation. Any perceived lack of transparency in processes associated with offshore petroleum E&P industry regulation could however result in Australia being seen as a source of sovereign risk by potential explorers, if it means that companies fear unexpected adverse decisions or imposts by government. That is, it could affect the level of investment in petroleum exploration and production.

The US systems and practices for regulation of the petroleum offshore E&P industry, including for technical advice, are usually more transparent than in Australia. This is facilitated through consultation with industry and information flow through the several committees from Congressional to agency level. These include Congressional Appropriations Committees, Congressional Oversight Committees and Advisory Committees and government Think Tanks. The Australian Government manages such decisions including through the Foreign Investment Board which is not obliged to detail final decisions.

Australia provides some transparency through Parliamentary Estimates Committees where departmental activities are scrutinised by the Opposition, and more broadly through Royal Commissions that investigate particular contentious issues. At departmental level formal and informal consultation with industry and the States occurs. Formal consultation includes use of departmental working groups such as those associated with the Upstream Petroleum Committee (UPS). The UPS then reports to a Standing Committee of Officials of the Ministerial Council for Minerals and Petroleum Resources. The departmental committees involve the Commonwealth and States/

Northern Territory (NT) and industry. Membership in the committees also occasionally includes representatives from environmental NGOs. The level of transparency to the public through committees however is much less in Australia than in the US where the committee structure includes a broader representation at higher level than in Australia (Shipan, 2004).

Openness

In Australia, the breadth of openness on matters relating to regulation of petroleum E&P can be often limited under its Westminister-type system to formal processes within government through Ministerial and departmental committees and working groups, and through formal and informal consultation with industry. On the other hand, involving those clients and stakeholders in the technical advice and regulatory processes through their inputs and review can promote better if not complete ownership of the regulation. Regulatory Impact Statements in Australia require posting of material on the Internet for comment, and the industry and the public, including environmental groups provide submissions. Interested stakeholders in offshore petroleum E&P regulation also include those with a demand for the petroleum resources. There is thus a significant national group of stakeholders in domestic users of oil and gas, and an international group of Australian stakeholders particularly when oil and liquefied natural gas (LNG) are exported.

Although there is no formal requirement to consult with the public on regulatory decisions or associated technical advice in Australia under its Westminister-type system of government, the Freedom of Information Act (FOI) allows for public access to much information on request. This option can help assuage public concern over the possible capture of the governmental regulators or technical advisers, or over researchers with perceived conflicts of interests. The exceptions to access under FOI are for information that is directed to the Minister or may affect the competitive advantage of a company (commercial-in-confidence). This means regulatory activity is not completely open to public scrutiny. Information on the performance of industry is provided however by both

government and industry. This information and industry information on future plans are reflected in media investment information and provide a degree of openness in relation to the industry.

Regulation of petroleum industry activities potentially concerned with publicly sensitive environmental implications now involves assessments of industry applications by the Australian Department of the Environment and Heritage in relation to the Environmental Protection Bioiversity Conservation (EPBC) Act. Environmental scientists within PGGAG often provide technical advice for the Resources Division of the Department of Industry Tourism and Resources (DITR) to formulate advice for DEH. Environmental impact statements associated with the EPBC can benefit from the public involvement achieved by a number of petroleum companies in Australia independently holding public meetings on environmental matters relating for example to developing offshore gas fields and landfall of gas pipelines. Additional consultation occurs through letters to Ministers and government responses to public actions by environmental and other groups.

In Australia Environmental Impact Statements are formulated for industry activities including developments in environmentally sensitive areas and where petroleum companies carry out prolonged phases of public consultation before developing such fields. Examples of environmentally sensitive areas are Barrow Island that is a 'Class A' Nature Reserve offshore Western Australia or the region of the Twelve Apostles scenic location offshore Western Victoria. The Environmental Protection Biodiversity Conservation Act administered by the Department of Environment and Heritage also addresses environmental concerns over offshore petroleum E&P applications and decisions are posted on their website. The process also provides a linkage to international conventions on environment, including UN Conventions (see Table A.2. p. 207).

For regulatory issues in the US, Congressional Committees and the Advisory Committee process provide avenues for considerable openness by including stakeholders. Although the Advisory Committee process provides a formal mechanism to assist in openness, its

effectiveness can still depend on an appropriate choice of committee members. It is known that the NGOs involved may be those considered to be 'more reasonable'. Thus even with formal advisory processes such as the US Advisory Committee process some potentially important players may not necessarily participate in the consultation (pers. comm., Pring, 2001). In Australia, an attempt at a similar approach to the US Advisory Committees was the participative technology assessment (PTA) conference held in Canberra in 2002 (Mohr 2002). In the US other less formally constituted committees, working groups and reference groups of stakeholders address specific issues and this can further add to openness. Publication for comment of rules for regulation of offshore petroleum E&P in the US contributes to openness as it allows comment by anybody on the final regulation. Openness with the scientific community through peer review occurs for technical advice for the US petroleum industry where the peer community can be large and expert.

Environmental interest groups in the US are an order of magnitude more numerous than in Australia and have a greater diversity and in some cases considerable expertise and sophistication. The need for public consultation can thus be greater than in Australia where environmental groups are less numerous. The Californian offshore oil industry for example has been under great pressure as a result of the Santa Barbara oil spill (Nation, 2003) with the public losing faith in their environmental performance. Disasters during transportation such as the oil spill offshore Alaska from the Exxon Valdez tanker in 1989 (US Environmental Protection Agency, 2006) have also doubtless damaged the perception of the public of the environmental performance of the oil industry.

Accountability

There can be a systemic danger to accountability and balance in technical advice for regulation from Westminister type governmental structures such as in Australia where regulatory advice can be solely from within particular departments on behalf of or to a Minister responsible for making decisions. The role of ministerial staff in this regard deserves closer scrutiny and study. This ability to confine process within an inclusive

group of ‘players’ appears often to be the case for regulation of the offshore petroleum E&P industry. Formal requirements for the external consultation which can provide greater accountability in technical advice and regulation are thus not generally strong. In Australia, normal communication by the Commonwealth on regulatory decisions and their technical underpinnings occurs within government, with States/Northern Territory and with industry.

In Australia parliamentary Estimates Committees and Hearings are a less powerful and inclusive equivalent of the US Congressional Oversight Committees. Parliamentary Estimates Committees involve government, the opposition and government officials whereas Hearings allow for public submissions. Regulatory processes in Australia can also be scrutinised by the National Audit Office and can ultimately be challenged in the High Court and sometimes in the Administrative Appeals Tribunal. Ultimately, Royal Commissions can be held. For governments in general, however, there remains a lack of a comprehensive model for assessing public accountability regimes and relationships in a more systematic fashion (‘t Hart, 2006).

A decision by an Australian regulator based on technical advice can be greeted with displeasure from industry if the decision is different from what industry wishes and in particular if it reduces their short term earnings. Technical advisers in both Australia and the US are likely at times to provide regulatory advice that is valid but which can cause pressure from industry on the regulator or the Minister if the advice is followed. For environmental NGOs that oppose the existence of the petroleum E&P industry, any technical advice that supports its existence can be unacceptable to government and this can cause political pressure in relation to greenhouse issues for example from flaring or venting gas to the atmosphere. Regulation of some key petroleum industry activities with environmental implications can involve, particularly when the public interest is high, assessments of industry applications by the Department of the Environment and Heritage (DEH) in relation to the Environmental Protection and Boidiversity Conservation Act (EPBC). Such Australian environmental legislation reflects environmental laws promulgated by the United Nations (see Chapter 2). Petroleum companies in Australia

have independently held public meetings and phases of public consultation on environmental matters relating to petroleum E&P proposals. Additional accountability occurs through correspondence with Ministers by environmental and other groups. Should a matter become publicly contentious there is the prospect of groups by-passing the Minister and appealing directly to the Prime Minister, as did the Internet industry in relation to privacy legislation (Internet Industry Association, 1998).

In the US the stakeholder input is afforded by the Congressional Appropriations Committees and other related Hearings (Moe, 1985a; Harris and Milkis, 1989; Scholz, 1991; Wood and Anderson, 1993; Shipan, 2004). Oversight by the Congress US General Accountability Office (USGAO) and scrutiny from the Congressional Budget Office (CBO) are also important avenues for accountability. Other accountability mechanisms include broad consultation with industry and Advisory Committees (Smith, 1992) that are discussed below. Formal and informal processes for communicating with the public in the US also include agency web sites, emails, hotlines, meetings, and taskforces. Public workshops can be another method of communicating with stakeholders including researchers. Technical review by researchers of technical advice can be much greater in the US than in Australia. Committees are also used to communicate with government, industry and interests groups particularly environmental NGOs. Interviewees in the US broadly considered that it was often better, given the challenge of communicating between different cultures, to err on the side of what was considered too much and too broad communication, if communication was to be effective (Williamson, 1997).

The cost of regulation to the industry, the agency (including for technical advice), and the community are formally assessed in the US by the Minerals Management Service, with the aim of not having unnecessary costs. This economic analysis of the cost of regulation incorporates the cost of inputs from industry and contractors. The US government in this way is accountable to industry for the cost of industry compliance with regulatory processes.

To seek to be accountable in the regulation in the US, publication of rules allows comment by anyone. This is a more detailed examination of regulation than the Regulatory Impact Statements in Australia where public comment is invited on the concept for regulation before its detailed development.

The US Advisory Committee and Accountability

A formal process aiming for accountability through a breadth of inputs, including scientific inputs, is in the US Advisory Committee process described by Cardoza (1981) and Smith (1992). At a systemic level the US Advisory Committee process can also be particularly powerful in seeking a better balance between community, industry, scientific and governmental interests in regulation and technical advice. In the process, inputs can be extremely broad and representative of stakeholders. Advisory Committees undoubtedly reduce the potential for litigation, particularly for areas such as environment which are subject to considerable public scrutiny. An example of the use of Advisory Committees is in choosing areas for release for petroleum exploration offshore Alaska, by the US Minerals Management Service. Those using the process considered that it is 'self correcting' because of the breadth of inputs. Funding is however cited as a constraint (Williamson, 1997).

The legislated Advisory Committee process as discussed earlier was developed in the US post World War II to use industry expertise in government policy but avoid anti-trust litigation (Cardoza, 1981). The process does rely, however, on appropriate membership of the committees, and this relies on who chooses the membership. Jasanoff (2004) explored how institutions struggled to determine which citizens should be included in consultation. Thus the choice of members for a committee may not be easy for government to make. Environmental groups feel that key NGOs have not always been chosen to participate. Pring (pers. comm., 2001) maintains that not having key environmental groups represented on some Advisory Committees restricts the balance in the advice from those committees.

de Jong and Mentzel (2001) suggest innovative institutional and decisive solutions for broad consultation may bridge the communication gaps and make technically complex policies both better informed and more legitimate, for example by installing lay panels and hearings. The recent analytical spotlight has been on some key issues of science-based governance (Joss 1999; Science and Public Policy, 1999) including the need for more participatory forms of governance and civic science (O'Riordan 1996; Leiss, 2000). However, they have acknowledged that such analyses often fail to locate science-based governance in a realistic context of regulatory processes and institutions. Consequently, achieving effective broad consultation is not necessarily easy while important political decisions may be deferred by 'further studies' or 'more science'.

Degree of Capture

Accountability by government to a regulated industry can be so great as to constitute capture of the regulator by the industry, rather than the regulator representing the interests of the community. This is a particular danger for industries where benefits and costs are concentrated (Wilson, 1980) like the offshore petroleum E&P industries in Australia and the US. In these industries benefits are concentrated in the companies through profits and in government through taxation, and costs are concentrated in the companies through capital and operational expenses and sometimes in government through infrastructure costs associated with developments. Second order benefits flow more broadly to the community through employment. In the US however a strong history of anti-trust legislation has aimed at mitigating this possibility of capture. The greater public scrutiny under the US Congressional committee system of governance can also mitigate more against such capture compared to the Australian Westminister system.

Technical advisers in both the US and Australia can aim to provide objective advice for regulation and policy development, but frequent consultation with industry, technical advisers with a background in the industry, and empathy with the industry, could mean that there would be a tendency for government to favour industry stances in providing that advice, and could thus indicate some level of capture. An advantage for avoiding

capture of Commonwealth technical advice in Australia compared to the US however is the greater separation in Australia of the technical advice role from the regulatory role. A disadvantage in Australia is the pressure that can be applied to States/ Northern Territory Designated Authorities by industry in petroleum industry centres. This situation is reflected in the fact versus value argument in relation to expert advice (Kuhn, 1970; Hammond and Anderson, 1986; Flemming, 1992). However, a nation's need for a particular industry to perform well is also likely to put pressure on both technical advisers and regulators to make decisions that favour that industry. This is likely to be particularly strong when that industry has a significant impact on the national economy and the respective national treasurers are known to be 'pro-business'. Capture could also occur through pressure from companies for technical advice and regulatory decisions that favour them. Through the above circumstances some level of capture can occur. Thus it is probable that the label 'brown advice' associated with resource departments, as opposed to 'green advice' associated with environmental departments is accurate to some significant degree (Hammond and Adelman, 1976).

The self-interested as opposed to altruistic beliefs in the groups which provide technical advice are also likely to affect its tone. Examples of such beliefs can be belief in the positive national economic contribution of an industry or environmental commitment. At interview the respective regulatory staff and technical advisers invariably appeared to be trying to provide objective advice. However, it was obvious for example that scientific advice in Greenpeace (an interview by the author in the previous study) would probably be opposite to advice on the same topic from a government resource agency. Irrespective of good intentions, a degree of capture of technical advisers appears to occur. This is particularly the case when there are uncertainties in scientific data, advice could favour the stance of the department or agency for which the technical adviser works and this could result in an inbalance in technical advice for regulation.

One reason Australian petroleum regulators and advisers are less likely to be captured is that in Australia the ability of industry to exert great pressure on States' regulators in particular, including through at least implied political influence, has led to a frequent

stance that if the Commonwealth agrees then the State will let industry do it. If the Commonwealth disagrees then the application can be refused or an acceptable solution can be sought. Although this may be no more than a device for avoiding pressure and deflecting pressure to another agency, such a practice can nonetheless provide a mechanism for avoiding capture by the industry. Furthermore, one complicating factor is that in Australia today a conservative federal government and labour state governments may seek 'blame shifting'.

Conflict of Interest

Because of the dangers of perceived conflict of interest in relation to accountability, it can be difficult in Australia and the US for regulators or technical advisers to use consultants who consult for their main livelihood for the industry on which governmental technical advice is being sought. In Chile, where interviews were carried out in a study prior to this thesis study, the relatively small size of the petroleum industry means that there is a heavy dependence on consultants. The danger of conflict of interest in the case of those consultants is likely to be lessened, however, because they are invariably international consultants who reside elsewhere in the world and are less likely to be also working for petroleum companies inside Chile.

Operational Factors

Use of Expertise

The assumption in Australia and the US is that technical advice for regulation of the offshore petroleum E&P industry will dominantly come from the regulatory department. In-house provision is more likely to be able to meet the continued need for timely and sometimes rapid access to the same or similar areas of expertise. In the Australian Government technical advice comes from the Petroleum and Greenhouse Gas Advice Group (PGGAG) in Geoscience Australia within the Department of Industry, Tourism and Resources (DITR). Technical advice also comes however, from the States/Northern

Territory Designated Authorities (DAs) that are responsible for some administration under the Petroleum (Submerged Lands) Act (P(SL)A). In the US the technical advice comes from within the Minerals Management Service.

In Australia and the US technical advice is also provided by industry both formally through the technical content of applications and informally through consultation. In Australia expertise on what constitutes good practice in technical advice can also come from the Australian National Audit Office (ANAO) (e.g. The Auditor General, 2002). Other external advice in both the US and Australia comes from governments of other nations, including from each other under a Memorandum of Understanding. Lists of the types of technical advice for resource regulation in Australia and the US are given in Appendices 3 and 5 (pp. 210 & 212).

In both Australia and the US developing the in-house expertise for technical advice for petroleum E&P regulation can be problematical because of the time it takes to develop the duel capabilities needed. Expertise for technical advice requires both scientific expertise and an understanding of regulatory practice and the form required for effective technical advice. Jasanoff (1990) refers to this as 'boundary work'. In both Australia and the US this duel capability can be developed on the job, normally by hiring a scientist or engineer and training them over some years in governmental practices. The author considers that it can take up to five years in the Australian case for the adviser to be of a fully professional standard.

Difficulty in acquiring appropriate expertise for technical advice areas can be the result of difficulty in hiring scientific staff in industry centres. This is tending to be ameliorated by the industry's trend to shed senior professionals in favour of junior professionals. Those senior professionals can be attractive to government employers because of their long experience in the industry.

If expertise is to be subcontracted from one Designated Authority to another in Australia, then the advising DA needs to have the requisite expertise for the particular phases of

technical advice and that may not always the case. In addition the DA seeking that technical advice needs to have sufficient capability in technical advising to recognise what advice can be needed. The DA along with the Commonwealth provides technical advice into Joint Authority decisions and some weight is given to the DA's technical input. This means that effective access to technical advice in Australia can be considered to be diluted compared to access in the US which does not have incorporated input from DA bodies that can have difficulty maintaining experienced technical advisers.

A challenge to effective access to expertise for technical advice can result from a systemic danger of less or even token use of technical advisers in Westminister systems where the channel from the regulatory area to its Minister can be direct. This danger of too narrow consultation can be significantly mitigated in the US by the formal external advice provided in the Advisory Committee system (Smith, 1992) and US Congressional Committee system which can allow more diverse inputs to public policy than in Australia. The expertise of the public can also feed from US Advisory Committees into technical advice for the regulatory process. That expertise can be only part of the process, however, and Weale (2001) considers that public involvement can be used only to complement both scientific advice and systems of political representation.

Expertise in technical advising in Australia and the US increasingly equates with promulgating worldwide 'good oil field practice' in part because the scientific enterprise has become global in character (Leshner, 2004). In addition, the international nature of the petroleum industry can allow for a considered view of worldwide best practice. The cooperative international channels in place have to access international technical expertise for both Australia and the US to aim at best worldwide practice. International fora also include those associated with hard and soft environmental law under the auspices of the United Nations, and relate for example to disposal of petroleum production facilities at sea.

An area of contrast between Australia and the US is in the comparatively low level of usage of external scientific research for technical advice in Australia. PGGAG in

Geoscience Australia provide the bulk of Australian Government technical advice for offshore petroleum E&P regulation and rarely use outside scientific input in formulating its advice, apart from data and information from industry that are associated with applications or from research that has been funded by industry. Industry funded research into environmental affects of drilling wells has contributed to technical advice, as has research into possible effects of seismic surveying on whales. Geoscience Australia also funds some academic research to leverage its own scientific capabilities in promotion of petroleum exploration.

In contrast MMS has considerable input to technical advice from joint and contracted research, not-for-profit research and academia (see http://www.mms.gov). This difference between the US and Australia doubtless reflects the greater size and age of the US offshore petroleum E&P industry. The higher amount of external research can help to support the regulatory work load for the larger US industry and to deal with a greater volume of complex issues.

US regulators use particular external groups for technical advice and research because of their established and recognised expertise in specific scientific areas. Other avenues for technical advice in the US include workshops, committees, peer review, industry, community groups and other government agencies

In contrast with Australia and the US, an interview in Chile with its less developed petroleum industry revealed (in a prior unpublished study by the author in 2000) that it has a very heavy proportional use of external particularly international consultants for technical advice for regulating petroleum E&P. A problem for access to expertise for regulating the petroleum industry in Chile can be the relative lack in the range of expertise that is available locally.

Timeliness

The time lines for technical advice in Australia are often set by regulatory staff in consultation with industry particularly where timeliness of decisions has significant financial implications for a company such as for petroleum field development. Agreed protocols for timing of advice between Commonwealth and State regulators and advisers, are also mechanisms in Australia to attempt to enhance timeliness.

The major difficulty with providing timely technical advice for offshore petroleum E&P industry regulation in Australia is incomplete provision by industry of data for adequate analysis to feed into the technical advice that is required in relation to the particular application. Where sufficient data do not exist to resolve complex technical questions relating to an application then advisers can request such data be collected by the company as a condition of granting the licence or lease. This can occur for production licences and when subsequent data require a major change to the mode of petroleum production then an additional approval process would be required. Industry staff involved in applications for approvals can change over time, however, and consultants have also been used to frame applications. Thus the industry can be simply unaware of or lose corporate memory of requirements for providing applications and the appropriate use of guidelines. This can result in multiple phases of requests to industry for data to assess an application and underpin technical advice. Differences in opinions between advisors, regulators and industry on what constitutes adequate provision of data can then pose the danger that the time needed to respond adequately may not always be available. Moving to objective based regulation has led to more flexibility in how industry may supply data for applications and what data they supply, and this can also result in less adequate initial provision of data to underpin technical advice and reduced timeliness.

Timeliness can be rapid when industry advice is accepted as technical advice and government in effect provides a post box function, but this can also constitute technical advisers simply not carrying out the required critical evaluation of company applications. This approach however, may occur when low levels of staffing for regulators and

advisers militate against a detailed response or when the absence of the required expertise makes critical technical evaluation and advice impossible within an agency. This can sometimes be a danger in Australia and particularly in industry centres when Designated Authorities have new staff or are unable to fill positions.

In the US the MMS had deadlines in contracts for research for technical advice. Definition of a problem can evolve slowly however and make quick decisions difficult. Outside influences can also slow the process. For processes requiring extensive legal review and advice the timing of government responses can be very slow. There are however, statutory requirements for timing for some regulation. Although there can be a trade off between timeliness and quality of technical advice for regulation, regulators in the US considered at interview that it was better for the advice to be of good quality than for that advice to be provided rapidly but to be of poor quality.

In both Australia and the US clear definition between regulators and the technical advisers of the scope and breadth of any needed technical advice, can be pivotal to timeliness of technical advice for regulation. Project management approaches to promote timeliness, including milestones and deadlines, are nonetheless mechanisms for assisting in timely delivery of advice.

Peer Communication

The important nature of the relationship and interaction between the adviser and the regulator was commonly mentioned by regulators in interviews for this study. In both Australia and US there can be factors that produce tensions between technical advisers and clients composed of the regulator and Minister, the industry and the general public. Thus maintaining effective communication and client satisfaction can be a challenge for regulators and technical advisers.

Regulators at interview in the US maintain that by far the greatest challenge in achieving satisfactory technical advice is in establishing and maintaining a joint understanding

between the regulator and the adviser of the needed advice and deliverables. The challenge in part reflects differences in cultures between the regulatory and technical advice groups (Edwards, 2004). Tensions between the technical advisers and regulators are in general reduced by effective communication between the groups. This is carried out in Australia through close interactions using liaison meetings, face to face contact, telephones and emails. Satisfaction of the Australian Commonwealth regulator with technical advice can also rely on the advice being seen as a benefit by the regulator for example because it adds credibility to regulatory decisions. Satisfaction of regulators with technical advice is also helped if the advice fits the purpose for which it is required and this can imply inter-alia that the scientific standard of the advice is maintained. In the US this is aimed at through reviews of various types or feedback from industry.

In the US communication by MMS for technical advice for regulation was between areas within the MMS itself. This type of organisational arrangement may introduce uncertainty (Donaldson, 1985) in the effectiveness of technical advising, because under pressure to obtain a regulatory answer this arrangement may result in insufficient provision of technical advice. In Australia, Geoscience Australia is an independent agency within the Department of Industry and Resources (DITR) and provides technical advice to Resources Division in DITR for petroleum E&P regulation. The Australian governmental arrangement for technical advice from Geoscience Australia means that Geoscience Australia focuses on technical advice as its function in the regulatory process and is thus systemically more likely under pressure to provide sufficient technical advice for regulation.

In Australia, the Joint Authority (JA) composed of the Commonwealth and Designated Authorities regulates some aspects of the P(SL)A legislation that governs offshore petroleum E&P. The DAs are clients of technical advice from the Commonwealth both through the JA mechanism and through informal requests for advice. This communication by the Commonwealth with the DAs is a systemic element of communication that is fundamental in Australia but has no equivalent for MMS in the US. This matter was discussed in Chapter 3 in relation to the US so that it should be

noted that the US and Australian systems for regulating the offshore petroleum E&P industry differ significantly. This systemic communication has inherent tensions because the DAs can be expected to represent strongly their local interests providing a balance to the Commonwealth's representation of the national interest. This can be a direct result of the federal model of government. Satisfaction of the DAs with Commonwealth technical advice is increased if that advice is able to deflect pressure by industry from the DAs and is not itself causing pressure on them from industry.

Communication of regulators and technical advisors with industry occurs formally and informally both in the US and Australia. Communication occurs through presentations by industry and in writing in relation to applications by industry, through committees and agency working groups, and as technical feedback from industry. Workshops are held to discuss topics of mutual interest.

In the US communication by the regulator with scientific societies helps in the choice of scientific researchers and consultants that provide input for technical advice for regulation. Peer communication on technical matters relating to advice for regulation of offshore petroleum E&P can also occur through conferences, seminars and workshops, and through use of the global IT network. Extensive publication of results the results of MMS research, and joint and contracted research relating to technical advice is a facet of scientific communication in the US (see http://www.mms.gov.au) but not in Australia. Geoscience Australia however integrates the results of their own studies of petroleum prospectivity with results of relevant published and unpublished academic and other research studies and publishes overviews to promote the release of exploration acreage each year.

In both Australia and the US agreements are in place to facilitate international communication and collaboration to inform of worldwide best practice for technical advice. This interaction is an important source of expertise and can provide advice on relatively rare occurrences or on recently introduced technology and its requirements. For

example, as stated previously Geoscience Australia and the US MMS have a memorandum of understanding for communication and collaboration.

Comparative Systems and Practices

The comparative systems and practices for operational elements of quality between Australia and the US that have been described in this Chapter are shown in Table 6.1.

	US	Australia
Criteria		
Strategic Transparent	Advisory Committees Consultation with industry Congressional Appropriations Committees Congressional Oversight Committees US General Accountability Office Think Tanks	Consultation with industry Consultation with States Departmental working groups Parliamentary Estimates Committees
Open	Posting of draft rules Formal consultation with industry Informal consultation with interest groups Congressional Committees Advisory Committees	Consultation with industry Ministerial Council and committees/ working groups Regulatory Impact Statements Media investment information
Accountable	Technical Congressional Oversight Committees Congressional Budget Office (CBO) Environmental interest groups Industry response	Environmental interest groups Industry response States' response Administrative Appeals Tribunal Royal Commissions Independent agencies eg UN Royal Commissions
Operational Expert	Experts within MMS Contract research/ not-for-profit and academia, Research partnerships with industry Workshops Intergovernmental/ world best practice Advisory Committees Industry	Experts within Geoscience Australia Industry expertise Intergovernmental/ world best practice Australian National Audit Office
Timely	Deadlines in research contracts Workshops to collect data Time needed to respond adequately for science based inquiry	Industry agreed timelines for some advice Time needed to respond adequately not always available
Peer Communication	Intergovernmental National and international scientific societies Publishing results Conferences, seminars and workshops Global IT networking	With Department of Industry Tourism and Resources With industry Intergovernmental Academic publications

Table 6.1: Comparative systems and practices for elements of quality in technical advice for Australia and the US

The key conclusions from this study are provided in the next chapter, Chapter 7 Conclusion.

CHAPTER 7: CONCLUSION

This chapter provides a summary of the research and conclusions from this analysis of systems and practices for management of technical advice for regulation of offshore petroleum exploration and production (E&P) industries in Australia with the United States as benchmark. The dissertation concludes that:

The Australian Government does not achieve in its technical advice the same levels of transparency, openness and accountability (strategic elements of quality in this analysis) as the US Government. This is largely associated with the systemic issues related to its Westminister form of government when compared to the US Congressional system. The use of technical expertise and peer communication (operational elements of quality in this analysis) are also less practiced in Australia largely because of its less developed petroleum research base reflecting the smaller scale and scope of a younger industry. Therefore science-based advice in Australia now needs to be reconsidered as long-term scenarios are being required for policy making.

The contribution that science can have in health and environmental regulation by government is becoming increasingly recognized (Jasanoff, 1997; Powell and Leuss, 1997). In regulation of genetically modified products, Levidow et al. (2005) even speak of the great burden placed on science. This study, however, remains one of the few that has mapped science and decision making in the critical middle management of a science based regulatory regime (referred to by Doern and Reed, 2001).

The role of technical advisers is described by Jasanoff (1990) as 'boundary work' at the interface between science and policy (including regulation). She describes the role as requiring the skills of a scientist and a lawyer (Jasanoff, 1997). The detailed meso-

management role is described in this thesis as analysing, assessing and packaging science for regulation (Bureau of Resource Sciences, 1997).

Revisiting the Propositions

The propositions elucidated in Chapter 1 are assumptions underlying this study. They are:

1. ***Technical advice constitutes a critical component for the effectiveness and efficiency of regulation of an essentially science-based industry such as petroleum exploration and production.***
2. ***Technical advice provides a knowledge and evidence base that can enhance the scientific credibility and public acceptance of regulation of science-based industry.***
3. ***Technical advice supports regulation that seeks to protect both the public interest and balance environmental cost-benefit with commercial risk and reward.***
4. ***Technical advice supports a risk versus reward approach in regulation rather than exclusive use of the precautionary principle.***
5. ***Technical advice is a coordination activity between the meso-level technical adviser and the regulator as policy maker.***
6. ***Technical advice occurs at the meso level of day-to-day use of science for regulation rather than as a linear approach to policy advice.***
7. ***Technical advice is only one of the expert inputs to regulation of science-based industry and is necessarily subject to political decision making***
8. ***International promotion of environmental issues is forming an international benchmark for environmental management and progressively impacting on setting domestic environmental standards for regulation of industry.***

These propositions are shown to be consistent the data in this study. The research addresses the structures and practices associate with regulation of the Australian offshore petroleum exploration and production industry with the US system used as benchmark. In relation to *Proposition 1*, the technical advice is seen by regulators and industry to be critical in regulatory systems which support a business environment where oil and gas companies can plan and execute projects with confidence often over several decades. In both the US and Australia technical advice capability is maintained within the regulatory department or agency. In Australia that is the Department of Industry Tourism and Resources (DITR) through its agency Geoscience Australia. In the US the capability is maintained within the Minerals Management Service (MMS) of the Department of Interior. Technical advice is heavily used in the framing and executing of regulation. That is because credible governance as demonstrated in a regulatory response can require that the science base of the industry applications be understood and that the resulting regulation be consistent with what is appropriate use of industry technology both in the view of the public (Doern, 1981; Brickman et al., 1985; Nemetz et al., 1986) and in the view of the industry. This is consistent with the validity of *Proposition 2*.

Domestic environmental issues relating to offshore petroleum E&P are the subject of technical advice both in the US and Australia. Coupled with the communities' well-known interest in government providing credible program funding and regulation for environmental preservation there is also a community interest in an acceptable return to itself from the exploitation of the petroleum resource. The required balance between these interests and the commercial return expected by industry is reflected in *Proposition 3*. This balance can be met through regulation to ensure that the operations of the industry are appropriate in relation to health, safety and environment and through taxation of the industry. The return to the industry can be ensured by regulatory processes that allow the industry to plan, finance, develop and produce petroleum, and reap returns from projects that are inherently medium to long term.

Inherent in the above processes in Australia and the US is the achievement of *Proposition 4*. Balancing community and commercial interests through regulation of the industry in Australia and the US and can imply acceptance of risks to achieve rewards rather than the exclusive use of the precautionary principle. The exclusive application of the precautionary principle to regulation of the petroleum industry could lead to no petroleum industry because of the inherent risks. It is the often stated aim of environmental NGOs that the industry should not exist but should be replaced by renewable energy industries.

Proposition 5 recognises that the technical adviser is involved in boundary work across science policy making and regulation (Jasanoff, 1990; Smith, 1992). This meso-management role is clearly reflected in the effort and concern in both the US and Australia to achieve effective interactions between their regulatory and policy areas and technical advice areas. This interaction is challenging (Edwards, 2004) in part because of the differences in cultures and educational backgrounds of the participants in the respective areas.

Proposition 6 addresses the ongoing coordination between technical advisers and regulators in formulation of technical advice for regulation of a science-based industry such as the offshore petroleum E&P industry. In both the US and Australia the meso-level systems and practices that are described in this study aim to achieve good quality day-to-day technical advice to support the current needs in the regulation of what seen in both countries to be a nationally important industry. The results of this study demonstrate that effective and clear communication of specific requirements and capability between technical advisers and regulators, appropriate use of diverse expertise and timeliness of advice can all contribute to good quality technical advice for regulation of offshore petroleum E&P.

Technical advice is, however, only one of the elements of advice that feed into regulation of offshore petroleum E&P. Regulation of offshore petroleum E&P in Australia and the US occurs within the legislated frameworks of elected governments. The legislative framework and regulation can therefore be subject to the political will of governments

and the voting public. Economic and other factors can thus also impact on regulatory decisions. *Proposition 7* reflects this.

The impact of international environmental issues relating to the offshore petroleum exploration and production industry is in part a response to the pressure exerted by environmental NGOs and national espousal of 'soft law' promulgated by the United Nations and forming an international benchmark for environmental management. These include the paradigm of sustainable development culminating in the Rio Declaration (United Nations World Commission of Environment and Development, 1987; United Nations, 1992), promulgations on oil pollution at sea (United Nations, 1969) and the Basel Convention on dumping of hazardous waste at sea (Pring, 1999). Most of the key international laws and principles listed in Table A.2 at page 207 (after, Pring, Otto and Naito, 1999a and 1999b; and Herriman, Tsanemi, Ramli and Bateman, 1997) relate to the offshore petroleum E&P industry. Many of the standards in this international environmental 'soft law' have become expressed as national 'hard law' and this is consistent with *Proposition 8.*

This research indicates that the systems and practices in the US and Australia for regulation of their offshore petroleum E&P industries support the contention that the propositions are broadly valid as underpinning assumptions for this study of the quality of the systems and practices used for managing technical advice for regulation of the Australian offshore petroleum E&P industry with the US as benchmark.

The Elements of Quality in Technical Advice

The elements for quality used as the model (Table 2.1) in this study include strategic elements (transparency, openness and accountability) and operational elements (use of expertise, timeliness and communication). A comparison of systems, practices and issues between Australia and the US using the elements for quality in the model is given in Table 6.1. These or similar elements of quality appear in the Auditor General (2002) performance audit of the Australian Taxation Office rulings for example, in publications

from the United Kingdom Office of Science and Technology (1997 and 2005) on the use of scientific advice in policy, and as attributes of an effective administrator (Rosenthal, 1973). Thus, these elements for quality of advice are those that are often accepted by governments and consequently are included in the model described in Table 2.1. The strategic and operational elements for quality provided in Tables 2.1 and 6.1 are used for the analyses in this study.

There are similarities in the systems and processes used to provide technical advice for petroleum E&P regulation in Australia and US. There are also some key differences due to the greater age and size of the US industry and the different political structure under which the respective industries operate. A detailed comparison of the systems practices and issues for managing technical advice in Australia and the US is provided in Chapter 6 and is summarised in Table 6.1. Stated below are the conclusions of the analysis.

Strategic Elements for Quality in Technical Advice: Some Comparative Factors

A key strategic difference between the US and Australia in technical advice and regulation of the offshore petroleum industry E&P is the higher systemic level of stakeholder involvement that can occur through the US Congressional system compared to that in the Australian 'Westminister' system. In Australia with the direct connection between the regulatory department and the minister, stakeholder involvement may be minimal and except for environmental areas that draw public scrutiny, can often be restricted mainly to communication between government and companies and industry peak groups. In the US the robust committee processes include Congressional Appropriations Committees and Congressional Technical Oversight Committees along with the broad representation of the legislated Advisory Committees (Cardozo, 1981) can allow the public, stakeholders and external experts to input to the regulatory process. These key difference between Australian and the US political and committee systems can impinge particularly on strategic aspects of policy advice analysed in this study, namely on transparency, openness and accountability.

In both Australia and the US because costs and benefits for the petroleum offshore petroleum (E&P) industry are concentrated mainly in the companies involved but also in revenue to government, industry capture of regulatory agencies is a real possibility (Wilson ,1980; Weaver, 2003). Wilson (1980) in discussing the politics of regulation refers to such situations involving concentration of costs and benefits as 'interest group politics' and Weaver (2003) deals with the associated classic pattern of industry capture of regulatory agencies. The Australian offshore petroleum (E&P) industry maintains and often refers to its good relationship with the Government. Technical advisors to offshore petroleum E&P regulation in both countries also often have backgrounds in the petroleum industry. Further, the industry is seen as nationally important in both countries. Consequently, a level of capture of both nations' petroleum regulators by industry seems almost inevitable. Environmental regulators and their technical advisers however, which also affect the petroleum industry in Australia could experience some level of capture by their constituencies including environmental NGOs because of shared values. Such a situation may in fact promote an overall enhanced balance in petroleum E&P policy making and regulation.

Structures designed to militate against capture and provide for transparency in regulation and accountability for regulators are better developed in the US compared to Australia. Transparency into the actions of US regulators is enhanced through the Committee structures described above, and the scrutiny of the US General Accountability Office (GAO) and the Congressional Budget Office. In Australia Parliamentary Estimates Committees and the possibility of Royal Commissions allow for transparency but can be less comprehensive as policy matters are usually deferred to politicians. At the departmental level in Australia working groups allow for transparency for industry and government and occasionally for environmental NGOs.

Transparency, openness, and accountability in regulation and associated technical advice in both nations are also enhanced through formal and informal interactions with industry. Openness is further enhanced through the committees referred to above and through public posting for comment of rules (in the US) and Regulatory Impact Statements (in

Australia). Overall, as shown in Table 7.1 below, the benchmark both strategically and operationally sets demanding standards of behaviour.

Operational Elements of Quality

Another major difference between Australia and the US is the greater number of researchers and research agencies and the greater breadth of technical research fora, products and advice on topics relating to petroleum E&P. This is due mainly to the greater age and size of the US industry. The result is that use of expertise and peer communication, that are operational quality elements for the analysis in this study, can be greater in technical advice for government regulation of the US petroleum E&P industry than for regulation of the Australian industry. Both nations however rely heavily on the expertise in technical advising that is retained in their regulatory agencies (the Minerals Management Service in the US and the Department of industry, Tourism and Resources in Australia).

The time required for adequate scientific enquiry to provide technical advice for government regulation of the offshore petroleum E&P industry remains an issue in both the US and Australia. Measures for timeliness however include timelines in research contracts in the US and timelines that are agreed by government and industry for some elements of technical advice in Australia. The matter of timeliness affects policy making in both the short-term (quick-fix crisis management) and long-term (science break-through forecasting). Governments are more adept at the former than the latter but both need to seek advice from technical experts.

Comparative Status of Elements of Quality

The comparative status of elements of quality between Australia and the US that is identified in the analysis is shown in Table 7.1.

Criteria	High	Medium	Low	Criteria
Strategic Transparent	US	AU		Opaque
Open	US	AU		Closed
Accountable	US	AU		Obfuscating
Operational Use of Expertise	US	AU		Generalist
Timely		US/AU		Untimely
Peer Communication	US	AU		Legitimizer

Figure 7.1: Elements of quality in technical advice for Australia (AU) compared with US (US)

Limitations of the study

The study concludes that some of the main challenges facing particularly strategic elements of quality (transparency, openness and accountability) for technical advice in Australia are inherent in its Westminister form of government. This study does not note any particular successes in technical advice for regulation by the United Kingdom's Westminister Government but does note well known regulatory difficulties relating to disposal of the Brent Spar floating petroleum storage, Mad Cow Disease, and dealing with the cultural differences between regulatory and technical advice staff (Edwards, 2004).

The study also focuses on a group within Geoscience Australia which provides technical advice for regulation of the offshore petroleum E&P industry. This group within the Department of Industry Tourism and Resources provides part of an example of how technical advice should be used for regulation (CEO Geoscience Australia, pers. comm.,

2004). This means that additional potential benefits from undertaking a study relating to a different more problematic area of technical advice for regulation of science-based industry needs further consideration. The author also acknowledges the difficulties associated with him researching an area where he is a participant commentator, including the possibilities of group think and advocacy.

Suggestions for Improvements in Processes for Quality in Technical Advice

Suggestions for the improvement in quality in Australian processes for technical advice would aim generally at mitigating the tendency to secretiveness in its Westminister system of government. For strategic elements of quality (transparency, openness and accountability) suggested improvements would include processes for greater inclusion of diverse societal and associated technical inputs which government officials perhaps in the interest of efficiency would prefer not to include. For operational elements of quality (use of expertise, peer communication and timeliness) suggested processes for improvement would include measures to ensure greater use of the appropriate depth and range of peer–reviewed scientific expertise in formulating technical advice (considering the stress of low staff availability) so that conventional quality management standards are clearly met even when this would not be particularly visible when following the conventional regulatory process.

Suggestions for Further Research

Apparent during the research was the absence of studies on meso-managing the quality of the technical advice that is a daily component of regulation of science-based industries. This may be the result in part of the 'turf tensions' that can result from cultural differences between regulators and technical advisers (Edwards, 2004). Meeting the challenges of providing technical advice, however, as a component of good quality regulation of science-based industry is clearly a component of good government.

Consequently additional studies of managing technical advice for other science-based industries could provide a worthwhile contribution to our knowledge of such matters. In similar studies comparisons with a benchmark could use either the high-medium-low (H-M-L) method as in this study or the often-rarely-not applicable (O-R-NA) method as appropriate. Research may also benefit from multidisciplinary studies involving psychological components. Ultimately, the topic is complex but worthy of further study particularly since long term requirements will almost certainly exist for good quality technical advice for the regulating nationally important science-based industries.

AUTHOR DETAILS

Dr Paul Williamson obtained a PhD in marine geophysics from the University of New South Wales. He then worked internationally in petroleum exploration and production (E&P) with the US multinational petroleum company Mobil Oil for the first phase of his professional career.

During the second phase he researched Australian petroleum prospectivity with the Bureau of Mineral Resources in the Australian Department of Primary Industry and Energy, and promoted Australian petroleum prospectivity internationally.

He was from 1990 the Associate Director in the Bureau of Mineral Resources in the Department of Primary Industry and Energy, responsible for technical advice for offshore petroleum E&P regulation under the Petroleum Submerged Lands Act. He continued in that role in the Bureau of Resource Sciences in the same department. The Bureau of Resource Sciences was a multi-disciplinary research agency that provided scientific advice to policy in areas including agriculture, fisheries, forestry, quarantine, animal health, minerals and petroleum.

In 1998 he was Group Leader of the offshore petroleum E&P advice area in the Australian Geological Survey, in the Department of Industry Science and Resources.

In 2005 he was appointed Group Leader of Innovation and Specialist Services in Geoscience Australia, a role in which he retained responsibility for technical advice for petroleum E&P data issues under the Petroleum Submerged Lands Act.

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Table A.1: Stages of the Policy Cycle and their Relationship to Applied Problem Solving (after Howlett and Ramish, 1995)

Stages in Policy Cycle	Phases of Applied Problem Solving
1. Agenda Setting	1. Problem Recognition
2. Policy Formulation	2. Proposal of Solution
3. Decision Making	3. Choice of Solution
4. Policy Implementation	4. Putting Solution into Effect
5. Policy Evaluation	5. Monitoring Results

Table A.2: Key International Environmental Laws and Principles

Principles

Sustainable Development

Laws – Nature

World Heritage Treaty 1972

Regional Nature Treaties

Convention on Wetlands of International Importance (and wildfowl habitat) 1972; (Ramsar)

Convention on Biological Diversity 1992

Convention on International Trade in Endangered Species 1973 (CITIES Convention)

Convention on Conservation of Migratory Species 1979 (Bonn Convention)

World Charter of Nature 1982

Mandate on Marine and Coastal Biological Diversity (Jakarta) 1995

Laws - Marine Resources

Law of the Sea Treaty 1982

International Convention for Regulation of Whaling 1946

Agreement to Promote Compliance with Conservation and Management Measures by Fishing Vessels on the High Seas

FAO International Code for Conduct of Responsible Fisheries 1993

Laws – Industry

EIA Conventions

Water Qualities Treaties

General Agreement on Tariffs and Trade (GATT)

Regional Free Trade Treaties

Basel Hazardous Waste Convention

Regional Hazard Waste Treaties

Marine Dangerous Goods Code (IMDG Code)

Treaty Banning Nuclear Weapon Tests in the Atmosphere in Outer Space and Under Water

Convention on Long Range Transboundary Air Pollution (LRTAP)

LRTAP Heavy Metals Protocol

International Convention on Prevention of Marine Pollution (London Convention) 1972 and 1996 Protocol

Laws – Regional

Regional Seas Treaties

Antarctic Treaty (United Nations, 1959)

Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Protocol for Environmental Protection to the Antarctic Treaty 1991/ Madrid Protocol

Air Qualities Treaties

Convention for the Protection of the Ozone Layer 1985 and Montreal Protocol 1987

Climate Change Convention 1992

Other

National Court Decisions

Multilateral Development Bank Guidelines

Development Assistance Agency Guidelines

Stockholm/Rio Principles

Agenda 21

UN Programmes

Regional IGO Programmes

Mining Industry/ Private Sector Codes, including

- Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the Exclusive Economic Zone
- International Convention on Civil Liability for Oil Pollution Damage (CLC)

ISO 14,000 Standards

Appendix 1: Organisations where interviews were held

This study

USA

Minerals Management Service (Petroleum)

Australia

Department of Industry Tourism and Resources

Department of the Environment and Heritage

Senior Executive Fellowship study (1997)

US

Department of Agriculture

Environmental Protection Agency

Food and Drug Administration

National Aeronautics and Space Administration

Nuclear Regulatory Commission

United Kingdom

Agriculture and Development Advisory Service

Department of Environment

Department of Trade and industry

- Oil and Gas Division
- Office of Science and Technology

Ministry of Agriculture, Fisheries and Food

Greenpeace

Science Unit

Japan

Ministry of International Trade and Industry

- Agency of Natural Resources and Energy
- Chemical Goods Safety Division
- Agency of Natural Resources and Energy
- Industrial Policy Bureau

Japan National Oil Company

Other

Chile Ministry of Mines (Energy)

Chilean Copper Commission

Appendix 2: Questionnaire Used for Interviews*

- In what areas do you provide policy advice?
- For which of these policy areas is scientific advice required?
- What types of scientific advice are provided?
- How much scientific advice is required?
    - Large or small elements of advice?
    - Number of advisings?
- How do you ensure the scientific advice is objective?
- How do you ensure the scientific advice is useful?
- Which organisation(s)/scientists provide this advice?
- How is communication with these organisations/scientists carried out?
- What other scientific advice would be useful to you?
- How do you choose organisations/scientists to provide you with scientific advice?
- How do you ensured the scientific advice is received in a form useful for policy development and implementation?
- How is it ensured that the scientific advice is of good quality?

- How do you ensure the advice is timely?

- How important is it that scientists providing policy advice are experienced in this activity?

- How do you ensure the cost of your scientific advice is acceptable?

- How do you ensure the scientific advice is acceptable to government, industry and the community?

* To be consistent with usage in this study, in the above the word ‘policy‘ would be replaced with ‘regulation’, and ‘scientific advice’ would be replaced with ‘technical advice’

Appendix 3: Types of Technical Advice for Regulation under the US Offshore Continental Shelf Lands Act

Below is a summary of the types of technical advice used for regulation by the MMS:

- In-house advice in support of development of policy and regulation;
- Advice on day-to-day regulation, including licensing;
- Describing the scientific rationale for and implications of regulatory decisions;
- Defining the gaps in scientific and engineering data;
- Explaining the scientific and technical bases for differences of opinion of various stakeholders;
- Monitoring the performance of industries;
- Risk assessments;
- Advice on mitigation of risk;
- Reports on occurrences and reasons of severe accidents;
- Research reports in support of development of regulation, from in-house and joint studies with universities or research organisations;
- Coordination of research;
- Assurance of quality in contracted research for government;
- Advice on sustainability of resource bases and industries;
- Cost benefit analyses for planning development of regulation;
- Monitoring developments within industries including new technologies to allow timely development of regulation;
- Recommending future directions for technical advice for regulation and setting time lines;
- Diverse ad hoc advice.

In addition, Bromley (1993) in a paper on the theory and practice of giving technical advice to government indicated that during the Bush Administration, technical advice in federal agencies increasingly included advice to other agencies.

Appendix 4: Providers of Technical Advice for Offshore Petroleum E&P Regulation

- In-house technical advisers
- In-house researchers
- Advisory Committees
- Companies
- NGOs
- The public
- Research organisations
- International governmental regulators
- Consultants
- Workshops
- Review Panels
- Universities
- Industry peak bodies
- Industry Associations
- Technical associations
- Literature

Appendix 5: Technical Advice Provided for the Australian Petroleum (Submerged Lands) Act (P(SL)A)

The regulatory processes for offshore petroleum E&P under the P(SL)A require a range of technical advice. This includes:

- Advice in petroleum policy development including advising for amendments to the Act, regulations and associated guidelines;
- Technical description of gazetted permits offered for exploration under the work program bidding system;
- In award of permits, advising on the bidder that has bid the work program that will best advance the exploration of the permit;
- Assessing equivalent or superior value of variations requested by industry, to primary-term work programs on exploration permits;
- Assessing the application for the 'location' over a discovery of oil and gas;
- Assessing the application for a retention lease if a petroleum field cannot be developed in the short term;
- If production is intended, assessing the stages of an application for a production licence;
- Assessing applications for licences for gas or oil pipelines;
- Assessing potential environmental impacts of proposed E&P activities to ensure that impacts will not be significant or long lasting. This is a test under the P(SL)A. Now technical advice is also requested by DITR for the Department of the Environment and Heritage in applying the Environmental Protection and Biodiversity Conservation Act (EPBC) that has broad application;
- Advising on objectives based management plans by companies. An example is data management plans. Because of the high technical content of activities by petroleum explorers and producers, technical advice is needed by government both for vetting company management plans prior to implementation and in monitoring company performance against the agreed management plan;

- ‘Statement of reasons’ that include technical advice to respond to inquiries by companies contemplating legal action through the Administrative Appeals Tribunal;
- Diverse ad hoc advice.